From Defense to Development?

International perspectives on realizing the peace dividend

Edited by Ann Markusen, Sean DiGiovanna and Michael C. Leary

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From Defense to Development?

In the 1990s, worldwide military spending plummeted by almost 40 percent. This peace dividend became available for investments in clean water, agricultural productivity and education, among others. Despite renewed upward pressure on military spending in the twenty-first century, a decade of quickened civilian investment enabled lasting payoffs for people around the world.

This impressive book tracks the mixed progress of twelve countries on five continents in moving resources from defense to civilian activity in the 1990s. Based on intensive field research, thanks to its truly international array of contributors, the book addresses each country with an impressive standard of scholarship.

This accessible book is written in nontechnical language and will be of great use and interest to academics involved with defense economics, defense studies and development studies. It will also prove popular with international development organizations, the defense industry and policy-makers around the world.

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Similarly, Markusen's Senior Fellow position at the Council on Foreign Relations, where she ran a series of study groups on defense conversion from 1995 to the present, offered us a forum of testing out our thinking on a broad range of analysts, conversion activists, industry managers, military personnel and policy-makers. In 1999, all the authors in this volume presented their studies to a double session of the Council's Roundtable on Defense Industrial Downsizing and Conversion at the Council in Washington and to a working group of economists at the World Bank. The following year, we presented them to a group of academics, NGO's and UN officials in New York at the invitation of the Ford Foundation. Our final analysis owes much to the feedback from the lively participants at these sessions. We would like to express our deep gratitude to Council on Foreign Relations President Les Gelb and Studies Directors Ken Keller, Gary Hufbauer,

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This effort followed on four years of similar work in disparate regions of the US, documenting the potential for, and realization of, defense conversion on shuttered military bases and in large military industrial complexes from Boston, Long Island, Key West, St Louis, Los Alamos, to Los Angeles and Seattle. Our framework for understanding the formidable challenges of defense conversion was enriched by these studies and by the team members participating therein: Joel Yudken, Catherine Hill, Jonathan Feldman, Mia Gray and Elyse Golob.

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Introduction

If there is a single turn-of-the-century trend that gives us hope from household to world scales, it is the phenomenon of conflict resolution and its companions, cooperation, education and investment – in place of war, destruction and privation. The 1990s were a period of remarkable progress in peaceful transition in the world, from South Africa to the former Soviet Union, to somewhat more tentatively, Northern Ireland and the Middle East. Spending on the military plummeted almost 40 percent worldwide. Although tensions and a worrisome rise in militarism are still percolating in the world, our knowledge and practice of conflict resolution has expanded enormously. Almost all people, even our military leaders, would agree that investments such as clean water, agricultural productivity and above all, education, are far more powerful in achieving human welfare than spending on war and defense.

The 1990s offer us an opportunity to assess the ease and difficulty with which a peace dividend can be realized. How well did former protagonists manage to reorient resources freed up by the cessation of hostilities, towards human and economic development? The comparative studies of military industrial downsizing and conversion contained in this book address this question. We choose for comparison countries that made particularly large investments in indigenous military industrial capacity over the previous few decades. Each author examines the extent to which his or her nation was able to cut back on military spending, how it reallocated freed up resources and whether it was able to reign in its military industrial complexes and why. We pay particularly pointed attention to industrial capacity rather than the downsizing of the armed forces and military bases, although these latter are also worthy of study.

Our country studies are unusual for an edited collection because the authors worked together to design a comparable framework for analysis and field research and we worked together to implement it and analyze our results. We spent one year building a common base of knowledge about the phenomenon of defense as an economic activity in disparate societies, noting too the roles played by the security situations of each nation. Each author sought knowledgeable analytical partners in each country – academics, defense analysts at public and private research institutes, marketplace watchers. We then designed a field research component appropriate for each case and spent six months making preparations for site visits and

interviews. Each researcher spent one to three months in the field over the summers of 1997 and 1998. Once reassembled at Rutgers, we shared and analyzed our data and made efforts to fill in where important information appeared to be missing.

Despite this labor-intensive research design, the discriminating reader will detect differences in the adequacy of our findings. Some researchers faced formidable resistance on the part of informants or difficulties in identifying them. Our research associate, Sudha Maheshwari, arrived in India just after the resumption of nuclear testing and found most doors closed to an Indian researcher working out of an American university. In Argentina, Graciela Cavicchia found the military industrial complex already dismantled and largely abandoned through a poorly managed privatization, making documentation difficult. In general, the more successful the country was in its diversification effort, the easier it turned out to be to identify key individuals to talk about it. Israel, for instance, was a researchers' dream.

Despite these difficulties, we are confident that our studies reveal the basic outlines of defense spending reform and of military industrial restructuring. We show that a plurality of causes – the nature of perceived threat and strategic response, the stature of the military in the country's psyche, the development agenda of current political regimes, whether the defense industrial base is publicly or privately run, the degree of diversification within defense firms and establishments, the degree of regional dependency on defense spending – conditioned the response of governments to the extraordinary opportunity for change that the 1990s offered. Some of the countries studied moved quickly and efficiently to dismantle their unneeded defense production lines and move resources into other productive work, while others failed to do so, protecting relatively large and uncompetitive military industrial assets at considerable public expense. Still others cut military spending and shuttered plants but failed to do so in ways that husbanded the resources released.

Military spending and commitments will continue to fluctuate well into the twenty-first century. It is our own belief that investments in human talent, productive capacity and environmental preservation will prove much more powerful than investments in weapons. Our studies demonstrate the cost to countries of not taking advantage of an era of relative peace to reorient priorities. For countries that have the will and leadership to make this shift, we show in a fine-grained and politically nuanced way the potential and pitfalls of moving from defense to development. We highlight cases where conversion and diversification work, and we show why. Even though the global project of peace and development may be set back in some regions for some periods, we hope that these studies offer a set of roadmaps for countries who wish to demilitarize their economies in the future.

1 From defense to development?

Ann Markusen and Sean DiGiovanna

Introduction

In the second half of the twentieth century, many smaller industrialized nations and larger developing countries built substantial military industrial complexes. They did so for diverse reasons – to ensure supply in the face of regional threats (South and North Korea, Israel, Egypt), to chart a third course between the superpowers (China, India), to overcome arms embargoes (South Africa) and for reasons of national pride. Often, the resources devoted to maintaining these industries were committed at the expense of other civilian development needs in social services, education, and public infrastructure.

When the Cold War ended, these countries enjoyed an exceptional opportunity to reassess these assets. In the years after the fall of the Berlin wall, the Cold War protagonists lowered their own commitments to military preparedness from 90 percent (Russia) to 30–40 percent (the US and western Europe). This prompted a globalization of the defense industry, as US and European companies began to merge across national borders and State-subsidized and aggressive arms marketing efforts successfully increased these countries' domination of the world arms market. In response to these developments and a diminution of security threats, many of the second tier countries cut back on defense spending and undertook significant downsizing and restructuring of their defense industrial facilities. Many tried to move people, know-how, plant, and equipment into civilian activities.

In this book, we analyze the relative success of eight countries in doing so: Argentina, China, India, Israel, Poland, Spain, South Africa, and South Korea. As a group, these countries all lowered their expenditures as shares of GDP (Table 1.1), and a half of them cut expenditure levels absolutely (Figure 1.1). For comparison, we also include a similar review of the United States, relevant not only because of its size and official commitment to conversion but also because its premier role in the military industrial world made it a natural model to which other nations looked for leadership. We rely on intensive study of the defense industry in each country, interviewing enterprise managers, government officials, industry watchers, and academics to probe what has actually taken place and how policy has shaped the results. Our team of authors worked to a common framework and spent time

Table 1.1 Military expenditures as a percentage of GDP

Case study countries	*1990*	*1999*	*Change*
Israel	12.3	8.1	−4.2
South Africa	3.6	1.3	−2.3
Republic of Korea	3.7	2.8	−0.9
Poland	2.7	2	−0.7
China	2.7	2.1	−0.6
Spain	1.8	1.3	−0.5
India	2.8	2.4	−0.4
Argentina	1.3	1.5	0.2

Source: SIPRI, 2002.

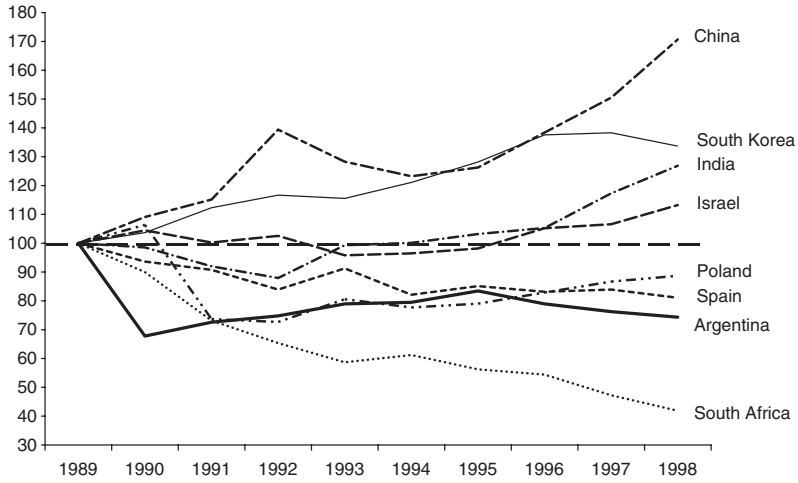


Figure 1.1 Index of military expenditures in the case study countries during 1989–98.
Source: SIPRI, 1999.

in the field in each of these countries, comparing notes before, during, and after on-the-ground research.

We show that the range of experience among these countries has been extraordinary. Countries like Israel, South Korea, and Spain have been relatively successful in moving military technologies, personnel and facilities into civilian markets, similar to the German experience and better than in the Unite States. At least two countries did poorly – Argentina dismantled its defense industry but was unable to parlay its assets into other productive activities, while India has done little to further conversion aims despite the costly burden of an antiquated armaments sector resulting in an increasing need to purchase quality military goods abroad. In China, Poland, and South Africa the results are mixed. Each has made some progress in moving redundant military industrial resources into other spheres of development but each faces formidable problems in the process.

What accounts for these differences? We explore the extent to which differences in industry and enterprise structure, product lines, and public versus private ownership shape relative success. We also examine the extent to which external factors – regional security considerations, international military cooperation, and the changing global industry and arms trade – have encouraged or constrained the choices that countries and defense industrial managers have made. Most importantly, we demonstrate how critical national commitment and leadership has been to success.

We conclude that progress in moving from defense to development in the 1990s was uneven and incomplete. Much remains to be done. Fortunately, the world continues to be a relatively peaceful place. Many conflicts have been ameliorated through negotiation. Economic development and democratization are increasingly seen as essential to real security. It should be relatively easy to continue to retire defense industrial capacity that is not required, and it is important to do so when the alternative may be weapons proliferation that feeds potential regional conflicts. We conclude our book with the inferences from our research for nations and international organizations demonstrating how hard-headed capacity assessments, effective conversion programs, international cross-learning and pro-conversion incentives can speed up the project.

Setting the stage, asking the questions

Since the late 1980s, the worldwide military spending has declined by nearly 30 percent, while procurement orders for military output fell by nearly 40 percent. Official trade in arms fell by a remarkable 40 percent. With the exception of a group of East Asian countries, most nations cut spending, some more than the others. These abrupt changes reflect the marked decline in perceived security threats following the end of the Cold War, as well as progress in resolving civil wars and regional conflicts in areas such as South Africa and the Middle East. In the beginning of the decade, many governments stated their preferences to use scarce national resources for investments in education and infrastructure, for social services and to induce private sector investment. This impetus was amplified by advice and incentives from the World Bank, the IMF, and the United Nations.

Nevertheless, in many countries, a strong constituency for military spending and military industrial investment and production has persisted. In the United States, a strong industry lobby and galvanized defense communities successfully resisted a return to pre-Cold War spending levels. Often, too, investment in a domestic defense industry was considered good development economics – a form of import substitution, a means for technology transfer, and a potential source of industrial know-how and export earnings in the future.

These beliefs persisted into the 1990s from France to South Africa to Russia, despite evidence that spin-offs from military sectors have been losing ground to innovations in commercial electronics and communications sectors (Alic *et al.*, 1992). These interests and views created "supply side resistance" to defense downsizing, hampering a defense to development agenda (Markusen, 1997). Such pressures were

more or less successful depending upon the particular regime in power at the time. A difference between, say, Republicans and Democrats in the United States could and did make a major difference in the efficacy of such resistance and in the relative success of conversion policies.

Given this context, we focus on the restructuring of domestic defense industries rather than on the macroeconomic allocation of the peace dividend for several reasons. First, we assess the extent to which extant military industrial complexes have acted as effective sources of resistance to the otherwise optimal military spending cuts, as they appear to have done to a greater or lesser degree among the major Cold War protagonists.

Second, we review how well and how quickly each economy absorbed the resources displaced from military production and the extent to which explicit policy has been responsible for the pace and outcome. We believe that "on the ground" scrutiny of the reuse of these resources yields insights, which are more useful to the policymaker than macroeconomic analyses of resource reallocation.

Finally, we are interested in the extent to which talent, technologies, and physical capital released from military production have contributed to emerging competitive advantages for other sectors in these nations' economies. It is only possible to see such effects by studying key military industrial sectors and the trajectories of their assets in the process of transformation. Our research complements that of other scholars focusing on the macroeconomics of the peace dividend (Gleditsch *et al.*, 1996; Brömmelhörster, 1999) and tracking the changing international division of labor in weapons production (Bitzinger, 2003).

At the heart of the research conducted for this book are three major questions. First, how have national governments changed their defense priorities and procurement strategies as a result of the end of the Cold War and in the new global security environment? Did governments develop consistent restructuring policies, and to what extent was defense conversion explicitly incorporated? Second, how have defense industry firms responded to changing defense procurement budgets? Did firms actively resist defense budget cuts (supply-side resistance)? Have firms been able to convert military resources to successful commercial production, either through internal product development or by aiding managers, workers, and technologies to move into new units? Finally, how have defense-dependent regions fared and have regional adjustment strategies contributed to the realignment of their industrial structures?

In the chapters that follow, each author/researcher attempts to explain conversion as functions of security, economic, political, military, and cultural circumstances and of intentional behavior on the part of government actors, firms and other agents. At the close of each of the chapters, the authors suggest ways in which policymakers and other concerned parties could improve the policy environment in which defense industrial restructuring is taking place. Each also reflects on his or her countries' experience as lessons for other countries grappling with similar circumstances.

In the rest of this introductory chapter, we review briefly the experience of three additional Cold War protagonists – Germany, France, and Russia, to help set the stage for our more in-depth studies. All nine of the study countries are associated through bonds of security alliance and/or hostility with several of the major

powers, and their evolved military industrial complexes bear the markings of such patronage or antagonism. For developing countries and smaller players in the developed world, the post-Cold War behavior of their former patrons has played a significant role in shaping their "room to move" in the 1990s. We document an emerging and relatively new international division of labor in weapons production and trade in which the major powers have strengthened their control of the weapons' platform market while others increasingly jockey for position as component and subsystem suppliers. We then offer a working definition of successful conversion and lay out a number of theses about political, industrial, security, and regional determinants of conversion progress. We end this chapter with a succinct statement of our most important findings.

Cold War protagonists' defense conversion progress

The countries studied in this book are embedded in a global economic and security environment in which their options are constrained by their relationships with the major Cold War powers and by their own regional security situations, internal defense-industrial structures, and economic geography. The chief Cold War protagonists – the United States, Europe, and Russia – responded to the end of the Cold War with divergent defense industrial plans and with quite distinctive strategies for use of the resources previously devoted to preparedness. They also faced dramatically different constraints and institutional problems in this project. Comparisons among them enable us to highlight differences in effort and achievement and to speculate on structural and behavioral explanations that may also hold in the case of developing countries. We review here two distinctive European responses – Germany and France, and then the United States and Russia. We suggest that Germany, relatively speaking, is a "best practice" case, with each of the others confronting greater difficulties.

Germany

In the ten years following the end of the Cold War, Germany was able to cut its defense budget much faster and deeper, in relative terms, than the other western allies. Much of Germany's security effort had been bound up in defending the frontier between East and West, with unusually large concentrations of spending in military personnel and operations. After 1989, priorities shifted dramatically from defense to stabilization. Germany's rapid build-down was also a response to the strength of other public sector imperatives, particularly the project of reintegrating East Germany into the reunified German nation. Tens of billions of dollars were needed for that effort, and the defense budget was the logical source in a fiscally austere era – in the early 1990s, approximately 6 percent of annual German GDP was spent on East German reintegration compared with 1.6 percent on national defense. Bases that had housed American, British, and French soldiers in the west were rapidly liquidated and devoted to new uses, though the record has been less salutary in the former East Germany, where base closure is far from complete.

On the military industrial front, Germany's defense firms were by design less defense dependent and less geographically separate from centers of civilian production than in the United States or Russia. Thus Germany faced less resistance on the part of defense contractors and host communities to rapid demobilization. Large firms like DASA, which accounts for a huge share of the German military industrial procurement, are only modestly defense dependent, and have been able to concentrate their efforts on commercial activities such as Airbus. The only glaring exception has been the success of the German aerospace industry in securing a continued, large national commitment to the controversial Eurofighter (Voss and Brzoska, 1996).

A strongly federalized nation, the central German government adopted a laissez-faire stance *vis-à-vis* firm and community adjustment (Brzoska *et al.*, 1999). Local and regional organizations assumed the leadership role in economic redevelopment. Because displacement from non-defense sectors was equally severe in the East, displaced defense workers and communities were not seen or treated differently from the structurally displaced in general. They were able to rely on existing generous federal structural programs for interim jobs, retraining and local economic development, as well as European Union funds (Konver I and II) targeted on defense conversion (Brömmelhörster, 1997).

The German conversion process has not been without its failures. It has been difficult to find uses for former military bases in relatively remote locations. In regions which specialize in tanks and shipbuilding, deep cuts have not been countered with comparable new activities. The reliance on regional leadership has meant that more affluent and experienced regions are quicker to respond and find it easier to assemble redevelopment resources. North Rhine-Westphalia and Bremen, for instance, facing base closings and loss of defense contracts respectively, have been aggressive and creative in their responses, while areas in the former East Germany, with little or no regional expertise and no experience with market-driven restructuring are at a distinct disadvantage (Elsner, 1995; Lindemann and Schirowski, 1997). Most military enterprises in the East went out of business within a few months of the fall of the Berlin wall, and very few of the nearly 100,000 jobs were saved through conversion and orders to destroy old weaponry. Nevertheless, Germany is in many ways a "best practice" case. Its relatively diversified defense industrial sector and its in-place structural programs helped lower resistance to defense cuts and facilitated efficient German redeployment of public sector resources.

France

France was slower to cut military spending in the post-Cold War period, lagging behind the other major western countries by about five years. Outlays declined in France only after 1993 and more rapidly thereafter, falling 8 percent in the period 1994–96 (Skoens and Gill, 1997; Markusen and Serfati, 2000). One scholar estimates that the lag cost France as much as $70 billion dollars in additional debt burden (Auffrant, 1996). Compared with Germany, a larger share of the French military budget was devoted to procurement and proved more difficult to downsize, for several reasons.

In France, the military industrial complex has played a pivotal role in the larger economy with the aircraft, communications, electronics, and nuclear sectors receiving disproportionate shares of public investments in R&D, considerable protection from international competition and significant export promotion assistance (Hébert, 1997). This explicit industrial policy resulted in a form of "constructed comparative advantage" in the nuclear, aircraft, and weapons industries, which have been major contributors to the French trade balance. Most of the contemporary large defense firms had been nationalized since the 1930s, nurtured as national champions (Kolodziej, 1987: 236). Defense conversion was sidelined in the 1990s by the need to both privatize and to merge firms to compete with the ever more giant American competitors (Le Blanc, 1998).

Despite dual use ambitions, the French industry had remained quite defense dependent. Moreover, it lacked the small and medium-sized firms that other countries, especially the United States, were able to rely on for commercialization (Markusen and Serfati, 2000). The French government has offered few incentives to firms to move in a dual use direction, nor has the French government shifted funding of technology programs away from defense in any meaningful way. Major new initiatives in aeronautics and space, nuclear and telecommunications sectors are closely tied to defense priorities, channeled to the large defense contractors, and remain the driving force in French technology policy (Serfati, 1997).

In France, conversion policy has chiefly taken the form of adjustment assistance for regions and workers. Over the next six years, the French plan to spend $420 million, supplemented by another $130 million from the European Konver and related programs, for regional adjustment policies, plus another $870 million for social displacement associated with naval and nuclear downsizing, far short of the $8 billion necessary to avoid unemployment (de Penanros and Serfati, 2000). Since the French military industrial complex is still heavily centered in the greater Paris region, it is harder to tap EU finds. Furthermore, the weakness of local and regional government hampers community initiatives. In the outlying shipbuilding-dependent region of Brest/Brittany, the main policy thrust is not conversion or diversification but "to consolidate the presence of defense industries and forces in the regional territory." In this case, central government domination of the regional process actually eliminated all proposed large scale civilian projects which might in any way threaten future military activity (de Penanros and Serfati, 2000). In both regions, relatively high unemployment associated with defense spending cuts has resulted in substantial resistance to further cuts.

The United States

From an unprecedented peacetime peak in the 1980s, US defense budgets plummeted nearly 28 percent in real terms by the late 1990s, mirroring worldwide average cuts in military spending. The cuts were not as rapid as in Germany, but nevertheless proceeded at a speed that made adjustment for firms, workers, and communities difficult, especially since the 1980s buildup had obscured significant deindustrialization in other manufacturing sectors. Because conversion success was

relatively limited, firms and communities remained active proponents of higher defense budgets, which by 1998 had become a reality.

The American defense industry emerged from the Cold War with a two-tiered structure of large, chiefly defense-dedicated firms and a larger pool of supplier firms, some of which bridged commercial and industrial markets. Despite substantial interest in greater civil/military integration in defense production, a rash of mergers in the 1990s reduced the number of large firms by about two-thirds, heightening the degree of oligopolization in various weapons systems. Procurement reform and dual use technology initiatives were undercut by new, more lucrative Pentagon inducements favoring arms exports and defense mergers. Both have encouraged defense firms, especially the largest and most specialized among them, to concentrate on military core competencies, aggressively (and successfully) pursue a larger international market share and to engage in mergers and divestitures which split off military from civilian activities (Oden, 1999; (Markusen, 1999a).

Widespread unemployment was prevented only by the relatively robust economy-wide growth rate, fed by financial markets and new technology sectoral growth. Nevertheless, pockets of severe displacement existed along the "gunbelt," the coast-to-coast arc through the south where the largest defense industrial investments were made over the Cold War period (Markusen *et al.*, 1992). These regions and their workforces were, relatively, poorly served by Federal policy, which offered nothing on the scale of the European KONVER (Oden, 2000). Revamped worker adjustment programs ended up serving only a fraction of those eligible (Powers and Markusen, 1998). A well-run program in the Department of Defense's Office of Economic Adjustment offered planning assistance to communities with military base or defense plant closings. Those communities, particularly in the north-east, which had had past experience with structural decline, were in a better position to mobilize state and local resources and expertise to tackle redevelopment (Hill and Markusen, 2000). We review the US experience at length in Chapter 2.

Russia

The Russian case is unique in the post-War period, just as the US case is – the two represent the outlier cases in terms of the "fruits" of victory and loss in the Cold War. In the ten years ending in 1996, when worldwide military expenditures fell by 31 percent, Russia's fell by 87 percent (Bonn International Center for Conversion, 1998) as the discredited military industrial effort gave way to other pressing priorities under the twin processes of democratization and marketization. The decline was precipitous and catastrophic for establishments and workers. Government and market shifts in demand to the civilian segments of the complex did not materialize, military technology did not rapidly diffuse to create new sectors, the arms export strategy was a miserable failure, and an expected inflow of capital investment never arrived (Gonchar and Wulf, 1997).

The size of the complex presented an enormous challenge. One researcher has estimated that the true size of the Soviet military industrial complex, not counting those in the armed forces, was about 10–12 million – somewhere between

10 and 20 percent of the nation's labor force worked in arms production at the end of the cold war (Gaddy, 1996: 23–4). In the midst of the ensuing chaos, the government chose to cut procurement and research faster than military personnel, deepening the industrial crisis, while managers chose to cut output less rapidly than orders and to maintain workers on the payroll, in large part because social services (housing, kindergarten) were tied to the workplace (Gonchar, 1998). More recently, Russian defense industrial base policy has encouraged consolidation and concentrated remaining procurement orders on a small number of elite enterprises which are as a result relatively successful in civilian markets as well (Gonchar and Wulf, 1997). Government failure to thoroughly privatize, with enterprises instead falling into older manager's hands while outside ownership is blocked, has resulted in larger chunks of redundant capacity staying in business (O'Prey, 1995).

Although the military industrial complex had commandeered the best of the professional and engineering corps over the decades, its industrial structure proved difficult to reorient. Publicly owned and managed through a command system, the structure was atomized and vertically disintegrated with little supply chain coherence. The design bureaus were organizationally and spatially separate from production facilities, as were components suppliers from systems integrators. Post-War reconstruction had sited many of the newer facilities in far-flung regional outposts, a very expensive process that exacerbated the coordination problem, and as more modern plants were built, older ones were never retired. Most factories had been "dual use" producers, but their civilian lines had been treated as second-class operations. Abruptly opened up to international competition, their consumer product lines floundered. (In autos, where the market has been protected, several former defense plants have become quite successful producers.) As defense output fell, civilian goods output fell as well, confounding expectations (Gonchar, 1998).

Some sectors did better than others in this process. Space and nuclear power, both still beneficiaries of government investment and stewardship, did quite well. Shipbuilding and aircraft losses were not as deep as in tanks and ordnance. Of all sectors, electronics did the worst, a testimony to the failure of the Soviet military industrial complex to replicate the semiconductor/computer/software revolution in the West. With personnel cuts of around 75 percent, some new firms were formed, but these are principally engaged in trade and informal economy activities, not in harnessing defense technologies and know-how to civilian production. Some managers remaining in the sector have shown remarkable entrepreneurial energy and resourcefulness under the conditions (Gonchar, 1998).

Much of Russia's military industrial difficulties reside in the economy-wide adversities of the period (Gonchar and Wulf, 1997). A financially pressed government could provide neither bridging finance nor buffering orders to ease the conversion process. Foreign investors, leery of most Russian investments, were particularly loathe to invest in the defense industrial sectors. Defense conversion has been thwarted by the slow construction of market economic institutions.

Despite the concentration of defense industrial facilities in certain regions, there has been little regional involvement in the conversion process. None of the regions possessed competence in economic development planning at the outset of the decade. The central government is trying to download defense enterprises onto

regional authorities, particularly to transfer responsibility for social services to that level without corresponding resources. In response, many regional elites have devoted their energies to pursuing higher spending on the military and liberalized arms exports rather than civilian industrial development.

An emerging international division of military industrial labor

All of the countries studied in this project operated within the spheres of influence of the lead Cold War protagonists. In many cases, the military equipment used by their armed forces and the character of their military industrial complexes were heavily shaped by the security, economic, trade, aid, and technology transfer relationships along these axes. In many cases – Israel, South Korea, the United States, the USSR, India, and China – these ties were intense and relatively unique (and changing over time). Our country-study authors constantly reminded us that the military industrial complexes under study were not autarkic, "independent" observations in a universe of such complexes, but have been and continue to be integrally linked with "mentor" nations' policies and defense industrial strategy.

While these relationships were dominated by security considerations during the Cold War, they have become more purely economic in the past decade. As military budgets plummeted in the United States, Europe and Russia, and fewer units of any particular weapons system are affordable, each nation strives to cover the stiff fixed costs of research and development by selling more units to other nations (Flamm, 1999; Gold, 1999). Governments have intensified efforts to market and promote arms exports and to loosen up on conventional arms controls to facilitate them. The United States alone spent nearly $8 billion in subsidies per year in the mid-1990s on arms export promotion (Hartung, 1996).

The result is an acceleration in the rate at which American and European weapons systems are outcompeting Russian and developing world efforts. Country after country, as the studies summarized here show, have abandoned their own efforts to design and build air and naval platforms, and have bowed to the superior quality and lower cost of imported systems, despite the dependence that this brings. The US increased its share of the world arms trade from 30 percent in 1989 to 45 percent in 1990, while France and Britain increased their shares by 14 and 23 percent respectively, in a period when the real value of arms traded internationally *fell* by more than 30 percent (SIPRI, 1997). Most other countries experienced, therefore, a declining share of sales in a declining market. Russia was the overwhelming loser.

But buyer countries have considerable leverage in the marketplace, since they can choose among a number of viable sellers across a number of competing nations. Over time, the device of the "offset" has become pervasive. Countries who have the will and means to purchase weapons can extract considerable concessions from seller nations, either as commitments to build and buy (and transfer technology for) components to the buyer country and/or to purchase other non-related goods in exchange. Complementing their "make or buy" decisions, buyer countries have

to decide whether to take their offsets in the form of military components and subsystems or civilian products. In many cases, the latter may be advisable, because civilian product lines are more income elastic and because the international market for arms is unlikely to pick up much in the near future.

As this process unfolds, a new international division of labor is evolving in which the wealthier nations with large, publicly supported R&D establishments (both corporate and government) continue to design and develop weapons systems and assemble them, while other countries jockey for position in various market niches. The American-designed F-16 is assembled in the United States, Turkey, Korea, and Taiwan with high tech componentry from Japan, Germany, Russia, and Israel and more cost-sensitive and commercially available components from Spain, Poland, Brazil, and South Africa. The process is complicated by the incipient internationalization of the arms industry, as major firms like Lockheed/Martin and British Aerospace seek partners and acquisitions among the military industrial sectors outside their own borders (Markusen, 1999b).

A major challenge for the second tier countries, then, is to gauge the competition, which emanates from within the advanced industrial countries as well as from other newcomers and to anticipate the future of this competition. Some, as we shall see, have done better than others. Bitzinger's work finds the same for a different set of countries (2002). Meanwhile, this economic calculus takes place within a complicated environment where the dominant countries that are customers and competitors are also security partners to a greater or lesser degree. At times, the signals from the agencies in charge of security may contradict those from trade and industry ministries – in the United States in recent years, marked differences in posture towards arms exports among State, Defense and Commerce Departments have become common knowledge.

Hypotheses on the causes of successful conversion

The path to successful conversion is marked by many obstacles and opportunities. Within this context, how do we measure success? In order to compare across such a diverse group of countries, we propose a broad definition of successful conversion as a process which results in a substantial reduction in defense industrial production with minimal economic disruption. Thus, a country in which the defense industry has been completely dismantled, leading to the scrapping of several industrial facilities and severe job loss, has not been successful at defense conversion. At the same time countries that have only partially reduced military output, but that have retained industrial capacity and minimized job loss have achieved some level of successful conversion.

When we started our fieldwork, we hypothesized the following causal relationships between country features and successful conversion. First, the evolved structure of the indigenous defense industry will have a large impact on the success or failure of conversion. Germany was able to reduce military production successfully because most German firms rely on defense divisions for only a relatively small proportion of their sales. Firms, industry groups and unions are more likely to oppose conversion

policy if their economic survival is threatened by cuts in military expenditures due to their inability to shift production to other profitable activities. Thus, defense industries characterized by firms that are more defense dependent will exhibit greater supply-side resistance and less successful conversion outcomes.

Furthermore, defense industries characterized by conglomerates and holding companies will be better able to swallow cuts in defense procurement through the reallocation of workers and resources across their various divisions. In addition, given a shrinking global market and increased competition in arms sales, countries that preserve comprehensive, platform-based defense industries will be less successful than those focusing on component or subsystem production.

A second major causal factor in successful conversion is the presence and quality of public sector management. High levels of state ownership, control, and regulation characterize most of the world's defense industries. Even in nations where military production is accomplished by private sector firms, government policies, and regulations often restrict the options open to defense firms. Thus, public sector planning and policy will influence conversion outcomes. Privatization is one strategy that many governments have attempted. Given that state-owned firms are often ill prepared for competitive markets, a methodical and long-term approach will be more successful than a precipitous sell-off of state-owned assets. Moreover, some countries will succeed in converting without privatization by requiring publicly owned firms to act more like private sector firms and/or by introducing public/private competitions. In addition, those nations in which the public sector invests time and resources in targeted conversion strategies will achieve greater conversion success than those in which the state provides no direction at all.

Third, we anticipated that national security concerns will be an important factor in determining the commitment of countries to conversion aims. Nations in the midst of regional conflicts or tense relations with neighbors will find it difficult to justify military conversion. Likewise, countries where regional tensions have eased will have greater success in pursuing conversion aims.

Finally, the location of the defense industry will influence the character of the conversion process. Industries located in large industrial agglomerations will be less likely to insist on targeted adjustment strategies and their fates will often be indistinguishable from the industrial economy as a whole. On the other hand, geographic concentration of the industry in defense-dependent regions will result in greater resistance to defense downsizing and the emergence of regional conversion strategies.

Conclusion

In the chapters that follow, we review the defense industrial conversion efforts of each of the nine countries and gauge the extent to which each confirms our expectations. In the final chapter, we compare across the set. In a nutshell, we conclude that nations with relatively integrated civil/military sectors have found it easier to shift gears than those with defense-specialized firms. Private sector ownership, in most cases, has made it easier for governments to cut spending faster and redirect resources, although aggressive defense industrial lobbies slow down

the process. Countries who have expertise in relatively specialized and higher technology markets in aerospace and defense electronics find it easier to shift resources to other productive uses than those who are producing heavy equipment platforms such as tanks, trucks, and ordnance. Geographical isolation has made it more difficult to move people and facilities into new activities. Surprisingly, altered security concerns do not map neatly onto conversion success.

References

Alic, J., Branscomb, L., Brooks, H., Carter, A., and Epstein, G. (1992) *Beyond Spinoff: Military and Commercial Technologies in a Changing World*, Cambridge, MA: Harvard Business School Press.

Auffrant, M. (1996) "Analyse Economique des 'Dépenses de Défense' des Principaux Pays Occidentaux," *Revue Française de Finances Publiques,* 54.

Bitzinger, R. (2003) *Towards a Brave New Arms Industry?: The Decline of the Second-tier Arms-producing Countries and the Emerging International Division of Labour in the Defence Industry*, Oxford: Oxford University Press.

Bonn International Center for Conversion (1998) *Conversion Survey 1998*, New York: Oxford University Press.

Brömmelhörster, J. (1997) *Konversionsförderung durch die Europäische Union: Fostering of Conversion by the European Union*, Report 9, Bonn: Bonn International Center for Conversion.

Brömmelhörster, J. (ed.) (1999) *Paying the Peace Dividend: Declining Military Expenditures after the Cold War*, Bonn: Bonn International Center for Conversion.

Brzoska, M., Wilke, P., and Wulf, H. (1999) "The Changing Civil–Military Production Mix in Western Europe's Defense Industry," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations Press, pp. 371–405.

De Penanros, R. and Serfati, C. (2000) "Defense Conversion in Two French Regions: Brest and Greater Paris," *International Regional Science Review*, 23(1): 66–80.

Elsner, W. (1995) "Instruments and Institutions of Industrial Policy at the Regional Level in Germany: The Example of Industrial Defense Conversion," *Journal of Economic Issues*, XXIX(2): 503–16.

Flamm, K. (1999) "Redesigning the Defense Industrial Base," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations, pp. 224–46.

Gaddy, C. (1996) *The Price of the Past: Russia's Struggle with the Legacy of a Militarized Economy*, Washington, DC: Brookings Institution.

Gleditsch, N., Bjerkholt, O., Cappelen, A., Smith, R., and Dunne, P. (1996) *The Peace Dividend*, Amsterdam: Elsevier.

Gold, D. (1999) "The Changing Economics of the Arms Trade," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations, pp. 249–68.

Gonchar, K. (1998) "Defense Industries in New Russia: Challenges and Progress," paper presented to the Study Group in International Defense Downsizing, Arms Exports and Conversion. Council on Foreign Relations, New York, February 1998.

Gonchar, K. and Wulf, H. (1997) "Lessons Learned from Conversion in Russia and Western Europe," *Defence and Peace Economics*, 9(4): 339–66.

Hartung, W.D. (1996) *Welfare for Weapons Dealers: The Hidden Costs of the Arms Trade*, New York: World Policy Institute.

Hébert, J.P. (1997) "Offsets and French Arms Exports," *The Economics of Offsets: Defence Procurement and Countertrade*, Amsterdam: Harwood Academic Publishers.

Hill, C. and Markusen, A. (2000) "Do Regions Matter? Evidence from Twelve Defense Downsizing Regions," *Berkeley Planning Journal*, 14: 82–103.

Kolodziej, E. (1987) *Making and Marketing Arms: The French Experience and Its Implications for the International System*, Princeton, NJ: Princeton University Press.

Le Blanc, G. (1998) "Weapons Production and Industrial Organization: The French 'Program Firms' Confronted with the Crisis of the Armaments Industry," paper prepared for the 1998 EARIE Conference. Centre for Industrial Economics, Ecole des Mines de Paris.

Lindemann, U. and Schirowski, U. (1997) *Sieben Jehre Truppenabbau and Konversion in Nordrhein-Westfalen*, Dusseldorf: Ministerium fur Wirtschaft and Mittelstand, Technologie and Verkehr des Landes Nordrhein-Westfalen, June.

Markusen, A. (1997) "How We Lost the Peace Dividend," *The American Prospect*, July/August: 86–95.

Markusen, A. (1999a) "The Post Cold War Persistence of Defense Specialized Firms," in G.I. Susman and S. O'Keefe (eds) *The Defense Industry in the Post-Cold War Era: Corporate Strategies and Public Policy Perspectives*, Oxford: Elsevier, pp. 121–146.

Markusen, A. (1999b) "The Rise of World Weapons," *Foreign Policy*, 114: 40–51.

Markusen, A. and Serfati, C. (2000) "Remaking the Military Industrial Relationship: A French–American Comparison," *Defence and Peace Economics*, 11(3): 1–29.

Markusen, A., Hall, P., Campbell, S., and Deitrick, S. (1991) *The Rise of the Gunbelt*, New York: Oxford University Press.

Oden, M. (1999) "Cashing-in, Cashing-out and Converting: Restructuring of the Defense Industrial Base in the 1990s," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations Press, pp. 74–105.

Oden, M. (2000) "Federal Defense Industrial Policy, Firm Strategy, and Regional Conversion Initiatives in Four American Aerospace Regions," *International Regional Science Review*, 23(1): 25–47.

O'Prey, K. (1995) *A Farewell to Arms? Russia's Struggles with Defense Conversion*, New York: Twentieth Century Fund.

Powers, L. and Markusen, A. (1998) *A Just Transition? Lessons from Defense Workers' Experience in the 1990s*, Washington, DC: Economic Policy Institute.

Serfati, C. (1997) "France," in P. Gummett and J.A. Stein (eds) *European Defence Technology in Transition*, New York: Harwood Academic Publishers.

SIPRI (1997) *SIPRI Yearbook, Armaments, Disarmament and International Security*, Stockholm: SIPRI.

SIPRI (1999) *SIPRI Yearbook, Armaments, Disarmament and International Security*, Stockholm: SIPRI.

SIPRI (2002) *SIPRI Yearbook, Armaments, Disarmament and International Security*, Stockholm: SIPRI.

Skoens, E. and Gill, B. (1997) "Arms production" in *SIPRI Yearbook 1996, Armaments, Disarmament and International Security*, Oxford and New York: Oxford University Press.

Voss, W. and Brzoska, M. (1996) *Eurofighter 2000: Consequences and Alternatives*, Bonn: Bonn International Center for Conversion.

2 Post-Cold War conversion

Gains, losses, and hidden changes in the US economy

Michael Oden, Laura Wolf-Powers, and Ann Markusen

Introduction

The Cold War grew out of the aftermath of a World War that decimated major European and Asian powers and involved a very real confrontation between large nations representing opposing political and economic systems. As the US assumed a role of world leadership in the late 1940s, the federal government launched an unprecedented international assistance effort and systematically mobilized the nation's industrial, technological, and human capital to meet the military challenges of the Cold War. In contrast, the 45-year Cold War era ended with a remarkable absence of violence, crisis, or conflict among the major parties. The dissolution of the Warsaw Pact and the Soviet Union failed to generate the sense of national purpose, solidarity, and sacrifice that forged foreign and domestic policy in the late 1940s. The end of the Cold War spawned no Marshall Plans or Committees for Economic Development, no GI Bills or *Endless Frontiers*, no fundamental reorientations of military, industrial, or technology policies.

In this relatively calm post-Cold War atmosphere, key institutions and insiders coalesced around "muddling through" and "satisficing" policies to reshape security strategy and restructure the military-industrial complex. Perhaps avoiding major revisions in security strategy and relying upon firms and financial institutions to reorganize defense industries was the right approach for the times. Advocates for bolder policies of disarmament, non-proliferation, and defense industry conversion failed to mobilize support or interest among the broader populace in the absence of intense external or domestic pressures. Yet while the post-Cold War conversion story is not one of new directions or innovative national policies, the one-third reduction in military spending over the 1990s did alter the fates of critical national industries, leading regions and hundreds of thousands of skilled personnel.

The main issue addressed in this chapter is what happened to the assets – the technologies, the human capital, and the organizational capacities – built up by the enormous 45-year investment in national defense. One allegory of post-Cold War conversion gives the leading (and only) role to that ever-popular abstraction, market forces. Defense demand was reduced, assets and resources were freed up, and the market, with the able assistance of financial institutions, reallocated these resources to more productive and profitable uses.

While surprisingly strong economic growth after 1994 reduced adjustment costs, the rest of the market allegory obscures as much as it reveals. The first gap in the market story is that government policy and decision-making inevitably affected the defense economy, shaping the investment, location, R&D, and personnel decisions made by private firms. New and revised government policies were put in place in the early 1990s that strongly influenced defense industry restructuring. The most important included a slightly amended national security strategy, a more restricted set of defense budget priorities, a return to more permissive arms export policies, defense industry policies promoting the merger and consolidation of major contractors, and a grab bag of programs to facilitate company, worker and regional conversion to nondefense activity. While these policy initiatives had a certain ad hoc character and often operated at cross-purposes, in many ways they overrode market signals in determining how assets were redeployed as defense demand declined.

In addition, market failures were prominent in the defense downsizing process in the form of involuntary unemployment and underemployment, information failures in markets, and under investment in R&D and human capital. If government actions implemented to mitigate these market failures generated economic benefits in excess of their costs, then an overall increase in social welfare could have resulted. In this context, successful conversion of defense-related assets to alternative productive uses, guided by the market but aided by cost-effective government intervention, became a crucial measure of the real efficiency of the post-Cold War adjustment process.

In this chapter, we evaluate how the ensemble of government policies associated with post-Cold War defense cuts shaped the behavior of firms, workers and defense-oriented communities and speculate about the effectiveness and efficiency of the resultant restructuring process in terms of conversion outcomes. The success of the downsizing and adjustment process of the 1990s is specifically measured along four coordinates.

First, did the US end up with a research and industrial base capable of meeting our immediate and future defense requirements in a cost-effective manner? Second, to what extent did defense-oriented firms succeed in transferring organizational strengths, know-how, and technology to alternative markets as defense sales declined? Third, were the skills, training, and knowledge embodied in the defense workforce effectively reallocated within and outside defense sectors? Finally, to what degree did defense-oriented regions succeed in stabilizing their industrial bases, retaining skilled labor, and diversifying their economies?

In addressing these questions, we not only attempt to document what happened, but evaluate outcomes relative to implicit counterfactuals – how the outcomes of defense conversion in the 1990s might have been different with an alternative mix of policies and incentives. We argue that the historic record of conversion and adjustment was generally poor over the 1990s. Policies encouraging the fast-paced merger and consolidation of large contractors undercut dual use policies and commercial–military integration resulting in a more segregated, technologically sluggish defense industrial base dominated by four financially vulnerable firms.

This model of restructuring also choked off relatively successful conversion and diversification efforts by some large contractors as well as technology transfer that could have benefited defense-dependent regions. The quick shock of large firm consolidation led to massive layoffs concentrated in major defense complexes resulting in long periods of unemployment and underemployment for defense workers and an inefficient reuse of skills and know-how. Defense restructuring over the 1990s produced highly uneven outcomes across defense-dependent regions, but a number of prominent defense centers experienced relatively high rates of unemployment, losses of major manufacturing and research facilities, and out-migration of talent.

Some of these costs were unavoidable as defense spending was ratcheted down at the end of the Cold War. But we argue that an alternative or even more neutral set of policies could have reduced adjustment costs, led to a more integrated commercial–military industrial base, and increased the conversion of technologies and human and physical capital to growth-enhancing activities. On close inspection, the defense conversion record of the 1990s is full of paths not taken, surprising successes, and lessons learned. Even if defense planning and spending are currently enjoying budget surpluses, hard choices may yet be on the horizon if economic and revenue growth falters or the geopolitical environment changes. The history of defense restructuring of the 1990s may, therefore, provide valuable insights for managing change in the future.

Firm conversion

The Cold War bred an impressive complex of technology, manpower, and capital equipment, largely managed by private-sector institutions that designed and produced the weaponry required for nuclear and conventional warfare. This complex and its government-underwritten activities generated a set of new technologies – radar, computers, semiconductors, satellite communications, and nuclear power – that radically shaped the trajectory of society at large. What happened to these capabilities in the face of a 1990s American cut in procurement in excess of 60 percent in real terms? Were they speedily downsized? Were the resources released effectively moved into new, nonmilitary productive activities? Have we managed to craft an efficient, flexible military industrial capability appropriate to post-Cold War challenges?

The answers to these questions vary with the institutional context. The 1990s cuts in procurement budgets were steep and difficult for firms to absorb. Smaller firms (and larger firms concentrating on subsystems and defense services) were relatively more successful in weaning themselves from defense dependency and moving talent and technology between civil and military activities. The largest firms, however, were caught up in the mid-decade flurry of mergers and divestitures that, while profitable in the short term, left them boxed into flat defense markets and shorn of civilian prospects. This led to a relatively poor financial and technical performance in the longer run and thus to intense political lobbying efforts for higher defense budgets, NATO-expansion, liberalized arms export policies, and relaxed anti-trust laws that would permit transatlantic mergers and privatization.

The Department of Defense (DOD) is now more vulnerable to these pressures because preservation of weapons production and development capacities is more dependent on the health of the four remaining defense giants. The most disheartening performance has been logged in the nuclear sector, where the huge government-owned, contractor-operated nuclear weapons design and stockpiling facilities remain largely intact despite numerous changes in the nature of the nuclear threat. Although this nuclear complex remains a formidable $30 billion a year operation and absorbs a major slice of American scientific manpower and public research budget, we do not address it in this chapter.

Large military industrial contractors

As the Cold War waned, large American defense contractors faced plummeting budgets, at home and abroad (Table 2.1). Each confronted a major strategic choice: redeploy financial and physical assets, know-how and manpower into civilian-oriented activities, or stick to defense markets and attempt to enlarge both the market and their market shares. Most analysts in the early 1990s expected them to do the former, downsizing but simultaneously moving personnel and cash built up during the Reagan defense spending boom into new product and service lines (Markusen, 1998). In the early Clinton years the federal government committed itself to playing an active role in this process through the Defense Reinvestment and Conversion Initiative, a set of programs in the Departments of Defense, Energy, Commerce, and Labor whose combined funding amounted to more than $16.5 billion over the years 1993–97 (Table 2.2). This investment program included significant funding through the Technology Reinvestment Project (TRP) and other programs to stimulate commercial–military integration through defense diversification and commercial spin-offs. This path was further reinforced by strong, positive Pentagon signals favoring civil/military integration, not just within a firm but right down to the shop floor.

Table 2.1 Military expenditures in selected countries during 1985, 1990, and 1996 (Index, 1996 = 100)

Region	*1985*	*1990*	*1996*
United Kingdom	141	135	100
China	62	74	100
France	106	111	100
Germany	159	129	100
Russian/Soviet Union	783	584	100
United States	138	116	100
Developing countries	101	117	100
Industrialized countries	161	138	100
World Total	146	133	100

Source: BICC Conversion Survey 1998, Appendix A1, pp. 259–62.

Table 2.2 Defense reinvestment and conversion-related programs (less rescissions) and restructuring reimbursements to firms (millions of 1997 dollars)

Fiscal year	*1993*	*1994*	*1995*	*1996*	*1997*	*Total*
Department of Defense (DOD)						
Technology Reinvestment Project	472	397	220	195	85	1,369
Other dual-use initiatives	381	1,227	1,536	1,237	1,030	5,410
Maritech (shipbuilding)	0	80	40	50	50	220
Military personnel assistance	756	596	985	1,093	0	3,430
Office of economic adjustment	80	39	39	61	53	272
Department of Energy (DOE)						
Office of worker and community assistance	85	100	115	83	62	445
Department of Commerce (DOC)						
Economic development administration	80	80	95	90	90	435
National Institute of Standards and Technology (NIST)[a]	140	228	319	301	320	1,380
Department of Labor (DOL)						
Displaced Defense Worker Training[b]	75	24	20	20	20	159
Multi-agency programs						
Conversion-related high technology initiatives[c]	0	1,072	827	744	730	3,373
Restructuring costs reimbursed						179[d]
Grand total	2,069	3,843	4,260	3,874	2,440	16,672

Source: All figures except data on restructuring cost reimbursements: Bischak (1997); data on restructuring cost reimbursements: US General Accounting Office (1997b).

Notes

a Numbers for NIST include Advanced Technology Program, Manufacturing Extension Partnership and in-house R&D.

b The National Economic Council in the White House estimated that about $178 million annually in general dislocated worker assistance funds (Job Training Partnership Act Title III) would go to defense workers, but subsequent experience failed to validate these estimates; about $20 million per year seems more reasonable based on actual grants made from the Title III National Reserve Account for 1994–96.

c Includes all new money over 1993 levels allocated for DOE CRADAs (Cooperative Research and Development Agreements), NASA Aeronautics Initiative, Department of Transportation Intelligent Vehicle Highway System, Multi-Agency High Performance Computing, Department of Commerce Information Highways and Environmental Protection Agency Environmental Technology.

d The US General Accounting Office reports that DoD had reimbursed firms for $179.2 million in restructuring costs through September 1996.

To some extent, large firms did move aggressively in this direction. TRW and Raytheon, and before their mid-1990s divestitures, Rockwell and Hughes, were able to lower their defense dependency significantly by applying defense-aerospace and electronics expertise to commercial satellites, telecommunications markets, and automotive projects such as urban traffic management and intelligent vehicle information systems (Oden *et al.*, 1996; Oden, 1999a). To do so, they became more entrepreneurial internally, creating new groups to facilitate cross-over of expertise.

Boeing consistently excelled in both civilian and military markets, aided by internal mobility practices that allowed personnel to move easily between civilian and military work. Evidence from the early and mid-1990s suggested that firms with robust diversification strategies were enjoying higher profits, greater productivity growth, and healthier rates of R&D investment than contractors more entrenched in defense markets (Oden, 1998).

But in the mid-1990s, a dramatic reversal occurred. A rash of mergers, initiated by Wall Street investment banking firms and encouraged by a remarkable shift in Pentagon policy, imploded the ranks of the largest defense contractors to four and split apart civilian from military divisions in a series of related divestitures (Figure 2.1; Markusen, 1997, 1998). Firms divesting themselves of defense ventures included Ford (Aerospace), Honeywell, General Electric, IBM, Unisys, Westinghouse, Chrysler, Tenneco, Texas Instruments, AT&T, General Motors (Hughes), and Rockwell. Excess corporate cash was dedicated to acquisitions, stock buy-backs and debt paydowns, and the managerial will to invest in conversion withered under the purported superiority of "pure play" defense firms.

The longer-run consequences of this particular form of consolidation for the defense industry, the Pentagon, and the economy as a whole have been largely negative. The industry is now led by a handful of very large, debt-laden firms who remain heavily dependent upon defense markets (Table 2.3). Both at home and abroad, defense markets are more or less stagnant, so that firms' options for growth are quite truncated. With support from the Departments of Defense and Commerce, the industry successfully captured a larger share of the world arms trade, up from 30 percent to 45 percent between 1989 and 1996, but exports still fell 10 percent. In recent years, these firms' military sales have increased modestly with upticks in the US defense budget and the privatization of defense research, service, and maintenance functions. An aggressive effort to forge transnational mergers, another route to growth, has been thwarted by European reluctance and inconsistent American policy (Markusen, 1999, 2000; Markusen and Costigan, 1999).

Elsewhere, we have argued that the mergers were driven chiefly by the anticipation of short-term gains from the profitable backlog orders of acquired firms, stock speculation, the ability to layoff unionized workers and move to lower cost locations, one-time sell-offs of valuable land, and generous merger cost reimbursements from the government, and not, as proponents claimed, by true efficiency gains (Markusen, 1998; Oden, 1999a). The financial performance of these firms over the decade tends to support this view. Stock prices, which had moved in lock-step with falling defense budgets from 1990–94, skyrocketed 55 percent in 1994, slowed dramatically thereafter and began to decline in absolute terms in 1997. Debt-to-equity ratios rose from 28 percent in 1994 to 34 percent in 1999 (Merrill Lynch, 2000: 47, 53). Profit rates have remained well below the economy-wide average. Although firms have diversified in closely related product lines, conspicuously in space-based communications, diminished access to commercial market expertise within their corporate organizations may be cutting deeply into their growth potential.

From the Pentagon point of view, the mergers have produced new problems. Despite verifiable cost savings on existing systems, the services now face fewer

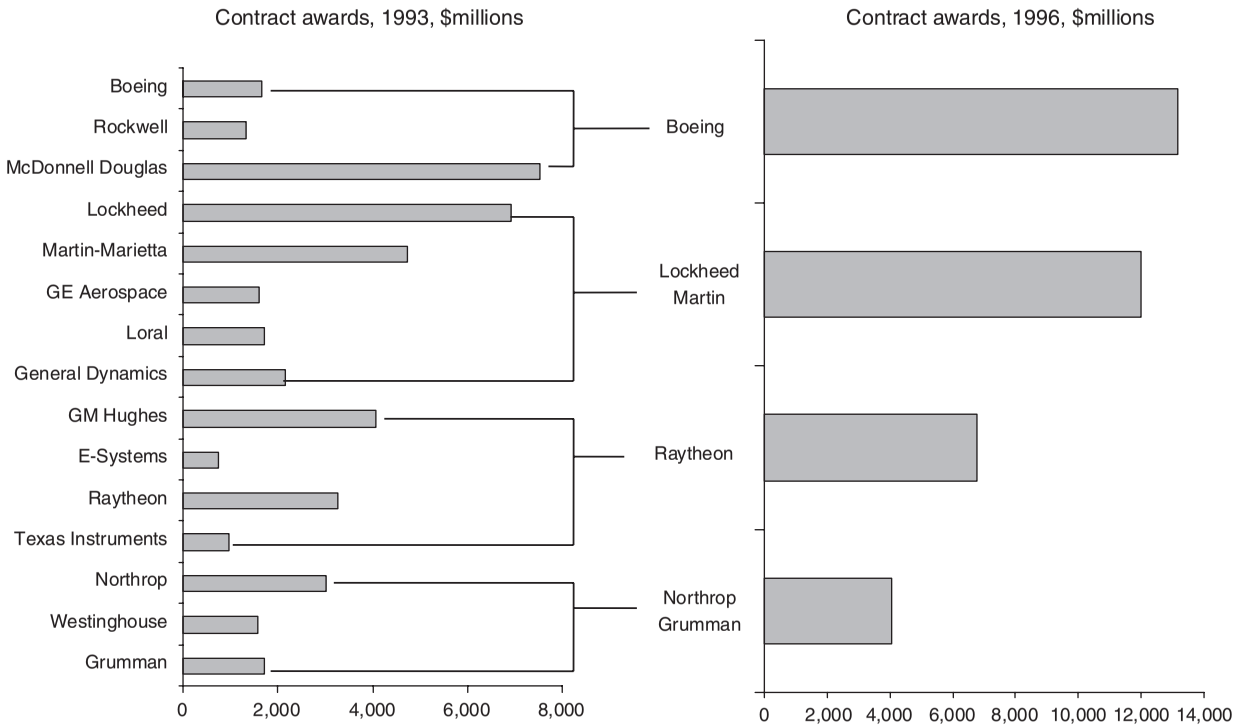


Figure 2.1 US defense mergers in the 1990s.

Source: All data are from the Department of Defense Publication (P01), 100 companies receiving the Largest Dollar Volume of Prime Contract Awards from the fiscal year of 1993 and 1996.

Table 2.3 Defense sales as a percent of total sales (in millions of 1999 dollars)

Firm	*1999 sales*	*Defense sales*	*Nondefense sales*	*Defense as % of total sales*
Newport News	1,912	1,912	0	100
Alliant Techsystems	1,079	921	158	85
Northrop Grumman	8,700	7,205	1,495	83
L-3 Communications	1,875	1,406	469	75
Litton	5,662	3,985	1,677	70
Lockheed Martin	25,488	17,745	7,743	70
General Dynamics	10,081	6,870	3,211	68
Raytheon	20,323	13,120	7,203	65
Boeing	51,417	18,290	33,127	36

Source: Global Securities Research and Economic Group, Merrill Lynch, Pierce, Fenner & Smith Inc, Defense Primer: The ABCs of Investing in the Defense Sector, March 14, 2000: 4.

competitors bidding on future systems, which may raise future prices and depress innovation. Defense firms' R&D spending as a share of sales has fallen from 4.7 percent in 1986 to 2.5 percent in 1998 (Merrill Lynch, 2000: 47), a trend at odds with the rest of the high tech economy. One Wall Street firm argues that there is a substantial brain drain in the defense industry, toward commercial high tech firms with more robust growth rates (Merrill Lynch, 2000: 51). An effort to open American markets to European competitors, which could counteract the negative effects of concentration, is in disarray, in part because the Pentagon fears the failure of any of the few remaining systems integrators in its stable.

In short, then, the transformation of large military industrial firms into more diversified high tech organizations was arrested by the short, sharp shock of the merger era. The task of reallocating technologies, physical plant and engineering, managerial and blue collar talent into new activities was given over to the market at large, and it is likely that a modicum of this capital was squandered in the process, as confirmed in our analysis of regional concentrations, addressed later. Long-term gains in both civilian and defense markets from the cross-fertilization of talent and technologies have terminated, leaving hundreds of thousands of scientists, engineers, and skilled workers tied up in defense work and distanced from the heady pace of innovation in the high tech world. Their managers are now more likely to pursue lobbying for permissive export arrangements and subsidies, higher defense budgets, more privatization and continued "buy American" practices as ways of maintaining profitability, all of which are questionable for American national security and affordability.

Smaller military firms

In contrast to large firms, successful conversion was surprisingly common among small to medium sized defense contractors, from suppliers of generic goods and

services to highly specialized manufacturers and research service providers. A look at smaller companies showed defense downsizing caused no major shakeout in the lower tiers of the supply chain. In a survey of 600 small to medium sized contractors, Feldman found that over the immediate post-Cold War period real sales and employment changed very little, and defense dependency in the overall sample declined marginally from 31 to 29 percent of total sales.[1] Since procurement spending plummeted over this period, it appears that major prime contractors were subcontracting more rather than taking work back in-house. A RAND survey of 465 subcontractors over the 1992–95 period found low failure rates (only 3 percent between 1992 and 1995) and some evidence of conversion and diversification (Vernez *et al.*, 1996).

Perhaps more surprising is the conversion performance of more specialized defense-dependent firms. In face-to-face interviews with 41 smaller companies in 1993–94, we found significant sales and employment losses in the early phase of defense downsizing (Oden, 1999a). Average defense dependency in this group fell from 69 percent in 1989 to 50 percent by 1994, much of it due to lost defense sales. But a number of firms posted a real increase in non-DoD sales. Contrary to naysayer accounts of defense conversion, the majority of the companies were conducting new product development, and 72 percent were selling new products or services in non-DoD markets. We also found that many companies had participated in, and benefited from, federal research and development support and technical assistance partnerships with state and local governments (Oden, 1999a).

In a follow-up survey of this group of firms conducted in the summer of 1998, 34 of the original 41 firms responded. It was found that these firms enjoyed positive sales growth over the years 1994–97. Employment stabilized, falling only 2.5 percent over this period, with the majority of firms in the sample actually adding jobs. Defense dependency continued to decline through expansion of commercial sales. Many of these firms utilized publicly funded technical assistance, worker training and marketing assistance, and most reported that their participation was somewhat or very important to their success. These results may be somewhat biased in that the firms responding to the follow-up survey were likely to be more successful. However, the survey revealed that only 2 of the original 41 firms had gone out of business (Oden, 1999b).[2]

As limited as public conversion assistance has been, this research indicates that it has been effective in specific cases in helping small and medium sized firms survive and diversify. Finally, it is noteworthy that most of the surveyed firms continued to serve defense markets even as they succeeded in expanding their commercial sales.

Worker conversion

The elimination of more than a million defense-related jobs in the private sector was a significant labor market phenomenon of the 1990s. Between 1987 and 1996, defense-related private sector employment in the United States declined from 3.5 million to 2.1 million – a 40 percent drop (Thomson, 1998). While those who lost jobs during this period represent a relatively small fraction of the US labor force,

the economic and political significance of defense industry job loss is out of proportion to its numerical importance: nearly one million of those who lost defense-related jobs in the 1990s worked in the manufacturing sector, as engineers, technicians, and skilled blue-collar employees. Net manufacturing job loss in the defense sector between 1987 and 1996 amounted to 922,000 workers (Thomson, 1998); nearly 5 percent of the entire manufacturing labor force in 1987. Moreover, defense industry workers have traditionally been better paid, higher-skilled, and more likely to be represented by unions than their nondefense counterparts.

The federal government acknowledged a special responsibility for the unemployment associated with the end of the Cold War. The Clinton administration in particular committed itself to playing an active role through the aforementioned Defense Reinvestment and Conversion Initiative (Table 2.2). One core goal of this investment program was to redirect resources that had been dedicated to US military superiority toward critical national priorities including health care and infrastructure. According to President Clinton, a key part of that rededication of resources involved the redeployment of the defense skill base.

Did defense worker policy in the 1990s fulfill its original promise? The record is mixed. Federal efforts to assist displaced uniformed personnel and DoD civilian personnel have been fairly successful, and aggressive experimentation in programs at the US Department of Labor (through the Defense Conversion Adjustment Demonstration) and among numerous local innovators, have shown impressive results in redeploying talent shed by private firms. In many cases, however, the transition policy failed to effectively reallocate skills, training, and knowledge embodied in the defense workforce. Although a strong economy in this period kept aggregate unemployment rates low, our research indicates that private sector defense workers did not, on average, experience rapid reemployment at wages comparable or better than those they had received in their former defense-related occupations. On the basis of several samples of displaced defense workers taken between 1987 and 1997, we noted that many, perhaps most, workers displaced from defense firms during this period found jobs that paid them less than their former wages and that failed to take advantage of their defense-bred skills. A sizable minority experienced a drop in earnings of 50 percent or more in their first job after becoming reemployed.

We contend that there are two major reasons for this. Despite a strong initial commitment to address defense workers' situations, and despite the opportunity to make the defense conversion initiative a showcase for new training, reemployment, and job creation policies, the main hallmark of federal transition policy has been acquiescence in defense industry consolidation and restructuring (see section "Firm conversion"). This process has viewed employees largely as impediments to cheaper weapons production. Second, private sector defense employees who were laid off, often did not find the assistance necessary to make satisfactory job and career changes. Local displaced-worker programs, while they varied considerably from place to place, were frequently unprepared – in terms of financial resources or administrative capacity – to serve this population. On both of these levels – defense industry policy and worker adjustment policy – a different kind of transition might

have reduced unemployment and underemployment of defense workers and led to a more efficient reuse of human capital.

Impacts of defense industrial policy on human capital

For those working in steel, autos, consumer electronics, and other durable goods industries during the 1970s and 1980s, mounting international competition and the gradual breakdown of a New Deal-era détente between workers and employers ushered in enormous changes. The financial restructuring of US manufacturing entailed consolidations, buy-outs and mergers in many industries, while at the micro level, firms introduced sophisticated computer-driven production equipment, adopted "lean business practices," laid workers off, and reorganized those who remained for higher productivity. Many of these same secular changes took hold in defense sectors during the post-Cold War drawdown – downsizing, substitution of capital for labor, layoffs, a shift from goods to services, a decline in union coverage, and a shift of industrial activity from the Northeast to the South and West.[3] It is plausible that an overall restructuring of America's labor markets simply "caught up" to defense workers after the Cold War's end.

In another sense, however, military industrial policy played a powerful role in the defense labor market changes of the 1990s. While defense workers became more exposed in the 1990s to market forces operating in the civilian economy, they remained tied to federal priorities, defense industry policies, and demand flows in a way that was highly unusual. Federal officials, because of their monopsonistic relationship to the defense industry, had an opportunity to manage post-Cold War downsizing more carefully, undertaking strategic planning as they did with the buildup of the military sector and promulgating policies that reallocated human capital and catalyzed new employment opportunities. By and large, however, they chose to manage the transition in a way that privileged defense company managers and shareholders over the planned conservation and reallocation of skills and talent. While the policies in the left column of Table 2.4 were clearly not the only factors influencing the labor market trends in the right column, the table underscores the point that federal policy-makers made little use of the means at their disposal to ensure that the skills and experience of the defense industry's human assets would be effectively reutilized.

Pentagon-led industry consolidation resulted in massive layoffs and inhibited the expected move toward civil–military integration and market diversification that would have led to increased labor retention and conversion (Markusen, 1997, 1998). In their drive to lower procurement costs through "lean production," defense officials typically encouraged downsizing, geographic relocation and outsourcing, while rejecting productivity strategies compatible with job retention, such as incumbent worker retraining (Powers and Markusen, 1999). Finally, by abandoning its initial agenda to invest a significant portion of the "peace dividend" in the creation of incentives for civilian technology development, the Clinton administration dashed the hopes of many defense employees that their skills might be reabsorbed in the production of electric vehicles, high-speed trains and alternative

Table 2.4 Post-Cold War changes in defense industrial policy and the defense labor market environment

Federal defense industry policy	*Defense labor market environment*
Pentagon-encouraged consolidations and mergers have reduced the number of major defense contractors from 15 to 4.	Goods-producing industries have shed labor as a result of consolidation and the institution of new production technologies and lean business practices; defense-related services industries have experienced a sharp relative increase.
Acquisition reform efforts have belatedly introduced the discipline of "lean production" to the defense industry.	Skill requirements in defense manufacturing are changing as companies introduce computer-driven production technology and adopt new systems of job classification and work organization.
Federal promotion and financing of arms exports has increased the US share of the world arms market – a by-product of this is the negotiation of offset agreements that transfer weapons production to other parts of the world.	Firms' geographic preferences have changed, shifting a greater percentage of defense-related employment to the southern and western parts of the US and increasingly (because of offset agreements) to other countries.
Federally sponsored R&D continues to be chiefly focused on military objectives, limiting the potential to jump-start job creation in cutting edge civilian sectors.	Union representation in the defense industry has declined, and reliance on labor market intermediaries such as temporary help agencies has grown.

energy technologies.[4] To some extent, this was an unrealistic hope – the links between civilian investment/technology development and defense firm capacities were not in many cases strong. Nevertheless, if the decrease in the military procurement budget had been offset by spending that had stimulated markets for advanced civilian technologies, the resulting demand-side pull would have helped to offset the disruption of defense layoffs by generating increased demand for skilled workers, particularly production workers. Small, targeted initiatives such as the Intermodal Surface Transportation Efficiency Act (ISTEA), have drawn on the procurement stimulus to a limited extent, but much of the potential for an effective "demand pull" job generation strategy is still unrealized.

Worker reemployment outcomes: the role of adjustment programs

Another major ingredient in assessing conversion outcomes for defense workers in the 1990s involves looking at the terms of their transition from defense to civilian work. Here we find that a significant subset of laid off defense workers had not become reemployed after as long as a year after layoff and that the drop in wages at reemployment was typically substantial (Congressional Budget Office, 1993; Mueller and Gray, 1994; Kodrzycki, 1995).[5] As might be expected, older workers, clerical and sales workers, and production workers typically had a harder time becoming reemployed and recovering their former wages than younger workers and workers in service and professional occupations. Some of the results are more

surprising, however. Kodrzycki (1995) found that the median unemployment spell among reemployed defense workers in New England was eleven months, and that 25 percent of the reemployed workers took at least seventeen months to find a new job. She also found that new employers tended to discount the skills and experience of defense workers: workers recalled to their former jobs had wage replacement rates about 21 percent points higher than those who accepted a job with a new employer.

It is true that displaced workers in general, particularly those who had been employed in the manufacturing sector, had reemployment difficulties during this period, and often took pay cuts when they moved to new jobs. Schoeni *et al.* (1996) cite a RAND Corporation research finding that the wages of displaced aerospace workers did not decline any more than the wages of workers displaced from non-aerospace industries. A 1993 Congressional Budget Office study also found that the share of people who exhausted their unemployment benefits was no higher for defense-related workers than for nondefense-related workers (Congressional Budget Office, 1993). It is possible that workers sampled in these studies, drawn from those who sought help from company or government-sponsored relocation assistance centers, are skewed toward groups that might be expected to have particular reemployment difficulties. Nevertheless, as compared with all displaced workers and with displaced manufacturing workers in the 1989–96 period, defense industry workers fared quite poorly.

Conditions in the national economy and specific regional economies were a strong determinant of the rapidity with which laid off defense workers found jobs. In Kodrzycki's New England study, the number of months workers remained unemployed was highly sensitive to the overall unemployment rates in both their states and counties of residence (Kodrzycki, 1995). As the economy came out of recession in the mid-1990s, it absorbed defense workers more quickly than it had in the early years of the drawdown.

Also important, however – particularly to the quality of the "match" between a laid off worker's skills and the job eventually found – was the quality of government-sponsored worker adjustment programs. Here, through innovative demonstration programs delivered locally with funding from the Departments of Labor and/or Commerce, federal conversion policy made a difference. In the Groton/New London, CT area, where the General Dynamics-owned Electric Boat submarine shipyard laid off more than 6,000 people in the course of the decade, local organizations collaborated to implement a DOL-funded demonstration whose goal was to help laid-off shipyard employees leverage their specialized trade skills to respond to a shortage of skilled construction and manufacturing workers in the area. Some were certified as construction trade workers, while others took short courses in computer-numeric machining and fiber optics installation (both in local demand) that built on the metal-working and electrical skills they had used in the Electric Boat shipyard (Hedding, 1998). The Strategic Skills Program in Massachusetts, part of the DOL's "dislocation aversion" demonstration project, worked with small defense manufacturers to help them combine strategic planning efforts in the wake of defense cuts, with intensive, customized training for incumbent workers, thus

helping to decrease the likelihood that these firms would need to lay off workers. Participating companies successfully committed themselves to incumbent worker training as a tool for furthering market diversification and other modernization objectives, prompting the DOL to conclude that

> by encouraging firms to invest in training incumbent workers as a readjustment strategy, the public sector can simultaneously help companies stabilize and increase their sales and help workers retain their jobs and enhance their skills.
> (Department of Labor, 1997: 4–6)

But innovative federal demonstration programs reached comparatively few private sector workers (see Table 2.2),[6] and most displaced defense workers who sought assistance used the standard services of Title III of the Job Training Partnership Act, the Economically Dislocated Worker Assistance Act (EDWAA). The quality of these services varied considerably from place to place; programs were helpful for people with good prospects for immediate reemployment, but did not provide structurally unemployed workers (such as craft production workers with specialized skills) with many options, because they were focused on and funded for quick labor market reentry. Due to strict funding limits, little attention was given to assessing individual defense workers' existing technical capacities and identifying occupations that built on them; rather, participants were shown boilerplate lists of growing occupations and asked to base retraining decisions on this information (see Mueller *et al.*, 1993; Mueller and Gray, 1994). Funding scarcity also constrained retraining options; according to Kodrzycki, "retraining for positions that would allow defense workers to recoup their former pay would require considerably greater per-worker funding than has been available."[7] A final factor limiting EDWAA's effectiveness was a lack of linkages to economic development agencies responsible for employment generation. Job training officials worked within a structure aimed at lowering short-term, frictional unemployment. Except in a few cases, such as the Groton example mentioned earlier, worker adjustment was perceived by State and local officials as a social service, unconnected with business attraction and job creation efforts.

Overall, then, defense-bred human capital might have been more efficiently allocated not only in the context of a different defense industrial policy but also in the context of bolder, better funded worker adjustment programs. Local innovators crafted particular programs that offered the flexible and sometimes unusually extensive financial resources necessary to prepare skilled but economically "mismatched" workers for new occupations, building on their existing skill sets where possible. But because responsibility for worker adjustment remained substantially local, and substantially under-funded, opportunities to undertake worker conversion on a more ambitious scale never bore fruit.

How might things have been different? Policy makers could have made a significant contribution to worker adjustment by taking greater responsibility for identifying the transferability of skills from declining to growing occupations, and then investing in defense workers as they transitioned into growing fields that

called on their skills. High-demand occupations like software design, programming and systems integration in many cases would not have been far out of reach of the skilled machinists and technical workers being displaced from the defense industry, especially if the resources for intensive skills upgrading had been present.[8] Though it would have required longer term training and more spending per participant than was permitted under EDWAA, a major federal commitment to defense worker retraining, combined with a stronger federal, state and local coordination (resembling a level of commitment in the GI Bill), would have likely yielded benefits significantly exceeding costs. Such a bold initiative could have alleviated the skill shortages that by the late 1990s had the firms scrambling to import technical labor from abroad.

Regional conversion

The effects of post-Cold War cuts on defense-serving regions in the 1990s were highly uneven. Leading defense complexes such as Los Angeles, Long Island, and Boston experienced scores of major plant closures, huge layoffs, and negative or sluggish rates of economic growth through the late 1990s, while Seattle, Northern Virginia, and lab-dependent northern New Mexico gained shares in defense contracting and enjoyed healthy economic growth. These differential outcomes were part of a broad geographic reconfiguration of US defense activity related to three interconnected processes: changing defense priorities and spending patterns; the declining number of major new weapons development projects; and the adjustment strategies of major prime contractors.

A number of major defense-serving regions were confronted with both the contraction of employment at existing facilities due to declining defense demand and losses from the transfer of work to other locales. In such hard-hit regions, efforts to convert capital, labor, and technology freed up due to reduced defense activity were commonly organized and led by public-sector organizations or public–private partnerships. In the early 1990s, organizations formed to carry out region-wide planning and programming typically focused on four aspects of the regional conversion problem: (1) the conversion of large contractor facilities or assets through diversification, spin-off of commercial activities locally or by transferring technology to other firms or entrepreneurs within the region; (2) assistance for small and medium sized defense firms to improve their competitiveness and help them diversify into civilian markets; (3) support of local employment and training institutions in efforts to reemploy displaced workers and retain skilled labor in the region; (4) activities to increase growth in the region's nondefense sectors by stimulating business start-ups or technology transfer among local firms and research institutions.

Did defense-serving regions, especially the major complexes deeply affected by cutbacks, manage to recover successfully, converting and repositioning their industrial and technological strengths, and skilled workforces? Despite a number of bright spots, regional conversion has been limited and leading defense centers such as Los Angeles, Long Island, Boston, and Central and Northern Connecticut suffered

deep losses to their research bases and high-tech manufacturing and service sectors throughout the 1990s. Locally organized programs to encourage conversion at small and medium sized firms, and innovative region-wide economic development and diversification initiatives registered impressive results in a number of places. But the scale and scope of federal funding and uneven capacity at the local level limited these successes. On balance regional adjustment to defense downsizing was a slow and arduous process for many defense regions, made more difficult by federal policies that encouraged a hyperactive consolidation and relocation of assets and offered paltry assistance to local communities to build meaningful conversion initiatives. An alternative set of policies would not have made post-Cold War restructuring painless for defense-dependent communities. However, bolder, more consistent national policies could have potentially reduced the costs of lost productivity, wages, and income in a number of regions.

Realignment of the Gunbelt

To evaluate the regional conversion process, it is first crucial to understand how national contextual factors shaped the timing and intensity of defense-related employment and income shocks in particular defense-oriented regions. Shifts in defense strategy and related budget priorities were one important factor explaining uneven regional impacts. The priorities embodied in the 1993 Bottom-Up Review (BUR) and subsequent Quadrennial Defense Review (QDR) ensured that overall procurement spending and large development programs for next generation weapons would be extremely limited in the 1990s (General Accounting Office (GAO), 1994, 1995). These spending/demand changes not only reduced sales and employment across defense regions, but also combined to dramatically alter the regional distribution of remaining defense purchases. Areas specializing in troop provisioning, ongoing tactical aircraft programs, maintenance, and engineering and information services generally fared better than advanced weapons research and production centers. Regional complexes specializing in strategic systems such as missiles and space, and related communication and electronics were particularly disfavored under the new spending priorities.

The relative dearth of major systems development projects undertaken in the 1990s had an additional effect on the regional distribution of defense activity. The long-term decline in procurement and new weapons development devalued specific positive externalities in regions specializing in technology-intensive, high-end systems. Firms no longer had the ongoing contract volume or the need to hold together capabilities for numerous major weapons development competitions to justify sustaining large, integrated or colocated research and production facilities in high cost regions.

Finally, the specific investment and location strategies defense firms implemented to adjust to falling sales, influenced by the DoD policies and financial market pressures previously noted, strongly shaped the regional reconfiguration of defense activity and the regional impacts of defense cutbacks in the 1990s. Merged companies used new corporate structures to rapidly reconfigure their operations

geographically to operate more profitably in the new market environment. As companies merged, many moved mature production facilities to lower cost regions and shut down smaller support or supplier facilities colocated with their major plants. While some companies retained core management and R&D activity in regional centers such as Los Angeles or Boston, many large contractors relocated headquarters and high-tech service operations from Cold War centers to the Washington, DC region (Oden *et al.*, 1996; Oden, 2000).

A longitudinal analysis of state contract data over the 1990s shows a distinct shift from high cost centers in the Northeast and California to Southern and Mountain States and states proximate to the Washington, DC CMSA (Oden, 2000, Table 2.5). Provisional results from the analysis of 194 CMSA-MSA regions suggest that the change in regional defense employment over the 1988–97 period was negatively associated with a region's share of total defense contracts in 1988, regional cost of living indicators for 1990, and directly associated with the procurement share of total defense spending. These results confirm the trend toward moving production out of the high cost urban defense complexes that formed the backbone of the Cold War weapons development and procurement system. A detailed study of five major defense aerospace regions underscored the uneven outcomes of contract cuts and locational shifts as well as the dramatic declines in regional centers such as Los Angeles, Boston, and Long Island (Oden 1999b, Table 2.6).

Regional efforts to encourage large company conversion

Against strong tides favoring closure and downsizing in established defense complexes detailed previously, local initiatives stimulated little local conversion or diversification in large firms. An argument can be made that the federal policy mix, with strong incentives for merger, relocation and consolidation, and limited funding for regional conversion and diversification efforts (in the neighborhood of $800 million to $1.1 billion over the 1992–95 period) had some dampening effect on large firm conversion and restructuring in place.

Would a more supportive set of policies or incentives, or even a neutral policy stance that did not subsidize merger costs, have led to significantly more regional conversion by large firms? Given deep procurement cuts and limited new development projects, major plant closures and downsizing would have occurred, especially at facilities producing weapons platforms. Again, a major civilian investment initiative was one measure that could have made a difference. Significant reuse at large contractor facilities might have occurred under a large-scale government investment program that included orders for mass transit equipment, alternative transportation vehicles or other capital equipment that could draw upon the specific systems integration and manufacturing skills of the platform makers. Civilian government investment for the major upgrade of the air traffic control systems did stimulate facility conversion at electronics divisions of several major primes including Martin Marietta (now Lockheed Martin), Hughes (now Raytheon), and Raytheon (US OTA, 1992; Oden 1999a). A number of major contractors also converted more dual use electronics and information systems service facilities to serve

Table 2.5 Changes in DoD prime contract awards by select states and region (in billions of real 1994 dollars)

	Average contracts (1986–87)	*Average contracts (1995–96)*	*Change in average from 1986–87 to 1995–96*		
			Total loss in real contracts	*Change due to decline in national contracts*	*Change due to regional shift*
Connecticut	6.6	2.6	−4.0	−2.5	−1.5
Massachusetts	11.0	4.6	−6.4	−4.2	−2.3
New England	20.0	9.0	−10.8	−7.5	−3.3
New Jersey	4.1	2.7	−1.4	−1.5	0.1
New York	12.3	3.4	−9.0	−4.7	−4.3
Pennsylvania	5.1	3.2	−1.8	−1.9	0.1
Middle Atlantic	21.5	9.3	−12.2	−8.1	−4.1
Illinois	2.2	1.2	−1.1	−0.8	−0.2
Michigan	2.7	1.2	−1.4	−1.0	−0.4
Ohio	6.1	2.6	−3.6	−2.3	−1.3
Northeast Central	15.2	6.8	−8.4	−5.7	−2.7
Minnesota	3.0	1.0	−2.0	−1.1	−0.9
Missouri	7.3	6.2	−1.0	−2.7	1.7
Northwest Central	13.7	8.9	−4.8	−5.2	0.4
District of Columbia	1.4	1.2	−0.2	−0.5	0.4
Florida	7.2	5.8	−1.4	−2.7	1.3
Georgia	4.6	3.6	−1.0	−1.7	0.8
Maryland	5.9	4.2	−1.7	−2.2	0.5
Virginia	8.3	10.5	2.2	−3.1	5.3
South Atlantic	29.9	27.9	−1.9	−11.3	9.4
Alabama	2.0	1.8	−0.2	−0.8	0.5
Mississippi	1.9	1.7	−0.2	−0.7	0.5
Southeast Central	5.9	5.2	−0.7	−2.2	1.6
Louisiana	1.9	1.0	−0.8	−0.7	−0.1
Texas	12.3	8.6	−3.7	−4.7	1.0
Southwest Central	16.1	10.6	−5.5	−6.1	0.6
Arizona	3.7	2.6	−1.1	−1.4	0.3
Colorado	3.0	2.0	−0.8	−1.1	0.3
Mountain	9.0	6.3	−2.7	−3.4	0.7
California	33.0	17.6	−15.4	−12.5	−3.0
Washington	3.5	2.3	−1.3	−1.3	0.1
Pacific	38.2	21.4	−16.9	−14.4	−2.4
US Total	169.3	105.4	−63.9	−63.9	0.0

Source: Prime contract data from DoD prime contract awards by region and state (P06) Fiscal years 1985, 1986, 1987 and fiscal years 1994, 1995, 1996. Price deflators are from the *National Defense Budget Estimates for FY 1998*, Table 5–8 Procurement Category.

Note
Totals may not sum exactly due to rounding.

Table 2.6 Employment in defense-related manufacturing in five aerospace regions, 1988–96

	Total employment (1988)	*Total employment (1996)*	*Percent change*	*National growth*	*Industry mix*	*Regional shift*
Boston	94,860	69,308	−26.90	13,003	−32,875	−5,676
Los Angeles-Long Beach	237,642	115,310	−49.40	32,585	−123,715	−31,198
Nassau-Suffolk, NY	56,186	19,965	−64.50	7,699	−21,356	−22,560
St Louis	45,164	35,388	−21.60	6,186	−19,133	3,171
Seattle-Bellevue-Everett	92,333	96,317	4.30	12,647	−12,779	4,116
Total five regions	526,185	336,288	−36.40	72,120	−209,858	−52,147
Total US defense manufacturing	2,212,485	1,657,151	−25.10			

Source: Based on Country Business Patterns data as compiled and estimated by Andrew Isserman, Regional Research Institute, University of West Virginia, 1998.

expanding civilian government markets for computer and telecom system upgrades (Curran *et al*., 1992; Oden, 1999a).

The encouragement of pure play defense mergers and government subsidies for downsizing costs did have a negative impact on other forms of regional conversion. Mergers between large contractors led to downsizing or closure of smaller divisions or facilities colocated with their major defense operations. Many smaller contractor-owned plants producing dual use electronic componentry, communications equipment, or information services were shuttered as merging firms rationalized and shed non-core units. Many of these satellite operations would have downsized without merger pressures, but there would have been more restructuring in place, or sell-offs to other firms who would have retained some production and jobs in these local establishments.

In addition, locally based diversification and technology transfer efforts like those of Grumman on Long Island and Hughes, Northrop, and Textron in Los Angeles were abandoned after these firms were taken over (Oden *et al*., 1994; Oden, 1999a,b). While most of these efforts were not generating large sales and employment gains in the short term, several firm diversification and tech transfer projects showed potential for longer-term growth and limited conversion of local technology and manpower.

In sum, government policies added a certain "hyperactivity" to the process of large company consolidation and relocation that damaged regional conversion efforts. The quick shutdown and downsizing of multiple large defense facilities swelled the stream of unemployed workers who swamped undermanned local employment and training institutions, cut off local suppliers, and rendered-down regional technology strengths. More neutral or supportive policies would not have dramatically reduced layoffs and facility closures in major defense regions but could have slowed the process down and contributed to more diversification, opened up

more opportunities for spin-off, and modestly increased the reuse of labor, capital, and technology.

Regional assistance to small and medium sized firms

The most successful regional conversion strategy involved supporting small and medium defense firm conversion with technical, marketing, and product development assistance. As noted earlier, conversion was a common and relatively successful strategy for such firms. Many smaller contractors in defense regions were dual-use or had some prior experience in nondefense markets. Targeting smaller defense firms was an effective way to stimulate regional conversion because these firms were less apt to merge or move and were more willing to invest in conversion which was often less risky than remaining stuck in unstable defense niches.

As the information in the section "Firm conversion" showed, smaller contractors stabilized sales and employment by supplying alternative markets with existing or newly developed products. Even more specialized defense-dependent firms gained from technical assistance and retained or expanded sales and employment in local facilities (Feldman, 1996; Oden, 1999a,b). Much of this expansion was classic facility conversion, which in the regional context stabilized the manufacturing base and sustained employment for skilled workers formerly engaged in defense work. A large number of companies surveyed in a four-region study of defense firms received assistance from regional conversion programs with many reporting that participation was very important to their success (Oden, 1999b).

The conversion of small and medium sized contractors was a clear and somewhat surprising success that was definitely aided by innovative local support organizations and a very modest public subsidy. Would a different set of federal policies have increased conversion of smaller contractors? Ironically the dramatic loss of local subcontracting business due to the rapid consolidation and relocation of major primes may have helped push smaller firms into risky conversion and diversification efforts. On the other hand, an alternative policy and incentive structure that encouraged more conversion and diversification at large firms may have opened opportunities to enter into new localized supplier networks in higher growth civilian markets. A higher level of federal conversion assistance to regional and local levels – especially in the early years (1990–94) when orders were plummeting at smaller firms – with less emphasis on technology development, would likely have stimulated greater conversion by small to medium sized firms.

Regional displaced worker assistance efforts

Employment retention through facility and firm conversion was the most effective form of worker conversion at the regional level. However, under any post-Cold War downsizing scenario, large layoffs in defense-dependent regions would have presented a serious challenge for the effective conversion of workers to skilled jobs paying wages equivalent to their former defense jobs. The broader process of

worker conversion was detailed in the section "Worker conversion," but some regional dimensions of the problem should be highlighted. Despite textbook renditions of labor markets, laid off workers, especially those not in high-end professional occupations, are not highly mobile. Because they have fixed assets and local ties, most displaced workers will tend to seek new work in their local labor market. In areas experiencing massive defense layoffs, there were few opportunities for individuals to find local work in their former occupations and/or at equivalent wage levels. The resulting industrial and occupational concentrations of un-employment added to the long spells of unemployment and underemployment shown in the studies summarized before.

Overcoming these classic market failures of unemployment and underemployment through effective education and training schemes can yield clear net benefits at the regional level. But, as noted earlier, the federal employment and training architecture was not geared for longer-term training or professional education – exactly the services that many defense workers in hard-hit regions needed to convert to quality civilian jobs. There were a number of smaller scale regional experiments that had success, but they were not typically linked to broader regional development strategies. The economic benefits would have been substantial, at both the regional and national level, if a major federal initiative had been in place to support long-term retraining. Tens of thousands could have undertaken training in the early 1990s to obtain new professional credentials, new college or graduate degrees or new skills in fast-growing technology service occupations. Newly trained personnel would have aided the expansion of high-technology manufacturing and service sectors in defense regions, decreased regional defense dependence, and reduced the skill shortages that emerged in some regions in the late 1990s. A comprehensive national retraining program would not only have contributed to national productivity and income growth but considerably increased the efficiency of the adjustment process in many regions.

Regional diversification initiatives

A final important component of regional conversion included broader economic development strategies to diversify the regional economy and reduce defense dependency. These efforts included measures to stimulate growth in local non-defense sectors, and also incorporated projects to encourage business start-ups by ex-defense personnel, spin-offs and technology transfer from larger defense companies.

In a number of regions, the shock of defense downsizing catalyzed, for the first time, region-wide economic recovery initiatives. In areas such as St Louis, Long Island, Los Angeles, and Tucson energetic efforts at organizing technology transfer and broader regional diversification efforts were launched in the early 1990s. These initiatives employed various economic development tools including innovative manufacturing extension services, business incubation, tech transfer consortiums, and seed and venture capital pools as well as more classic tax abatement, convention,

and tourism development schemes (Oden *et al*., 1993, 1994, 1996; Oden, 2000; US Department of Commerce, 1997). Some were more successful than others with outcomes dependent on regional capacities, experience with previous episodes of structural change, and success at overcoming jurisdictional fragmentation.

Successful examples include a Long Island project to increase technology transfer to local firms, and encourage start-ups from major regional research centers including Brookhaven National Labs, Cold Spring Harbor Laboratory, and the State University of New York at Stony Brook. Most dealt with medical equipment, biotechnology, commercial electronics, or software applications. State and regional authorities also sponsored two highly successful business incubators concentrating on software and biotechnology start-ups. There were also a few cases of successful start-ups by ex-aerospace engineers or technologists (Oden *et al*., 1994; Project Long Island, 1997). These efforts eventually culminated in a true strategic planning effort launched in 1994 by a newly formed business organization. This group built upon many of the earlier defense adjustment projects, adding venture capital funds, new technology and university partnerships in a long-term drive to diversify the region's manufacturing and high-tech service sectors (Project Long Island, 1997).

Another interesting effort at technology transfer and regional diversification occurred in St Louis. Prompted by defense downsizing concerns, a local conversion task force launched a regional critical technology initiative to assay the defense and civilian technology base in the region, and find ways to improve technology transfer between firms, local universities, and government research centers. Recommendations were made to improve links between commercial firms, local universities and locally sited federal research programs in order to support diverse and emerging high-tech sectors outside of defense. Related efforts to prompt McDonnell–Douglas (now Boeing) to survey its patent files for possible commercial applications or invest in a modest technology transfer project were not successful. However, the critical technologies project was effective at increasing collaborative research between public institutions such as Washington University, large commercial firms such as Monsanto, and a number of smaller high-tech firms in materials, biotechnology, and environmental engineering service sectors (Meyer, 1998). This effort eventually led to the establishment of a more permanent institution, the St Louis Regional Technology Alliance, whose objective is to continue to build collaboration and capture research funding from public and private sources to stimulate nondefense high-tech sectors.

In each example, there is some evidence that these activities are beginning to contribute to regional recovery and diversification, although it is impossible to tie larger regional trends to these particular programs. The Long Island Initiative corresponded with a modest revival of the region's high-tech manufacturing and service base. Long Island experienced significant job growth in 1996–97 in computer services, electronics, medical equipment, and biotechnology sectors (Johnson, 1997; Project Long Island, 1997). The economic recovery in St Louis has been steady since the mid-1990s, manufacturing stabilized, and growth in high-tech service sectors occurred despite the defense slump. In the St Louis MSA,

computer-related services, R&D services, and management services added over 10,000 jobs during the 1989–97 period (Meyer, 1998).

Conclusion

Our assessment of the post-Cold War conversion process is generally critical in two major respects: the actual outcomes of the process were not what were hoped for at the onset of the 1990s; and there is strong evidence that an alternative set of polices could have stimulated more conversion and yielded considerable efficiency gains for both the defense and broader industrial base.

Returning to the four questions posed at the outset, it is not clear that the defense restructuring process has produced a research and industrial base capable of meeting our immediate and future defense requirements in a cost-effective manner. To meet current and future security needs we must now rely on a highly concentrated industry that is more segregated from fast-moving commercial technology and that must eventually be fed with costly new weapons projects that could be out of line with real security needs. The defense merger movement, combined with weak and contradictory federal policies, limited the transfer of defense-bred assets and capacities to civilian markets. Federal funds to encourage diversification and spin-off were squandered as consolidating firms rolled up their fledgling projects to hone in on mature defense businesses and raise cash to pay off debt. Companies that were successfully diversifying got little federal support and most were forced to sell off their defense divisions due to the high stock premiums offered in the mid-1990s.

The intensity and rapidity of shutdowns, downsizing, and relocations at the large primes, and the corresponding abandonment of diversification experiments, led to high levels of regionally concentrated worker displacement. Aside from a few illuminating examples of successfully designed programs, the national employment and training system was not capable of dealing with post-Cold War downsizing. Laid off defense workers experienced long periods of unemployment, their skills and knowledge in many cases wasted. Finally, while the impacts of defense cuts were uneven across regions, a number of major defense complexes experienced 1930s-style economic downturns, while sometimes bold locally led attempts to reorient regional industries, technologies, and talent were severely constrained.

But isn't this glum assessment out of sync with the bright economic record of the 1990s? Didn't incremental and piecemeal policy making allow (perhaps inadvertently) the quick write-off of excess defense capacity and make way for new burgeoning high-tech development? Would a different, bolder federal program really have made any difference?

The initial success of certain large firm diversification efforts and the widespread conversion of smaller firms shut out of the merger wave suggest that different policies could have yielded more conversion, diversification, and technology transfer – a greater payoff from the massive Cold War investment. A policy stance that did not add government subsidies and encouragement to the forces driving merger and consolidation would have contributed to this outcome.

Aggressive and strategic federal policies, including investment in civilian technology and procurement, more powerful incentives for commercial diversification and dual-use development, and greater efforts to retain and reorient the defense labor force would have promoted a more integrated and dynamic industrial and technology base. If properly designed and implemented, a more robust conversion policy could have left us with a more diverse vibrant manufacturing base, which despite the hot house expansion of "new economy" sectors, continues to erode across a number of sectors. Ironically, more efficient and widespread conversion could have also led to a more suppler, dynamic defense industry comprised of healthy, more diversified large firms, and flexible small contractors.

More firm conversion may have reduced, to some extent, the level and degree of un- and underemployment experienced by defense workers. But the most glaring shortcoming of workforce conversion consisted of the limited attention and investment allocated to helping workers' transition to jobs in which they could recoup or nearly recoup their former earnings and continue to use their core skills. Together with spending to stimulate markets for civilian technologies, a large-scale program for long-term retraining and education, similar to the GI Bill in the 1950s, could have had substantial payoffs, particularly given the skill shortages of the late 1990s. Better coordination in the job training and placement system would also have produced better results. Going forward, the DOL should continue to take a strong leadership role in applying the lessons learned in the Defense Conversion Demonstration program to other workers at risk of mass layoff and those already displaced.

The end of the Cold War, like its beginning, offered a window for an imaginative and far-reaching revision of national priorities. After an initial, short-lived period of innovation, the effort to forge a robust conversion policy ran into a climate of derision about federal government initiatives both domestic and foreign. Giving in to this cynicism left the process of post-Cold War adjustment adrift and generated costs and inefficiencies that may not yet be fully amortized.

Notes

1 A survey of 600 defense companies which excluded the top 50 defense contractors was completed by Jonathan Feldman in 1995 (Feldman, 1996). The firms surveyed ranged from specialized makers of electronic components totally dependent on defense sales, to construction contractors with less than 5 percent of their sales to the DoD. The survey obtained information for the 1989–93 period.

2 In the course of the follow-up survey we discovered from other respondents or sources that two of the nonresponding firms had gone out of business. Four of the nonrespondents replied to an initial contact, but refused to participate. One company apparently received the survey but all efforts to follow up were unsuccessful.

3 During the 1980s buildup, an estimated 815,000 manufacturing jobs were created; 923,000 defense-related manufacturing jobs were lost during the drawdown (Thomson, 1998). Sales and employment statistics for a sample of nine major defense contractors show that employment declines have outstripped declines in sales. These nine contractors as a group underwent sales declines of 5.7 percent from 1989 to 1997 but laid off over

41 percent of their employees, Northrop Grumman's sales declined by 15 percent in real terms between 1989 and 1997, but its workforce dropped by nearly double that, or 26 percent. Lockheed Martin saw sales increase by 35 percent but increased its workforce by just 8 percent during this period.

4 At his post-election Economic Summit, for instance, President Clinton proposed an aircraft industry policy to create civilian job opportunities for laid off defense aerospace workers.

5 Defense workers might be divided into three groups in terms of their skills, experience, and reemployment prospects (Economic Roundtable, 1992). One group, constituting about one-third of laid off workers, was in "generic" occupations from which transition into new jobs could be expected to be relatively easy. A second group, again comprising roughly one-third of the work force, was concentrated in lower skilled, less specialized production and clerical jobs, workers whose ability to sustain a decent income was linked to the relatively generous pay offered by large defense companies rather than to specialized skills. The third group comprised of specialized workers – defense engineers, higher level managers and precision production workers with specific knowledge that is not in high demand outside the defense industry. For many in this group, the choice was between accepting major wage cuts and lower skilled work or undertaking long-term retraining for completely different occupations.

6 With respect to displaced military personnel and DoD civilian personnel, the government had a better record. As Table 2.2 shows, the government dedicated many more resources to involuntarily discharged soldiers and civilian DoD employees than it did to defense workers in the private sector. Comprehensive planning around military base closures, with federal funds for germinating economic development projects, has resulted in some job creation where transitions were well managed locally (Markusen and Hill, 1997). Displaced service personnel have also received intensive, long-term assistance through initiatives like the "troops to teachers" project. Unfortunately, no statistics were available with which to compare DoD civilian and military displaced worker outcomes with those of private sector displaced workers.

7 Kodrzycki, 1995, p. 14. EDWAA participants typically entered training courses that lasted 9–12 weeks.

8 A 1997 white paper by the American Electronics Association identified severe unmet demand for skilled workers in high technology occupations, particularly in programming and systems integration areas (AEA, 1997).

References

American Electronics Association (1997) White Paper on High-Tech Worker Shortage. Washington, DC: American Electronics Association.

Bischak, G. (1997) *US Conversion after the Cold War, 1990–97: Lessons for Forging a New Conversion Policy*, Washington, DC: Bonn International Center for Conversion and National Commission for Economic Conversion and Disarmament.

BICC conversion survey (1998) Bonn international center for conversion and national commission for economic conversion and disarmament, *Conversion Survey*, Washington, DC: BICC, Apendix A1, pp. 259–62.

Congressional Budget Office (1993) *Reemploying Defense Workers: Current Experiences and Policy Alternatives*, Washington DC, CBO.

Curran, L., Kaplan, G., Reizenman, M., and Watson, G. (1992) "Companies in profile," *IEEE Spectrum*, December, 29(12): 37–45.

Economic Roundtable (1992) "Los Angeles county economic adjustment strategy for defense reductions," *Report to the Community Development Commission of Los Angeles County*.

Feldman, J. (1996) "The successful conversion of defense serving firms to commercial activity," PhD dissertation, Rutgers University.

Hedding, W. (1998) Electric boat dislocated worker assistance coordinator, at Groton Metal Trades Council, Groton, CT, in person interview, February 25, 1998.

Johnson, K. (1997) "A revived Long Island finds life after military contracts," *New York Times*, July 7, p. A-1.

Kodrzycki, Y.K. (1995) "The costs of defense-related layoffs in New England," *New England Economic Review*, March/April: 4–24.

Markusen, A. (1997) "The economics of defense industry mergers and divestiture," *Economic Affairs*, 17(4): 28–32.

Markusen, A. (1998) "The post Cold War persistence of defense specialized firms," in G. Susman (ed.) *The Defense Industry in the Post-Cold War Era: Corporate Strategies and Public Policy Perspectives*, Oxford: Elsevier, pp. 121–146.

Markusen, A. (1999) "The Rise of World Weapons," *Foreign Policy*, 114: 40–51.

Markusen, A. (2000) "Should we welcome a transatlantic defense industry?," in J. Reppy (ed.) *The Place of the Defense Industry in National Systems of Innovation*, Pence Studies Program, Cornell University, Occasional Papers #25.

Markusen, Ann and Catherine Hill (1997) "Do regions matter? Evidence from twelve case studies of regional response to defense downsizing," paper presented at the Klein Symposium on the Management of Technology Smeal College of Business, Penn State University, September 17.

Markusen, A. and Costigan, S. (1999) "A defense industry for the twenty-first century," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the Twenty-First Century*, New York: Council on Foreign Relations Press, pp. 409–24.

Merrill Lynch, Pierce, Fenner & Smith Inc. (2000) *Defense Primer: The ABCs of Investing in the Defense Sector*, March 14.

Meyer, L. (1998) *Development of Critical Technologies in Greater St Louis*, 1990–98, St Louis: St Louis Defense Adjustment Program, January.

Mueller, E.J. and Gray, M. (1994) "Displaced and mismatched: the inadequacy of federal retraining programs for defense workers," Center for Urban Policy Research, Working Paper 75. New Brunswick, NJ: CUPR.

Mueller, E.J., Cachaaza, J., Feldman, J., Fice, D., Gray, M., Goldberg, L., and Zeidman, A. (1993) "Retraining for what? Displaced defense workers come up against EDWAA," Center for Urban Policy Research, Working Paper no. 57, September, New Brunswick, NJ: CUPR.

Oden, M. (1998) "Defense mega-mergers and alternative strategies," in S. Gerald and S. O'Keefe (eds) *The Defense Industry in the Post-Cold War Era*, Amsterdam: Pergamon Press, pp.147–71.

Oden, M. (1999a) "Cashing-in, cashing-out and converting: restructuring of the defense industrial base in the 1990s," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations Press, pp. 74–105.

Oden, M. (1999b) "The post Cold War adjustment of defense regions: the role of regional planning in mitigating the effects of structural change," paper presented to the ACSP Conference, Chicago, October 23, 1999.

Oden, M. (2000) "Federal defense industrial policy, firm strategy, and regional conversion initiatives in four American aerospace regions," *International Regional Science Review*, 23(1): 25–47.

Oden, M., Hill, C., Mueller, E., Feldman, J., and Markusen, A. (1993) "Changing the future: converting the St Louis economy," Working Paper 59, Center for Urban Policy Research, Rutgers University.

Oden, M., Mueller, E., and Goldberg, J. (1994) "Life after defense: conversion and economic adjustment on Long Island," Working Paper 82, Center for Urban Policy Research, Rutgers University.

Oden, M., Markusen, A., Flaming, D., Feldman, J., Raffel, J., and Hill, C. (1996) *From Managing Growth to Reversing Decline: Aerospace and the Southern California Economy in the Post Cold War Era*, Project on Regional and Industrial Economics, Rutgers University.

Powers, L. and Markusen, A. (1999) *A Just Transition? Lessons from Defense Worker Adjustment in the 1990s*, Washington, DC: Economic Policy Institute, April.

Project Long Island (1997) *A Periodic Progress Report*, Autumn.

Schoeni, R.F., Michael Dardia, Kevin McCarthy, and George Vernez (1996) *Life After Cutbacks: Tracking California's Aerospace Workers*, Santa Monica, CA: RAND.

Thomson, A. (1998) "Defense-related employment and spending, 1996–2006," *Monthly Labor Review*, July: 14–33.

US Department of Commerce (1997) *Defense Adjustment Program-performance Evaluation*, Washington, DC: Department of Commerce Economic Development Administration, November.

US Department of Defense (DoD) (1985) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1986) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1987) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1993) *100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards, Publication P01*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1994) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1995) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1996a) *100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards, Publication P01*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1996b) *Prime Contract Awards by Region and State, Publication P06*, Washington, DC: Department of Defense.

US Department of Defense (DoD) (1998) National defense budget estimates for FY 1998, Table 5–8 Procurement Category.

US Department of Labor, Employment and Training Administration (1994) *Evaluation of the Defense Conversion Adjustment Demonstration: Interim Report on Implementation*, Washington, DC: DOL.

US Department of Labor (1997) *Responses to Defense Cutbacks: The Dislocation Aversion Approach*, Washington, DC: DOL.

US Department of Labor, Employment and Training Administration (1997) *Responses to Defense Cutbacks: Demonstration Evaluation Findings*, Washington, DC: DOL.

US General Accounting Office (GAO) (1994) "Future years defense program, optimistic estimates lead to billions in overprogramming," GAO/NSAID-94–210, July.

US General Accounting Office (GAO) (1995) "Bottom-up review: analysis of key DoD Assumptions," GAO/NSAID-95-56, January.

US Office of Technology Assessment (OTA) (1992) *After the Cold War: Living with Lower Defense Spending*, Washington, DC: US Government printing Office, February.

Vernez, G., Dardia, M., McCarthy, K., Malkin J. and Nordyke, R. (1996) *California's Shrinking Defense Contractors: Effects on Small Suppliers*, Santa Monica: RAND Corporation.

3 The Spanish defense industrial restructuring in the post-Cold War decade

Antònia Casellas

Introduction

Spain has significantly downsized its defense industry in the 1990s with mixed results in moving workers and facilities into civil sector activities. In the 1980s, the electronic and aerospace sectors enjoyed the support of governmental policies, which targeted them as engines for Spanish re-industrialization. As a result, they managed to advance their technological capability and became more competitive in the production of subsystems for the international market. Improvement in technological capability, specialization in subsystems, and internationalization have also benefited civil production in these sectors, and now accounts for more than 50 percent of total sales. In contrast, the naval, armament, and ammunition sectors have not been able to adapt to the new defense environment. Both sectors have gone through a deep production crisis while remaining totally dependent on defense markets.

Post-Cold War budgetary defense cutbacks have taken place in all Spanish defense industrial segments. Defense sales decreased by 29.5 percent in the period 1990–96, and the Spanish defense industry lost 54 percent of its total direct employment. While the decrease in defense sales is linked to lower military expenditures, the extensive job loss is also attributable to an ongoing industrial restructuring process in publicly owned firms initiated in the 1980s.

The Spanish defense industry represents a complex defense conversion process as it combines progress in and barriers to defense conversion. On the one hand, there are several features that reinforce a low supply-side resistance to defense conversion. First, from an industrial perspective, Spain is a second-tier defense producer with a relatively small defense industry in terms of direct employment and assets. Second, Spanish defense firms are specialized in electronic and engineering subsystems, which have a high capability for dual-use production. Third, there is no defense economic dependent region in Spain. Fourth, the Spanish defense firms have already undergone an extensive labor force restructuring. Finally, the defense firms are in a process of privatization and integration into the international defense production, which could reinforce their specialization in subsystems. On the other hand, the Spanish defense industry presents barriers to defense conversion.

First, governmental industrial policies do not have a clear military conversion or dual-use industrial policy. Second, reversing the tendency of the early and mid-1990s, the military budgets for the late 1990s show an increase due to the costs associated with the professionalization of the Armed Forces and new procurement programs. Third, R&D governmental budgets for the late 1990s give priority to defense research programs over civil research programs. Fourth, within the process of privatization, procurement commitments by the Spanish Defense Ministry become important in order to attract foreign investors into the public-owned defense firms. Finally, at the firm level, there is little debate of the possibilities of defense conversion for the Spanish defense industry.

The defense industry has played a central role in the industrial policy of Spain during the last two decades. It accounts for only a tiny portion of the Spanish economy in terms of direct employment, sales, and assets. Sources disagree on numbers, but scholars estimate that the Spanish defense industry does not generate more than 1 percent of the total Spanish industrial product. However small, in the last two decades, it has played a key role within the Spanish industrial policies aimed to the re-industrialization of the Spanish economy. In this sense, Spain is a good example of the importance that second-tier defense industry has for a medium-sized industrialized country.

The Spanish defense industry has undergone a strong transformation, linked to Spain's democratization process initiated in the mid-1970s and later, its integration into European Union (EU), North Atlantic Treaty Organization (NATO), and Western European Union (WEU). Despite historical differences, the case of Spain is also extremely important because it can bring insights into the dilemmas Eastern European countries may encounter in the transformation of their military force and industry as these countries recover their democratic institutions, integrate in international organizations, and move toward a market economy.

This chapter investigates the adaptation of the Spanish defense industry to the end of the Cold War and its progress toward defense conversion. Special attention is paid to the peculiarities of the Spanish defense industry within changing political and economical contexts. This study relies on primary and secondary data. The primary data was obtained during a field research in Spain in the summer of 1998. In addition to reviewing publications at defense related research institutes and governmental and nongovernmental document centers, interviews were conducted with Spanish scholars, Armed Force members, politicians, members of the administration, company managers, and peace groups.

To understand the unique features of the Spanish defense industry and its adaptation to the post-Cold War era, the next section analyzes the defense industrial context under General Franco, and the restructuring of the Armed Forces, the defense industrial and procurement policies after his death in 1975. The section that follows next studies the Spanish defense industrial policy in the post-Cold War era with special attention to the budgetary austerity and its effects on the industry. The section "Character and location of the Spanish defense industries," presents the character and location of Spanish defense firms and explores the strategies adopted by these firms in the 1990s. The characteristics of labor cuts occupy

the section "Defense industrial restructuring and workforce cuts." The section "Imports and exports in the post-Cold War era," studies Spanish defense imports and exports in the post-Cold War era, highlighting the disagreement on export values among sources. The penultimate section focuses on the shift in defense budgets in the late 1990s and the budgetary impact of the professionalization of the Armed Forces. Finally, this chapter concludes with policy recommendations.

Military industrial evolution during the Cold War era – the defense industrial context under Franco

The nature of military spending and procurement in Spain during the Cold War period was heavily marked by the relatively unique, for Europe at that time, dictatorship of General Franco. Three features are prominent: (1) the bilateral defense agreement between Spain and the US; (2) fragmentation of procurement decisions within the Spanish military government; and (3) higher spending on personnel than on procurement.

Isolated in the international sphere since the end of the Second World War, Franco was able to break the international embargo due to a bilateral agreement with the US in 1953. The agreement established a Spanish-American Defense Treaty for which the US provided military and economic aid in exchange for base facilities in Spain. The initial agreement was reiterated through other agreements and treaties in 1970, 1976, 1982, and 1989. Similar to the case with South Korea, under the bilateral agreements, the US influenced the patterns of defense spending and procurement in Spain by assuming the role of provider of military assistance. Under the bilateral defense agreement, the US equipped Franco's Armed Forces with secondhand US weapons creating a strong dependency on procurement that negatively affected the Spanish defense industry (Molas-Gallart, 1995).

A second feature that adversely affected the Spanish defense industry was the fragmentation of procurement decisions. Under Franco's dictatorship, the Armed Forces were divided into three military ministries – Air Force, Navy, and Army – to accommodate the different political tendencies within Franco's military strata. The arrangement provided stability to the regime, but it caused coordination problems and economic inefficiencies (Molas-Gallart, 1997a). The division in procurement decisions reinforced a military industrial base highly fragmented by sectors as well as geographically. In the 1960s, the military industry started a process of integration on a sector-by-sector basis. This process produced Empresa Nacional Santa Bárbara de Industries Militares, S.A. (SANTA BARBARA) as a company that unified the facilities of the Army and Construcciones Aeronáuticas S.A. (CASA) and an integration of aeronautic firms. Despite the creation of these two military conglomerates, the industry in general stagnated even with Spain's rapid industrialization process in the 1960s, and an average annual GNP growth of about 7 percent.

The military industry languished in part because spending was high on personnel compared to procurement. Franco's Armed Forces were over-manned, a structure which "can be traced to the end of the Civil War, when many fighters on the

victorious side stayed in the Armed Forces […]. The result was a top-heavy force structure with an excess of low and middle rank officers" (Molas-Gallart, 1997b: 268). In the frame of the Cold War, under US protection, Franco's military policy was focused not on external threats but on suspected internal enemies – political, social, or cultural organizations that could challenge his regime. The presence of a high number of military personnel, although poorly equipped, fulfilled Franco's internal security agenda.

After the death of Franco in 1975, the Spanish defense industry was especially weak in terms of assets and technology capability. The political transition to a democratic society implied the transformation of the military forces in three key ways: the recognition of social and political pluralism, a change in the perception of threat, and the professionalization and subordination of the military forces to civil society (Bañón-Martinez and Barker, 1988). To facilitate this process, the successive democratic governments introduced slow, but significant changes in the structure of the Armed Forces. These changes, which will be analyzed in the next section, had a direct repercussion on defense procurement and the defense industrial policies undertaken by the democratic governments of the late 1970s and 1980s.

Restructuring of the Armed Forces, defense industry, and procurement in the democratic period

To modernize the Armed Forces and to adapt them to a democratic society, governments since Franco have placed special emphasis on establishing civil control on the military strata. The implementation of civil control involved the modernization of the internal organization of the Armed Forces, as well as the improvement of their operability and equipment, beginning in 1977 with the newly created Ministry of Defense and in 1984 with the subordination of the Army, Navy, and Air Force under the Ministry of Defense. The government also included younger and more professional members within the command structure, since the incorporation of the Spanish forces into international military alliances (NATO and WEU) reinforced the need for a more professional force with a higher level of operability. In 1985, the government cut personnel while raising salaries substantially and giving greater weight to professional merit in promotions (Fisas, 1996; Molas-Gallart, 1997b).

As a result, the Armed Forces downsized by one-third, from 1984 to 1995. The number of conscripts fell by 40 percent. The Ministry of Defense also sold thousands of installations to the public sector. Despite these cuts in personnel, the spending on defense personnel did not necessarily decrease (Table 3.1). Persistent high personnel expenditures and their inflexible character meant that governmental cuts in military spending following the end of the Cold War era affected mainly procurement (Molas-Gallart, 1997b).

Simultaneously with personnel and organizational reforms, in the 1980s the Spanish government initiated the modernization of military equipment. Expenditures for procurement expanded from 35 percent of the military budget in 1982 to 42 percent in 1986. The Army lost ground as acquisitions by the Navy and

Table 3.1 Defense force restructuring

Year	*Military personnel active service*	*Military personnel transitory reserve*	*Transitory reserve cost*⋆	*Armed Forces (per 1,000 citizens)*
(1984)	342,000	—	—	8.2
1989	277,000	—	—	7.1
1990	263,000	8,364	40,232	6.8
1991	246,000	10,733	42,684	6.3
1992	198,000	12,440	51,376	5.1
1993	204,000	12,598	50,723	5.2
1994	213,000	13,330	52,780	5.5
1995	206,000	13,396	54,026	5.4
(2000)	180,000	—	—	

Sources: Data compiled from Fisas (1995), IISS (1997), and ACDA (1996).

Notes
The modernization of the Armed Forces started with the reduction of military personnel in 1981 through compulsory retirement at age 64. In 1985, the government created a Transitory Reserve, which allowed for further substantial cuts in personnel.
⋆ million pesetas at 1994 levels.
— data not available.

the Air Force increased. The defense budget for 1988 was allocated in the following way: 37 percent Army, 24 percent Navy, 19 percent Air Force, and 20 percent Minister of Defense (Library of Congress – Country Reports, 1988; Copley, 1996). In 1984, the government bought from McDonnell Douglas 72 F-18 aircrafts and signed an offset agreement worth $1,540 million (US$1981) over a period of ten years, extendable to three more years (Molas-Gallart, 1996a).

The offset agreement with McDonnell Douglas emphasized technology transfer and was part of a strategy of the Spanish government to use military procurement as a tool of industrial policy. The objective of this policy was to target the engineering and electronic sectors with the goal of creating a defense industry with adequate financial and technological resources to supply, in a mid-run, the Spanish Armed Forces, and to enable the public-owned Spanish defense electronics industry to compete in the international defense market. The agreement with McDonnell included aerospace-related offsets: manufacturing, assembling, testing, repairs, and revision of aircraft; other defense relevant technologic offsets; and indirect commercial offsets. The offset led to the creation of an office to coordinate such agreements – the Offsets Management Office.

The F-18 defense offsets represented two-thirds of the total value of defense offsets signed by Spain during mid-1980s and early 1990s. At regional level, Madrid secured the majority of the defense offsets. At company level, the aerospace firm CASA and the electronic conglomerate INDRA profited the most, capturing 90 percent of the F-18 defense offsets, or 30 percent of all offsets. The rest of the offsets were divided into a large number of firms, by the end of 1993, 413 defense and commercial firms took advantage of offset agreements. The number involved suggests that, apart from CASA and INDRA, corporations took small participation

of offset operations. Yet, the offset agreement policy had economically positive effects: the creation of jobs, the improvement of exports of Spanish defense and civil products to the US, and Spanish defense firms acquiring experience in international cooperation. The second most important offset agreement, also signed with McDonnell Douglas, was in 1984, for the acquisition of 12 Harriers AV-8B. During the 1980s, US firms captured around two-thirds of total offsets agreements (Molas-Gallart, 1996a, 1998). The offset policy objectives were embedded in large political and economic agendas, worth explaining at greater length.

Political and economic underpinnings of the new defense industrial policy

The Socialist government strategy to target defense industries as engines for Spanish re-industrialization was the result of a combination of factors: (1) the incorporation of Spain in international organizations and the need to fulfill NATO's equipment standards and to improve the level of effectiveness of the Armed Forces; (2) the need to find an industrial sector that would compensate for the economic crisis in traditional industrial sectors (manufacturing, shipbuilding, mining, etc.); (3) the notion that offset agreements first, and European R&D cooperation in military projects later, would promote technology transfers to Spain to allow indigenous production; (4) the strategy to use military procurement as a measure to accommodate the military strata; and (5) the limitations of the EC subsidies in all industrial sectors other than the military.

In the 1980s, Spain initiated a belated process of integration into international defense organizations. In May 1982, Spain joined NATO, and a popular referendum in March 1986 confirmed the status of the country within the alliance. In the referendum, Spaniards agreed to be part of NATO's structure under three conditions: (1) Spain would remain outside of the integrated military command; (2) it would continue to prohibit installation, storage, and introduction of nuclear weapons in its territory, and (3) it would revise the treaties that had allowed the US to station troops in Spain since 1953 and reduce US military presence in the country.[1] Spain subsequently joined the WEU, Europe's defense alliance, and joined France, Italy, and Portugal to create joint air, land, and maritime forces (IISS, 1996). The incorporation of Spanish Armed Forces in these organizations required modernization of Spanish military equipment, an expensive proposition. Developing a high technological indigenous defense industry would avoid a trade deficit and win jobs for Spaniards.

Spanish leaders also desired to find an industrial sector that would compensate for the crisis in traditional industrial sectors and modernize the Spanish economy. From the early 1970s to the 1980s, the economic problems of Spain were linked to those in the international economy (oil price increases), and internal organizational and structural deficiencies (a poor taxation system, inflexible labor market, a concentration on traditional, and obsolete industry). Additionally, Spain suffered from competition from new industrialized countries in those industries in which the country was specialized: steel, shipbuilding, textiles, and heavy chemicals

Table 3.2 Military R&D expenditure, 1987–93

Project	*Allocation 1987–89 (million pesetas)*	*% total*	*Allocation 1990–93 (million pesetas)*	*% total*
Eurofighter	24.0	35.2	98.2	82.1
C2, simulators, arms systems	7.6	11.1	5.1	4.3
Missiles	—	—	4.5	3.8
Combat vehicles	—	—	3.4	2.8
Communications and electronic	5.8	8.5	2.5	2.1
Detection and navigation aids	3.0	4.4	2.1	1.8
Technology cooperation	—	—	1.5	1.2
Military computing	—	—	1.0	0.8
Munitions and explosives	—	—	0.6	0.5
Optronics, infrared, materials	9.6	14.1	0.6	0.5
Nuclear, chemical, and biological	—	—	0.1	0.1
Total	68.2	100.0	119.6	100.0

Source: SIPRI yearbook (1996).

(Salmon, 1995). The government considered the defense electronics industry as a possible high technological industrial niche.

Apart from the offset agreement programs presented earlier, in the late 1980s, the Spanish administration initiated an ambitious participation in European R&D projects. By 1989, under the direction of the Directorate of Armament and Material, Spain was participating in twenty-four cooperative R&D programs. Of these programs, the European project Eurofighter captured a considerable percentage of the total investment (Table 3.2). Spain's gross expenditure on military R&D became one of the highest of the world, being in 1990 twice that of Canada, a country with similar economic size (Table 3.3). The high investment in R&D and the cooperation with European defense projects brought confidence to the Spanish defense industry as it showed a clear commitment of the government to support the industry.

Government expectations were reflected in the declarations of the Director General of Armaments and Material (DGAM), Juan Fernando Ruiz Montero, who in 1988 asserted that by the year 2000, 90 percent of the Spanish military equipment would be of Spanish design (SIPRI, 1996). The government's defense policy based on offset agreements, R&D investment, and procurement plans also transmitted to the military strata the message the Socialist government was determined to modernize the Armed Forces, with a significant cut in personnel but modernization of equipment. The engagement of the Armed Forces in research activities in a European framework was also a good mechanism to expose historically isolated Spanish military officials to European defense projects.

Finally, the strategy of re-industrialization through the support of military electronic and engineering systems allowed the Spanish government to provide subsidies to industrial firms without transgressing the limitations of the EC industrial

Table 3.3 Expenditures in R&D – comparative table

Countries	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
US	67.8	65.5	62.6	59.7	58.6	59.0	55.3
	31.0	28.0	26.0	24.0	24.0	25.0	22.0
UK	42.7	43.6	43.7	442	40.9	44.5	—
	19.0	18.0	18.0	16.0	17.0	—	—
France	37.3	37.0	40.0	36.1	35.7	33.6	—
	22.0	21.0	24.0	21.0	19.0	17.0	—
Spain	**12.6**	**19.1**	**18.4**	**16.8**	**15.6**	**12.5**	**10.6**
	7.2	**13.0**	**12.0**	**10.0**	**8.4**	**7.2**	**6.1**
Germany	12.4	12.8	13.5	11.0	10.0	8.5	8.4
	4.7	4.6	5.0	4.2	4.0	3.5	3.3
Italy	10.4	10.3	6.1	7.9	7.1	6.5	—
	6.8	6.0	3.5	4.5	4.3	3.9	—
Canada	8.3	7.5	7.1	6.4	6.2	—	—
	3.3	3.1	2.8	2.6	2.6	—	—

Source: SIPRI yearbook (1996).

Notes
First row: Military R&D as a percentage of total government expenditure on R&D.
Second row: Military R&D as a percentage of national R&D expenditure.

policies, which restricts subsidies in all industrial sectors other than the military. To support the defense industrial strategy, the government designed a group of public policies that included: (1) Offset agreement programs supporting technology transfer; (2) long-term budgetary plans forecasting real growth in procurement defense budgets; (3) a concentration of R&D budgets within the defense sector; (4) promotion of exports of weapons to developing countries through specific line of credits; (5) the encouragement of mergers among electronic firms; and (6) the creation of spin-off companies to participate in international programs.

The attempt to create an indigenous public-owned defense industry using offset agreement strategies and participation in R&D European defense programs, did not contemplate attracting foreign investment into Spanish defense firms, despite a strong influx of foreign capital into the Spanish economy at this time. In fact, Northrop sold its 25 percent share of CASA back to the Spanish government, which it had held since 1965. By the end of the 1980s, Spanish military firms were almost 100 percent under Spanish capital (Molas-Gallart, 1996b). This policy radically changed in the post-Cold War era.

Defense industrial policy in the post-Cold War era

The policy of promoting the military industry as an engine of Spanish industrial recovery ended with the beginning of the 1990s, when the government shifted to a new austere military policy.

The end of the Cold War era and subsequent global procurement adversely affected Spanish defense exports. Spain had targeted developing countries as a defense market, offering them special credit lines. By the end of the 1980s, an unpaid arms export balance had grown large and problematic. Both the slump in export demand and payment uncertainty argued against continuation of the export-oriented defense strategy (Oliveres, 1998b).

Budgetary restraint came to dominate Spanish policy. In 1991, Spain signed the Maastricht Treaty, which was ratified in the fall of 1993. The treaty imposed budgetary austerity, committing Spain to its convergence criteria. The Maastricht Treaty convergence criteria were: (1) a public sector deficit of not more than 3 percent of GDP; (2) public debt no more than 60 percent of GDP; (3) interest rates no more than 2 percent above the average of the three lowest rates in the EU; (4) inflation no more than 1.5 percent above the three lowest in the EU; (5) remaining in the narrow band of the Exchange Rate Mechanism (ERM) for two years. At the time of the agreement, Spain had the highest interest rates in the EU, approximately 13 percent, and a high inflation and public sector deficit.

Additionally, offset agreements and involvement in European projects did not provide the technology transfer that the government forecasted in the mid-1980s. The implementation of the offset programs, especially the F-18 aircraft program, was difficult and it did not provide the expected outcome regarding technology transfer. First, the magnitude of the offset and the long span of time to implement the program made it difficult to manage the agreement. McDonnell Douglas presented lists of potential offsets that had to be evaluated, assessed, and approved or disapproved on a one-by-one basis by the Offsets Management Office. Second, Spanish industry had limited high-technological capability to absorb the high volume of direct defense offsets. Third, the government had further expenditures as they agreed to pay additional costs Spanish defense firms incurred in producing components for McDonnell. Finally, the majority of the offsets targeted indirect commercial sectors where the Spanish economy was already strong, such as chemicals, pharmaceuticals, and food products, and was concentrated in a few firms and regions (Molas-Gallart, 1996a).

Spain also withdrew from the majority of international defense R&D projects, with the exception of the Eurofighter. This failure in R&D projects meant that:

> the Spanish technology base suffered doubly: first, from working as a junior partner on projects unsuited to its unique requirements; and second, from gaining technology only in niches already mastered by others rather than in unique areas where it might become a sought after partner in later years.
>
> (SIPRI, 1996: 401)

Despite this experience, the government decided to maintain its participation in the Eurofighter, for political as well as economic reasons. Since the Eurofighter was the major Spanish R&D project, withdrawal would broadcast the absolute failure of government's R&D policy. Furthermore, the cancellation would result in

considerable job loss and damage to national firms, especially CASA (Voss and Brzoska, 1996).

By late 1991, Spain shifted its policy from offsets to partial joint development and production with international companies. The Offset Management Office created in the mid-1980s was transformed into the Industrial Cooperation Management Office. Under this new defense industrial policy, Spanish defense firms could negotiate closer with their intentional partners. Experience gained through cooperative and offset agreements in the 1980s helped Spanish defense firms to win some prime contracts with international firms. In electronics, for instance, CECELSA (later subsumed in INDRA) became a prime contractor for the simulators and automated test beds for the Harrier II Plus (Molas-Gallart, 1997b). The Spanish Ministry of Defense also implemented a new procurement policy aimed at containing costs. The Ministry approached other domestic companies as new military suppliers, to generate competency and cost-reducing competition. Around 700 new companies registered themselves as "firms of interest for national defense," a prerequisite to become a defense military supplier (Molas-Gallart, 1996b).

Budgetary austerity and its effects on the defense industry

Military budgets fell from 5,044 million in constant 1994 US$ in 1989 to 2,899 million US$ in 1994 (ACDA, 1996).[2] The 1982 Expenditure Planning and Budget Provision Act, renewed in 1987 and 1990, established "a minimum annual real increase in maintenance and investment outlays of 4.4 percent and a maximum annual growth for the whole of the defense budget of 2.2 percent in real terms" (Molas-Gallart, 1997b: 277). Nevertheless, in February 1992, in the context of economic recession, the new Minister of Defense, Julian Garcia Vargas, delivered a procurement plan characterized by strong budget cuts (SIPRI, 1996). The procurement director resigned in protest but the cuts took place and military spending as a percentage of GNP fell by more than one-third (Figure 3.1).

Budget cuts affected procurement more than personnel expenditures, deeply affecting the defense industry. Budgetary austerity and the abandonment of the military industrial policy of the 1980s caught the defense industries by surprise. They also generated some discomfort among military analysts who saw in them a shift in government priorities and an abandonment of the modernization project. They claimed that the government's security policy of incorporating Spain into international defense organizations, with its consequent need of qualified personnel and equipment, was inconsistent with massive military cuts (Cosidó, 1994; Bardaji and Cosidó, 1995).

The budgetary cuts in the early 1990s resulted in a dramatic loss of direct defense industrial employment, nearly 54 percent from 1990 to 1996 (Table 3.4). The layoffs were across sectors, altering the industrial distribution of defense workers (Table 3.5). Aerospace suffered the lowest relative losses; armament and ammunition lost more than double what aerospace did. Defense sales decreased in the same period 29.5 percent. The shifts in employment and sales among sectors

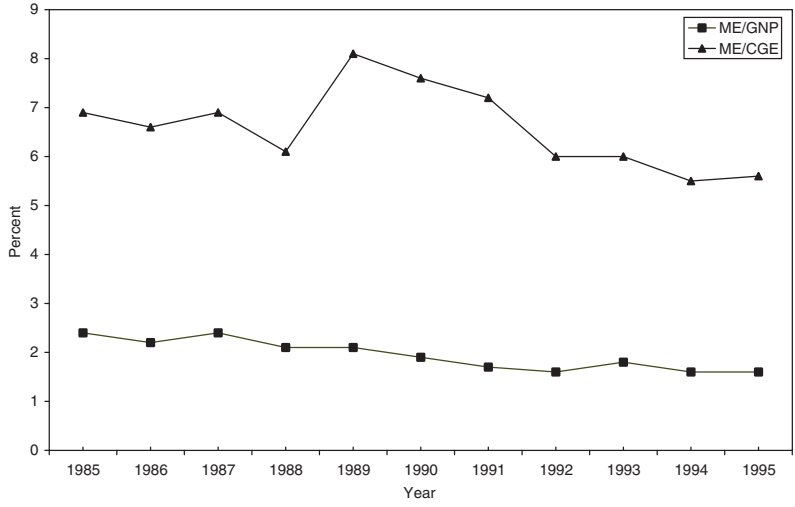


Figure 3.1 Share of military expenditure in GNP and government expenditures in Spain.
Source: US Arms Control and Disarmament Agency (1996).

Table 3.4 Direct defense industrial employment, 1985–96

Year	*Direct employment in military production (number of workers)*
1985	29,414
1986	30,922
1987	30,496
1988	31,211
1989	26,659
1990	25,339
1991	23,521
1992	21,391
1993	16,097
1994	13,050
1995	13,126
1996	11,676

Source: AFARMADE (1997b) and Oliveres (1998b).

reveal the influence of the defense industrial policies of the 1980s that actively targeted the engineering and the electronic industries as well as the importance of the Eurofighter project.

Despite dramatic loss of defense jobs, in the 1990s, the Spanish defense policy did not clearly favor military conversion. The EU military conversion initiative framed in the KONVER program was mainly sought after by European member

Table 3.5 Defense workers and sales by sector

	Direct employment in military production (number of workers)				*Growth rate (%)*	*Defense sales (million pesetas 1996)*				*Growth rate (%)*
	1990	%	*1996*	%		*1990*	%	*1996*	%	
Aerospace	6,476	25.6	4,289	36.7	−33.8	78,834	33.1	67,080	39.9	−14.9
Armament/ammunition	6,217	24.5	1,491	12.7	−76.0	27,173	11.4	14,891	8.9	−45.2
Communication/electronics	3,325	13.1	1,700	14.6	−48.9	45,528	19.0	40,996	24.4	−10.0
Naval	8,421	33.2	3,779	32.4	−55.1	58,568	24.6	40,171	23.9	−31.4
Land vehicles	900	3.6	417	3.6	−53.7	28,352	11.9	4,949	2.9	−82.5
Total	25,339	100	11,676	100	−53.9	238,455	100	168,087	100	−29.5

Source: Data compiled from AFARMADE (1997b).

states' governments. In 1993, KONVER I financed 50 percent of seven Spanish projects for an amount of 7.55 million ECU, or 5.8 percent total KONVER funds. These subsidies were more the result of regional and firm initiatives than governmental ones. Catalonia, with strong institutions and with a tradition of lobbying in the EU, was awarded two projects, even though the region has practically no military industry. KONVER I awarded to La Seu d'Urgell (Catalonia) 100 million pesetas for the conversion of military installations toward the civil sector. The conversion involved 1,600 square meters in downtown, 15,000 square meters in the suburbs, and 300 hectares of forestland, the biggest increment of public land and real estate in city's history (Ganyet, 1998). Considered a successful model of defense conversion, the city and the Armed Forces reached an agreement for which the military transferred their installations to the city in exchange for a new zoning law that would allow the Armed Forces to build a housing complex. The city reused some of the former military real estate to create a college in the suburb, and it planned to build in downtown a group of public services and infrastructure to include a library, arts school, TV and radio station, nursing home, and open space. Madrid, with a high concentration of military industries, secured only one project (Molas-Gallart, 1996b). For the period 1994–97, from the KONVER II, Spain received only 23.30 millions, or 4.7 percent, representing a smaller percentage than previously (Brömmelhörster, 1997).

Character and location of the Spanish defense industries

The Spanish defense industry has been historically dominated by the public sector and presents especial transitional problems as a result. In 1996, the defense public-owned industries accounted for 73 percent of total defense sales (Manonellas *et al.*, 1998). These industries were overseen by the Ministry of Industry, which compartmentalized them into four specialized firms: (1) Aerospace, Construcciones Aeronáuticas, S.A. (CASA); (2) Electronics, INDRA; (3) Shipbuilding and Repair, with Empresa Nacional Bazán de Construcciones Navales Militares (BAZAN); and (4) Arms and Ammunitions, with SANTA BARBARA. In 1997, the government integrated the firms into La Sociedad Estatal de Participaciones Industriales – State Society of Industrial Holding – (SEPI), which now comprises all State-held industries. Starting a process of privatization of major public-owned firms since 1996, SEPI included the military industries in the privatization process in the late 1990s.

Private defense firms, representing 27 percent of the sector in 1996, had historically played a secondary role within the military industry. They manufacture munitions, firearms, artillery systems, vehicles, auxiliary material, components, and subsystems.

Spain has a geographically uneven distributed defense industry. Madrid has a high concentration of defense establishments as a result of the 1980s defense industrial policy (Table 3.6). Due to this policy, the traditionally dominant arms and ammunition industries of the Basque Country lost importance as the defense electronics and engineering systems firms concentrated around Madrid rose in importance and number (Molas-Gallart, 1995). Despite its large share, the Madrid

Table 3.6 Location of the Spanish defense firms

Region	*Number of establishments*
Madrid	42
Basque country	16
Andalusia	12
Catalonia	5
Castilla-Leon	5
Galicia	5
Murcia	4
Castilla-La Mancha	4
Aragón	3
Canary islands	2
Asturias	2
Valencia	2
Rioja	2
Extremadura	1
Total	105

Source: Data compiled from Manonellas *et al.* (1998).

region is not dependent on military industry. In fact, no region in Spain is economically dependent on the defense industry, but several *localities* are, due to the small size of the Spanish military industry in terms of direct employment and assets. El Ferrol in the Northern region of Galicia, and San Fernando in the Southern region of Cádiz are two cities dependent on the shipbuilding yards of the public-owned naval company, BAZAN.

Firms responses

Mergers

In the 1980s, as a part of the public policy strategy to strengthen the Spanish military industries, the government encouraged mergers among defense firms, with special emphasis on the electronics sector. In 1985, two public electronics firms, EESA and EISA, merged, creating the public electronic conglomerate INISEL. In 1992, and after several unsuccessful attempts, INISEL joined CESELSA, the first private firm in military electronic components, creating INDRA. Previous to its merger with INISEL, the private firm CECELSA had reached an agreement with another public-owned firm specialized in telecommunications, Amper. With this agreement, CECELSA transferred to Amper its military telecommunication business in exchange for a 10 percent share in Amper (Molas-Gallart, 1995).

Although the merging strategy proved to be successful among electronic firms, in other military industrial sectors, it did not work. In the early 1990s, in the armament and ammunition sector, there was an attempt to merge the public-owned conglomerate SANTA BARBARA with the most important private Spanish

defense group, Unión Española de Explosivos (UEE), a spin-off of the chemical company Unión Explosivos Rio Tinto. The attempted merger between SANTA BARBARA and UEE was unsuccessful as a result of disagreements over the value of the companies involved. Molas-Gallart (1997b) suggests that the failure was tied to the deep production crisis of the sector as well as the lack of interests of the government that had concentrated its re-industrialization policy in the electronic and aerospace sectors.

Spin-off strategy

Another strategy developed by defense firms in the framework of the post-Cold War was the creation of spin-off companies. The creation of these firms was the result of Spain's participation in European arms development programs, especially the Eurofighter aircraft program.

In 1989, a resolution of the Cabinet of Ministers Council created Industria de Turbo Propulsores S.A. (ITP). ITP was the result of spinning-off the aircraft engine maintenance division of CASA and its initial goal was the production of components for the Eurofighter engine. Compañia Española de Sistemas Aeronáuticos (CESA) was also created in 1989 as a result of the Spanish participation in the Eurofighter. CESA was a spin-off of the hydraulic component activities of CASA with the goal of producing aeronautic accessories. In 1989, another spin-off of CASA created International de Composites S.A. (ICSA), as a firm specialized in design, manufacture, and marketing products made of compound materials. The result of these spin-off strategies has been successful, as the firms have become viable beyond government contracts. In the late 1990s, ITP defense production represented only 30 percent of total sales. CESA became specialized in the production of aeronautical accessories for the military as well as civil sectors. ICSA organized its production into three main business units: aeronautical, defense, and industrial. ICSA's defense unit specialized in the production of missile launching tubes, Aerospatiale, DASA, and Bae Dynamics being its principal clients (AFARMADE, 1997a).

Attraction of foreign capital and firms

The aeronautic and electronics mergers and spin-offs helped firms to specialize production and be more competitive, yet, Spanish defense firms still lacked access to capital, technology, and international marketing networks. To solve this deficiency, at the beginning of the 1990s, the government designed a defense industrial policy to attract foreign investment. The government developed a procurement policy that, assuring major control of procurement contracts to Spanish companies, established the requirement that a state company awarded with a prime contract could have a foreign subcontractor with a minority share in the contract. In the context of post-Cold War, as the international arms market was becoming more competitive, some foreign companies looking for new markets found the Spanish governmental procurement strategy attractive. Although the government did not

design a specific policy to shape the involvement of foreign capital, the Spanish government wanted to maintain control over all possible decisions of public-owned companies. Within this context, the model that dominated was minority investment of foreign capital (between 40 and 49 percent) in the public-held industry (Molas-Gallart, 1996b). Under this new industrial strategy, in the early 1990s, Hughes (US) bought a minority participation in three INDRA companies (ENOSA, Gyncosa, and SEA). Thomson (France) reached a participation of 49 percent in SAES, a company of INDRA group specialized in submarine electronics. Thomson-CSF acquired a similar participation in Amper Sistemas. Rolls Royce (UK) bought 45 percent of ITP. Lucas Aerospace (UK) took 49 percent share of CESA. Aerospatiale (France) took 15 percent of ICSA. During the same period, CASA initiated negotiations with Germany's Dornier and later on with Daimler Benz. The negotiations, however, were not successful due to significant losses at CASA at the beginning of the 1990s and the inflexibility of the Spanish government regarding its level of control over the company (Molas-Gallart, 1995).

Privatization

In the late 1990s, the influence of international firms in Spanish defense industries was changing as the process of privatization of public-owned defense firms took place. The privatization of the publicly owned defense firms was linked to the presence of a new government in Spain. After fourteen years of Socialist government, in 1996 the conservative Popular Party (PP) won the general elections. That year, the government under the new Prime Minister Aznar initiated a process of privatization of publicly owned companies. The privatization process aroused the criticism of some economic and political sectors, which stressed that the policy would help to meet the Maastricht criteria but would not directly address the structural problems of the Spanish economy (Estefania, 1997). It also prompted the opposition of labor unions, who were afraid that the process would involve layoffs. Despite the criticisms and union opposition, the government successfully privatized publicly owned companies without effective opposition from political, economic, or social agents.

The process of privatization of the publicly owned defense firms started in 1998. The Ministry of Industry, through its managers in SEPI, insisted that the main objective in the privatization of the defense industries be the enhancement of industrial prospects for companies. The Ministry recognized that, from an industrial perspective, Spain did not have industries with the technological capability to absorb the publicly owned defense firms, especially in the aeronautic and electronics sectors. For that reason, SEPI's managers emphasized the need to unify industrial and financial interests involving international and national capital. The formula adopted by the government embraced the presence of international partners who could provide technological, organizational, and marketing skills, and Spanish financial institutions who would contribute domestic capital (Núñez, 1998).

Privatization of the publicly owned defense firms is fully accepted by the Spanish military. Top officers in the Spanish Defense Ministry justify privatization

as a necessary process to advance the Spanish defense industry (Ceballos, 1998). They argue that in the context of international defense cooperation, there is no conflict between national defense interests and international ownership of defense firms. Relative to possible partners for privatization, officers point out that Spain's cooperation in European defense projects makes European companies excellent candidates as owners. In this context, they also emphasize that the increasing role of the WEU and the willingness to advance a common European defense policy reinforces the idea of European defense ownership of firms. However, they also stress that cooperation with, and ownership of Spanish defense firms by US companies, could benefit the sector. In this sense, the presence of US capital is well accepted and considered a valid option (Ceballo, 1998; Torrente, 1998).

Despite a long tradition of defense cooperation with the US and acceptance of US capital by the Spanish government and military, in June 1999, following a long process of negotiations with major European defense firms, SEPI merged CASA with the German firm DASA. This merger meant the takeover of CASA by DASA, with the German company controlling more than 85 percent of the shares of the newly created firm. While signing the merger, SEPI's presidents asserted that the agreement's goal was "to help the consolidation of the European aerospace industry" (Zafra, 1999). Consistent with the policy to include Spanish capital, the agreement between the government and DASA secures that, in the privatization of the company, Spanish financial institutions will have preference over a proportion of shares. By the end of 1999, the Spanish government had only approved the privatization of the electronic firm INDRA.

Defense sectors and the military and civil production in the post-Cold War era

The governmental defense industrial policies of the mid-1980s and the firm strategies analyzed in the previous section have had differential impacts by sectors. Aerospace and electronic sectors have benefited from governmental support, successful mergers among public and private companies, spin-offs linked to the participation in European arms programs, and internationalization through the attraction of foreign capital and firms. As a result, these two sectors have advanced their technology capability and have become more specialized in the production of subsystems for the international market. Their civil production has also benefited; by the late 1990s, civilian sales accounted for more than 50 percent of their production. The naval and arms and ammunition sectors have not enjoyed comparable governmental support. Both sectors have gone through a deep production crisis while remaining dependent on mainly domestic defense markets, especially in the arms and ammunition sector.

Aerospace

A unique firm, the historically public-owned firm, CASA, dominates the Spanish defense aerospace sector. Until its merger with DASA, CASA had been a publicly

owned firm, whose main stockholder, at 99 percent was the State industrial holding SEPI. CASA operates seven facilities in four provinces: Barajas and Jetafe, in the Madrid province; and Illescas, in Todelo province, both in the center of Spain; Tablada and San Pablo, in Sevilla province, and Cádiz and Puerto Real, in Cádiz province, both in the South. CASA is the main Spanish contractor on the Eurofighter project.

Before CASA's merger with DASA, the firm received a diverse group of offers regarding its privatization, including one from Aerospatiale which was interested in CASA assets as a way of keeping up with British Aerospace (Martí, 1998). Simultaneously, British Aerospace presented to the Spanish government different formulas of privatization, which ranged from the acquisition of a percentage of CASA to an exchange of shares between the companies (Ayora, 1998). Initially, SEPI managers considered that the integration of CASA into Airbus would mandate the privatization of the company (Cargador, 1998; Cifuentes, 1998). Their goal was to segregate part of CASA's facilities and workforce to Airbus. CASA expected to have 4.2 percent of the new Airbus, and that Airbus would control around 15 percent of CASA. For that purpose, in 1998 an agreement between CASA and the future Airbus established that CASA would segregate its factories in Getafe (Madrid) and a part of its factory in Puerto Real (Cádiz) and around 1,100 workers (Cabanes, 1998). The Spanish government and the firm were also interested in increasing their 4.2 percent share of Airbus (Cifuentes, 1998). The other companies in the Airbus consortium are Aerospatiale, Deutsche Airbus owned by DASA, and British Aerospace.

Despite CASA's managers' intent to wait for CASA's integration into Airbus, the difficulties and delays in creating Airbus moved SEPI to reach a bilateral agreement. In June 1999, CASA and DASA merged. The new firm became the first shareholder of Airbus with a 42 percent interest, and the Eurofighter project with 43 percent holdings. In the share exchange, DASA controls between 86.5 and 88.5 percent of the new firm, while SEPI secures the rest. DASA already has two factories in Spain that employ up to 5,000 workers (Zafra, 1999).

During Franco's period, CASA specialized in the manufacturing of the US designed F-5 fighters, and built a reputation for its transport aircraft. The company has three divisions, aircraft, maintenance, and space. Today, CASA's aircraft division designs, manufactures, and commercializes in-house military aircraft: medium transport aircraft designed for military and civilian use (CN-235 M and CN-235 Persuader, C-212) and a control aircraft (C-212 Patrullero) that meets short-range maritime surveillance needs – search and rescue, traffic control, environmental control, etc. CASA also designs and manufactures structures and components for international companies, such as Boeing, Eurocopter, McDonnell Douglas, Northrop, and Saab (B-777, Superpuma/Cougar, DM-11, F-18, Saab-2000, etc). A military product of CASA with no civilian use is the ground attack training jet (C-101). It also has an exchange agreement with Chile's Enaer.

After a period of losses in the early 1990s, CASA became the most successful Spanish defense firm by the end of the decade. Its net profit increased from 1,235 million pesetas in 1993 to 6,500 million pesetas in 1997. In May 1997,

CASA won a contract with the Colombian air force for the supply of three airplanes CN-225 at a value of 7,000 million pesetas (Zafra, 1997). CASA increased its exports from 67 percent of total production in 1990 to 87 percent in 1997. Simultaneously, CASA underwent a drastic cut in its workforce, from 9,544 workers in 1990 to 8,398 in 1993, and 7,695 in 1997 – an overall decline of 19 percent. The labor cuts were part of the industrial restructuring process aim to reduce production costs. The firm then presented its unions with another plan for further workforce reduction of 13 percent, or approximately 970 people (El País, 1998b).

The future of CASA will depend on DASA's future strategies. Previous to the merger, the strategic goals of CASA included increasing its participation in European programs, consolidating its position as an aircraft military transportation company, entering the market of emission systems, and maintaining its leading position in carbon fiber (Cifuentes, 1998). The company planned to invest 141,000 million pesetas in R&D in the period 1998–2002 (Vanguardia, 1998). CASA had no specific plan for defense conversion of its defense production. By the late 1990s, however, civil sector sales represented a significant percentage of total CASA sales. Total sales were divided between 56 percent civil and 44 percent military in 1997; and 58 and 42 percent respectively in 1998 (CASA, 1997, 1998). Due to the dual use characteristics of CASA's products as aircraft transportation and subsystems, the company is well positioned for directing its production toward the civil market.

Electronics

The characteristics of the Spanish defense electronics firms are the result of the industrial policies of the 1980s. Unlike the aerospace and naval sectors, the electronic sector is not dominated by one company. The variety of electronic firms in size, number, and specialization of their workforce, and characteristics of their production, put the Spanish defense electronics industries in a good position for a dual-use production and diversification toward the civil market.

INDRA

The INDRA group was created in 1992 as a result of a merger between INISEL and CESELSA. INDRA is the Spanish leader in the defense systems sector. Until 1998, control of the firm was divided in the following manner: the public industrial holding SEPI (63 percent), Thomson-CSF (25 percent), Grupo Perez-Nievas (3.5 percent), Banco Bilbao-Vizcaya (3.5 percent), and others (5 percent). INDRA is located in the Madrid region. In 1998, Thomson's 25 percent share became a problem for INDRA's privatization as the Spanish government considered that the sale of SEPI's shares would leave control of a key Spanish electronic firm in Thomson's hands (with 43 percent participated by the French government). To facilitate the process of privatization, the government reached an agreement with Thomson, in which the French firm agreed to reduce its shares to 10 percent. In exchange, Thomson would participate in the development and production of simulators for the Eurofighter. During the privatization process, INDRA wanted

to maintain the stakes Hughes and Raytheon already had in two of its subsidiaries – Enosa and INDRA ATM. In January 1999, the government approved the privatization of 66 percent of INDRA. The new shareholders are: Thomson with 10 percent, two Spanish Banks – Caja Madrid with 10 percent and Banco Zaragozano with 5 percent. The remaining 75 percent of the firm's capital are located in the financial market – 35 percent in international markets (Díaz-Varela, 1999).

Defense accounts for 34 percent of INDRA's total output. Defense products include radars, simulators, and automatic test systems. INDRA provides technical assistance and maintains Spanish Air Force radars. The company supplies electronic systems for the Eurofighter and the Frigate F-100 programs. INDRA has also won electronic subsystems subcontracts with Lockeed Martin and Raytheon. Since its creation, INDRA has increased its exports from 16 percent of total sales in 1993 to 26 percent in 1997. The workforce has decreased from 5,300 workers in 1992 to 3,385 workers in 1997. Company managers assert that the decrease in workforce is necessary after a merger. They also emphasize the labor productivity gain, which, in their opinion, has increased almost 73 percent from 1993 to 1997 (Carvajal, 1998).

INDRA is well positioned to diversify its production toward the civil market, which accounted for 66 percent of its total production in 1997. This market included electronic systems and components for several sectors: telecommunications, transportation, energy and environment, industry and commerce, health, and finance and insurance (INDRA 1997, 1998).

Industria de Turbo Propulsores, S.A. (ITP)

ITP was created in 1989 by a resolution of the Cabinet of Ministers Council, prompted by Spain's participation in the Eurofighter. ITP supplies the equivalent of 13 percent of the EJ-200 engine of the Eurofighter. ITP was designed to promote the Spanish aeronautical engine and gas turbine industries as well. The company is involved in research, design, development, manufacturing, and maintenance of engines with aeronautical, naval, and industrial applications such as generation, and for use in oil and gas pipelines. ITP's production and service lines – engineering, manufacturing, and maintenance – are dual use in nature. ITP's shareholders are: Rolls Royce with 45 percent, Turbo 2000 (Sener and BAZAN) with 51 percent, and IBV Corporation bank with 4 percent. ITP has two production centers, one in Zamudio (Vizcaya province) and the other in Ajalvir (Madrid province).

Despite ITP's original link to the Eurofighter, defense production represented only 30 percent of the total sales for the firm in 1998. That year, the firm's manager Joaquín Coello asserted that ITP could not count on the Eurofighter program for its survival (Angulo, 1998). Firm managers are clearly oriented toward pursuing the civil market. The company invests around 20 percent of sales in R&D and plans to increase its sales in the civil aviation market, with special emphasis on Latin America markets. The strategy of ITP in Latin America is to buy firms that have production problems but are familiar with their national markets. ITP has bought 60 percent of the Mexican firm ITR. The company also plans to gain new aerospace maintenance business in Spain and Latin America and become a European leader in turbines for the civil market.

Naval

Similar to the Aerospace sector, the naval sector is dominated by one company, BAZAN, a 100 percent public-owned firm that builds, maintains, and repairs war ships. The company also produces diesel engines, turbines, armament, and arms systems. BAZAN headquarters are in Madrid; the shipyards are located in three Spanish coastal cities. The biggest is on the Northwest coast, in El Ferrol (Galicia region). Medium and large vessels – aircraft carriers, frigates, corvettes – are built there. BAZAN's facility in the city of Cartagena (Murcia region on the Mediterranean coast) specializes in building submarines, special-units – oceanographic ships, surface vessels – and medium-sized vessels. The shipyard in San Fernando (Cádiz province close to the Straits of Gibraltar), produces patrol crafts, tugs, launches, and hydrographic vessels.

BAZAN was created in 1947 during Franco's period and initially constructed US-designed frigates and the French-designed submarines Daphne and Agosta. BAZAN has traditionally enjoyed a commitment from the government for a significant slice of the procurement pie, which provides the majority of its businesses. In recent years BAZAN has enjoyed some success in exporting naval vessels, winning a contract in 1992 to build Thailand an aircraft carrier. In 1995, the Spanish administration accepted a controversial increment of fish imports as one of the inducements to obtain an order for BAZAN for four new corvettes from the South African Navy. In 1996, BAZAN held exploratory talks with China for possible sales (Copley, 1996). In 1997, BAZAN signed a contract with Chile for the production of two submarines and sold patrol ships to the Philippines and Colombia (BAZAN, 1998).

Between 1986 and 1990, BAZAN reduced its workforce by one-fifth due to a company crisis (SIPRI, 1996). In contrast to the other publicly owned defense firms CASA and INDRA, which were able to recover by the late 1990s, BAZAN still generates losses, making privatization of the company difficult.

To improve productivity and to position it for privatization, the government approved a new industrial plan for BAZAN in 1998, which attempts to increase total sales by 7–9 percent a year. Simultaneously, it plans to become more competitive, increasing exports from 8 percent of total sales in 1997 to 25 percent by 2002. The plan calls for an investment of 15,000 million pesetas and reorganization into four areas: systems and arms, platforms, propulsion, and maintenance. By 2002, company managers expect to increase activity by 62 percent on platforms, 74 percent on systems and arms, 19 percent on maintenance, and 9 percent on propulsion (Larrañaga, 1998). The new plan also entails subcontracting all other activities not included in the four mentioned groups and cutting the workforce by 33 percent or 2,517 jobs, in five years.

Of the three shipyards, San Fernando in the South and El Ferrol in the North will be most affected by labor cuts. At San Fernando in Cádiz, layoffs have already reduced the labor force from 4,000 to 1,400 in the last decade. With the new plan, San Fernando will lose 209 more workers. El Ferrol in the North of Spain, with 3,734 employees, will lose one-third (1,230) of its jobs. Cartagena at the Mediterranean coast, with employing 2,028, will lose 468 (El País, 1998b).

BAZAN has made some attempts to convert to civil markets. At the beginning of the 1990s, it started producing fast vessels in its shipyard in San Fernando. The experience was initially successful at the commercial level. BAZAN sold several civilian ships to Spain and Italy. However, being a public-owned company with direct subsidies from the government, BAZAN had to close its civilian production on the order of the EU that forbids direct subsidies in all industrial sectors other than the military. More recently, BAZAN initiated commercialization of a forest fire detector (Perez de Lucas, 1998). Despite these diversification initiatives, the immediate future of BAZAN is still tied to defense production and more specifically, to Spanish defense contracts. In 1997, the Spanish Army ordered construction of four F-100 frigates with the Ministry of Defense approving the investment of 300,000 million pesetas (Mollejo and Pastor, 1998). Recent contracts with the Spanish defense ministry reinforce BAZAN's historical dependency on national defense procurement.

Armament and ammunitions

SANTA BARBARA, historically one of the most important national defense companies, is also one of the smallest, with only 1,800 employees in 1998. The state-owned firm was created in 1960 as Franco's government unified the Army's factories. SANTA BARBARA manufactures arms, ammunitions, and land platforms. The firm has six factories around the country: Granada in the South; Oviedo and Trubia (Asturias province); La Coruña (Galicia region) in the North; Palencia in the interior and Murcia on the Mediterranean cost; and sales and managerial offices in Madrid. SANTA BARBARA has a subsidiary company, SB BLINDADOS, S.A., which is dedicated to the design, manufacture, and updating of vehicles and tanks. It has 310 workers and is located in Alcala de Guadaira (Seville province) (SANTA BARBARA, 1997, 1998).

SANTA BARBARA was created with military criteria and this has jeopardized its productivity. Until 1984, the company was the producer of the French designed AMX tank for the Spanish army. Since then, the company has faced serious financial and technological problems. Its scattered locations around the country and the lack of industrial planning has made the company poorly competitive in international and national markets. In 1987, the Army contracted with the company to upgrade 210 AMX-30s to NATO standards. Only sixty-two were upgraded, because US rifles were available more cheaply. In 1997, Spanish newspapers reported that SANTA BARBARA had to replace 8,000 Cetme rifles at a cost of 5,000 million pesetas to substitute for a defective line of production (González, 1997).

By the mid-1990s, SANTA BARBARA had laid off around half of its work-force and was close to bankruptcy (SIPRI, 1996). In 1994 and 1995, the company reached its highest net losses, 28,361 million pesetas and 27,547 million pesetas, respectively. In 1997, the loss decreased to 6,265 million pesetas. During this period, its subsidiary SB BLINDADOS S.A. was profitable, winning in 1997, the Spanish defense contract for the production of the Pizarro and the Leopard tanks. The success of the subsidiary opened the door to its privatization. In 1997, the government received offers for SB BLINDADOS S.A. from Spanish defense and

transport companies, such as Gamesa and Patentes Talgo. In 1998, however, the government decided to privatize the entire SANTA BARBARA conglomerate. As of 1999, the process of privatization had had not yet concluded. The German companies Kraus-Maffei, Wegmann, and Rheinmetall are among the possible buyers, as well as the US company General Dynamics. The future existence of the company may be secure and similar to the case of CASA it could merge into a European or US arms and ammunitions firm. To increase productivity, the firm will likely close or restructure some facilities, leading in turn to further workforce cuts.

Defense industrial restructuring and workforce cuts

Mergers, spin-offs, and attraction of international partners have produced ongoing labor reductions. Budgetary defense cutbacks of the post-Cold War and the privatization process of the late 1990s have also increased job losses.

The publicly owned Spanish defense firms have been characterized by low productivity. Similar to other state-owned firms privatized by the Socialist government, attempts to privatize the defense industry by the new conservative government revealed the need to stem historical losses. Since the beginning of the restructuring process, labor unions have actively resisted layoffs. Comisiones obreras/Workers' Commissions (CCOO), Unión General de Trabajadores/General Workers' Union (UGT), and Unión Sindical Obrera/Trade Union Alliance (USO) the three largest unions in the sector, have also demanded that the government involve them in the privatization negotiations. Despite unions' opposition, the industrial plans undertaken by the companies have been inflexible in regard to workforce reduction. Overall, firms have eliminated 62 percent of direct defense industrial jobs over the ten-year period 1985–96. In the period 1990–96, the Spanish defense industry lost 54 percent of its workers (AFARMADE, 1997b). This share will increase as new mergers and privatization takes place.

Agreements between firms and unions on workforce cuts have involved two models: early retirements and resignation incentives. In the most common model, firms and unions agree upon the age at which workers will accept retirement and the financial compensation that workers will receive for resigning. BAZAN's latest industrial plan proposes retirement for all workers who are 52 years old by December 1999 (El Ideal Gallego, 1998). Through SEPI, the government absorbs the costs of early retirements and incentive resignations. SEPI covers labor layoff costs through revenues from privatization of other public-owned firms (Oliveres, 1998a). In some cases, firms have used KONVER subsidies to relocate workers or to create new jobs. In 1993, for instance, BAZAN received 233.34 million pesetas to diversify its military production toward the civilian sector in its Cartagena factory. INDRA received 135 million from KONVER to develop airplane control test equipment in its San Fernando de Henares (Madrid) factory (Konver-España, 1993). SANTA BARBARA won KONVER subsidies for training its workforce for relocation to firms in the civilian sector (Lacruz, 1998). In 1997, from a total of 158 jobs lost in SANTA BARBARA, 73 workers were relocated in subsidiary firms and 65 workers older than 52 years were retired (SANTA BARBARA, 1998).

Firm managers and government officials attributed the better financial performance of the public-owned defense firms to the post-layoff ambiance, which they claim, increases labor productivity (Carvajal, 1998; Cifuentes, 1998; Núñez, 1998). Despite gains in productivity, labor reduction shows the decreasing importance of the sector in terms of industrial production.

Imports and exports in the post-Cold War era

For purposes of comparison with other countries studied, this section presents Stockholm International Peace Research Institute (SIPRI) and Arms Control and Disarmament (ACDA) data. Data on imports and exports of defense material varies greatly depending upon the source. Information on exports was highly confidential in Spain until 1997, when the Parliament adopted a law that allowed the publication of export data. Despite the new policy, sources still disagree on the total value of exports, due to the use of different data collection systems. The dissimilitude in value of the Spanish defense exports deserves special attention and will be addressed at the end of this section.

On average, Spain imports conventional weapons at a value five times higher than it exports. With purchases of US$2,189 million at constant 1990 prices, Spain ranked number 20 in SIPRI's leading recipients of major conventional weapons for the period 1991–95. As supplier of weapons, exports reached US$374 million; a ranking of nineteenth (SIPRI, 1996). Due to the unilateral defense agreements between Spain and the US, US defense companies have dominated the supply of major weapons to the Spanish Armed Forces. During the period of 1987–95, Spain imported conventional weapons from five other countries: Italy, France, Germany, United Kingdom, and Qatar. Of total of twenty-three contracts, twenty-one were supplier contracts, just two were weapons licensing deals. With regard to exports, for the period 1984–95, Spain sold major weapons to five countries: Angola, Chile, Colombia, Turkey, and Thailand, with Thailand signing three of the seven contracts. The 1992 contract to build a Thai aircraft carrier was significant in that it represented the first time that any country had built an aircraft carrier for a foreign navy. Of the total export contracts for the period 1984–95, five were supplier contracts and two licenser.

In the post-Cold War era, Spanish exports represent around 0.5 percent of the total world exports (ICE, 1998). This situation contrasts with the 2 percent of world exports Spain attained in 1984, a year in which government defense policy oriented toward exports to developing countries reached its peak (Fisas, 1995).

Export data demonstrates the increasing importance of components and subsystem sales between Spanish and international companies. Some sources ignore this form of production, and its exclusion may result in a misconception on the real value of defense exports by second-tier defense countries such as Spain. Table 3.7 shows that on average, ACDA and SIPRI provide export sales for values two times lower than Vicenç Fisas. These sources also disagree on the tendency of exports. While ACDA and SIPRI data show a sharp decrease in 1995 exports with regard to previous years, Fisas' data reveal a definite increase. The ICE Bulletin published

Table 3.7 Exports 1990–95

	1990	*1991*	*1992*	*1993*	*1994*	*1995*
SIPRI (US$ million 1990)	—	72	64	53	123	62
ACDA (US$ million 1995)	402	99	194	178	369	80
Fisas (real US$ million)	379	280	355	357	417	460
ICE (real million pesetas)	—	16,734	17,659	17,866	9,478	16,339

Sources: Data compiled from ICE (1998), SIPRI (1996), ACDA (1995), and Fisas (1995).

by the Spanish State Department of Commerce also details an increase of exports for the year 1995, although its value is much lower than the ones provided by the other sources.[3]

Consistent with the discrepancy on the evaluation and value of export sales, is a disagreement on the destination of exports. Government data indicate the EU and the US are the main receivers of Spanish arms. The official source also points out that sales to Southeast Asian countries have risen considerably from 1998, surpassing those to Middle East countries (ICE, 1998). Fisas' study for the period 1988–97 designates developing countries, Turkey, Morocco, Thailand, Chile, Iran, South Korea, and Jordan, as the highest importers of arms from Spain. The sector that exported most was aerospace (52 percent), followed by the naval sector (20 percent), arms and munitions accounted for 12 percent of exports, transportation, and the electronics sector, 8 percent (Fisas, 1995).

The difficulties in monitoring Spanish military exports suggest that the methodology on data collection should be overhauled. With the growing importance of military subsystems in export data, concerns arise about verifying the real industrial capability of defense firms. Dual-use production may compound this problem as countries and companies use different standards to classify their output.

Recent trends in military expenditures and professionalization of the Armed Forces

Spanish military spending in the late 1990s reversed the downward budgetary trend that dominated since the end of the Cold War. In December 1996, the government announced a new defense policy and spending initiative: (1) professionalize military forces; (2) integrate Spain into NATO's military structure; and (3) improve Armed Forces' image in Spain.[4] The Defense Ministry budget for 1998 represented 1.1 percent of GDP (57.5 percent personnel and 42.5 percent procurement) and an increase of 3.2 percent relative to 1997. The budget for 1999 increased by 4 percent from 1998. The Ministry of Defense recognizes as military spending the 127,129 million peseta allocation by the Ministry of Industry for weapons modernization program, as well as 96,670 million pesetas for credits to defense companies in 1997. The industry credits are appropriated to the following projects: 70,251 million to the Eurofighter, 23,099 million to the F-100 frigate, and 3,320 million to the Leopard tank (Ministry of Defense, 1998). New procurement

agreements amounting to 300,146 million pesetas will be paid between 1998 and 2010. Additionally, the government has budgeted 1,604,231 million pesetas in military spending for the period 2000–15. These programs have become crucial to support the Spanish military industry, especially BAZAN, CASA, and SANTA BARBARA, and more indirectly the electronics sector.

The government approved budget for R&D in 1999 returned to the policy of the 1980s, military R&D recaptured a high proportion (39 percent) of total government expenditures for R&D (El País, 1998a). The return can be considered part of the privatization strategy, considering the major attraction of the state held companies is their large defense programs – CASA and INDRA with the Eurofighter, and SANTA BARBARA with the Leopard tank.

Ongoing professionalization of the Armed Forces is also affecting the defense budget. Spain is shifting from a conscripted to a professional military. Total cost will depend on the number of personnel and the percentage of budget allocated to procurement and personnel (Torrente, 1998). Political parties and non-governmental organizations have presented different models, varying in number of personnel as well as a percentage of GDP: from 180,000 military units costing around 2 percent of GDP to 84,000 personnel units amounting to 1 percent of GDP (Fisas, 1998). In 1998, the government had not yet decided the final number, but it would range between 150,000 and 170,000 members (Torrente, 1998). There has been a debate over the benefits and problems related to the creation of a professional Armed Force. Some scholars believe the benefits of professionalization as a conscripted service has a high opportunity cost not always taken into account (Dalmau, 1998). Peace groups are calling for a reduced military, between 40,000 and 50,000, and want defense education to shift toward the promotion of human rights and democracy (Ambrona, 1998; Romeda, 1998). There is also a demand for major participation by the public in defense and security issues (Armadons, 1998).

Policy recommendations

The Spanish defense industry has undergone a dramatic transformation in the last two decades. Even though there is no defined government policy directly supporting defense conversion, the industry is diversifying its production toward the civilian market in the electronic and aerospace sectors. In this regard, the conversion process in Spain is more a result of the combination of industrial policies and firm strategies than of the implementation of an intentional conversion policy.

In the mid-1980s, government efforts to target electronics and engineering sectors as engines of re-industrialization, and offset agreement programs supporting technology transfers, did not succeed in their goals of creating a strong indigenous defense industry. However, the attempts helped defense electronic firms gain experience in subsystems and enabled them to win prime contracts with international companies. Participation in European defense research projects did not help to develop a strong indigenous defense industry, but it helped the aerospace sector to specialize and internationalize its production. Firm strategies developed by

electronics companies in the late 1980s and early 1990s, anticipating growing defense procurement, created specialization that subsequently helped the companies cope with declining domestic and international defense markets. In adapting to the post-Cold War era, the Spanish defense industry dramatically cut its labor force and became more specialized in subsystems for the international market. A declining defense market and growing specialization in subsystems have prompted aerospace and electronics firms to develop civilian production.

Despite the magnitudes of cuts, the Spanish defense industry has exhibited little supply-side resistance to defense downsizing. Though there are some defense-dependent cities, there is no defense-dependent region in Spain and until now, the defense industry has been dominated by the public sector, which in 1996 accounted for 73 percent of total defense sales. Although labor unions opposed cuts, their bargaining power has been limited due to economic and political circumstances. Job loss is attributable to complex causes: budgetary constrains imposed since 1991 by the Maastricht Treaty; merger strategies among electronic firms in the early 1990s; continued downsizing of the majority of public-owned defense firms until the mid-1990s; and more recently, privatization of public-owned defense firms. Agreements between firms, the government, and unions regarding defense workforce cuts have involved two strategies: early retirements and resignation incentives. Low supply-side resistance to defense downsizing is also due to the fact that from an industrial perspective, Spain is a second-tier defense producer with a relatively small defense industry in terms of direct employment, sales and assets.

The privatization of the public-owned firms and the internationalization of the Spanish defense industry create a further context in which dual-use production may play an increasing role. If this approach is to succeed several conditions must hold.

The government should redirect its defense industrial policy toward the conversion and diversification of defense firms. Recent budgetary trends are not in that direction. The late 1990s budgets contain a general increase in military expenditures, a high percentage of governmental R&D in the defense sector, and new procurement plans. This policy is justified by the need to provide new equipment to the professional Armed Forces and to attract foreign capital into the privatization of public-owned defense firms. Nevertheless, it has the negative effect of increasing the dependency of Spanish firms on government subsidies and procurement; instead of strengthening Spanish firms, such an emphasis puts them in a weak position and encourages them to specialize in a declining and highly competitive world defense market.

Companies themselves must enter the debate on military conversion, dual-use technologies, and the potentials for the Spanish defense industry. Specialization in electronics and engineering subsystems shows considerable potential for conversion. Spanish electronics and aerospace defense firms are already directing large portions of their production to the civil market but companies still rely heavily on defense procurement contracts. At the firm level, it is widely and inaccurately believed that conversion or dual production implies industrial downsizing. Firm managers as well as government and defense officials assume that conversion does not apply to

a second-tier defense producer country such as Spain with an already limited defense production.

The privatization of aerospace and electronic firms should guarantee the technological, organizational, and financial stability of firms. Because new industrial plans for the public-owned naval, armament, and ammunition firms imply further labor cuts with strong negative affects in already weakened local economies, adjustment programs for displaced workers should be implemented.

The responses of Spanish defense firms to the post-Cold War era are linked to the economic, political, and military transformations that Spain has undergone since its democratization process, initiated in the mid-1970s, and its subsequent integration into EU, NATO, and WEU. Despite historical particularities, the case of Spain is instructive because it foreshadows the dilemmas Eastern European countries may encounter in the transformation of their military forces and industries as these countries recover their democratic institutions, integrate into international organizations, and move toward a global market economy. The lessons from a second-tier defense producer such as Spain show the limitations of targeting defense industries as engines of re-industrialization but it also suggests the potential for advancing and rationalizing domestic defense production, finding a niche in international defense and civilian markets. Specialization in subsystems may facilitate a dual-use strategy and thus position the defense industry to advance in the civilian market.

Privatization of Spanish defense companies and interest from European as well as US firms in the process reveal the increasingly international character of the defense industry. As firms move from public-owned into international private ownership, there is a growing need for the regulation and control of the defense industry with international institutions and tools. Spain should be willing to join in this process.

Finally, as the internationalization of the defense industry proceeds and subsystems become the main industrial product for countries like Spain, there is a need to revamp arms trade statistics. Disagreement among sources regarding Spanish defense exports, in the 1990s, underscores the need to rethink the methodology that governmental as well as non-governmental organizations use in data collection. The growing importance of defense subsystem production can result in severe misconceptions about the real level of defense industrial production of second-tier defense countries.

Notes

1 In 1988, there were 12,000 US military personnel in Spain, at four major bases and at several smaller communications and navigation facilities. The major US bases were: the naval complex at Rota near Cadiz, which provided fuel and ammunition storage facilities for American forces; and three airbases Torrejón, east of Madrid; Zaragoza, in the north-east; and Moron, near Seville in the south. On September 28, 1988, and after a year of negotiations, the US agreed to withdraw the 401st Tactical Air Wing from Torrejón, within three years, and to reduce the overall personnel size. In 1996 US, forces numbered 2,420 members – 2,200 Navy members and 220 Air Force members (IISS, 1997).

2 The Spanish defense budget in absolute terms and as a percentage of GNP generates diverse data depending of the source. The Spanish Defense and Security Industry Association (AFARMADE), an association that includes almost the totality of companies producing military products, considers as defense spending the budget of the Ministry of Defense. Under this consideration, military expenditures as a percentage of GNP have decreased from 1.9 percent in 1988 to 1.1 percent in 1998. ACDA data also shows a clear decrease in military expenditure as a percentage of GNP, however, it provides a higher percentage, from a 2.4 percent in 1987 to 1.6 percent in 1995. Following ACDA's data, the share of military expenditures as percentage of total government expenditures for the period 1985–95 reached its peak in 1989 with 8.1 percent expenditures and decreased to 5.6 percent in 1995 (Figure 3.1). Vincenç Fisas (1998, 1996) provides a higher percentage as he includes as military expenditures, not only the allocation of the Ministry of Defense, but also allocations of other ministries. Among them, Fisas includes the Ministry of Industry allocations in support of defense industrial production, and the Ministry of Foreign Affairs allocation for international defense operations. Fisas also pays attention to special lines of credits and allocations by regional governments. His military expenditure as a percentage of GDP shows also a decreasing tendency, but the percentage of expenditure is considerably higher than the previous ones. Fisas estimates that the percentage of expenditures has fluctuated from 2.7 percent in 1989 to a 2.2 percent in 1998 (Fisas, 1998).

3 The disagreement on exports could be explained by the different data collection systems that the sources use. The ICE Bulletin only considers defense exports transactions classified as weapons. SIPRI considers the arms transfers between governments. ACDA takes into account the transfers of arms and arms components between governments. Fisas estimates his data from official sources, company's publications and press releases. Molas-Gallart (1997b) also notes the discrepancy among sources and points out that the reasons for these lie in the inclusion or exclusion of defense components and subsystems. AFARMADE data reinforces this theory, and shows that, for the period 1990–96, the percentage of sales to the Spanish Defense Ministry have decreased 47.1 percent, while other sales – exports and sales to other Spanish firms – have increased 15.1 percent.

4 Traditionally, the Armed Forces have not enjoyed a positive image in Spain. This is the result of several factors: (1) the association of military personnel with the dictatorship period; (2) geographical segregation of military members from the rest of the population – military bases, special housing, etc; (3) the 1981 abortive coup in which some factions of the Armed Forces and the Civil Guard participated; and (4) the historical lack of transparency of, or information on, the Armed Forces. Since the mid-1980s, there has been an effort to improve communication. New publications such as Revista Española de Defensa, the presence of Spanish politicians in international military organizations – Javier Solana in NATO and Luis de Puig in WEO; the participation of Spanish military forces in NATO troops in the former Yugoslavia, and other peace keeping operations as well. All have had a positive effect on the relationship between the Armed Forces and Spanish society (Huesca, 1996). In 1996, the government gave priority to the improvement of the military's image through centers such as Instituto Español de Estudios Estratégicos, and increasing collaboration with universities and educational centers.

References

Arms Control and Disarmament Agency (ACDA) (1995) *World Military Expenditures and Arms Transfers*. Washington DC: ACDA.

Arms Control and Disarmament Agency (ACDA) (1996) *World Military Expenditures and Arms Transfers*. Washington DC: ACDA.

AFARMADE (1997a) "Spanish Defense Companies," CD-Rom, Madrid: AFARMADE.

AFARMADE (1997b) *La Asociación Española de Fabricantes de Armamento y Material de Defensa y Seguridad (AFARMADE), y el Sector Industrial de la Defensa*, Madrid: AFARMADE.

Ambrona, P. (1998) "Profesionalización del Ejército Español," paper presented at the International Peace Conference of Sant Cugat del Valles, July 17–19, 1998.

Angulo, C. (1998) "No Podemos Vivir Eternamente del 'Caza' Europeo," *El País*, August 31, 1998.

Armadons, J. (1998) "La Profecionalització de l'Exercit Espanyol," paper presented at the International Peace Conference of Sant Cugat del Valles, July 17–19, 1998.

Ayora, A. (1998) "British Aerospace Ofrece un Intercambio Accionarial para Fusionarse con CASA," *Empresas*, Negocios, May 2, 1998.

Bañón-Martinez, R. and Barker, T.M. (1988) *Armed Forces and Society in Spain Past and Present*, Social Science Monographs, Boulder, New York: Columbia University Press.

Bardají, R. and Cosidó, I. (1995) *España y su Defensa en 1995*, Madrid: Incipe.

BAZAN (1998) *Informe Anual 1997*, Madrid: BAZAN.

Brömmelhörster, J. (1997) *Konver II*, Report 9, Bonn: Bonn International Center for Conversion.

Cabanes, G. (1998) "CASA Presenta un Plan para Reducir 970 Empleos, el 40% en sus Centros Andaluces," *El Correo de Andalucía*, July 8, 1998.

Cargador, G. (1998) "Industria Condiciona la Privatización de CASA a la Reestructuración de Airbus," *Expansión*, May 1, 1998.

Carvajal, A. (1998) INDRA's Director of Technology and Quality, interview, San Fernando de Henares, Madrid, Summer 1998.

CASA (1997) *Informe Anual 1996*, Madrid: CASA.

CASA (1998) *Informe Anual 1997*, Madrid: CASA.

Ceballos, T.C. (1998) Defense Attaché to the Spanish Embassy in the US, Washington, interview, Washington, DC, Spring 1998.

Cifuentes, I. (1998) CASA's Deputy Sales and Marketing, interview, Madrid, Summer 1998.

Copley, G. (ed.) (1996) *Defense & Foreign Affairs Handbook*, London: International Media Corporation Limited.

Cosidó, I. (1994) *El Gasto Militar: El Presupuesto de Defensa de España (1982–1992)*, Madrid: Eudema.

Dalmau, J.C. (1998) "Prespectiva Económica y Servicio Militar: Hacia un Ejercito Profesional," paper presented at the International Peace Conference of Sant Cugat del Valles, July 17–19, 1998.

Díaz-Varela, M. (1999) "El Gobierno Privatiza el 66% de INDRA, por lo que Piensa Obtener 75.000 millones," *La Vanguardia*, January 30, 1999.

Estefanía, J. (1997) "Escenarios Alternativos," *El País*, March 2.

Fisas, V. (1995) *Secretos que Matan, Los Derechos Humanos y la Exportación Española de Armamento*, Madrid: Icaria.

Fisas, V. (1996) "Spain and the Disarmament Dividend," paper commissioned by BICC for its Conversion Survey 1996.

Fisas, V. (1998) "El Coste del Ejército Professional y los Presupuestos de 1998," *Anuario CIP, 1998*, Madrid: Icaria.

Ganyet, J. (1998) Mayor of La Seu d'Urgell, interview, Summer 1998.

González, M. (1997) "Santa Barbara Entrega al Ejército 8,000 Fusiles para Sustituir a los Defectuosos," *El País*, June 5.

Huesca, A. (1996) "Spanish Attitudes Towards Multinational Defense," in P. Monigart (ed.) *Future Roles, Missions, and Structures of Armed Forces in the New World Order: The Public View*. New York: Nova Science Publishers, Inc. pp. 103–116.

ICE Bulletin (1998) "Exportaciones de Material de Defensa por Países de Destino. Periodo 1991–1996," Subdirección General de Comercio Exterior de Material de Defensa y su Doble Uso, *Boletín Económico de ICE*, no. 2566.

Ideal Gallego, El (1998) "PP y Sindicatos Coinciden en la Necesidad de Rejuvenecer la Plantilla de Bazán," *El Ideal Gallego*, June 26.

INDRA (1998) *Informe Anual 1997*, Madrid: INDRA.

INDRA (1997) *Informe Anual 1996*, Madrid: INDRA.

International Institute for Strategic Studies (IISS) (1997) *The Military Balance 1996/97*, Oxford: Oxford University Press.

International Institute for Strategic Studies (IISS) (1996) *The Military Balance 1995/96*, Oxford: Oxford University Press.

Konver-España (1993) *Programa Operativo KONVER, 1993*, Unión Europea FEDER Program Dossier.

Lacruz, T. (1998) SANTA BARBARA General Secretary, interview, Madrid, Summer 1998.

Larrañaga, M. (1998) "Exportar Más y Ajustar la Plantilla a la Carga de Trabajo Real, Claves para el Plan Industrial de BAZAN," *ABC*, June 29, 1998.

Library of Congress (1988) "Country Studies, Spain," http://lcweb2.loc.gov/

Manonellas, M., Oliveres, A., and Xarles, G. (1998) "La Industria Española de Armamentos: de la Política Industrial a la Economía de las Empresas," *Anuario CIP, 1998*, Madrid: Icaria.

Martí, O. (1998) "Aérospatiale ha hecho una Oferta por CASA, Ahora le Toca Decidir al Gobierno Español," *El País*, Economía, July 7, 1998.

Ministry of Defense (1998) "Presupuestos del Ministerio de Defensa," http://www.mde.es/

Molas-Gallart, J. (1998) "Defence Procurement as an Industrial Policy Tool: the Spanish Experience," *Defence and Peace Economics*, 9: 63–81.

Molas-Gallart, J. (1997a) "Spain," in P. Gummett and J.A. Stein (eds) *European Defence Technology in Transition*, Amsterdam: Harwood Academic Publishers, pp. 197–218.

Molas-Gallart, J. (1997b) "Country Survey IX: Spain," *Defence and Peace Economics*, 8: 267–306.

Molas-Gallart, J. (1996a) "From Offsets to Industrial Cooperation: Spain's Changing Strategies as an Arms Importer," in S. Martin (ed.) *The Economics of Offsets: Defense Procurement and Counter-trade*, Studies in Defense Economics, vol. 4, Amsterdam: Harwood Academic Publishers, pp. 299–320.

Molas-Gallart, J. (1996b) "Industria, Tecnología y Comercio en la Producción Militar: el Caso Español," *Cuadernos Bakeaz,* June 15, 1996.

Molas-Gallart, J. (1995) "The Industrial Strategies of Military Producers and the Future of the Defense Firm in Spain," in A. Latham and N. Hooper (eds) *The Future of the Defence Firm: New Challenges, New Directions*, NATO ASI Series, Series D: Behavioural and Social Sciences, 79: 147–60.

Mollejo J. and Pastor, A. (1998) "El Ministro de Industria Dice que la Fábrica de Cartagena es la Más Valiosa de BAZAN," *La Verdad*, July 19, 1998.

Núñez, P.P. (1998) SEPI's Director de Participadas, Ministry of Industry, interview, Madrid, Summer 1998.

Oliveres, A. (1998a) Professor, Economics Department, Autonomous University of Barcelona, interview, Summer 1998.

Oliveres, A. (1998b) "Les Administrations Publiques Espagnoles et la Regulation de l'Industrie des Armaments," Working Paper.

País, El (1998a) "Defensa Acapara la I + D," *El País*, September 30, 1998.

País, El (1998b) "El Ajuste de Bazán lo Asumirá la SEPI," *El País*, July 9, 1998.

Pérez de Lucas, A. (1998) Naval Engineer, Director of Research and Development Area of BAZAN, interview, Summer 1998.

Romeda, R. (1998) "Profesionalización del Ejército Español," paper presented at the International Peace Conference of Sant Cugat del Valles, July 17–19, 1998.

Salmon, K. (1995) *The Modern Spanish Economy*, London: Pinder.

SANTA BARBARA (1998) *Informe Anual 1997*, Madrid: SANTA BARBARA.

SANTA BARBARA (1997) *Informe Anual 1996*, Madrid: SANTA BARBARA.

Stockholm International Peace Research Institute (SIPRI) yearbook, (1996) *Armaments, Disarmament and Internationally Security*, Oxford: Oxford University Press.

Torrente, F. (1998) General Director of Defense Policy, Ministry of Defense, interview, Madrid, Summer 1998.

Vanguardia, La (1998) "CASA Invertirá 141.000 Milliones de Pesetas en I + D Hasta el 2002," *La Vanguardia*, Economía, July 20, 1998.

Voss, W. and Brzoska, M. (1996) *Eurofighter 2000: Consequences and Alternatives*, Brief 5, Bonn: Bonn International Center for Conversion.

Zafra, J. (1999) "La Alemana Daimler Chrysler Integra a la Española CASA en su Grupo Aerospacial," *El País*, June 12.

Zafra, J. (1997) "Contrucciones Aeronauticas Vende en Colombia Tres Aviones por 7.000 Milliones de Pesetas," *El País*, June 12.

4 The Polish defense industry

Restructuring in the midst of economic transition

Marla K. Nelson

Introduction

Contracting global demand for armaments coupled with downward pressure on defense budgets has precipitated a deep crisis in defense industries around the world. For the countries of Central and Eastern Europe (CEE), these devastating blows have been dealt in combination with the shift from a command toward a market-driven economy and in many cases, the withdrawal of state support for the industry. This chapter explores restructuring and conversion within Poland's defense industry in the 1990s.

Poland represents a particularly interesting case in four respects. First, examining defense adjustment in the context of Europe's new security architecture and Poland's political and economic transformation. Second, Poland was the third largest military producer, after the Soviet Union and Czechoslovakia, in the Warsaw Pact. Since the fall of the Soviet Union and the break up of Czechoslovakia, Poland has, arguably, become the most important arms producer in the region. Third, the Polish government has tied the privatization and restructuring of the defense industry to the modernization of its armed forces. Finally, despite the formidable obstacles that the Polish defense industry faces and uneven government support for the restructuring and conversion of the industry, some firms, and regional and local authorities have implemented creative adjustment strategies.

This research relies on multiple data sources including interviews with government officials, industry representatives, academics, and regional development officials; data released by state, national, and international data agencies and regional development authorities; and archival materials. All interviews were conducted over a four-week period in July and August of 1998.

The chapter begins by briefly exploring Poland's past and present security relationships and examining recent and projected trends in military expenditures, procurement, and arms transfers. From there it focuses on the characteristics of the Polish defense industry and the nature of the crisis it faces. Next, it examines adjustment strategies at the national, regional, and firm level, outlining the barriers to industry restructuring at each spatial scale and examples of how some of these obstacles have been overcome.

Security context

Security policies in communist Poland were shaped by the military doctrine imposed by the Soviet Union through the Warsaw Treaty Organization (WTO). Founded in May 1955 under the Warsaw Pact, the WTO united the armed forces of Poland, the Soviet Union, the German Democratic Republic, Hungary, Czechoslovakia, Romania, Bulgaria, and Albania. Created in response to the inclusion of the Federal Republic of Germany in the North Atlantic Treaty Alliance (NATO), the WTO was designed to maintain a balance of power throughout Europe.

As the largest non-Soviet member of the WTO, the Polish Army was a key component of the Soviet bloc security system. The overall strategy of Poland's army throughout this period was the prevention of war in peacetime and the defense of the Soviet Union and its allies in wartime. The Soviet Union, meanwhile, acted as the cornerstone of Polish defense policy. Hundreds of years of foreign invasions, occupations, and partitions had demonstrated that the preservation of the Polish State and its territorial boundaries were at the mercy of Poland's stronger, more aggressive neighbors. Poland was particularly threatened by the inclusion of the Federal Republic of Germany in NATO. In 1960, Conrad Adenauer, then NATO's Federal Chancellor, promised Germans who had been expelled from the lands recovered by Poland after the Second World War "…that their homeland would be assured, if West Germany remained loyal to NATO" (Adenauer, as quoted in Pieciukiewicz, 1996). Poland's alliance with the Soviet Union was the only means of defending its Western border.

Since the dissolution of the Warsaw Pact in mid-1991, Poland has abandoned Soviet proscribed military doctrines in favor of re-nationalized ones that focus on local and regional security issues. This has entailed more than merely revamping old strategies; it has required the formulation of completely new ones based on the prevailing geographical, political, and economic realities of the region (Kile, 1994).

The threat from the West disappeared with the end of the Cold War leaving Poland without any well-defined military opponents, but the newly found sovereignty of Poland and its CEE neighbors brought unwanted ambiguities to the region. Former Warsaw Pact members were left in limbo, a "sort of involuntary neutrality or non-alignment" (Moller, 1996: 5). In response to their nonalignment, emerging doctrines in CEE have emphasized increased integration and cooperation with Western security structures, particularly NATO, and the formation of regional and subregional defense agreements.

NATO membership has been the top foreign policy goal for Poland since the outset of political and economic reforms:

> European institutions are important to Central Europe because they legitimize the programs of their political leaders to society. But NATO is especially important because it anchors the United States to Europe and provides additional psychological security to [states such as Poland] which have been so tossed about by history. NATO, with its trans-Atlantic ties, is seen not just as

> an Article 5 guarantee[1] against aggression but as a stabilizing instrument that ensures continued statehood.
>
> (Simon, 1995)

Poland's security objectives were realized on March 12, 1999 when Poland, along with Hungary and the Czech Republic, became a full-fledged member of NATO. In addition to its military contributions, Poland's inclusion will help the alliance become a stabilizing force in the region. Poland, which sees itself as a potential bridge between NATO and the east, hopes that cooperation with its CEE neighbors, particularly Slovakia and Lithuania, will help bring them into the alliance (Jonas and Zygulski, 1999).[2]

In efforts to make the Polish armed forces compatible with NATO's military structures, Poland has sought to establish civilian control over military institutions and the armed forces. Polish forces have been increasingly downsized and professionalized. Between 1989 and 1993 the armed forces were nearly halved from 350,000 to 180,000 (Table 4.1).[3] Interestingly, in the subsequent two years the ranks rebounded to 278,000. This increase may have been made to cover gaps in the armed forces as a result of the breakup of the WTO. Many former WTO member nations have found themselves in the position of having to establish defense systems that had previously been provided by the Soviet Union. In accordance with "Military 2012," a 15-year modernization program for the armed forces approved in September 1997, the number of army personnel will be scaled back to 180,000 by 2004 (Ministry of National Defense, 1997: 14).

NATO requirements also mandate changes in the structure of the Polish armed forces from a barrel to pyramid configuration. The share of officers will be reduced from 46 to 30 percent while the percentage of noncommissioned officers will grow from 23 to 40 percent. Professional and contract soldiers will account for 60 percent of all army personnel (Zygulski, 1997: 5). These changes will occur gradually via retirement, voluntary discharges, and other forms of natural attrition.

NATO membership will guarantee national security and bring political prestige, but not without a cost. New member nations are required to modernize their

Table 4.1 Polish armed forces, 1989–95

Year	*Polish armed forces (numbers in thousands)*
1989	350
1990	313
1991	305
1992	270
1993	180
1994	255
1995	278

Source: US Arms Control & Disarmament Agency, World Military Expenditures and Arms Transfers 1996.

armed forces with NATO-compatible weapons and equipment. Given this mandate, it comes as no surprise that the expansion of the alliance came on the heels of intense lobbying efforts in the United States by US arms producers who stand to gain entrance into a multibillion dollar market for their wares.[4] The next section examines recent and projected trends in military expenditures, procurement, and arms transfers.

Military spending, procurement, and arms transfers

Military spending

Since the end of the Cold War, military expenditures throughout the CEE have been substantially reduced. While a reduction in military budgets has been common throughout Europe, the scale of decline in the east and the west has not been comparable. Unlike their western counterparts, the countries of the CEE have had to face the costs of political and economic transformation as well. As a result, resources previously earmarked for military expenditures have been rerouted to developing market economies and bringing about improvements in living standards.

While Western European defense spending fell by 12.2 percent between 1986 and 1992 Poland's spending dropped by 78.1 percent.[5] Polish military expenditures in real terms plummeted from 18.6 billion dollars in 1989 to 3.7 billion in 1993 (Table 4.2). Drastic cuts in military spending were coupled with a smaller share of expenditures allocated to procurement. Procurement accounted for 31 percent of Poland's total military budget in 1990, but only 11 percent in 1993 (Kiss, 1997: 112). Since 1993, military expenditures have increased, reaching 4.9 billion in 1995. Between 1997 and 1998, defense expenditures rose 4.9 percent in real terms (Ministry of National Defense, 1998).[6] Further increases in military outlays are projected as Poland is called upon to meet the financial responsibilities of NATO membership, an especially probable scenario given that leaders in France, Britain, and Germany have vowed not to raise their contribution to NATO's common funding (Tigner, 1997: 1). According to a US Congressional Budget Office report,

Table 4.2 Polish military expenditures, constant price figures, 1989–95

Year	*Constant 1995 US$ (in millions)*	*% change from previous year*
1989	18,550	
1990	10,060	−45.8
1991	8,135	−19.1
1992	3,839	−52.8
1993	3,707	−3.4
1994	4,760	28.4
1995	4,887	2.7

Source: US Arms Control & Disarmament Agency, World Military Expenditures and Arms Transfers 1996.

Poland will have to increase its funds devoted to the procurement of new weapons systems to six times current levels to bring the armed forces up to NATO standards (Hartung, 1998).

According to United States Information Agency (USIA) counts, 80 percent of Poles support efforts to join NATO, and most are prepared to accept membership responsibilities. Poles in fact, appear more willing than their Czech and Hungarian neighbors to pay for NATO membership. A majority (56 percent) is willing to increase the nation's defense budget to pay for enlargement while just less than a third (31 percent) are opposed. Most feel that the cost of bringing Poland into NATO should be shared with other members of the alliance (Fleury, 1997: 2). Some analysts, however, fear that as Poland and its CEE neighbors labor to meet their NATO obligations and adapt to the alliance's standards, they may launch themselves on a path of nonsustainable development, resulting in military postures that are too expensive and inadequate for meeting national security needs (Moller, 1996: 9).

Procurement

The Ministry of National Defense (MoND) is responsible for the procurement of military equipment and weapons systems. The department of procurement and department of research and implementation within the MoND draft procurement plans which are then accepted by the Deputy Minister for Armaments and Infrastructure and chief of the General Staff. Once procurement plans are accepted, the Minister of National Defense must approve them. The National Defense Committee of the Polish Parliament advises the MoND in the drafting of the budget and plans for military equipment and weapon orders (Zukrowska, 1998). The Ministry of Economy (MoE) is involved in the procurement process when licenses must be issued, technologies are imported, or military production is placed abroad (Zukrowska, 1998).

In June 1999, the Polish Government passed a bill that ties larger purchases of foreign military material and equipment to offset deals promoting the defense industry. The Compensation in Military Hardware Purchases Act, or "Offset Act," requires that all foreign companies and consortia that receive contracts from the MoND worth 1 million Euro and above must compensate the defense industry by at least 50 percent of the total value of the contract (Luczak, 1999). Offset transactions should ensure at least one of the following aims: the development of the Polish defense industry; the opening up of new export markets for Polish firms and products; the transfer of advanced technology; the expansion of R&D activities; and the creation of new jobs (Hypki, 1999: 34). An Offset Office within the MoE will oversee offset negotiations.

As a crucial funding mechanism for the government's current restructuring plan (see section "Adjustment strategies at the national level"), and the main source of technology transfer to the Polish defense industry, the offset legislation directly links industry restructuring to the modernization of the Polish armed forces. According to government estimates, income from offsets alone is expected to total between $325 million and $2.5 billion through 2012, not including the offsets from the combat aircraft award (Taverna, 1999a). In subsequent years, however,

defense imports are expected to decrease forcing a decline in offset investments. As a result, relying on procurement to keep the defense industry afloat over the long run is a risky proposition. Under the new legislation, offset transactions can also be focused toward industrial branches outside the defense sector. The MoE should use the opportunity provided by Poland's current military needs to encourage investment in dual-use technologies and sectors outside of the defense industry that may serve as long-term drivers of growth.

In accordance with NATO requirements, Poland is to increase transparency in the procurement process, particularly in the acquisition of major weapons systems. Although procurement reforms have made some progress, further reform is necessary to strengthen democratic mechanisms of decision-making and control. One industry watcher interviewed for this research remarked that military tenders need to be better announced and firms need to know that their bids are accepted or rejected based on merit rather than favoritism.

The controversy and confusion surrounding the Defense Ministry's $800 million contract for equipping the Huzar combat helicopter highlight the need for more transparency in the procurement process. In October 1997, after four years of intensive lobbying efforts by the United States and Israel, Poland selected the Israeli Elbit–Rafael consortium to supply antitank missiles and flight deck electronics for the Huzar. In December 1998, however, after Israel failed to meet a testing deadline Poland discontinued the agreement with Israel and announced that a new tender procedure would be organized in spring of 1999. Some critics contend that the breaking of agreement may have been caused, at least in part, by pressure exerted by the United States on behalf of Boeing North America, whose Hellfire II missile was to be a strong competitor in the follow-up tender. United States officials have also suggested a lack of clarity in the Huzar affair. In 1997, American Secretary of State Madeleine Albright questioned the tender procedure in a letter to then Prime Minister Wlodzimierz Cimoszewicz (Zygulski, 1998). In March 1999, a team of experts from the Ministries of the Economy, Finance, and Defense decided that the Huzar program should be abandoned and foreign helicopters should be purchased instead.

Currently Poland is reviewing offers for modern fighter-bombers to replace its fleet of aging Soviet jets, a contract valued at between $2.5 and $3 billion. The Polish Defense Ministry first announced its procurement plans in April 1997 and announced invitations to tender soon thereafter. Boeing and Lockheed-Martin have both offered full offset deals for the purchase or lease of F-18s and F-16s. Europe's DaimlerChrysler Aerospace-Dassault Mirage 2000–5 and the British Aerospace (BAe) JAS 39 Gripen are also in the running. BAe is prepared to make an investment in the Polish arms industry at least equal to the value of the contract. Although the tender process has dragged on for several years and final procurement decisions are not likely to come anytime soon, Poland plans to purchase sixty aircraft by 2012 and lease a number of planes in an interim period before it gathers enough funds for the final purchase.

Although US suppliers are generally considered to be favored in Poland's procurement decisions, pressure to buy from European producers has grown as Poland

strives to join the European Union (EU). Many industry watchers are convinced that Poland will have to give at least a portion of its procurement to European firms (Taverna, 1999a).

Arms transfers

During the Cold War, members of the WTO alliance were the primary recipients of Polish armaments. Outside the WTO, Poland exported military goods to a wide range of countries in the Middle East, Africa, Latin America, and Asia. In 1986, Poland exported over $2 billion worth of arms accounting for 12.4 percent of total Polish exports (Table 4.3, Figure 4.1). Arms exports were a lucrative activity that provided Poland with much-needed hard currency.

The collapse of the WTO market, shrinking global demand for armaments, relatively low competitiveness of export products, and the UN embargo on Iraq and Libya have caused Poland to lose its distinguished position as a top arms exporter. Polish arms exports dwindled from over $2 billion in 1986 to a mere $50 million a decade later. To combat this decline, the Polish government has actively engaged in export promotion by organizing arms trade exhibitions and providing government support in arms deals. Expansion of arms exports is widely considered to be necessary for the survival of the industry. While it is unlikely that Poland will reemerge as a leading exporter given the tightening global market for armaments, the new offset legislation will likely boost the military and civilian exports of Poland's defense producers.

Throughout the Cold War, the Soviet Union was the main supplier of armaments to Poland at prices far below world standards. The dissolution of the COMECON in 1990 and the WTO in 1991 has opened Poland and the rest of the CEE up to suppliers outside of the former Soviet sphere of influence. While

Table 4.3 Polish arms transfers, 1989–96 (constant 1996 million US$)

Year	*Arms imports*	*Arms imports as a % of total exports*	*Arms exports*	*Arms exports as a % of total exports*
1986	1,630	10.4	2,038	12.4
1987	1,087	7.4	1,713	10.7
1988	1,271	7.9	1,525	8.6
1989	763	5.9	488	3.0
1990	292	3.0	269	1.7
1991	0	0.0	124	0.7
1992	0	0.0	22	0.2
1993	11	0.1	11	0.1
1994	21	0.1	73	0.4
1995	71	0.2	41	0.2
1996	60	0.2	50	0.2

Source: US Arms Control & Disarmament Agency, World Military Expenditures and Arms Transfers 1997.

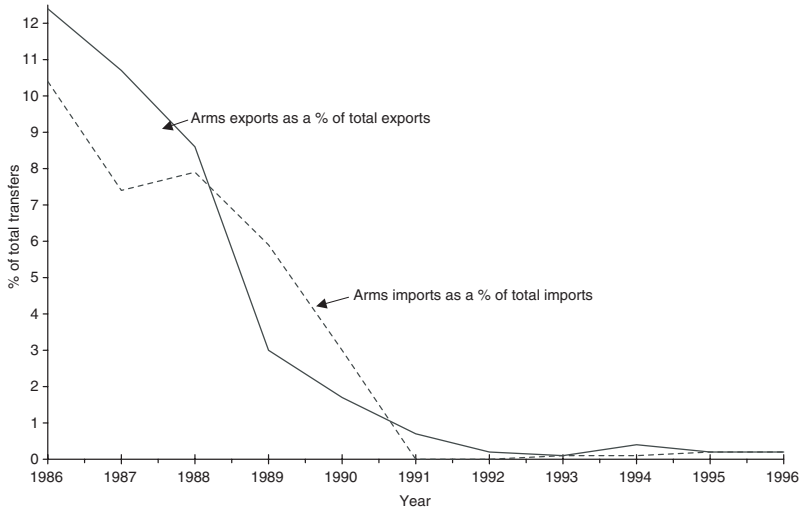


Figure 4.1 Polish arms transfers as a percentage of total transfers, 1986–96.

the majority of armaments procured from abroad continued to come from former Warsaw Pact members through the mid-1990s, Poland's trading partners will increasingly include enterprises from the West as Poland calls upon Western defense firms to help bring its armed forces up to NATO standards.[7]

Poland has faced wide fluctuations in the value of arms imports over the past decade and a half. The slashing of the Polish defense budget with cuts concentrated in equipment investments left few, if any, resources for the procurement of armaments from abroad during the early years of transformation. Arms imports collapsed from more than $1.6 billion in 1986 to zero in 1991–2. Although they have subsequently risen, dipping again slightly in 1996, import values remain far below the levels achieved during the 1980s. Arms imports are projected to increase as a result of Poland's entrance into NATO.

Realizing the difficulties cash-strapped nations such as Poland face in making major military purchases, the US government has implemented subsidy and loan programs to underwrite NATO expansion and help finance the modernization of CEE militaries. The largest of the direct subsidy programs for weapons exports is the Pentagon's Foreign Military Financing (FMF) Fund, which provides grants and loans for the transfer of US military equipment. Between 1996 and 1997, two-thirds of the countries receiving FMF financing from the Pentagon were either CEE states or former Soviet Republics (Hartung, 1998).[8]

The Pentagon has allocated $20 million per year in FMF funding for FY 1997–8 to the Central European Defense Loan (CEDL) Fund to support the acquisition of NATO-compatible equipment by Central European countries (Hartung, 1998). A second loan program available to the countries of the region is the Defense Export Loan Guarantee (DELG) program. Begun in November 1996, the program

authorizes countries to receive US government guarantees for up to $15 billion in commercial loans for weapons purchases. The Polish government has recently taken a $100 million loan for the purchase of communication and command equipment not produced in Poland but necessary to meet NATO requirements. In addition to the grant aid and loan programs, the Pentagon and arms manufacturers offer low-cost leases and free transfers of used, surplus equipment in hopes that CEE states will outfit their armed forces with American equipment.

Defense industry background

Characteristics of the defense industry

During the nearly three-and-a-half decades of WTO cooperation, the defense industries of CEE were highly integrated into the Soviet military industrial complex. WTO member nations were assigned areas of specialty, creating a division of labor within the alliance. In accordance with this division Poland became a leading manufacturer of tanks, fighter aircraft, antiaircraft guns, and communication stations. In Poland as elsewhere in the CEE, the defense sector was comprised of two basic types of producers, large vertically integrated firms designed to carry out the full production cycle at a given location, and subcontractors and suppliers whose obligation was exclusively to military producers.

Since the dissolution of the WTO, Poland perpetuated its lines of specialization and has begun the design and production of some new lines. The present-day defense sector can be divided into four industrial categories: aircraft; ammunition, missiles, and explosives; radar, electronics and optical devices; and armored vehicles. The aircraft sector is in the poorest financial health with only two of Poland's six aircraft companies reporting positive earnings in recent years (Rzeszow and Okecie), and PZL-Mielec reporting losses of up to $33 million in 1999 (Taverna, 1999a). Yet, the sector stands to benefit significantly from the modernization programs and thus has attracted the attention of numerous Western aerospace firms. In addition to the tender for fighter jets and combat helicopters Poland has announced programs for light airlifters and VIP aircraft. Given the internationalization of the defense industry, the future for Poland's defense producers lies primarily in component production with Poland's final producers possibly engaging in some subassembly work and platform production as well.

Poland's defense sector is principally located in the southeastern quadrant of the country – an area known as the Central Industrial Region. The origins of the industry can be traced back to the interwar period when armament factories were established in Starchowice, Pionki, Swidnik, Mielec, Rzeszow, and Stalowa Wola. In 1918, when Poland regained its sovereignty after 123 years of partition, a national defense industry was needed to insure its protection.

The climate and landscape of the Central Industrial Region are well suited to the defense industry, particularly the aviation sector. Moreover, government officials thought that the location of defense plants there would help stimulate the lagging agricultural region – and a number of "new towns" did spring up around

the armaments factories. To a large extent these settlements and the surrounding region were, and remain, heavily dependent on defense facilities for employment and the provision of public services.

While both the climate and the desire to disperse development affected the location of these early armaments facilities, the region's strategic position far from Poland's potential aggressors, Germany and the Soviet Union, figured most prominently in the siting of the industry. The Central Industrial Region lost its favorable location when Poland's boundaries shifted westward after the Second World War.

Smaller agglomerations of defense facilities exist in Poland's northern ports of Gydnia and Gdansk. Several other enterprises are located in small- and medium-sized cities scattered throughout the country. Aircraft producers are concentrated in Warsaw and the Central Industrial Region. Armored vehicles, ammunition and small arms, and explosives are produced at facilities throughout the country while the main optical electronics facilities are located in Warsaw, Gdansk, and Gydnia. The two top producers of logistic equipment are located in the city of Lodz and the town of Pionki, both in the Central Industrial Region.

In 1989, 128 Polish firms had "special status" or participated in the production of arms, and military and logistic equipment. At the height of military production in 1988, these enterprises employed 180,000 people in civilian and defense production (Table 4.4). Currently the MoE includes 45 industrial plants on the list of the defense industry. The list includes 34 "core" producers and 11 "non-core" plants that produce a large quantity of goods for the military. In addition to these 45 industrial plants there are 10 institutes engaged in defense related research and 12 factories that specialize in the repair of defense equipment. Defense-related research institutes and factories engaged in repair are accountable to the MoND, not the MoE. Thus, they are not generally included in analyses of the industry.

Despite the large number of firms with "special status" during the Cold War, only a few were regarded as military producers. All of Poland's firms with special status were, and remain, dual-use. WSK PZL-Swidnik for instance produced civilian motorcycles from the start of the company in the 1950s until the mid-1980s. By the time production had ceased, Swidnik had produced more than 2.5 million

Table 4.4 Employment in the Polish defense industry

Year	*Employment in civilian and special production (numbers in thousands)*
1986	175
1988	180
1990	145
1992	99
1995	85
1997	74

Source: Wieczorek and Zukrowska (1996: 8); Wieczorek (1998: 5).

motorcycles. Swidnik's civilian profile presently consists of a range of products including components for civilian aircraft, wheelchairs, car trailers, and food processing machines. Swidnik's civilian profile illustrates the wide range of civilian products that Poland's defense firms produce – from high-tech goods based on defense-related technologies to unrelated, less sophisticated products. The employment of dual-use production was an attempt partly to offset the fluctuations in military demand and partly to disguise the military function of the facility. The situation was similar elsewhere in CEE (Kiss, 1997). Accordingly civilian production lines were based on political as well as economic decisions.

In the former Soviet Union the military sector and defense production took precedence over other aspects of social and economic policy (Anthony, 1994). This ordering of priorities was felt throughout the region, positioning CEE's defense enterprises at the core of the command economy, and military production at the top of national interests. Although defense firms faced strict supervision and control, they likewise enjoyed preferential treatment. In Poland, defense enterprises were given priority access to technical and raw materials, investment and R&D resources, on favorable terms that artificially increased their profitability and competitiveness (Kiss, 1997; Wieczorek and Zukrowska, 1996). Defense workers also benefited from the industry's privileged position. Pay scales in the industry were well above the national average.

The nature of the crisis facing the defense industry

The Polish defense industry has faced obstacles similar to those confronting all heavy industries in the transformation to a free-market economy: low competitiveness of export products; limited marketing experience; lack of access to capital; high levels of inflation; and underutilized production and labor capacity. These impediments coupled with the contraction of the global arms market and imposed trade embargoes have hurled the Polish defense industry into a state of near financial collapse.

Total output from military-related enterprises plummeted more than 77 percent from 5,760 to 1,310 million zloty between 1988 and 1992 (Table 4.5). During this period civilian production also fell dramatically, leaving no room for the transfer of military to civilian production in the early years of the crisis. From 1986 to 1992, defense production as a share of total industrial output slipped from 2.07 to 0.36 percent (Table 4.6). The share of defense production has remained low accounting for only 0.42 percent of total industrial production in 1997. Whereas the capacity utilization rate of the arms industry was between 80 and 85 percent in 1988, by 1995 this figure had fallen to 20–25 percent (Zukrowska, 1997: 70).

As the value of civilian production increased between 1992 and 1995, the value of defense production dwindled further. One might be inclined to characterize the simultaneous increase in civilian production and decrease in defense production as "conversion." However, given that total production levels were far lower in 1995 than those reached in the 1980s, it is more accurate to refer to the changes in the industry as "downsizing" especially when one considers the level of job loss experienced in this period (Zukrowska, 1997: 70). By 1995, more than half of the

Table 4.5 Production in the defense industry (constant 1995 million zloty)

Year	*Value of total production (defense and civilian)*	*Value of defense production*	*Value of civilian production*
1986	5,390	2,910	2,480
1988	5,760	3,100	2,660
1990	3,380	1,200	2,180
1992	1,310	870	440
1995	2,300	580	1,720

Source: Wieczorek and Zukrowska (1996: 8).

Table 4.6 Defense production as a percentage of total industrial production, 1986–97

Year	*Defense production as a % of total industrial production*
1986	2.07
1987	2.09
1988	1.21
1989	1.16
1990	1.15
1991	1.15
1992	0.36
1993	0.45
1994	0.40
1995	0.40
1996	0.45
1997	0.42

Source: Economy Ministry data used in Wrabec (1998: 15).

180,000 employees working in the defense sector at the height of production in 1988 had lost their jobs (Table 4.4). The 34 firms representing the core industry currently employ roughly 68,000 workers (Warsaw Voice, 1999a).

Defense producers have lost any privileges they might have enjoyed during the Cold War. The disintegration of the WTO was accompanied by the collapse of the interregional supply system that had provided inexpensive supplies and resources to military-related enterprises during the era of WTO cooperation. Without this supply network, defense firms no longer have access to inputs at below market costs. Furthermore, firms are required to maintain defense-related production lines even though they sit idle in many cases. While they receive some government funding to cover maintenance costs, they do not receive a full reimbursement. Unpaid bills and stockpiles of military equipment, spare parts, and raw materials have added to their financial woes.

Defense workers have also experienced a loss in status. The salaries of defense workers have decreased relative to private sector salaries. As a result, defense firms have had a difficult time retaining highly skilled workers. Defense producers in the

most severe financial shape have had difficulties paying wages. In December 1998, workers staged a sit-in at the Radom-based Lucznik Metal Plant. In addition to calls that the government begin industry restructuring immediately, workers demanded overdue salaries.

The psychological shock of the changes has been one of the most difficult problems for enterprises to overcome.

> Many managers felt very bitter about being 'let down' by the state after decades of protection. From one day to the next they seemed to have been left with the burdens of military production that had been imposed on them by the state. As Stanislaw Kaniak, Managing Director of the PZL-Wola Mechanical Works in Poland, put it, they felt 'in a way cheated' by the authorities.
>
> (Kiss, 1997: 148–9)

The above quote reminds us that the transformation of the defense industry has played out on a very personal level. Despite the tremendous economic progress that has been made in Poland since the outset of transition, many people remain wary of the insecurities that have arisen in the new political and economic climate. The next section examines the efforts (or lack thereof) undertaken by the central government to stabilize and restructure Poland's defense industry since Poland's transformation to a market economy and the collapse of eastern export markets.

Adjustment strategies at the national level

In 1987, Polish authorities, cognizant of the future awaiting the defense industry, proclaimed conversion a national objective. Yet, severe cuts in the defense budget left little money for a centrally administered conversion program or for the investment required to fully convert defense industries to civilian production. The government remains supportive of conversion of the industry to civilian production. However, they have done little to encourage it other than cutting military expenditures. Arguably, recent increases in defense expenditures have bolstered military markets and acted as a disincentive to conversion.

In the early years of reform, competing powers within the same government oftentimes came to a head on whether there should be a specific restructuring policy aimed at the defense industry. Supervising ministries including the MoND and the Ministry of Industry and Trade (MoIT) sought desperately to help defense industries survive while those within the Ministry of Finance and the Ministry of Privatization adopted a "hands-off" approach (Kiss, 1997: 114). In addition to internal government conflicts and financial constraints, political instability resulting from frequent changes in government further hindered efforts to reorganize the industry and promote conversion. Enterprises were expected to prepare and implement restructuring and conversion programs on their own. As plant managers associated conversion with government abandonment of the industry, many developed an antagonistic attitude towards it (Kiss, 1997: 175).

Alarmed by the ruinous forecasts of defense analysts and influenced by parliamentary pressure and a series of labor strikes in 1992, the MoIT formulated a consolidation program for the industry in 1993.[9] The program sought to minimize

costs by concentrating defense production in a smaller number of firms. While there were 128 enterprises with special status in 1989, the industry consisted of 31 core producers by 1995. Defense production was consolidated in the remaining firms in efforts to minimize costs. With a few exceptions, these 31 final producers remain the core of the Polish defense industry.

Consolidation of the industry was coupled with ownership restructuring. Of the 31 firms that retained their special production status, 28 were transformed into State Treasury joint-stock companies. Three of these then transferred their ownership to a third-party creditor. The State Treasury acted as the sole owner in the remaining 25 cases except for 20 percent of the shares, which belonged to the company staff as mandated by the law of ownership transformation (Wieczorek and Zukrowska, 1996: 22).

Some firms – including PZL Mielec, Huta Stalowa Wola, Gamrat, Stomil, Niewiadow, Pronit, and Unimor – were split into holding companies. The rationale behind the holding company scheme was that it would allow smaller parts to grow and help absorb the undercapacity of the other components. It turned out however, that competition was greater than anticipated. Although some parts have been quite successful, they have not been able to grow fast enough to absorb surplus labor and production capacity in the lagging components (Czerwinski, 1996).

Early attempts to privatize the industry fell through, given the conflicts among competing political powers, opposition by managers of defense plants and by defense workers, and the concerns of some government officials that a state-run defense industry was necessary to protect the security interests of the Polish State. In addition, Poland's early economic reforms, although the most far-reaching in the CEE, were focused on fiscal and monetary policies; structural reforms were limited. As a result, the privatization of all major state enterprises, including defense firms, has moved at a protracted pace.

Early industrial programs and policies aimed at the defense industry also included the clearing of debts. By 1996, the total debt of the industry had been halved.[10] Debt relief, while essential for survival, did not confront the chronic underinvestment in the industry. In 1996, Roman Czerwinski, then Undersecretary of the MoIT, who was in charge of the defense industry, worked on a commercialization program to attract capital investment to the industry. The program was never implemented due to lack of funding, interministerial conflict, and ultimately a change of governments.

The inability of the Polish government to agree upon and implement a restructuring program for the defense industry has exacerbated the crisis facing defense producers. Government indecision has left many firms in limbo, encouraging them to adopt a "wait and see" attitude. Although defense producers have been expected to implement their own restructuring programs, government control over and restrictions on the industry have limited firm-level responses. As one firm manager, frustrated by the lack of action on the part of the government, implored:

> Let the guys in Warsaw make a decision so that we'll know what to do. Let them make *any* decision. Then we would be able to undertake decisions here

> in our own company – which plan we should implement, what/who we are looking for, and so on.
>
> (emphasis in original)

The current coalition government of Solidarity Election Action (AWS) and the Freedom Union (UW) has taken a more proactive approach and has attempted to accelerate the privatization of the industry. Even political officials and industry analysts who had previously been opposed to privatization now realize it is necessary. Without privatization, the collapse of the ailing industry is imminent. The State Reserve and Defense Department within the MoE drafted a privatization plan and an analysis of export possibilities based on MoND's projected purchases outlined in the Military 2012 program. The plan, which the MoE submitted to the government in July 1998, divided Poland's 45 defense factories (31 core and 14 noncore) into 5 groups (Wrabec, 1998). According to the plan, firms in the first group would remain under full state control. Those in the second group would be structured into holding companies that would remain in State hands. The detached, independent components within the holding company would be sold to different investors.

In the third and fourth groups, shares of the participating firms would be sold to outside investors, but the State would keep the "golden share" and thus, would possess the decisive vote on key issues. Finally, the fifth group would be entirely privatized without any conditions. Military production would be transferred to other facilities rendering the production profiles of firms in this category purely civilian.

MoE's restructuring program called for the establishment of a National Defense Industry Fund, a shareholders' company in which the State Treasury would hold a 100 percent stake. The fund would manage shares of the companies that had already been or would soon be transformed into state single shareholder companies. It was to guarantee that the money foreign investors paid for shares in defense factories would stay in the arms industry and help close the technological gap between the Polish arms industry and foreign firms.

Detractors of the MoE's privatization scheme felt that proponents of the plan were overly optimistic about the interest of foreign investors given the conditions attached to privatization. They argued that strategic investors would not want to commit themselves to an enterprise in which the State Treasury must have a prevailing number of shares. What the MoE proposed, critics contended, was not really privatization:

> Privatization means handing a company over to a private entrepreneur. Establishing a special holding company – the National Defense Industry Fund, imposing cooperation links on companies, and transferring production from one place to another – all this has nothing to do with privatization. In this way factories can be privatized but at the same time kept under state control.
>
> (Bien, 1998)

Although the National Defense Industry Fund would likely prove beneficial for lagging defense firms, opponents feared that the Fund would penalize stronger

companies. Sales achieved from selling the stocks of the most lucrative companies would be used for the restructuring and possibly privatization of weaker firms. Such requirements would likely make strong firms less appealing to potential buyers.

> The initial program proposed in the MoE's study was revised seven times before the Polish Government passed a bill for the privatization and restructuring of the industry in June of 1999. Unlike earlier drafts, the final version of the program does not include the National Defense Industry Fund. Instead, individual companies will be privatized without the assistance of any central fund. The abandonment of the centralized approach is due primarily to the strong insistence of Poland's liberal-oriented reform leader, Deputy Prime Minister and Finance Minister Leszek Balcerowicz.
>
> (Luczak, 1999)

In the accepted plan, 34 of Poland's 45 defense producers have been designated as vital for the national security. Firms that are considered important for national security but are unlikely to maintain the necessary volume of activities needed to survive in a competitive marketplace will remain under state control with the state maintaining idle production capacity (Hypki, 1999). Two firms, Zch Nitro-Chem SA (explosives) and TM Pressta SA (shells and missile components), will not be privatized. Six additional firms, all of which are involved in the production of explosives, will be partially privatized with the state holding a majority control of company shares.

Thirteen firms are scheduled for privatization with the state holding less than 51 percent of company shares and nine are scheduled for total privatization. ZR Radmor SA, a radio producer in Gydnia will take majority control of Unimor-Radiocom Ltd. and Unimor-ZUMT Ltd. prior to privatization. Three firms are currently under bankruptcy procedures: ZM PZL-Wola SA which produces tank engines, GZE Unimor SA, a producer of metal parts, and aircraft and engine producer WSK PZL-Mielec. In the case of WSK PZL-Mielec, activities will be transferred to a new company, which will initially be controlled by the state (Luczak, 1999).

The revenues from the sale of shares to the public and private investors will be used to finance MoD purchases from the Polish defense industry and fund R&D and defense export promotion programs. Revenues will also be reinvested in the restructuring process to provide operating loans for firms and finance pre-privatization marketing analyses.

Despite earlier efforts at debt relief, many of Poland's defense firms still face mounting debts that reduce their attractiveness to private investors. As a preliminary step in the privatization process the state will cancel in whole or in part some of the financial obligations towards the state and convert some of the obligations into the transfer of shares. For the thirty-four firms in the program the scheduled debt reduction will amount to $65 million dollars (Luczak, 1999).

Although the Polish Government accepted the privatization plan, some skepticism remains among industry watchers, political officials, and firm representatives regarding implementation of the plan. They fear offsets and investment in the

industry, spurred by privatization, cannot cover the costs of privatization and restructuring. Restructuring of the defense industry is an important issue that stands to affect thousands of workers and numerous communities but it has not been made the topic of national debate. At the moment, restructuring of the coal and steel sectors are regarded as more important given that they are more geographically concentrated than the defense industry, and their reform is necessary if Poland is to join the EU. Furthermore, Poland has a "full plate" in terms of policy at the moment; it is currently in the process of changing its administrative, health, education, and social security structures.

Despite government proclamations, conversion never emerged as a national objective. In tying industry privatization and restructuring to the modernization of the Polish armed forces, the current plan, does not directly emphasize or encourage conversion from military to civilian production. However, some of Poland's defense firms have been provided with conversion assistance by the Industrial Development Agency (ARP), a financial institution established by the central government in 1992 with the purpose of granting loans to, and issuing guarantees on behalf of, state-owned enterprises in the process of restructuring. In 1999, ARP spent 117 million zloty for the restructuring of six arms manufacturers: ZM Lucznik SA, ZTS Pronit SA, WSK Swidnik, Stalowa Wola, ZM Mesko SA and ZM Dezamet Nowa SA. The ARP received 100 million from the National Labor Fund with the remaining monies coming from its own resources. Most of the funds have been used for the establishment of six subsidiaries that produce civilian goods. ARP also plans to convert company debts into company shares.

Adjustment strategies at the regional and local levels

Local and regional responses to the crisis in the defense industry have been rather limited. One regional development official remarked that the defense industry is thought to be beyond local control and thus, is treated with some distance by local and regional authorities. The lack of bottom-up adjustment strategies is likely to continue in the short run as Poland progresses with administrative reforms that seek to reorganize the structure of regional and local government in efforts to increase the state's efficiency and make Poland's administrative structures more comparable with those in the EU. While local-level reforms are well underway, the current coalition government only recently approved meso-level changes that scale back the number of provinces. As of January 1, 1999 Poland consists of 16 provinces, down from 49. It will likely take some time before regional-level officials and institutions adapt to these changes.

The central government and the EU have provided some assistance to regions hardest hit by cuts in military-related production. In 1993, the government established the Polish Agency for Regional Development (PARD), a State Treasury Fund that coordinates all EU PHARE programs and seeks to promote economic development in regions most severely affected by economic restructuring. Unlike the EU's KONVER programs, which provide assistance specifically for conversion efforts, the PHARE funds support a broader range of regional development initiatives

that seek to mitigate regional disparities and help facilitate the integration of the CEE into the EU.

On the local level, Polish authorities have established a pioneering tax-free economic zone – special economic zone (SSE) Euro-Park Mielec – on the grounds of the PZL-Mielec aircraft factory. The principal aim of SSE Euro-Park Mielec is to attract investment to the zone via location inducements that will alleviate area unemployment, promote the development of small- and medium-sized firms, and utilize existing industrial assets. In 1990, PZL-Mielec, like many other defense producers, lost its eastern markets. In response the company resorted to mass layoffs. In the 1980s, PZL-Mielec employed roughly 24,000 people.[11] By 1992, employment had plunged to roughly 10,000. Despite increased attempts at civilian production, the activity provided by PZL-Mielec's niche markets was marginal and was thus unable to pull the firm out of its precarious situation (Kiss, 1997). PZL-Mielec, the town, and the surrounding region teetered on bankruptcy.

Established in 1995, the zone has attracted over $161 million in foreign direct investment, creating 4,000 new jobs. Zone administrators have issued 41 business permits. Out of them 5 have lapsed leaving 36 companies with valid permits within the zone. Almost half of the projects within the zone are greenfield investments in which investors build new facilities on lots they purchase. The remaining projects use existing facilities (Warsaw Voice, 1999b). Companies operating within the zone are exempt from income taxes during the first 10 years of the zones' 20-year existence, and are taxed at 50 percent of the regular rate during the subsequent decade. Companies also enjoy tax breaks on business-related investment expenditures.

Although SSE Euro-Park Mielec is funded by the central government and managed by ARP, the idea for the zone was generated at PZL-Mielec. Zone officials cooperate closely with the local employment office, which offers special incentive packages to investors including the reimbursement of training costs and surveys of investor needs and worker skills. In addition, local residents have recently established the Center for Vocational Training, which differs from the local employment office in that it provides actual training tailored to investor needs. While the Center receives funds from the central government, it is a local initiative. Further prospects for bottom-up, locally led adjustment strategies may open up as local decision-making and action widen, and development officials and citizens adjust to the emergent administrative structure.

Government officials have created sixteen additional zones throughout the country since the establishment of SSE Euro-Park Mielec, most recently in 1997, with the Europark Wislosan Tarnobrzeg SSE. The largest of Poland's SSE's, Europark Wislosan is spread out over four subzones within the region. One of subzones includes Huta Stalowa Wola, an armored vehicles and artillery firm, and Poland's largest military producer during the Cold War. Similar to Mielec, Stalowa Wola is a one-enterprise town. At the height of production in the 1980s, more than half of the town's 75,000 inhabitants worked in or for the enterprise with 22,000 people employed at the factory (Kiss, 1997: 124). By the mid-1990s employment at Huta Stalowa Wola had been cut to 14,000.

It is hoped that Europark Wislosan will generate 11,000 new jobs. As of October 1999, seventeen firms have been granted permits to operate in the zone. They have

thus far invested over $19 million and employed 2,700 people. ARP manages both the Mielec and Tarnobrzeg zones. Zone officials at Europark Wislosan are hopeful about the future and stress the advantages of being able to learn from the experiences at Europark Mielec.

Despite early achievements, the SSEs have faced severe criticism by opponents at the local, national, and international levels. In Mielec, for instance, local residents have been skeptical of zone activities and officials, particularly in the early months of the zone. As Euro-Park Mielec officials recount:

> A lot of promises were made by the government… [They] told the people that the zone would solve their problems. Naturally expectations were high. People expected that a miracle would happen, and happen rapidly. It was a very difficult time for zone managers. People waited for and expected results practically from day to day.

At the regional level opponents argue that the zones draw investment away from other places within Poland. Employment and investment gains in the zones have been coupled with losses in towns and cities that do not share the special economic status.

The EU also opposes the existence of SSEs on the grounds that they promote unfair competition. Realizing however, that stable legal regulations are required to attract investment, particularly foreign capital, government officials are working to save Poland's SSEs without jeopardizing prospects for EU membership. Although the future of Poland's SSEs remain uncertain, officials at Euro-Park Mielec are confident that Poland's entrance into the EU will not negatively effect future investment in the zones:

> It's difficult to say [what's going to happen to the SSEs] at this stage. Maybe there will be some changes that will make Poland's special economic zones similar to zones in Western countries… Regulations may be different, but [the] zones will still exist.

Investors will maintain their privileges if they make a commitment to invest in the zones before the end of 2002. To be more compatible with EU requirements, tax exemptions will likely be replaced by government grants.

Firm level-adjustment strategies

Defense enterprises have reacted to the crisis affecting the industry in three principal ways. Many firms have cut overhead costs by decreasing the size of enterprises. This has chiefly entailed the dismissal of redundant workers. As noted earlier, job loss experienced in the industry has been severe, the situation exacerbated by relative labor force immobility in Poland, the existence of one-enterprise towns, and the lack of social protection packages for unemployed defense workers. In response to the crisis affecting the industry – particularly the downsizing of the workforce – labor unions have lobbied for the revival of military production and immediate government action in industry restructuring. Alongside labor-initiated lobbying campaigns, the defense industry has experienced a number of strikes.

Roughly 18,300 additional workers are projected to lose their jobs as a result of the current privatization initiative (Hypki, 1999). In response to demands by labor, the government is currently in the process of drafting social protection packages for defense workers who will be laid off as a result of industry restructuring. Worker provisions will include incentives to early retirement with a full pension and training for new professions. Early-retirement provisions are especially important given the higher than average age of the industry workforce (Czermanski, 1996). The early retirement provisions will reduce the total working period required to earn full pensions by two to five years (Hypki, 1999). In crafting these social support initiatives, government officials are bearing in mind the unemployment levels in regions where the defense firms are located as well as future prospects for individual firms (ibid.).

Second, defense firms have sought out cooperation with Western companies as a means to ensure their survival and revive the ailing sector. Cooperation with foreign firms promises access to Western capital, technology, and expertise. Polish defense firms are presently working with foreign firms in both the civilian and military spheres. Offset arrangements tied to Polish imports of foreign-made weapons will enhance such relationships.

Foreign investors find Polish defense firms attractive given their highly skilled and relatively inexpensive labor. Moreover, cooperation with the Polish defense industry allows foreign firms access to the Polish market and exposure to industry representatives that have extensive knowledge and experience in markets unfamiliar to Western firms. Polish officials are hopeful that exports will increase to the foreign investors' countries.

WSK PZL-Krosno provides an interesting example of a firm that was able to regain its competitiveness through foreign cooperation. With 80 percent of output destined for markets in the former Soviet Union, WSK PZL-Krosno was hit especially hard when eastern markets collapsed in the early 1990s (Bibrowski, 1998). Facing bankruptcy, the company with support from ARP sought a buyer for its least profitable sector – the aviation equipment division. In 1996, WSK PZL-Krosno established a limited-liability company with Coltec Aerospace Canada Ltd. under the name Menasco Krosno. Menasco Krosno currently produces landing gear components for a variety of Boeing aircraft manufactured in the United States and for Lockheed Martin's F-16s fighter planes.

Subcontracting agreements with foreign firms for component production have not only benefited Poland's second- and third-tier producers but its original equipment makers as well. For instance, WSK PZL Swidnik, producer of the Sokol multirole helicopter line, boasts widespread subcontracting agreements with Western firms. Swidnik produces Airbus doors and door mechanisms for Deutsche Erocopter and Latecoere, fuselage assemblies for the Agusta A109 Power, and center wing boxes for the Aerospatiale/Alenia ATR 72. Swidnik's subcontracting work accounts for roughly one-fifth of annual sales (Taverna, 1999b).

Finally, many enterprises have increased civilian output while military-related output decreased, raising the share of civilian sales in total (Kiss, 1997: 108). While the overall shift away from military production is encouraging, some experts

contend that "conversion" has been used as a survival strategy until military demand is revived (Kiss, 1997: 178). Interviews with industry representatives substantiate this assertion. When the Vice President of a profitable firm that substantially increased its share of civilian production was asked about his firm's conversion strategies, he replied:

> Well, I don't differentiate between the [civilian and defense] markets because I am not really interested in which [type of unit] my customer places the component that we manufacture. It doesn't matter to me if it goes to a military [product] or if it goes to a civilian [one]. I know only that we participate in both markets. I don't ask the customers if it is military or commercial. It doesn't matter.

As the subcontracting role has become increasingly important to all of Poland's defense producers, this earlier quote is germane not only to second- and third-tier component manufacturers, but to platform makers as well.

Although all of Poland's defense producers are dual use, firms tend to favor military production because there was strong and stable demand for years and the profits are generally better in military markets. According to a representative from one defense firm:

> We can't compare the prices that we get for [military goods] to the prices we get for civilian products. So, in the case of a collapse in the [military] market, we can't expect that [our] civilian production would support us, that we would survive. It would have to be increased enormously to compensate for decreases in demand for [military goods].

The end result is that many firms prefer to produce guns rather than butter, complicating conversion efforts. Conversion to civilian production although easier in an autonomous market with no competition, is much more difficult in an open economy given actual and perceived differences in the quality of goods from the CEE versus those from the West or Asia. One defense producer that manufactured pressure cookers as part of its civilian production line found that they had been very popular prior to reforms, but faced with competition from producers outside of the CEE, the product was viewed as too heavy and inferior relative to its competitors. Even if Polish products are competitive in quality to Western rivals, they are often perceived as inferior. (This holds for military goods as well.) As one industry representative informed me:

> [Products] that are labeled "eastern" are regarded as lower quality. It's a problem of people's mentality rather than of the quality of our products. We could have papers confirming that are products are of high quality, but it'll take many years to prove that.

The lack of marketing skills and experience has posed a further obstacle to expanding civilian markets particularly in the early years of Poland's transformation to

a market economy. Highly competitive civilian goods sometimes became outdated before they could be effectively brought to market.

To overcome marketing and perception obstacles, many firms have engaged in cooperation with foreign companies and have taken advantage of their partners' marketing skills and resources. Huta Stalowa Wola is a good example. According to firm management, roughly 60 percent of the firms' production is exported (roughly 2,000 building machines, small tractors, and bulldozers yearly). Its exports are sold in North America by Komatsu-America. Together with Komatsu-America, Huta Stalowa Wola has also created a marketing company "DRESTA" to sell their products in Asia (Tyrala, 1998).

Clearly, prospects for the conversion of the Polish defense industry exist as firms become more accustomed to market conditions, and the domestic economy improves. However, instead of exploring future opportunities in civilian markets, arms manufacturers – reeling from military cutbacks – may opt instead to try and recapture lost military markets that have been bolstered by NATO expansion. This may be a mistake, as the long-run income elasticity of demand for consumer goods is apt to be higher than that for military equipment.

Policy recommendations/conclusions

The defense industries of the CEE have confronted obstacles similar to those facing all of the region's heavy industries in transitioning to a free-market economy: low competitiveness of export products; limited marketing experience; lack of access to capital; high levels of inflation; and excess production and labor capacity. These blows have been dealt in conjunction with the withdrawal of state support for the industry, contracting global demand for arms and the collapse of export markets and have inhibited the implementation of large-scale conversion efforts in Poland and elsewhere in the CEE (Kiss, 1997).

Poland, once a leader in the transition to a market economy with its "shock therapy" reforms, has been slower to take on structural changes including the privatization of state-owned industries. The protracted pace of privatization and lack of a coherent defense policy toward the industry have impeded the ability of some defense producers and local and regional development officials to pursue proactive adjustment strategies. The Polish government pronounced its support for conversion to civilian production but never implemented any government policies or programs to help facilitate the process.

Current defense industrial policy ties the privatization and restructuring of the defense industry to the modernization of the Polish armed forces. This plan promises to help Poland's defense producers directly via increases in orders from the Polish military and indirectly through offset legislation, which requires foreign companies and consortia that receive defense contracts to transfer production and or technology to Polish defense plants. Without provisions to facilitate conversion however, this strategy stands to increase the dependence of Polish firms on military production.

Creative strategies by firm management, local development officials, and State agencies are helping the Polish defense industry adjust to and overcome the

formidable obstacles it faces. More can be done to advance the long-term viability of the industry (in both civilian and military markets), promote the conversion to civilian production and ease the pains associated with restructuring.

Polish defense producers can take a "high road" versus a "low road" to competition in both military and civilian markets. The competitive advantage Polish firms currently enjoy as a result of lower labor costs and cost savings in other factors of production (i.e. land and energy) are likely to erode as the economy matures and Poland joins the EU. Firms need to develop their competitive advantage around unique skills and specializations rather than rely upon cheap input costs. A number of Polish firms, particularly in the aircraft and radar and electronics sectors, have this potential.

Government policy toward the industry can focus more on bolstering demand for civilian production rather than exclusively on expanding military markets. Offset deals have the potential to facilitate this expansion. Industry representatives and government officials can strategically engineer offset deals that enable Polish firms to become better producers of higher end components with strong civilian markets, and to provide access to key technologies transferable to civilian production spheres. Basing defense industrial policy solidly on procurement, however, is a risky venture. As the Spanish case (Chapter 3) illustrates, offset deals do not always result in the transfer of technology as expected. Moreover, such policies may increase dependence on military production placing the defense industry in a weaker position in the long run. Foreign and private interest in these firms is likely to wane once Poland's big-ticket procurement needs are complete.

Also, workers and communities have been hard-hit by the downsizing of the defense industry, a trend that will continue. The government needs to develop social protection packages for the 18,000 workers estimated to lose their jobs in the current restructuring and privatization process. Worker provisions should include the right to early retirement with a full pension for the aging defense workforce and training for new professions. After years of painful downsizing with no provisions for defense workers, it appears as if the government has finally begun working on this front.

Finally, future prospects for local and regional adjustment strategies may widen as development officials and citizens become more acclimated to Poland's emergent administrative structure. Regional and local officials need to use national and international funds to encourage the development of entrepreneurial, flexible institutions that can respond quickly and efficiently to the needs and challenges facing firms and communities. The Center for Vocational Training in Mielec is one such attempt.

Notes

1 NATO's Article 5 guarantees the protection of NATO members – "an armed attack against one (member)… shall be considered an attack against them all."
2 NATO expansion has not been uniformly supported. Russian officials have warned that the expansion of the alliance will have a destabilizing effect throughout Europe. In joining NATO, Poland, Hungary, and the Czech Republic may have lost the opportunity to simultaneously strengthen ties with Russia and the West.

3 Personnel reductions were initiated in 1988, just prior to widespread economic and political reforms.
4 Bruce Jackson, director of strategic planning for Lockheed Martin Corporation, is co-founder and president of the US Committee to Expand NATO, a nonprofit organization committed to the enlargement of the security alliance.
5 Figures calculated by author from data in the BICC Conversion Survey 1998.
6 Despite recent increases in defense spending, military expenditures as a share of GDP have held steady or declined because of the rapid expansion of the economy.
7 According to ACDA data, Poland received $80 million of arms transfers from other Eastern European countries. During this period, Poland received no arms deliveries from Russia (US Arms Control and Disarmament Agency, 1996).
8 It should be noted that Israel and Egypt receive the lion's share of FMF dollars.
9 Central administration reforms undertaken by the ruling coalition in the prior administration dissolved the MoIT. The development of programs for the defense sector became the responsibility of the State Reserve and Defense Department within the MoE.
10 Debts were reduced through bank settlement and court agreement procedures, negotiations of the ways of liabilities payments, as well as compensation of losses incurred due to the embargo of arms sales to some countries in the Middle East (Milewski, 1996: 87).
11 This figure includes some branches outside of Mielec.

Attributed interviews

Bohler, Don (1998) Executive Director, Poland Office and Vice President, Central Europe, Lockheed Martin International, S.A., Warsaw, August 11.

Chraniuk, Wlodzimierz (1998) General Director, Polish Chamber of the Producers for National Defence, Warsaw, July 29.

Cox, Colonel James H. (1998) Defense and Army Attaché, US Embassy, Warsaw, July 14.

Czerwinski, Roman (1998) Member of the Board, PCO. Former Undersecretary of the Ministry of Industry and Trade in charge of the defense industry, Warsaw, July 20.

Dufrene, Roman (1998) Director, Telecommunications Research Institute, Warsaw, August.

Glebicka, Iwona and Magdalena Wloszczyk-Lomiak (1998) Department for Special Economic Zones, Industrial Development Agency, Warsaw, July 17.

Hoover, John (1998) Economic Counselor, Economic Counselor, Defense Attaché Office, US Embassy, Warsaw, July 14.

Indyk, Marek (1998) Administrator, SSE Euro-Park Wislosan, Tarnobrzeg, July 30.

Krawczyk, Zygmunt (1998) Vice President and R&D Director, POLSPACE Ltd., Warsaw, July 20–24.

Kurhanowicz, Ewa (1998) Scientific and Economic Specialist, Defense Attaché Office, US Embassy, Warsaw, July 14.

Legiewicz, Ryszard (1998) Vice President and Development Director, PZL-Rzeszow, Rzeszow, July 21.

Majewski, Krzysztof (1998) Head Specialist, The State Reserve and Defense Department, Ministry of Economy, July 13.

Olek, Jerzy (1998) President, EGR-Bierun, Bierun, July 28.

Olesky, Piotr (1998) Marketing Manager, Zaklady Mechaniczne Bumar Lab_dy, Gliwice, July 23.

Penczek, Piotr (1998) Professor and Head of Department, Polyesters and Epoxy Resins, Industrial Chemistry Research Institute, Warsaw, July 15–17.

Podbielski, Peter J. (1998) Lieutenant Colonel US Army and Chief, Office of Defense Cooperation, US Embassy, Warsaw, July 14.

Sanderson, Melissa (1998) Second Secretary, Political–Military Affairs, US Embassy, Warsaw, July 15.

Sobon, Janusz and Ingmar Wyczalek (1998) Deputy Director, Marketing & Development and Marketing Executive, Euro-Park Mielec. Mielec, July 31.

Stachyra, Andrzej Marek and Bozena Wojcik (1998) Marketing Manager and Public Relations Manager, PZL-Swidnik, Swidnik, August 7.

Szczepanski, Cezary (1998) President and Director General, ETC-PZL Aerospace Industries Sp. z.o.o., Warsaw, July 16.

Tyrala, Andrzej (1998) Director, Department of Industrial Real Estate and Property, Huta Stalowa Wola, Stalowa Wola, August 3–6.

Zukrowska, Katarzyna (1998) Instytut Rozwoju I Studiow Strategicznych, Warsaw, July 24.

References

Anthony, I. (1994) "Restructuring the Defence Industry," in I. Anthony (ed.) *The Future of the Defence Industries in Central and Eastern Europe*, SIPRI Research Report No. 7, New York: Oxford University Press, pp. 58–90.

Bibrowski, W. (1998) "Looping the Loop," *Warsaw Voice* 39, (518), September 27.

Bien, K. (1998) "State-Owned Toys," *Rzeczpospolita*, July 9, Commentary.

Czerwinski, R. (1996) "Problems of Diversification of the Activity of the Defence Industry," in the proceedings form the 4th International Defence Industry Exhibition in Kielce, Poland, *Chances and Threats of the Defence Industry in the Second Half of the 1990s*, September 13–14, 1996, Kielce, Poland.

Fleury, C.J. (1997) "Polish Public Overwhelmingly Endorses NATO Membership," *Opinion Analysis*, US Information Agency Office of Research and Media Reaction, M-199–97, November 26, pp. 1–3.

Hartung, W.D. (1998) "Welfare for Weapons Dealers 1998: The Hidden Costs of NATO Expansion," *Special Report by the Arms Trade Resource Center*, World Policy Institute at the New School, March. http://www.fas.org/asmp/natocost.html.

Hypki, T. (1999) "The Polish Defence Industry Restructuring Programme," *Military Technology*, August, pp. 23–34.

Jonas, A. and Zygulski, W. (1999) "Prof. Bronislaw Geremek, Minister of Foreign Affairs, talks to the Voice's Andrzej Jonas and Witold Zygulski," *Warsaw Voice* 11, (452), March 14.

Kile, S. (1994) "Military doctrines in Transition," *The Future of the Defence Industries in Central and Eastern Europe*, SIPRI Research Report No. 7, New York: Oxford University Press.

Kiss, Y. (1997) *The Defence Industry in East-Central Europe: Restructuring and Conversion*, SIPRI, New York: Oxford University Press.

Luczak, W. (1998) "Thirty Willing to Buy Shares," *Prawo i Gospodarka*, July 8, p. 4.

Luczak, W. (1999) "The Polish Defence Industry Towards a New Shape," *Military Technology*, April. http://proquest.umi.com/pqdweb?TS = …4&Sid = 6&Idx = 4&Deli = 1&RQT = 309&Dtp = 1 (accessed October 8, 1999).

Milewski, J. (1996) "Prospects of the Development of Polish Defence and Aircraft Industry in the Light of the Needs of the Armed Forces of the Republic of Poland and its Economic Potential," in the proceedings form the 4th International Defence Industry Exhibition in Kielce, Poland, *Chances and Threats of the Defence Industry in the Second Half of the 1990s*, September 13–14, 1996, Kielce, Poland.

Ministry of National Defence (1997) *The Polish Armed Forces: Illustrated Guidebook*, Warsaw: The Ministry of National Defense Press and Information Office, November.

Ministry of National Defence (1998) *Basic Information on the MoND Budget for 1998*, Warsaw: The Ministry of National Defense Press and Information Office.

Moller, B. (1996) "Military Restructuring and Conversion in post-Cold War Europe," in B. Moller and L. Voronkov (eds) *Defence Doctrines and Conversion*, Brookfield, VT: Dartmouth Publishing Company Limited, pp. 1–22.

Pieciukiewicz, T. (1996) "Security in Central and Eastern Europe: A View from Warsaw," *Parameters*, Winter. http://carlisle-www.army.mil/usawc/Parameters/96winter/pieciuk.htm

Simon, J. (1995) "Central European Civil–Military Relations and NATO Expansion," McNair Paper 39, April.

Taverna, M. (1999a) "Poland to Tie Arms Purchases to Industry Restructuring," *Aviation Week & Space Technology*, March 22. http://proquest.umi.com/pqdweb?TS=…3&Sid=1&Idx=8&Deli=1&RQT=309&Dtp=1 (accessed October 6).

Taverna, M. (1999b) "Swidnik, Mielec Seek Western Partners," *Aviation Week & Space Technology*, March 22. http://proquest.umi.com/pqdweb?TS=…3&Sid=2&Idx=2&Deli=1&RQT=309&Dtp=1 (accessed October 6).

Tigner, B. (1997) "Burden-Sharing Debate Mounts," *Defense News*, July 14–20, p. 1, 21.

US Arms Control & Disarmament Agency (1996) *World Military Expenditures and Arms Transfers*, Washington, DC.

US Arms Control & Disarmament Agency (1997) *World Military Expenditures and Arms Transfers*, Washington, DC.

Warsaw Voice, (1999a) "In Defense of Defense," *Warsaw Voice* 8, (539) February 21.

Warsaw Voice, (1999b) "Prosperous 1998," *Warsaw Voice* 13, (544), March 28.

Wieczorek, P. (1998a) *Przeysł obronny państw Europy Środkowej i Wschodniej (The Defense Industry in Central and Eastern Europe)*, Warsaw: Polish Foundation of International Affairs, February.

Wieczorek, P. and Zukrowska, K. (1996) *Conversion in Poland: The Defense Industry and Base Redevelopment*, BICC Brief 8, Bonn: BICC.

Wrabec, P., (1998) "Arms Sector Consolidation, Privatization Seen," *Warsaw Gazeta Wyborcza*, July 8, p. 15.

Zukrowska, K. (1997) "Hectic Messages from the Arms Market and the Polish Experience," in H. Bullens and S. Tachibana (eds) (with the assistance of W. Reynolds) *Restructuring Security Concepts, Postures and Industrial Base*, IPRA Security and Disarmament Commission Paper 9, AFES-Press Report 63, pp. 65–73.

Zukrowska, K. (1998) "State Budget in Changing Economic and Security Environment," paper prepared for NATO Economic Colloquium on *Economic Developments and Reforms in Cooperation Countries: The Role of the State with Particular Focus on Security and Defense Issues*, Ljubljana, Slovenia, June 18–19.

Zygulski, W. (1997) "Squeezing into NATO," *Warsaw Voice* 38, (465): 5, September 21.

Zygulski, W. (1998) "We Don't Have Lift Off," *Warsaw Voice* 50/51, (530/531), December 20.

5 The dismantling of the Argentine defense industry

Graciela P. Cavicchia

Introduction

The end of the Cold War introduced an era of deep cuts in military budgets even in nations far from the center of the conflict. South American countries were among the nations with high rates of post-Cold War disarmament, demobilization and demilitarization. Argentina is an excellent bellwether case because it was one of a handful of developing nations to aspire to produce the full range of military systems (Ball, 1988). It also enjoys a relatively educated and technically sophisticated workforce. However, the end of the Cold War did not precipitate a defense conversion process in Argentina as in many other developing countries. Rather, it triggered the collapse of the Argentine Defense Industrial Complex (DIC) – the only wholly owned national heavy industry – through national economic and institutional restructuring.

This chapter explores the causes of the DIC's economic collapse and the dynamics of Argentine defense restructuring through the privatization process. It also probes the reasons why a state-owned industry run by the armed forces did not ensure efficient levels of military and civil production to provide adequate national defense.[1] It documents the relative failure of the Argentinian regimes of the 1990s to extract technologies and human skills from the DIC in ways that might have increased the productivity and performance of the Argentinian economy.

Security and institutional context

Although most Latin American countries are democracies, many countries' relationships with each other are unstable and evolving. The acquisition of new military equipment has caused the escalation of minor border disputes into regional wars. Argentina also faced conflict with the United Kingdom over the Falklands Islands that erupted into a full scale war in the early 1980s.

By the end of the Falklands War, the demoralized Argentine military recognized that it had performed poorly and could not keep up with the advanced military technologies possessed by its adversaries. In the subsequent rethinking of national security, Argentina first turned to peacekeeping policies. It sought agreements to solve conflicts arising from territorial claims and power struggle issues with its

neighbors. It succeeded in settling an historical boundary conflict with Chile and signed an agreement with the United Kingdom to avoid problems in the South. It also signed the Tlatelolco Treaty with Brazil to forbid the development of any type of nuclear weapons within the region and initiated efforts to keep the region free of chemical weapons.

Up through the 1990s, Argentina refused to engage in a high-tech weapons race that might heighten regional instability. Argentina strongly opposed the idea of an arms competition with Chile and Brazil and strongly supported the future of regional economic cooperation via MERCOSUR. In 1999, after almost seven years of deliberation, a strategic defense policy was passed by Congress, ending a downward cycle in the military budget. It is unclear whether this policy will be affordable.

The economic backdrop

Although Argentina was one of the world's most prosperous developing economies up through the Second World War, it experienced slow economic growth from the 1940s until the start of the Convertibility Plan in 1991. By the mid-1970s, its economic growth rate had declined significantly and was interpreted widely as a failure to transform the country into a fully integrated global market economy. In the mid-1980s, Argentina suffered from its longest period of stagnation in the century. Capital flowed out, as elites and businesses invested abroad. Overall economic productivity fell, while the public sector deficit and poverty increased sharply. In 1983, the new democratic government attempted to control high levels of inflation by introducing four successive stabilization programs, but these failed to rapidly and permanently control the fiscal deficit of the public sector (World Bank, 1993).

In 1989, President Carlos Saul Menem took office when inflation was at its highest level. Following initial failures, a new monetary program succeeded in controlling the fiscal gap. The Convertibility Plan, in 1991, guaranteed the one to one convertibility of the peso into US dollars. The Plan provided for the modernization of the structure of the state through institutional reforms of the federal government, privatization, and restructuring of liabilities with domestic and foreign creditors (World Bank, 1993). The program included the conversion, liquidation and privatization of state-owned enterprises which accounted for a large share of the deficit since the mid-1970s. State-owned industries' losses reached $700 million in 1991. The privatization process began in 1992 and targeted outsized and ill-managed industries, which had been tolerated since the mid-1970s. Most components of the defense industrial complex – the largest component of state industry by far – as well as other state-owned companies, were liquidated, privatized or converted.

The speed at which economic and institutional restructuring measures were implemented during the 1990s produced some negative economic and social effects. The national industrial dismantling, regional economic instability, rising external debt, high levels of unemployment and low levels of national and foreign investments postponed economic recovery. Amidst such dramatic change, little policy attention was paid to the severe impact of such measures, especially those creating massive lay-offs and plunging entire local economies into recession.

Changes in military spending and force structure

Except for a brief blip up in the mid-1980s, Argentine military expenditure has been declining since the end of the Falklands conflict in 1982, accelerated by the loss of stature of the military in the public eye. The defense budget accounted for 4.4 percent of the gross domestic product in 1980 but fell to 1.7 percent by 1994 (Table 5.1).

Argentina's military budget is unusual in that a very large portion of it consists of salaries and pensions. Total Argentine defense spending for 1997 was $4.7 billion, of which only $700 million went to operating costs, such as munitions, fuel and maintenance. The remaining $4.0 billion funded military salaries and pensions.[2]

The heavy personnel cost burden complicates the ability of the armed services to compete with those of other countries technologically. The Air Force, with an annual $80 million budget for technology expenses, is unable to modernize its equipment. CITEFA, the Armed Forces' R&D Commission, assigns almost 80 percent of its budget to personnel expenses leaving almost no room for technological development. The new national defense policy passed in the late 1990s restructures the retirement system and replaces tenure with a merit-based promotion program. Over time, then, this retiree burden will shrink in significance.

Rise and deformation of Argentine defense industry complex

The beginnings of the DIC started with interventionist state industrial planning in the 1940s. The state deliberately chose to emphasize national defense and national arms production, accompanied by civil production in a highly diversified, dual use industrial complex. But by the end of the 1980s, the DIC had failed to accomplish the basic objectives for which it was created.

The creation of the DIC

The DIC was established in 1941 by the armed forces after the Second World War embargo on Argentina. It was composed of three major industries that grouped together forty-eight enterprises. The DIC was 99 percent state-funded and located in major cities where labor and infrastructure was plentiful and accessibility to transportation routes good. Initially, the DIC was dedicated almost solely to national defense production. It was wholly state-owned and managed by the armed services. But from the outset, the DIC was designed to not just promote national defense through military and technological development but to create comparative advantage in civilian industry. By 1990, 73 percent of jobs in the DIC were in dual use facilities – mainly steel, petrochemical and shipping[3] (Table 5.2).

The DIC's major industries were YPF in the state oil production, SOMISA in the heavy steel production, and the Dirección General de Fabricaciones Militares (DGFM) in the civil and military production. DIC production capabilities included chemical, petrochemical, heavy steel, naval, civil metal-mechanic, military, aircraft, aero-spatial, mining, timber and construction. These industries were administratively dependent on the DGFM, Secretaria de Producción para la

Table 5.1 Military expenditures indicators (constant 1993 pesos, in billions)

	1980	*1982*	*1984*	*1986*	*1988*	*1990*	*1992*	*1993*	*1994*
Military expenditures	9.815	7.120	4.976	4.979	4.609	2.954	3.426	3.366	4.558
Central Government expenditures	27.188	22.071	29.237	35.168	23.231	16.078	21.214	31.629	39.829
Military expenditures as % of: Central Government expenditures	36.10	32.30	17.00	14.20	19.80	18.40	16.10	10.60	11.40
Military expenditures as % GDP	4.40	3.50	2.30	2.30	2.10	1.50	1.40	1.30	1.70

Source: Sheetz, 1995, tables 2 & 3.

Table 5.2 Defense industrial complex personnel structure, 1990

Type of production	*No. of Employees*	*% of DIC workforce*
Dual production	23,134	73
Steel mill	(16,438)	(52)
Chemical & petrochemical	(3,285)	(10)
Shipyards & dockyards	(3,411)	(11)
Civil production	2,099	7
Military production	6,289	20
Total	31,522	100

Source: Ministerio de Defensa, 1991.

Defensa (Defense Production Department) run by the Army and Navy; and the Estado Mayor General de la Fuerza Aérea, run by the Air Force.

Without centralized defense planning, each military service made decisions independently. Their autonomy increased over time, weakening the complex's overall performance (Fontana, 1996). New military acquisitions were often not consistent with existing equipment and were not linked to long term reequipment plans. Contracts were almost always awarded on the basis of price alone. Maintenance and start-up costs were not taken into consideration during the acquisition process, and as a result, much of the equipment could not be used.

Structure of the DIC

Under State management, the defense industrial sector was run by different rules and cultures from other industries. Due to their military origins, the directors and public officials of the DIC differed as a managerial class from their counterparts in the private sector. Maximization of profits, efficiency and productivity were never sought. The notion of the military as a public institution was conflated with the notion of military as a state corporation (Perez-Esquivel, 1995).

To make matters worse, the lack of centralized control allowed each service to manage its enterprises autocratically. The Navy ran four military production companies: Astilleros y Fábricas Navales del Estado S.A. (Shipyards), TANDANOR (Naval Dockyards), Astillero Domecq Garcia (Shipyard), EDESA and Sisteval S.A. (Naval Service). The Air Force oversaw three arms production industries: Area Material Córdoba (aircraft), TEA and Sintesa S.A. The Army managed Fábricas Militares de Domingo Matheu (Portable arms, pistols, rifles and machine guns), Fray Luis Beltrán (Ammunitions), Materiales Pirotécnicos, Villa María (Demolitions, dynamite, propulsion loads) and Fábrica de Tanques Tamse (Military tanks).

Military engineers acted as heads of the DGFM, a decentralized Public Administration Agency that carried out the designs of the military services. The DGFM was the most diverse of the state-owned industries (Table 5.3). By 1983, the DGFM had control over more than 250 military and civilian state-owned

Table 5.3 Dirección General de Fabricaciones Materiales (DGFM), 1990

Industry	*Production*	*Main Products (%)*			*Capacity rates (%)*
		Defense	*Civil*	*Dual*	
FM Fray Luis Beltrán	Military	75	9	16	30
Altos Hornos Zapla	Heavy steel	33	0	67	10
FM VCE	Cables	6	56	38	83
Fábrica Militar Rio Tercero	Arms	58	27	15	40
FM San Francisco	Metal-mechanic	30	70	0	15
FM Domingo Matheu	Military	73	9	18	—
FM San Martín	Metal-mechanic	69	19	13	—
FM Tolueno Sintético	Chemical	0	86	14	—
FM Acido Sulfúrico	Chemical	0	0	100	94
FM Villa Maria	Military	53	40	7	—
FM Materiales Pirotécnicos	Military	40	27	33	—
Establecimiento Minero Capillita	Mining	17	83	0	—
Centro Forestal Pirane	Timber	33	67	0	—

Source: Dorin, 1994.

enterprises (Giannoni, 1995). It also had the distinction of being the industry with the highest fiscal deficit and was the first to be privatized.

By 1976, the military industrial sector had become an expensive proposition. Although the DIC had amassed significant debt and operated at high levels of inefficiency, the military government opted to continue national military production while subjecting civilian sectors to international competition. However, during the 1980–7 period, mainly due to the lack of centralized defense planning and an inefficient industrial management, the DIC showed dramatic economic losses, rising from $187 million to $681 million per year with net negative investment throughout the decade (Dorin, 1994).

Efforts to gain technological edge

Like other nations newly entering the arms market in the 1970s and 1980s, the Argentine military aspired to build leading-edge weaponry that could be exported. In the late 1970s, Argentina began implementing its Plan de Desarrollo de Armas (Development Arms Plan), a central feature of which was the ambitious Cóndor missile project. Subsequently, the Plan grew to encompass the computerization of all arms systems and the design and production of the Mirage, Dagger, A4B, and IA-63 Pampa systems and a Cóndor missile. By 1991, foreign pressures, financing constraints and changes in foreign policy, put an end to Argentina's high-tech efforts in the arms sector.

The rise and fall of the Cóndor I and II projects demonstrate the economic and political difficulties facing Argentina's bid for high-tech arms capacity. The idea for a missile project first appeared in 1978 with the Cóndor I, a meteorological satellite project. By the early 1980s, Argentina was one of the few countries capable of

producing missiles (Ball, 1992). In 1995, the government decided to finance the Cóndor II project as a way of building a proprietary technological base for Argentina. The Cóndor II, a surface-to-surface missile with a range of 300–500 miles, attracted international interest, especially from the United States, the United Kingdom and Israel. A joint venture with the Germans, who managed the project, the Argentines designed and developed the system which they then planned to produce with Saudi Arabian financing for the Egyptian government (Perez-Esquivel, 1995; Giannoni, 1995). The Cóndor II was the first high-tech Argentine military weapon produced with domestic research and licensing.

During the Gulf War, the United States pressured Argentina to cease development of the missile. Being at a time when it was also confronting its formidable economic problems, the Menem administration changed its foreign policy and reestablished relations with the UK and the US and ended confrontation with Chile. To suppress any possible export of the missile, the US, UK and Israel compelled Argentina to dismantle and destroy the Cóndor II under the non-proliferation agreements of 1991, although the Alacrán, a short-range missile produced with 20 percent of the Cóndor II's capacity, is still active and is being used by the Air Force.

These projects reveal the Argentine commitment to indigenous technological development, weapons construction and the technological and political hurdles such efforts faced. Dependence on foreign technology and expertise remained high throughout the experimental period. Budgetary deficiencies and a highly competitive international arms market encumbered the cultivation of Argentine comparative advantage in weapons production. Due to lack of public financial support, current performance is poor at the state-owned Instituto Nacional de Tecnología Aerospacial (INTA) and the Comisión Nacional de Actividades Espaciales (CONAES), entities dedicated to space and satellite programs' R&D.

An international arms division of labor

As an alternative to indigenous research and development, Argentina engaged in several large joint ventures with firms in other countries who provided the knowledge while the Argentine DIC produced the product. Such internationalized arms programs usually lasted a decade, and the results were exasperatingly obsolete by the time development was completed. The national programs were costly and demanded considerable economic and financial planning. With budget constraints and a lack of centralized control, these programs were poorly executed, if it all. The four major National Defense Programs that involved foreign countries' licenses were the Plan Nacional Naval Militar, TAMSE, the IA-63 and the Cóndor I and II. All of them resulted in such poor outcomes that they were finally de-activated. As with the Cóndor II effort, the others at most added only marginally to Argentine industrial capabilities.

Under the Plan Nacional Naval Militar in 1983, the Navy undertook the construction of sixteen warships under German licenses. The Argentine government financed the construction of the initial prototypes; the first six ships were built in Germany with the next ten planned to be built in Argentina. In 1982, due to

budget constraints and shortages of skilled labor and facilities, the plan was discontinued. However, the Argentine shipbuilding industry gained some expertise. The production of naval vessels in Argentina improved substantially over this period, due to transfer of technology from Germany since the late 1960s (Harkury, 1989). Unfortunately, the world market for ships is highly competitive, and demand is sluggish.

The Tanque Argentino Mediano (TAM) was a medium-sized tank designed and developed by the German company Thyseen-Henschel. In order to start up production in 1982, the Argentine Army created a new state-owned defense company, TAMSE (Tanque Argentino Mediano Sociedad del Estado). But TAMSE had difficulty in accessing foreign markets, thus depressing the level of production dramatically. By 1997, the company was producing one tank per month and continued to be subsided by the national treasury.

The IA-63 Pampa was an advanced trainer airplane built under German license. This project required a large investment in imported high-technology equipment for Area Material Córdoba. The first prototypes were offered to the international market, but the United States was the only country interested in buying it and then decided that the Pampa was too advanced for American purposes. Here again, budgetary and financing constrains plagued the project and ultimately left little to show for the investment.

Arms imports/exports and the "make buy" mix

During the 1970s and 1980s, because Argentina's industrial complex could not achieve the minimum efficient scale of production by relying on domestic procurement spending, it attempted to export items of medium sophistication. At the same time, the government tried unsuccessfully to lower its dependency on arms imports through import substitution (Table 5.4). High levels of imports and large national purchases of defense equipment occurred simultaneously. The Argentine defense industry was never able to reduce its technological, hence political, dependency on industrialized countries, and Argentine weapons could not effectively compete in the international market (Harkury, 1989; Sheetz, 1993).

The causes of poor export performance include both the structure of the Argentine military and the absence of competition in its publicly owned military industrial economy. The Argentine branches of the armed forces rarely cooperated with each other in arms procurement decision-making. Their autonomous structure made it easier for them to import rather than to buy from domestic suppliers (Sheetz, 1993). At other times, services established their own enterprises for a specific product instead of buying it from an industry run by another domestic armed force. Altos Hornos Zapla supplied steel to almost all military industries, and yet its capacity utilization rate, in 1990, did not reach the 10 percent level (Fontana, 1986).

In the early 1980s, the Alfonsín Administration decided to "buy" rather than "make" much of its weaponry, due to the DGFM's poor performance. Over the subsequent decade, arms imports crept up. By the end of 1994, they reached $54.5 million, due in part to the acquisition of 36 A-4M aircraft. This single sale by a US

Table 5.4 Arms imports and exports 1969–87 (1982 million US$)

Year	*Exports*	*Imports*
1969	2.3	286.4
1970	0.0	319.7
1971	2.3	486.9
1972	21.9	686.0
1973	19.6	755.6
1974	0.0	972.2
1975	0.0	918.8
1976	0.0	738.8
1977	7.7	1,988.9
1978	0.0	2,752.8
1979	12.5	3,142.8
1980	5.8	2,525.5
1981	10.6	668.1
1982	0.0	729.0
1983	19.3	169.9
1984	74.2	139.5
1985	54.0	142.7
1986		
1987	17.0	
Total	247.2	17,423.6

Source: Sheetz, 1993.

company to Argentina constituted a 100 percent increase over all defense sales from 1950 to 1982. The Foreign Military Sales Program of the US Security Assistance Office facilitated US involvement and cooperation with the Argentine military departments. Through the 1990s, the Argentine military establishment shifted to purchasing most goods (military equipment) and services (training) from the United States. Despite this shift to foreign-made military equipment, subsidies were continuously given to the Argentine DIC to save some industries from bankruptcy (Sheetz, 1996).

The dismantling of the DIC, 1992–97

At the end of the Cold War the altered world and regional security situations only hastened the collapse of the DIC, which had been experiencing losses far before this. Military restructuring had begun with the end of the Falklands War, due not only to poor performance by the military during the conflict but also to human rights violations and a defense structure that was increasingly unable to ensure national defense. As the services shifted increasingly to imported equipment, the Argentine defense industry fell into dire economic straits – its losses escalated from $65 million in 1980 to $655 million by 1987. Indeed, the DIC displayed its worst economic performance during the 1980s though employment continued to climb (Dorin, 1994; Gisover, 1995a,b,c,d,e) (Table 5.5).

Table 5.5 Economic evolution of the main DIC enterprises, personnel (P) and annual balances (thousand australes)

Year	*DGFM*		*Steel*			
			SOMISA		*HIPASAM*	
	Personnel	*Balance*	*Personnel*	*Balance*	*Personnel*	*Balance*
1980		4.4	11,762	(38.4)		(36.1)
1981	8,246	(6.0)	11,162	(165.6)		(218.0)
1982	13,855	264.8	10,847	(613.0)		(381.8)
1983	13,515	320.9	10,780	(3,011.0)		(3,222.0)
1984	14,321	(15,761.0)	10,780	(11,736.0)		(201,333.0)
1985	14,208	(104,588.0)	11,550	(181,546.0)	1,480	(110,243.0)
1986	13,515	(151,163.0)	12,522	(243,815.0)	961	(104,044.0)
1987	12,110	(338,444.0)	12,287	(194,373.0)	1,383	(541,375.0)
—						
1990	8,645		11,564		1,328	

Year	*Chemical*				*Navy construction*				*Total*	
	GRAL MOSCONI		*BAHIA BLANCA*		*TANDANOR*		*AFNE*		*Personnel total*	*Balance total*
	Personnel	*Balance*	*Personnel*	*Balance*	*Personnel*	*Balance*	*Personnel*	*Balance*		
1980					1,330	0.7	4,000	4.1	17,092	(65.1)
1981	590	17.5			1,203	2.1	3,635	1.0	24,836	(358.6)
1982	577	80.9	290	(13.2)	1,144	4.9	3,639	29.0	30,352	(628.5)
1983	608	385.6	287	31.7	1,056	11.7	3,618	29.1	29,864	(5,454.7)
1984	723	31,832.0	298	2,096.0	1,040	83.0	3,746	904.0	30,908	(12,715.0)
1985	786	105,374.0	320	46,339.0	966	950.0	3,570	5,607.0	32,880	(238,047.0)
1986	763	73,278.0	237	57,601.0	894	3,013.0	3,284	8,686.0	32,176	(356,444.0)
1987	755	230,239.0	410	166,087.0	936	13,914.0	2,972	8,560.0	30,853	(655,541.0)
—										
1990			383		714		2,697		31,522	

Source: Dorin, 1994.

Note
AFNE received subsidies of $4,800 in 1983, $141,000 in 1984, $851,000 in 1985 and $11,097 in 1986.

The end of the Cold War, the absence of regional conflict and Argentina's fiscal crisis propelled the problem of the military industrial complex to the forefront. As we have seen, Argentine President Menem implemented a privatization plan in 1991 that was designed to take Argentina out of its economic depression. One of its key innovations was to dismantle the Defense Industrial Complex as a route to debt relief and fiscal improvement. In this process, the government discriminated among sectors, favoring facilities with clear foreign interests, like aircraft, and those vital for domestic procurement, like ammunitions and small guns.

The privatization context

Beginning in 1989, the year that the Menem Administration took office, Argentina faced a severe economic crisis, resulting in hyperinflation, that deeply affected the national morale. The new government adopted a rigid adjustment program designed to reduce the State's share in the national economy and cut the deficit. During this profound state crisis, neoliberal reforms dismantled the entrenched entrepreneurial state, privatizing all public companies and placing the armed forces' power under civilian control. It marked the end of the DIC and the beginning of the demilitarization process (Perez-Esquivel, 1995). The Administrative Emergency and State Restructuring Act passed in 1990 promoted participation of the private sector in the national economy and aimed to improve industrial productivity and management. The privatization and liquidation of state industries with the worst financial performance were given top priority.

The privatization process was intended to reduce fiscal costs and to modernize the armed forces. It did not succeed. Armed forces' budgets remained the same, and fiscal debt increased significantly. The government's objective to reduce the external debt through proceeds from the privatized enterprises was not achieved. In 1991, the external debt was $55.4 billion, while the external debt in 1997 climbed to $155 billion (Clarin Digital, 1997). In 1991, the DIC's total value before privatization was estimated at $5.6 billion (Ministerio de Defensa, 1991) while the approximate income from sales of facilities was only $700 (Sheetz, 1996). Corruption, a secretive process and absence of public scrutiny resulted in the sale of assets at well below true value.

DIC privatization, liquidation and conversion experiences

The Menem government wanted to rid itself of unproductive enterprises that were generating large fiscal deficits and external debt and privatization was the method it used. In 1990, the DIC employed 31,522 workers in military and civil production. Among the DIC's sectors, the number of workers supported in these enterprises was quite high – 11,564 in SOMISA steel production, for instance and another 8,645 in the defense industries (DGFM) (Table 5.5). Much of this was in dual-use industries – in 1990 the DIC's military production sector's assets were only 17 percent of the DIC's total assets, and the sales for the same sector were a small 2.1 percent of the total DIC's sales (Ministerio de Defensa, 1990) (Figure 5.1).

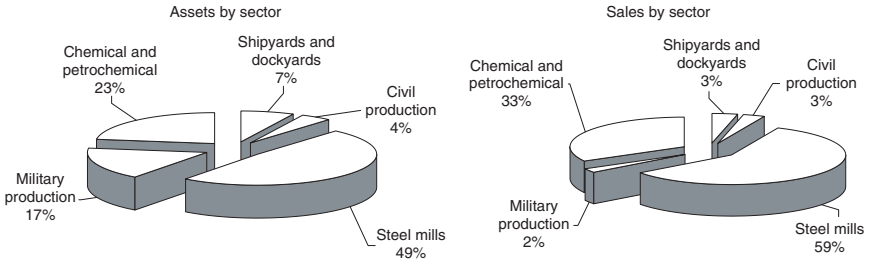


Figure 5.1 Assets and sales by sector.
Source: Ministerio de Defensa, 1991.

In what follows, I document the disposition of major elements of the DIC over the 1990s and associated unemployment.

SOMISA

SOMISA was the most important steel plant in Argentina. Despite its paper assets of $2,152 million and its total debt of $676 million, it sold for a mere $152 million (Ministerio de Defensa, 1991). The privatization was implemented after two bailouts, labor strikes and community demonstrations in the City of San Nicolás. The labor-restructuring plan offered "voluntary" retirements or a labor re-conversion program that consisted of compensation and unemployment paychecks for a few months. Once SOMISA was privatized, labor was reduced by half, although the plant's production levels remained the same (Perez-Esquivel, 1995).

The government attempted to sell only a 60 percent share of SOMISA in order to avoid creating a private monopoly. However, after a second state intervention, SOMISA was sold completely to the private firm, Techint. With this purchase, Techint controls all steel production in Argentina (Perez-Esquivel, 1995). No current records are available on the fate of the more than 5,000 workers displaced. Current unemployment in San Nicolás is estimated at 25 percent.

Forja Argentina

Forja Argentina, which employed 472 in 1991, was the last remaining national railroad contractor before its liquidation in 1993. The book value of total assets was $14.7 million and its total debt $38.1 million in 1991 (Ministerio de Defensa, 1991). In 1992, its buildings and equipment were liquidated for $1.7 million to Inviza S.A. The machinery and equipment were later sold at auction. The offices in Buenos Aires were sold for $335,000. Today, all railroad materials and provisions have to be imported (Perez-Esquivel, 1995). The employees were again invited to participate in the Voluntary Retirement Program. No attempt has been made to survey their re-employment experiences.

FM ECA

FM ECA was the only producer of brass for military ammunition during the Falkland War. By the late 1990s, brass production had decreased in quality and quantity, and brass for military production is now imported. In 1991, FM ECA's assets were valued at $157 million (Ministerio de Defensa, 1991). It was sold for $15 million to a group comprised of one Chilean and two Argentine companies, after the State absorbed all existing debts. This was the first case of Chilean investment in the Argentine Defense sector (Perez-Esquivel, 1995). The labor force of 1,016 employees was subsequently reduced by 35 percent with no severance program implementation (La Nación, 1998).

TAMSE

TAMSE was run by the army, producing the TAM tank under German license. With 259 employees in 1991, it was valued at $753 million and had a total debt of $188 million (Ministerio de Defensa, 1991). A plan to sell 100 tanks to the Middle East was proposed as a last attempt to save TAMSE from privatization. TAMSE did not have a marketing department or qualified technicians to sell the product, so the plan failed. The government decided to rent the plant until its final liquidation. TAMSE produced 120 tanks for the army before its liquidation (Perez-Esquivel, 1995). The plant continued to employ the existing workforce until closing and offered a consequent Voluntary Retirement Plan thereafter.

Area Material Cordoba (AMC)

Fábrica Militar de Aviones (FMA), established in 1927 in Area Material Córdoba (AMC), Córdoba province, was the first aircraft factory in Latin America. AMC was the largest aircraft enterprise in Argentina, employing 2,959 workers in 1991 (Ministerio de Defensa, 1991). The American firm Lockheed Martin was the only company to show interest in AMC. The Argentine government finally reached a deal with them, fearing that AMC would close and liquidation would end the Argentine aircraft industry as well as displace 3,000 workers and technicians. Currently, Lockheed is leasing AMC for 25 years.[4]

The contract between the Argentine government and Lockheed was contingent upon several conditions. Lockheed must repair and maintain Air Force planes and has to negotiate any engineering, repairing, modification, production or other service changes with the Air Force or the Argentine government. Lockheed is required to develop programs to support domestic military aircraft production and services. It is also obligated to service domestic or foreign commercial aircraft within the region.

More significantly, Lockheed had to commit to employ the existing labor force as a measure for local economic stability. In 1995, Lockheed estimated the company would win 30 percent of the total South American aircraft repair and maintenance market, which it estimated to be 1,158 military and commercial

airplanes and helicopters and 2,164 aircraft engines. For this level of activity, it would need 2,000 workers until 1999 and possibly 700 more for the 2000–05 period. Consequently, Lockheed laid off almost 1,000 workers in July 1995, saving $40 million in personnel costs (Clarin, 1995). The government hoped that the 959 workers laid off would be re-absorbed after job training by the end of the decade when Lockheed planned to export aircraft technology (La Nación, 1997). After a long period of community confrontation, laid off workers were transferred to the Voluntary Retirement Program or received compensation. Governmental statistics do not break down the percentage of unemployment by sector, but cases like AMC suggest the high impact of defense industrial shutdowns on national levels of unemployment.

By the late 1990s, however, the sale to Lockheed Martin with its associated agreements looked good, especially in contrast to the other complexes reviewed above. Lockheed Martin was upgrading eighteen of the Air Force's 36 Fightinghawk A4-AR Skyhawks with new radars at a price of $5.5 million per plane, with pilot training projected to be an additional $1.7 million (La Nación, 1998). The company was also modernizing thirty of the Air Force's instruction planes. In addition, the Argentine government was negotiating contracts for the maintenance of Bolivian and Brazilian Skyhawks to be manufactured at AMC by Lockheed Martin. These national and regional projects suggest that privatization of Area Material Córdoba was a successful effort in Argentina, albeit chiefly dependent on continued military spending. It is unclear how foreign ownership of AMC will affect the longer term prospects of Argentine economic activity in this complex.

Worker and community experiences

In the rush to privatize, little attention was paid to the potential for conversion of technologies, plants, equipment or personnel. As a result, successful reuse was uncommon, and widespread unemployment ensued, particularly in defense dependent regions. This outcome was the result of both government policy failure and indifference on the part of firms buying the assets. Nevertheless, in a minority of cases, some workers found new jobs through successful privatization, in civilian activities that branched off from former defense related work or in unrelated growth sectors. One unexpected benefit for some communities has been the disposition of military land and structures.

Labor policies and voluntary retirement program

The layoffs of military industrial personnel began before the privatization process, and no labor policies were implemented until the privatization process officially commenced. During the restructuring process, labor strikes and community demonstrations were common around the country as the unemployment rate rose dramatically. Restructuring involved all the state industries and communications

companies. The government implemented the same Labor Programs at the National level for all industries, whether civilian or military. Implementation of "tight" economic measures during the 1990s, clustered around large layoffs in recently privatized industries, generated social tension. Conflicts arose in Neuquén, Buenos Aires, Salta, Jujuy and Córdoba provinces. The Constitution and laws provide for Freedom of Peaceful Assembly and Association, and the government respects these in practice. In major cities, citizens protested high unemployment and declining living standards. Riot policemen clashed with tens of thousand of people, who were blocking roads, bridges, and government buildings. In La Plata, police fired tear gas and rubber bullets at crowds and arrested seventy people. In the northwestern province of Jujuy, border guards injured fifty while breaking up roadblock set up by 200 workers and their families.[5] Outcomes in government–protester negotiations are yet to come.

Thousands of workers lost their jobs during the DIC's dismantling initiative in 1992. Salta Province endured 4,000 layoffs with almost no labor absorption from the private sector. In Río Negro Province, 2,000 jobs were placed under the Voluntary Retirement plan. Córdoba province has absorbed 50,000 layoffs since the economic reconversion plan, and the Santa Fe province suffered 6,000 layoffs from SOMISA and another 18,100 layoffs in other industries. These workers either agreed to access a Voluntary Retirement Program or they were transferred to the Labor Reconversion Plan. In order to implement the Voluntary Retirement Program, a loan of $300 million was obtained from the World Bank. The labor programs implemented did not anticipate the large number of layoffs and were not significant contributors to reemployment.

The State Workers labor union repeatedly denounced the Labor reconversion plan as a layoff plan in disguise. It offered laid-off workers salaries for two, six or twelve months depending upon circumstances. It precipitated many confrontations, demonstrations and strikes against the privatized or liquidated defense industries. More than once, the Armed Forces' Civil Personnel labor union (PECIFA) severely criticized the absence of a labor program in the Defense Department during the National defense restructuring. In May 1997, PECIFA condemned the layoff of more than 1,200 civil personnel (La Nación, 1997).

Most of those who subsequently obtained work found it outside of the privatized facilities. Some of these jobs were the product of state initiatives – through the late 1990s, 25 percent of net new national employment was generated through labor programs such as Proyecto Joven, Proyecto MicroEmpresas, Proyecto Imagen, Programa Trabajar and Programa Proempleo. But most were purely private sector expansions. Airlines, small pharmaceutical companies, and small gun manufacturers absorbed some laid-off defense white-collar workers; this included Tursol, La Macarena, Helitecno, Aerolinks, Fiala & Asociados, Alexander Taylor, Control Logístico, Rayo Electrónica and Aerotest, all operating in aircraft, engines and/or repair services. Air force pilots, engineers, mechanics and technicians eager for higher salaries and work stability have chosen to work in the private sector. Private companies were willing to hire military chemical and petrochemical engineers as

they are highly qualified and trained. Military officers were often hired in security service companies or they have started their own enterprises in the security business. Military subofficials often work as security guards or, like many in the unemployed population, as taxi drivers.

Yet others found jobs completely unrelated to their previous line of work. Before the 2001 crisis set in, a significant share of new jobs were created in construction in urban centers and in infrastructure improvement. Also, an increase in service-related jobs from 1984 to 1995 helped to absorb a significant number of unemployed personnel. White-collar employees were easily transferred from the military sector into the growing private sector. The more recent Argentine crisis has undoubtedly curtailed many of these options.

Community impacts through land redevelopment

Many communities have been plunged into ongoing depression by the implosion of the DIC. Some have, however, benefited from land and facilities sold by the Argentine military. These tend to be located in the larger urban centers.

By 1991, the Argentine military owned hundreds of properties in the provinces and in the City of Buenos Aires. In order to alleviate the budget crisis and reduce operative costs, the armed forces decided to sell or rent most of these properties. Since 1991 the army has sold some twenty-five properties for a total of $20 million. Another 170 properties, 88 percent of the total, continued to be offered for sale as of 1998 (La Nación, 1998). By 2000, the army expected to realize $250 million from real estate sales including military bases in La Tablada and in Campo de Mayo (approximately 5,000 hectares) planned for residential development. The Patricios regiment in Buenos Aires has signed a $24 million contract with Jumbo, a supermarket chain, to build a shopping mall on its grounds. The Navy has been leasing ships for Patagonia coast tours, and the Air Force may rent one of its airstrips for automobile races. The national government has sold the Defense Department building in downtown Buenos Aires for $6.6 million to the Buenos Aires Education Department.

Other real estate contracts include the leasing of thirty-three airports around the country for a 30-year period. These airports currently account for 85 percent of the national air traffic. The "Aeropuertos Argentina 2000" group, led by the American company Ogden, the Italian Assaeroporti and the America Sudamericana Corporation, offered an annual payment of $171 million for these properties. The plan for the airports' modernization will include an investment of $2,040 million during the leasing period. Law 23,985 stipulates that all income generated from military properties fund armed forces' procurement. However, those funds had not been allocated or distributed as of 1998.

Not all land privatization activities involve liquidation. New construction has been planned as well. As part of the Military Properties restructuring plan, the Argentine government must create a "Ciudad Militar" (Military City) in Villa Martelli, the province where Buenos Aires is located. The Ciudad Militar will be a centralized base for the joint operation of the Armed Forces. It will be equipped

with high-tech communication systems to allow control over all military bases around the country. The plan for the Ciudad Militar will require around $396 million in a 12-year period. The realization of Ciudad Militar will depend on successful implementation of the new Armed Forces Restructuring law. Even though the military restructuring process is well in place, there are still significant numbers of issues regarding the relationship between the armed services, budget allocation and salary structure and responsibilities.

The sale of real estate is an instance of successful conversion. It is clear that a large number of military properties in prime downtown Buenos Aires locations have been sold and converted into high-income generating properties. It is especially positive when these properties are leased to commercial investors as this income helps defray military operating expenses.

Policy implications and future prospects

Argentina's military industrial sector is now a small remnant of its former size, and the nation's high-tech arms ambitions have been abandoned. The country's ability to buy arms and equip its armed forces depends entirely on the health of its economy and on state trade-offs among competing economic, social and military priorities as well as on the succes of the 1998 Armed Forces Restructuring Law. Very little of the industrial capabilities created over the Cold War decades were transformed into productive civilian activity, although some of the land and labor devoted to national defense has made its way into other sectors.

The 1998 restructuring plan addressed many of the issues covered in this chapter. The law proposed an increase of 15 percent in the national defense budget between 1999 and 2004 on a base of $3.5 billion. In order to modernize the armed forces and incorporate new technologies, the Government planned to allocate up to $1billion in new funds, relying on foreign credit if necessary. Some revenue was anticipated to come from the continued sale of military real estate.

The new law clearly lays out active civilian control over the military. It provides for the creation of a military personnel system based on responsibility and merit and not tenure. The government decided to reduce the numbers of men in the armed forces in order to increase salaries and training. Military personnel will be required to have a high school degree, and military educational institutions will be open to civilians as well. Military social security will be provided under the civilian social security system, eliminating the costly retirement burden over time. In concert with a new emphasis on peacekeeping and regional stability, the government committed to new military missions: a joint peacekeeping mission with the UN, a peacekeeping mission to support national and neighboring countries' communities, and a MERCOSUR defense mission in conjunction with the armed forces of the MERCOSUR countries.

Of those military industrial facilities not shuttered or privatized, Fabricaciones Militares, Astilleros y Fábricas Navales, and Edcadassa e Interbaires will continue as publicly owned military production facilities. The government hoped to stimulate private investment in defense production, especially for dual-technology

development, and wherever possible, to conduct dual-technology developments with other countries. The Defense Department will be responsible for the evaluation, plan and execution of all arms acquisition, acting as a centralized defense planning entity and overcoming interservice rivalries in arms purchases. To accomplish this goal the government will promote joint exercises among the three forces, avoiding counterproductive actions or procurement. There will be a strategic plan for the geographic location of current and future military bases. The Restructuring Law may improve future complex performance, especially if accompanied by overall economic recovery, regional stabilization, growth of private investment and a tight control over corruption. However, in the late 1990s, the economic outlook darkened, tightening the fiscal constraints on this project.

In Argentina, conversion and reuse was not a priority in the dismantling of the DIC. The low public regard for the leadership of the DIC, closely linked to the discredited armed forces, created little demand for conversion *in situ*. In choosing privatization as the method of restructuring, the state left the disposition of manpower, equipment, plant, land and technology in the military industrial complex to the buyers. With the exception of the Lockheed–Martin deal, where the government insisted on certain provisions for the continuation of economic activity, no strings were attached to bargain basements sales. Nor were labor adjustment policies or funding for retraining effective in parlaying existing skills into related civilian activity. In some cases, labor, equipment, property, managerial and engineering skills were successfully transferred into civilian activities, especially in the cases of white-collar workers and urban real estate. The absence of a concerted conversion effort resulted in extensive waste of accumulated resources and talent, and continuing, regionally concentrated, high levels of unemployment.

Notes

1 The research reported in this paper relies upon fieldwork in Argentina in 1997 as well as secondary data from defense-related publications and national newspapers. Defense firms' headquarters and defense-related Institutes and Foundations were visited. One active and two former military officials who participated in the privatization process were interviewed. Policy makers and research fellows in the field were especially helpful in supplying additional data.

2 Argentina spends an unusually large portion of its defense budget on retirees. This is the product of a new policy in the late 1980s that allowed soldiers to retire at age 40. By 1991, a total of 71,000 people were collecting such pensions, nearly as many as the remaining 88,000 in uniform. The share of military pensions in total defense outlays rose from 14 percent in 1980 to 25 percent in 1995 (Sheetz, 1996). The pensions constitute a major drain on the national treasury (Jaunarena, 1996).

3 The DIC's major industries were YPF in the state oil production, SOMISA in the heavy steel production, and the Dirección General de Fabricaciones Militares (DGFM) in the civil and military production. DIC production capabilities included chemical, petrochemical, heavy steel, naval, civil metal-mechanic, military, aircraft, aero-spatial, mining, timber and construction.

4 The Lockheed–Martin deal was also facilitated by the 1992 Investment Protection treaty with the United States. It provides guarantees against arbitrary confiscation of assets and assures there will be no limits on repatriation of profits for US companies. The US

Ambassador to Argentina, Terence Todman, was key to both the securing of this treaty and to the Lockheed–Martin purchase of Area Material Córdoba (Giannoni, 1995).

5 In 1996–97 the government invested $180M in new arms and training for The Gendarmes who are prepared to serve in case of social conflicts. They are trained and equipped to restrain one large upraising and three small ones simultaneously, or eight small ones at any given time. The Gendarmes' first appearance was in Neuquén, during a civil conflict. In April 1997, the Security and Intelligence Commission recommended to the government some critical short term modifications for security and intelligence forces (La Nación On Line, 1997).

References

Ball, N. (1988) *Security and Economy in the World*, Princeton NJ, Princeton University Press.

Clarin Digital (1995) "Lockheed Martin in Argentina," July 30, 1997.

Clarin Digital (1997) "Argentina: Los Estados Unidos Quieren mas Armas en América Latina," February 5, 1997.

Dorin, F. (1994) "Industria de la Defensa en la República Argentina," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Fontana, A. (1986) "Fuerzas Armadas, Partidos Políticos y Transición – La Democracia en la Argentina," Buenos Aires, Centro de Estudios de Estado y Sociedad.

Fontana, A. (1996) "La Función de la Defensa en el Nuevo Contexto Internacional," Buenos Aires, SER en el 2000.

Giannoni, G. (1995) "Argentina. Report on the Project on Defense Conversion in Developing Countries," Washington DC, Center for Strategic and International Studies.

Gisover, P. (1995a) "Astillero Ministro Manuel Domecq Garcia S.A.," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Gisover, P. (1995b) "Informe sobre la Producción Bélica en la Argentina," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Gisover, P. (1995c) "Privatización y Mercado de Trabajo en las Empresas de Defensa – Sector Siderúrgico y Metalúrgico," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Gisover, P. (1995d) "Dirección General de Fabricaciones Militares," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Gisover, P. (1995e) "Tanque Mediano Argentino SE," Buenos Aires, Consejo de Investigaciones Científicas y Técnicas.

Harkury, R. E. (1989) "The Defense Industry in Argentina: Bases Abroad: The Global Forcing Military Presence," New York, Oxford University Press.

Jaunarena, H. (1996) "Argentina's Military Up for Sale," March 16, 1996. Http://www.well.com/ user/uki/military.html

La Nación On Line (1997) "La Argentina y Brasil, en Integración de Defensa," January 8, 1997. Http://www.lanacion.com.ar/97/01/08/p05.html

La Nación On Line (1997) "Dominguez no ve razones para la violencia," January 27, 1997. Http://www.lanacion.com.ar/97/01/27/p06.html

La Nación On Line (1997) "Acepta la Fuerza Aérea Combatir el Narcotráfico," February 7, 1997. Http://www.lanacion.com.ar/97/02/07/p01.html

La Nación On Line (1997) "Claves para la Lucha contra el Narcotráfico," February 23, 1997. Http://www.lanacion.com.ar/97/02/23/p01.html

La Nación On Line (1997) "Aporte Militar Contra el Narcotráfico," February 26, 1997. Http://www.lanacion.com.ar/97/02/26/p01.html

La Nación On Line (1997) "Venta de Pólvora: Fabricaciones Militares aun no Contestó por la Venta," March 11, 1997. Http://www.lanacion.com.ar/97/03/11/p08.htm

La Nación On Line (1997) "Mapa del Desempleo en el Interior," June 8, 1997. Http://www.lanacion.com.ar/97/06/08/p02.htm

La Nación On Line (1997) "La Industria ya Comenzó a Desprenderse de Operarios," December 22, 1997. Http://www.lanacion.com.ar/97/12/22/e01.htm

La Nación On Line (1998), December 3, 1998.

Ministerio de Defensa, Argentina (1990–91) "Privatizationes," Buenos Aires, Ministerio de Defensa.

Perez-Esquivel, E. (1995) "El Complejo Industrial para la Defensa. Historia de su Evolución y Desmantelamiento," Working Paper, Buenos Aires.

Sheetz, T. (1993) "Industria y Comercio de Armas: Propulsores de Desarrollo?," Buenos Aires, Eural no. 48, Centro de Investigaciones Europeo-Latinoamericanas.

Sheetz, T. (1995) "La Racionalidad en la Toma de Decisiones Respecto a la Seguridad Externa, las Adquisiciones Bélicas y el desarrollo Tecnológico Nacional," Buenos Aires, Universidad Nacional de Quilmes.

Sheetz, T. (1996) "A Peace Dividend in South America? Defense Conversion in Argentina and Chile: The Peace Dividend, Contributions to Economic Analysis," North Holland, Bonn International Center for Conversion.

World Bank (1993) "*Argentina: From Insolvency to Growth*," Washington DC, World Bank.

6 Diversification and niche market exporting

The restructuring of Israel's defense industry in the post-Cold War era

David A. Lewis

Introduction

A complex web of factors has shaped the size, structure, and economic and socio-political importance of the Israeli military-industrial complex. Most important among these factors has been Israel's tenuous security environment. Until recently this geographically and demographically small nation has been completely surrounded by militarily, economically, and geographically larger – and from the Israeli perspective – hostile nations. That situation has begun to change. The advancement of the peace process (as well as the wider reduction of world tensions due to the end of the Cold War) has prompted the Israeli government to rethink the structure and purpose of its defense industry. The government, the Israeli Defense Forces (IDF), and the defense firms have mounted a three-pronged strategy to restructure the military-industrial complex designed to cut cost while maintaining the capacity to deter its enemies. Similar to the vast majority of the world's defense industries, Israel has downsized the workforce and tried to eliminate capacity in response to the post-Cold War structural decline in both world markets and domestic demand for weapons. Second, in the interest of maintaining capacity in critical technologies, national policy has guided the development of high-tech niche markets for both domestic consumption and export. In addition, the Israeli firms have leveraged their competitive advantage in the retrofitting and upgrading of other nation's platforms from both NATO and former Warsaw Pact producers. The third prong is one of diversification, by which defense firms are seeking opportunities in civilian markets. There is also a fourth option, which is to consolidate via the mergers of defense enterprises to reduce capacity and capture the benefits of economies of scale. Although this appears to be desired by the firms and many government officials, it has been hampered by government ownership of the three largest defense firms, stiff opposition by well-organized labor unions, and the host communities of production facilities.

The IDF's response to the changing security landscape has led to new procurement specifications, force restructuring, and reduction. The IDF is restructuring to face new military and economic challenges by becoming a smaller, more professional military force dependent on high-tech capabilities. The military elite believe that

restructuring the IDF to a professional army with greater technological capabilities will better prepare the nation to deter and/or respond to new kinds of security threats (Cohen, 1992, 1995a; Dvir and Tishler, 1998; Klieman, 1998).

The future for Israel looks markedly different than the past, not only because of the changed security landscape, but also because the environment in which policy is made has changed. Even the casual observer can recognize three significant changes regarding security policy in Israel. First, the once unquestioned and closed security policy debate has become increasingly subject to civilian oversight and public debate. Second, in contrast to the past, Israel has participated in international, regional, and bilateral arms control negotiations and future Israeli concessions are anticipated. Third, Israel has never drafted an official security doctrine. In the past, this flexibility has been regarded as an asset, but many security experts now believe a written doctrine is necessary to forward the peace process and Israel's integration into the international arena. Each of these changes has and will continue to impact the Israeli arms industry.

Israel's approximately 150 defense firms can be categorized into a three-tiered structure that includes: (1) the three largest, government-owned firms (Israeli Aircraft Industries, Rafael, and TAAS, formerly Israeli Military Industries); (2) privately owned large and medium-size firms (ELOP, Elbit, Tadiran, Elisra, and ECI); and (3) a set of relatively small privately owned firms producing a narrow line of defense products (Dvir and Tishler, 1998; Steinberg, 1998). The ten largest firms employ 78 percent of the roughly 48,000 defense workers, account for 82 percent of total production, and 87 percent of all defense exports (Dvir and Tishler, 1998). These firms are also highly concentrated in three regions (listed here in descending order of aggregate employment) Tel Aviv, Haifa, and Jerusalem (Felsenstein, 1986; Gradus *et al.*, 1993).[1]

In the late 1980s and early 1990s, the Israeli defense industry entered a crisis fueled by the nexus of four important factors. First, there was a decline in domestic demand as triple-digit inflation forced the central government to reduce spending severely, including defense expenditures (from 1985 to 1995, there was a 37 percent decline in military expenditures in real terms), and compelled it to devalue the national currency. Second, there was an international decline in demand for defense products, reducing the external demand for Israeli defense goods, which had quadrupled in the 1980s. Third, the unprecedented decline in regional tension altered the security landscape in the short and long term. Finally, a shift in public opinion led to a national debate on long-term security policy and the necessity of domestic production of major platforms.

The 1985 Ministry of Defense (MoD) announcement of prolonged contraction of domestic procurement appears to have been the incentive for firms to convert some of the production capacity to commercial sectors in the mid-to-late 1980s. Early attempts at diversification of defense-dependent firms were often unsuccessful as a result of firms' poor strategy. Nevertheless, firms learned from earlier mistakes and altered their strategic approach to the commercialization of defense technologies and some projects received significant public investment to promote the transition. Rafael, ELOP, Tadiran, and Israeli Aircraft Industries (IAI), all have opted to separate

fledging commercialization projects from the defense unit, in which the original concepts often originated, and seek the expertise of managers with commercial market experience to head the projects. These stand-alone businesses are nurtured via capital investment and technology transfer, including highly skilled labor, from the parent companies. The aggregate data regarding Israeli exports and industrial production, as well as the limited firm data, indicate that while defense exports have risen in real dollar terms, commercial output and exports of defense-dependent firms have increased at a higher rate. This has resulted in a decline in defense dependency and increased Israeli integration into the global economy. One significant factor – cited in the interviews and by outside observers – is that the peace process has played a role in increasing foreign investment and the opening of markets formerly closed to Israeli firms (Sennott, 1998).

The globalization of the economy, Israel's need to open more international markets for its goods, the reduction of regional tensions, and the increasing public participation in security related decision-making are all trends that will continue. The pressures to convert (from both shrinking markets and the high cost of production of platforms) will lead to more diversification and specialization in the Israeli context. Another major factor that will determine the size and character of the Israeli arms industry is the internationalization of weapons production. I agree with Dvir and Tishler (1998), who argue that Israel will continue to produce Israeli-specific weapon systems and reduce the size of its defense industries, while still maintaining a competitive advantage in sophisticated subsystems, retrofitting and upgrades.

Ultimately, the production units of government-owned defense firms will be privatized and a consolidation process will ensue.[2] Some argue this will enhance the Israeli defense industries' international competitiveness and prevent future intra-Israeli competition in the international arms market (Dvir and Tishler, 1998; Klieman, 1998; Rodan, 1998d). One potential drawback of consolidation is that it may negatively impact the innovative capacity that has been the hallmark of the Israeli defense sector. Furthermore, as regional tensions are ameliorated, defense markets continue to shrink, and the Israeli economy grows, the importance of the defense sector to provide employment will decline (Dvir and Tishler, 1998; Steinberg, 1998). The probable response of firms will be to continue to diversify. Individuals who leave the defense sector with high levels of skills will continue to convert their technological capabilities into commercially beneficial activities.

In contrast to others, I argue that government policy has been central to the success of conversion. The shift in security policy – in combination with the overall national industrial policy and massive strategic investments in R&D and education, in conjunction with ample US financial and military assistance, including technology transfer – has resulted in significant civilian high-tech spin-offs. This is not to suggest that defense leads to development, but rather that national industrial policy, linked to investments in human capital and both civilian and defense R&D, has provided the foundation for successful conversion. In the words of Ben-Gurion, "science in our day is the key not only to knowledge, but also a progressive economy, to physical and mental health, and to military strength" (Ben-Gurion, 1997: 241).

The next section elaborates on the security environment and how it has helped to restructure the Israeli defense industry. The section "Past, present, and future policy ramifications" examines how government policy has changed and the resulting impact on the military-industrial complex. The section "The burden of defense spending" examines the size of the defense burden over time and the shifting IDF force structure. The relationship between IDF restructuring, procurement, and the security environment is the subject of the next section. A historical analysis of the defense industry is also covered in the section. The section that follows provides a detailed look at some of the firms' responses. The conclusion probes policy implications and speculates about the future.

The Israeli security landscape

Israel's small land area and geopolitical position have shaped the size and structure of its military-industrial complex. Israel's nearly six million people are squeezed onto a land area of 20,770 square kilometers (8,019 square meters) which is only 60 kilometers wide at the narrowest point. Since its creation, Israel has been engaged in conflicts ranging from invasions designed to annihilate the State, border raids onto its territory, internal rebellion within Israeli controlled territories and national boundaries, and a Cold War-like arms race. From a security perspective, Israel's small size has a limiting affect regarding flexibility in the use of land as a buffer zone, which is of chief concern in preventing civilian or military casualties in the event of an invasion.[3] Hence, technological superiority and deterrence have been major elements in its security policy (Carus, 1986; Cohen, 1995a; Dvir and Tishler, 1998).[4]

On the western edge of the nation is the Mediterranean Sea, to the north is Lebanon, Syria is to the northeast, Jordan is due east, and Egypt is to the south. These countries constitute what military theorists call the perimeter.[5] An outer ring of concern – remote military commitments[6] – consists of Iraq, Iran, Saudi Arabia, Morocco, Libya, Oman, Qatar, United Arab Emirates, Kuwait, Algeria, and Sudan. Additionally, the state has the problem of the Occupied Territories (intrastate military commitments) of the West Bank, Gaza Strip, Golan Heights, and the Southern Lebanon Security Zone, which are viewed as key security buffer zones by many IDF officers, a substantial number of the government's security policy experts, and a significant portion, though not a majority of the Jewish citizens of Israel (Aronoff, 1989; Arian, 1995; Bancroft, 1997).[7] The most recent polls indicate that the number of Israelis willing to exchange the Golan Heights for a secure peace with Syria and a withdrawal from Southern Lebanon has been increasing despite the recent rise in violence in Southern Lebanon. A January 2000 poll by the Jaffe Center for Strategic Studies indicates that currently 60 percent of Israeli citizens favor a land for peace deal that includes a complete withdrawal from the Golan Heights, up from the 1999 figure of 55 percent and the 1998 figure of 44 percent (Drori *et al.*, 2000).

The Madrid Peace Process and collapse of the Soviet Union have significantly altered security concerns shifting the regional balance of power in favor of Israel.[8]

With the end of the Cold War and the decline of their most important ally, the Arab world has been softening its stance against the West, as evidenced by the Gulf War alliance, significantly decreasing perimeter concerns since the signing of the Camp David Accords in 1979.

As perimeter concerns have declined, both intra-frontier and remote commitments have increased. The Palestinian Intifada[9] in 1987 and the Iraqi Scud missile attacks during the Gulf War demonstrated the need to restructure the security forces and policy, and to improve capabilities to prevent further attacks, particularly since other nations hostile to Israel are increasing their capability to launch missiles that could have more destructive, nonconventional warheads. These factors have led to the creation of the Rear Command within the IDF ranks, specifically trained to deter and, if necessary, subdue further internal attacks and reduce the threat of missiles (Cohen, 1995a,b).[10] Furthermore, these changes in the security landscape are altering procurement priorities, which are in turn shaping the restructuring of the defense industry.

With the proliferation of missiles and weapons of mass destruction, remote challenges are also on the rise.[11] The military elite believe that restructuring the IDF into a professional army with greater technological capabilities will better prepare the nation to deter and/or respond to these new kinds of security threats (Carus, 1986; Cohen, 1992, 1995a; Dvir and Tishler, 1998; Klieman, 1998; Rodan, 1998a). The emphasis on developing indigenous reconnaissance satellites, the Arrow II anti-ballistic missile systems, the Jericho II long-range surface-to-surface missile, and a decided change in policy to purchase less sophisticated weapons on the open market indicates the effect of the shifting security concerns on the restructuring of the defense industry. [12] Increases in funding for other R&D programs, including the Unmanned Arial Vehicles (UAVs), Remotely Piloted Vehicles (RPVs), and laser defense technologies, also reflect these changes (Steinberg, 1998; Fulghum, 1999).[13]

Past, present, and future policy ramifications

The shifting international and domestic security environment will continue to reshape Israeli procurement decisions. As previously discussed there are three significant changes regarding security policy in Israel: (1) security policy is increasing subject to civilian oversight and public debate; (2) Israel has participated in arms control negotiations and agreements; and (3) Israel is currently debating the benefits of an official public security policy. Each of these changes ultimately will impact the Israeli arms industry, as demand moves toward more sophisticated electronic devices and precision weapons and away from heavy armored divisions to monitor and defend the border from invasion.

Piercing the veil of secrecy

Historically, the Israeli security regime has operated behind a veil of secrecy, with little public discussion or dissent regarding outcomes. Slowly this veil is deteriorating in the face of international and domestic pressure. In the past, the only real

actors in the process were the MoD, the IDF, and the defense firms. Because of Israel's small population, combined with mandatory military service, the boundaries between these actors were blurred (Kimmerling, 1984; Mintz, 1984; Steinberg, 1998). Some have argued that protracted violent conflict, combined with the nature of Israeli society (forced conscription and many individual actors switching between the civilian and defense sectors), have contributed to the development of a garrison state (Kimmerling, 1984; Mintz, 1984). Cohen (1995b) counters that the military elite have, to a significant degree relative to their level of autonomy, respected democratic institutions.[14]

The three main actors in the procurement process are: the MoD, the IDF, and the defense firms. The Israeli defense industry is dominated by the IDF and the state-owned firms which have received the vast majority of procurement revenues. The major bureaucratic actors in the procurement process are the commanders of the military branches of the IDF, the IDF General Staff, the MoD (usually the Minister, Director-General, and the Economic Advisory), heads of the domestic defense industry, the Finance Ministry, and the Prime Minister. The lead civilian actor is the MoD, headed by the Minister of Defense (Steinberg, 1998).[15]

As the lead civilian actor, the MoD has historically been weak, lacking a strategic staff and deferring to the IDF for interpretation of intelligence reports and planning expertise related to the security policy (Kimmerling, 1984; Mintz, 1984; Steinberg, 1998).[16] This places the IDF as the dominant actor within the procurement triumvirate. The IDF's General Staff is comprised of officers from the different branches.[17] The General Staff's function is to make decisions concerning procurement, training, force structure, and the mission of the IDF. The IDF's Planning Division (AGAT) has significant analytic capabilities and plays a key role in advising the General Staff.[18]

For major R&D or procurement projects, the General Staff creates a dedicated Special Projects Office (SPO) responsible for managing the process. The SPO acts as an interest group, defending the project against critics. SPOs have considerable power that enables them to resist criticism both internal and external to the IDF, as evidenced by the need for cabinet-level debate to end the Lavi project (Aronoff, 1989; Steinberg, 1998).[19]

The decision-making process has undergone some changes as a result of its failure in the case of the Lavi combat aircraft, the uncovering of the long-hidden corruption in the "Dotan Affair," and the inability to implement policies to reform the defense industry. Several external institutions have been instrumental in changing the procurement process, including the State Auditor, the Knesset Committee on Defense and Foreign Affairs, the press, as well as public opinion voiced through the peace movement led by Peace Now and ultimately the ballot box (Aronoff, 1989; Steinberg, 1997).

However, the old bureaucratic system has resisted public oversight. The inability to reform the defense industry significantly has been attributed to interconnections at the highest levels of the public sector, the IDF, and the defense firms. Though information on aggregate defense spending – including indirect and direct US aid – is available and the State Auditor's unclassified reports occasionally provide sketchy information on procurement-related issues, in general, these processes and the cost

of the decisions remain secret (Lissak, 1984; Steinberg, 1997). There are no White Papers and only personnel cost within the defense budget are open to public debate (Cohen, 1995a). The shroud of secrecy regarding Israel's nuclear capability, the cost of its development and maintenance, is evidence of the degree of autonomy and insulation the IDF and MoD continue to have from open democratic process.

The rise of the Peace Now movement in 1978 is generally regarded as a major catalyst to Begin's peace treaty with Egypt, though fiscal crisis was also a significant factor (Aronoff, 1989). Growing public demand for peace is clearly evident as more Israeli citizens back possible land for peace deals. This is also indicated by the recent early national election in which Ehud Barak was elected on the platform of honoring the peace accords, Israel's withdrawal from Southern Lebanon and its fast-tracking talks with both the Syrians and the PLO in the context of a sound security doctrine. As this process moves forward, the nature of domestic demand for military hardware will shift as it declines and public oversight of the procurement process should increase.

Israeli security policy and regional arms control

Israeli security policy is intricately linked to its small size, past embargoes, and its regional relationship which places high priority on: (1) deterrence; (2) moving the battle onto enemy territory; and (3) obtaining a quick and decisive victory (Steinberg, 1997; Dvir and Tishler, 1998). Currently, many argue that in light of the changing security environment, a written long-term security policy will help to establish more trust with Israel's neighbors and lay the foundation for creating Confidence and Security Building Measures (CSBM) necessary for all bilateral and multilateral arms control agreements. A former high ranking intelligence officer stated that "a long-term security strategy would serve to ease regional tension while increasing trust."

Clearly related to national security policy are regional arms control agreements. From the Israeli perspective, international oversight, and compliance organizations have failed to enforce multi-lateral treaties.[20] The combination of international and domestic economic forces, public pressure, and reduced regional tension have resulted in Israeli participation in the international Chemical Weapons Convention agreement in 1993,[21] which is perceived as a first step toward more arms control agreements in the region.[22] In addition, Israel is publicly debating its ambiguous nuclear policy (Sontag, 2000).[23] With each step in the peace process many members of the international community have relaxed trade restrictions, increasing Israeli firms' foreign markets and providing a significant return on the investment in converting the sophisticated defense technologies to exportable commercial products.

The burden of defense spending

Israel's security concerns contribute to the immense size of the military-industrial complex relative to the physical size of the state, its population, and its economy. Israel ranks among the highest in the world in per capita spending for the military

sector, armed forces per 1,000 citizens, and military expenditures as a percent of GDP (see Table 1.1).[24] Most analysts agree that Israel has been, for the majority of its existence, in an unusually difficult position from which to develop a strategy for both short and long-term security policy. The historic reality and lingering perception of being surrounded by hostile nations, some of which have larger military forces (see Tables 6.1 and 6.2 for size comparisons) and more equipment (as well as being collectively much larger when allied), magnifies security issues for this geographically small and isolated nation. Furthermore, there are internal security issues that present yet another dimension to security policy. International isolation, both economically and militarily, as well as the lingering memory of two previous arms embargoes, has increased the pressure to be self-reliant, stimulating the creation of an immense indigenous military-industrial complex. Comprehending

Table 6.1 Comparison of 1995 arms budgets

Outlay	*Israel*	*Total Arab Ring States*	*Syria*	*Jordan*	*Egypt*	*Lebanon*
Defense budget in 1995 current $ billion	6.9	6.271	2.62	0.448	2.86	0.343
Arms imports 1991–94 ($ million)						
New orders	4,300	5,800	900	100	4,800	NA
Deliveries	3,300	6,300	1,400	100	4,800	NA

Source: Cordesman, 1996, and additional data from US experts and International Institute for Strategic Studies (IISS).

Note
For an explanation of the various countries' different measures see pp. 29–75 Cordesman, 1996. Data does not include nuclear weapons, as Israel is the only country to possess any.

Table 6.2 Greater Middle-East balance of power

State	*Total active personnel*	*Total active army personnel*	*Tanks*	*OAFVs*	*Artillery*	*Combat aircraft*	*Armed helicopters*
Israel	185,000	125,000	4,700	11,350	1,750	449	117
Ring States	773,000	540,000	9,341	11,050	4,950	1,228	267
Egypt	320,000	45,000	3,450	4,870	1,640	564	99
Jordan	95,000	110,000	1,141	1,200	550	82	24
Lebanon	43,000	55,000	350	180	180	3	4
Syria	315,000	330,000	4,400	4,800	2,580	579	140
Iran	450,000	513,000	1,065	1,065	2,948	295	100
Iraq	350,000	382,000	4,400	1,980	1,980	353	120
Bahrain	85,000	10,700	281	281	58	24	10
Kuwait	10,000	16,600	329	329	40	76	16
Oman	25,000	43,500	76	76	102	46	0
Qatar	85,000	11,100	238	238	40	12	20
Saudi Arabia	70,000	105,000	2,900	2,900	498	295	0
UAE	65,000	70,000	964	964	172	97	42

Source: Cordesman, 1996.

this vulnerable position is critical to understanding the size and composition of the defense industry as well as the IDF and the security policies that impact the changes in the military-industrial complex.

Restructuring the IDF

In response to the changes in the modern battlefield,[25] the 1991 Gulf War, and recent peace agreements, the IDF is restructuring to face new military and economic challenges by becoming a smaller, more professional military force dependent on high-tech capabilities. Overall, since the recent peak in 1984 of 205,000 troops in the standing force, there has been a 14.6 percent reduction to 175,000 in 1997, of which 31,000 are professional soldiers (Dupuy *et al.*, 1993; Cohen, 1995a; SIPRI, 1996; Opall, 1997).

As the IDF restructures to adapt to new security challenges, its procurement demands have changed to focus on preserving selective defense industrial capacity and cutting costs while still deterring its enemies. The approximate distribution of military personnel across the service branches is 104,000 army, 9,000 navy, and 28,000 air force. The remaining 34,000 are in the Rear Command, Special Operations, Central Command, and in maintenance operations. The most recent trend is the movement of personnel from the infantry into the Air Force (Dupuy *et al.*, 1993). The announcement from the MoD to implement the IDF 2000 Plan should accelerate the shift of personnel from the infantry into the air force and Rear Command and the professionalization of all the military service branches (Opall-Rome, 1999a).[26]

A major economic challenge besides the reduction in the military budget has been the shift of significant labor cost from the general budget to the IDF as Israel privatizes and liberalizes its economy.[27] Historically, the cost of pension and matching funds for reservists has been paid from the general treasury funds, but this substantial cost has been shifted to the IDF. As a result the major costs savings has been on the labor side of the equation, though the IDF has also cut cost by reforming its procurement strategy. Though less substantial than the labor savings, procurement savings were realized by using generous US military aid to purchase equipment and major platforms that were less sophisticated but less expensive from the United States (or in some cases, the international market). This was combined with the use of domestic procurement funds to sustain industrial capacity in critical high-tech areas.

The structure and evolution of the defense industry

The Israeli military-industrial complex has been shaped by Israel's unique security concerns, the memory of two arms embargoes, the use of the industry as an integral part of industrial development, and the philosophy of David Ben-Gurion. Ben-Gurion asserted that only through integrating national industrial policy, investments in education and science, the role of the military services and industries, and cultivating strategic international partners could Israel sustain and defend herself.

The development trajectory

The life cycle of the Israeli arms industry fits the model developed by Brzoska (1999) for Less Industrialized Countries (LIC). The five phases of this model sequentially include: (1) as a result of an arms embargo the industry is pushed to develop major weapons platforms; (2) the industry grows rapidly (the 1970s and 1980s); (3) growth levels off and the industry may experience decline measured in constant dollar output (the late 1980s); (4) production under license agreements replaces domestic development of major platforms; and (5) a disjuncture develops between the small domestic market and large ambitions. The Brzoska model aptly describes the cause of current crisis of the overcapacity in the Israeli defense industry.

The origins of the Israeli defense industry

The seeds of the Israeli defense industry were sown in the 1930s and were nurtured by necessity, large investments in science and technology, and foreign technology partnerships. The origins of the Israeli defense industry can be traced to small clandestine manufacturing facilities in Palestine under the British Mandate. In 1948, the newly born Israeli state absorbed these facilities within the IDF, and the Ministry of Defense and the state developed the majority of all new facilities. In 1990, 98 percent of defense industry firm shares were owned by the state, though the current trend of privatization of state firms has begun to erode state ownership in this sector (Razin and Sadka, 1993).

Guided by Ben-Gurion, the Israeli central government invested vast resources in technological innovation, a central tenet in the state's doctrine of economic growth, security, and independence. When compared to other nations, Israel historically has been among the top ten nations in the world in per capita investment in R&D (Steinberg, 1994b).[28] For example, in 1993 Israel invested 4.55 percent of GNP on R&D compared to the US spending of 2.7 percent, England 2.3 percent, and Japan 2.6 percent (Steinberg, 1994b).[29]

The arms industry gradually expanded and upgraded to meet the immense security requirements of the nation while developing modest industrial capabilities. By 1967, the nurturing of the state, the arms industry in Israel had developed impressive indigenous capabilities in the areas of arms maintenance, retrofitting, license production, small arms and ammunition development and production, and limited capabilities in major platforms development (Carus, 1986). Some evidence suggests that by 1967 Israel was close to building operational nuclear weapons, though there is debate on the subject of uranium enrichment and nuclear technology (Hersch, 1991).

The embargo and takeoff

The rapid ascension of Israeli defense industries as developers of sophisticated, high-tech weapons with a reputation for dependability was aided by a national policy of massive investment in the defense industry and general R&D, a strong system of higher education, the immigration of a high percentage of professionals

(Carus, 1986; Beenstock, 1998; Dvir and Tishler, 1998), and numerous transfers of technology, primarily from the United States.[30] In the wake of the embargo, the push for self-reliance was so intense that there was a massive increase in indigenous production of major weapons, to a high mark of 83 percent of IDF procurement in 1989 from 8 percent in 1970 (Wulf, 1993). [31] These factors combined with battle-proven capabilities and liberal export policies. Israeli military products were very competitive on the world market by the late 1970s and through the mid-1980s, despite Israel's isolation from many international commercial markets. In this period, the IDF purchased the full spectrum of defense products from domestic producers, but its demand cycle forced liberal export polices to absorb excess capacity and reduce per unit cost (Carus, 1986).

Collapse of demand, domestic economic crisis, and rationalization

As both domestic and international military expenditures declined in the mid-1980s, the central actors regarding defense industrial capacity sought to ensure Israel's security while facing the crisis in overcapacity. The MoD, the Ministry of Finance and the IDF steered the rationalization process of the defense industry through procurement policies that maximized US military aid, retained and built capacities in critical technologies, and maintained (perhaps improved) Israel's position in the international division of arms production. One of the major decisions was to shift procurement of less sophisticated equipment to the United States, where military aid in US dollars could purchase these goods at a lower cost per unit. This strategy also meant that R&D and production of high-tech defense products would still be supported via IDF procurement, R&D partnerships, and targeting the export of sophisticated subsystems.

International demand for Israeli military products and support services was primarily from other politically isolated nations with questionable scruples such as South Africa, as well as other marginalized nations in Africa; nations from Central and South America; South-East Asia; and Iran until 1979 (Dvir and Tishler, 1998).[32] In the 1970s and early 1980s, this provided a market for the excess capacity beyond the industry's domestic demand and allowed for continued expansion as exports rose to over 80 percent of production (SIPRI, 1996; Dvir and Tishler, 1998). This expansion was further aided by US assistance in the form of grants, loans, technology transfers, license production agreements, and collaboration on the development of new military technologies. Additionally, the United States became a steady customer of sophisticated Israeli military subsystems. As a result of substantial US aid, at times as much as $4 billion a year,[33] the Israeli arms industry has been able to provide favorable credit terms to its clients, making the product even more attractive.[34] However, with the collapse of the Soviet Union and other changes in the international political climate, the arms market is shrinking, and competition is intensifying. As a result Israel, like many other third-tier nations, is faced with surplus capacity and has restructured its industry (Wulf, 1993).[35]

Simultaneous with the decline in international demand, there was a dramatic reduction in domestic arms expenditures, from a high of $11.2 billion in 1984 to $6.7 billion in 1994 (expressed in 1994 constant dollars; ACDA 1995). This was an annual average reduction of 2.9 percent per year, totaling 37.8 percent for the decade.[36] As the Brzoska model suggests, the net production of the industry was curtailed with this overall decline in domestic procurement expenditures and reduction in foreign sales. This crisis in the industry forced an approximate 50 percent cut in employment from approximately 90,000 in 1985 to 48,000 in 1998, with further contraction anticipated (Dvir and Tishler, 1998).

Decline in domestic military demand was both the result of, and compounded by, severe domestic economic crisis. In 1985, a comprehensive economic stabilization program was instituted in response to multiple years of triple-digit inflation (500 percent in 1985) (Carus, 1986). Concurrent with spiraling inflation and stagnation of economic growth, military expenditures (ME) rose as percent of central government expenditures (CGE) and an aggregate total in real terms. Defense industry production fluctuated between 20 and 30 percent of total GDP in the period between 1975 and 1985 (Beenstock, 1998).

The stabilization program curbed inflation, improved the Israeli currency on the international market, and restrained its accelerating international debt service. The main elements of the stabilization program included: (1) remedial adjustment in the exchange rate of the shekel against the dollar; (2) major cuts in government subsidies for basic food items and transportation; (3) some privatization of government-owned companies; (4) an increase in tax revenues,[37] and (5) MoD procurement cuts. Over the next decade, defense expenditures declined by more than 37 percent.[38] The other major factor in the success of this program was $1.5 billion in emergency aid from the United States over a two-year period. The combined features of the Stabilization Policy succeeded in reducing inflation and accelerating the growth of Israel's GDP (Carus, 1986; Rivlin, 1992; Razin and Sadka, 1993). The policies also served to reduce overall CGE, ME, and ME as a percent of CGE.

Concurrent with this trend of reduced military expenditures has been the reemergence of license production, retrofitting, and arms maintenance as the primary functions of the arms industry. Although there has been a decline in major platform development and production, the Israeli arms industry remains an attractive partner for international collaborative development of new weapons systems. This is because of the high levels of government investment in the military technologies, combined with the well-qualified and experienced labor force, proven dependability, and past success in the development of sophisticated weapons (Carus, 1986; Klieman, 1998). The US arms industry has taken the lead in collaborating with Israeli firms to develop such cutting-edge technologies as UAVs, RPVs, laser technology, advanced radar, electro-optic devices, stealth technology, and anti-missile missiles.

Diversification and niche marketing strategy

Thus far I have argued that the combination of the structural decline in demand, economic crisis, and the changing security environment have promoted

a restructuring of the IDF resulting in significant change in the Israeli defense industry. Contrary to the interpretations of others (Dvir and Tishler, 1998), I find that the central government has played a significant role in promoting these changes and enhancing civilian spin-offs. In this section, I will discuss the role of central government policy in directing the firms' responses towards niche high-tech export marketing and diversification.

Policy steers the course

Israeli government policy has shaped the military–industry restructuring and the commercial spin-offs from the original investments in defense technologies *vis-à-vis* its long-range security, defense procurement, export, and industrial policies. To a lesser extent investments in education, commercial R&D, and the recently established incubator network have enhanced the success of the conversion effort. The connection between security policy and the size of a nation's defense obligations needs little discussion, but in the Israeli case, the national government seized the opportunity in 1979 and, again with the Madrid Peace Process to lead the nation toward a more peaceful future with a reduced defense burden.

As the nation faced economic crisis in the mid-1980s, the central government restructured procurement radically impacting the survival and advancement of particular sectors of the defense industry. Though some have argued that long-range planning has been adhoc (Wald, 1992), the decision to restructure the IDF to a more professional army (Cohen, 1995a) coincides with the recent R&D efforts and changes in procurements (Steinberg, 1997). Furthermore, the shifting of domestic procurement to support targeted technologies for security purposes and to maintain a significant place in the international division of labor in the globalizing defense industry also enhances the industrial innovation in the commercial sector. Dvir and Tishler (1998: 1) argue that:

> Israeli defense industry was instrumental in transforming Israel's civilian industry into a successful high-tech industry. The entrepreneurial spirit, the problem solving approach and the system oriented approach, which are characteristic of most of the successful high-tech firms in Israel, originated in Israel's military and defense industry. Moreover, the defense sector is still a very important source of new technological know-how and experienced human resources for the civilian high-tech industry.

Carus (1986), Steinberg (1998), Greenberg (1997), and Klieman (1998) also cite training and defense technologies as key inputs into the success of Israel's high-tech commercial activities. Anecdotal evidence of the path to tech transfer was provided by a conversation with a former IDF officer in a special unit using sophisticated surveillance technologies for advanced warning. Some ten of the eleven individuals in his unit are using the training and/or technology in commercial ventures. Of the eleven, six formed new firms after their conscription period with the IDF. Dvir and Tishler (1998: 24) provide a list of twenty high-tech firms that utilize dual-use

technologies managed by former ranking IDF officers or employees of the defense industry.

The shift in procurement – to purchase more sophisticated products and subsystems from domestic producers while importing lower-end market products and platforms, primarily from the United States – is motivated by four major factors. The first is security-related – the desire to maintain capacity in technologies that the military elite believes will provide significant deterrence and technological advantage in the event of a hot conflict. The second is cost savings, to avoid the high cost of producing major platforms and to maximize US military aid since the cost per unit to purchase these products is less in the United States than from Israeli manufactures. Third, many of the subsystems are dual-use technologies which provide the greatest opportunities for spin-off. Fourth, Israel anticipated the shift to global production and desired to maintain access to next generation weapons, which it can do by producing critical subsystems that enhance performance (Dvir and Tishler, 1998).[39]

Two other development policies that build on the foundations of defense and commercial R&D investments are high levels of education spending,[40] general industrial policy, and the aggressive encouragement of new technology firm formation through a national technology incubator program. Discussions with Ami Lowenstein (then Director of Dimetec), and Rino Prido, Program Manager of Israel's incubator network, suggest that a portion of current tenants have entered an incubator directly after leaving the IDF or a defense firm.[41] Furthermore, as with most Ministry of Industry and Trade programs, two of the criteria for government investment in new commercial product development are: (1) the product must be export-oriented given the relatively small domestic market and (2) the product must represent a substantial improvement of an existing technology or be an entirely new product (OCS: MIT, 1997). The government reasons that the additional risk associated with developing entirely new products is balanced by the reality that the successful ventures will reap first mover benefits for the Israeli based firm, and thus for the nation.[42]

Diversification of defense firms

The 1985 MoD announcement of prolonged contraction of domestic procurement appears to have been the incentive for firms to convert some production capacity to commercial sectors in the late 1980s. Though a portion of these first efforts failed, executives from the firms I interviewed indicated that they learned from these mistakes. In the 1990s, efforts of firms to diversify production were predicated on a new strategy which removed the commercial ventures from defense activities, improving the outcomes. The aggregate data regarding Israeli exports and industrial production, as well as the limited firm data, indicates that while defense exports have risen in real dollar terms, commercial output and exports have increased at a higher rate. This has resulted in a decline in defense dependency and increased Israeli integration into the global economy. One significant factor – cited in the interviews and by outside observers – is that the peace process has played a role in

increasing foreign investment and the opening of markets formerly closed to Israeli firms (Sennott, 1998).

Defense-dependent firms' failed attempts at diversification in the late 1980s included: (1) IMI's attempt to develop and market card-operated phones as well as security locks adapted from tanks and armored vehicles; (2) IAI's endeavors in civilian aerospace; (3) Rafael's move to develop medical diagnostic equipment and electro-optics; (4) efforts by Elbit to develop civilian computer accessories; and (5) Soltam's attempts to manufacture pots and pans. The unfortunate key characteristic of all of these efforts had been the lack of the upper-management's enthusiasm. Organizational problems also characterize these failures. Once a potential conversion project was identified, the development, production, and marketing were performed within the same business unit working with the military technology. The failure to conceptualize the differences between military markets and civilian customers was a significant cause of failure. To the credit of many firm managers, the larger firms continued their quest to diversify via converting defense technologies into commercially viable products.

My interviews, conducted in the summer of 1998, uncovered a change in the strategic approach to the defense firms' commercialization of former defense technologies. The efforts of these firms are buttressed by national industrial and security policy, and sometimes the political power of organized labor which secured necessary long-term government support of commercialization ventures. Rafael, ELOP, Tadiran, and IAI all have opted to separate the fledging commercialization projects from the defense unit in which the concept originated and seek the expertise of managers with commercial market experience to head the projects. These stand-alone businesses are nurtured via capital investment and technology transfer including highly skilled labor from the parent company. The following examination of several firms' experiences with diversification is based on my interviews with key actors.

Firm case studies

Tadiran

Tadiran is the largest publicly traded defense firm in Israel and the second largest electronics firm. It had over $1.2 billion in sales in 1997. A subsidiary of Koor industries, Tadiran has five major "strategic groups" (divisions) that include: (1) Telecommunications; (2) Communications; (3) Electronics Systems; (4) Computer Software; and (5) Appliances and Batteries. Each of these units is composed of two to five subdivisions that operate independently.

Their basic markets are high-tech communications systems in both commercial and defense sectors. Growth has been based on increasing exports and productivity through continual innovation. Roughly 57 percent of the workforce is engineers (29 percent) and technicians (28 percent). R&D investment has risen from 4 percent of total sales in 1990 to 6 percent of total sale in 1996. Throughout the 1990s Tadiran's growth strategy has been effective with aggregate sales rising from

$651 million in 1989 to over $1.2 billion in 1997. Simultaneously, exports have risen and defense dependency has declined.

A key firm manager asserted that one major reason for "the increase in exports has been the opening of markets, particularly Asian markets, since the Oslo accords." The large majority of export sales has been commercial, contributing to the decline in defense dependency, and reflects the growing telecommunications market internationally. Exports have risen as a percent of total sales from 39.5 percent (1993) to 47 percent (1996). The Asian financial crisis was cited as damping exports and total sales by as much as 10 percent in 1996 and 1997. However, previously closed markets in Asia catalyzed an increase in exports to Asia from just 13 percent of all exports in 1993 to a total of 30 percent of all exports in 1996, despite the fiscal crisis in the region.

Tadiran's defense dependency dropped from a high of 45 percent in 1991 to 33.1 percent in 1996. The preliminary figures showed a slight increase in 1997, but it is attributed to the completion of a major commercial contract to install telecommunications equipment for the national telephone company, Bezeq. It was suggested that the canceled orders from Asia would have prevented any increase in the percentage of sales to defense markets.[43]

Another factor in increasing commercial sales was the decision in the early 1990s to transfer commercially viable enterprises out of defense units and establish them as free-standing business units. Two examples are Scopus Ltd and Telematics, Ltd. In addition, Tadiran is nurturing seven other start-up firms, four of which have their origins in defense units.

Israeli Aircraft Industries (IAI)

Bedek, established in 1953 for the purpose of maintaining and refurbishing aircraft, later developed into the IAI, which is a government-owned firm (Dvir and Tishler, 1998). The IAI produced the Fouga Magister jet trainers and upgraded the Mirage III, which involved strengthening its wing structure and adding an improved electronics package. With the embargo in 1967, the IAI began the design and production of an indigenous combat aircraft, Kfir, based on the Mirage V airframe.

Through the 1970s the IAI expanded to over 22,000 employees in 1985, when it was the largest industrial employer in the nation. The industry-wide crisis which began in the mid-1980s, followed by the cancellation of the Lavi in 1987, forced a restructuring of the IAI. Some of the primary goals of the military elite guiding the process were to maintain industrial capacity in retrofitting, upgrading, missiles, and avionics, as well as an interest in maintaining the capacity in airframe design and retaining aerospace engineers. Complicating the problem further was strong resistance from organized labor at the IAI and other defense firms to avert job losses, wage restructuring, and privatization efforts. In 1987, the IAI workers, then numbering over 20,000, organized mass demonstrations and engaged in civil disobedience in an effort to prevent the cancellation of the Lavi aircraft. While they failed in this regard, they succeeded in gaining pledges from the government for replacement projects.[44] All interviewees regarding the restructuring of the IAI (regardless of their affiliation with government, the IAI management, or labor

unions) cite the role of labor in securing a long-term commitment from the national government to invest in developing a commercial aeronautics division. One IAI official stated that "without the political pressure of organized labor, it is probable that the government would not have committed long-term funds to help IAI development commercial units."

IAI labor's fight coincided with the interests of the military elite. The government contracts established the foundation from which the IAI began to develop the commercial units of the firm. Though the IAI would experience a series of financial and job losses as the firm attempted to penetrate the highly competitive commercial aviation and satellite markets, today it appears that the long-run return to the investments are beginning pay dividends. Defense News reports that the IAI will post record sales totaling $2 billion in 1999 leading to record profits. The transition to commercial market shows defense dependency declining from roughly 88 percent in 1985 to 64.5 percent in 1998 (Opall-Rome, 1999b). The commercial sector outperformed the targets set in 1993 by the IAI management (Flight International, 1998: 10). Revenues exceed $2 billion in FY 2000 with commercial sales increasing faster than the defense business (AWST, 2002).

Exports are also on the rise to 75 percent of total sales in 1999 and the IAI's labor force expanded to 14,000 in 1998 from its low point of roughly 11,000 in 1990 (Opall-Rome 1999b). The entry into commercial aviation required the IAI to reorganize and establish free-standing business units such as Galaxy Aerospace.[45] Galaxy Aerospace designs and produces executive jets, helping to maintain Israel's aeronautic and aerospace engineers and airframe design capacity. Another example is Bedek Aviation Group, which provides the commercial aviation industry with fleet maintenance services as well as aircraft conversion, such as the recently completed contract with UPS to convert B-747–200 from a passenger airliner to a cargo craft.[46]

On the military side, the IAI has successfully attracted international joint ventures with US Defense giants Boeing and Lockheed Martin. In October of 1998, IAI and Boeing announced the establishment of a strategic agreement (Internal IAI memo). Other joint ventures with American defense giants include: (1) the Arrow missile system (Lockheed Martin); (2) the recently completed deal to be the sole subcontractor to build rear stabilizers for F-15 fighters; (3) upgrading USAF T-38 (McDonnell Douglas); and (4) IAI and General Dynamics are currently jointly marketing a new IAI developed anti-tank round (Mulholland, 1998). Moshe Keret, CEO of IAI, when interviewed by Defense News, indicated that a merger had been discussed with Lockheed Martin and that more joint ventures were anticipated (Defense News, 1997, one on one). In addition, steps have been taken to establish a joint marketing company with Elbit Systems, an independent aerospace and defense systems firm.[47]

ELOP (Electro-Optics)

The origins of ELOP can be traced to Professor E. Goldberg establishment of private Goldberg Instruments, established in 1937 after he emigrated from Germany. Over the years, ownership has transitioned from government-owned (1962), to 50 percent foreign control (1964), and back to the private sector Israeli control (50 percent

Tadiran and 50 percent Federmann Group, 1978). In 1992, the Federmann Group obtained 100 percent of the firm. Currently, ELOP is a private firm with no public trading, therefore access to data is quite restricted.

The defense mission of ELOP began during the War of Independence, providing aerial photography technology to the defense forces. Since its inception, ELOP (Goldberg Instruments) has been a technology-oriented firm and currently, of the 1,800 employees, 60 percent are engineers and scientists, 20 percent technicians, 30 percent production workers, and 10 percent other. Even before independence, Professor Goldberg was building defense instruments, first for Germany during the First World War and then England in during the Second World War. With the War of Independence and after, Goldberg recognized that the military was the only customer requiring the sophisticated instruments he was designing and producing. This defense dependence is still significant today. In 1994, 98 percent of sales were in defense markets. Efforts were made to expand international sales and diversify products into civilian sectors. By 1998, commercial sales had risen to 20 percent of total sales, which had grown by 35.1 percent to $311 million. Exports, in both defense and commercial sales, skyrocketed in this brief period moving from 33 percent (1994) of sales to 79.4 percent (1998).

Six attempts at commercialization strategies in the early and mid-1980s all failed because they were conducted in-house. The story of Fruitonics illustrates this point. Applying computerized pattern recognition technology, originally developed for defense, ELOP developed a machine to recognize defects and the size of the fruit. The design, production, and marketing of this equipment were performed in the business unit that developed the technology for the IDF. This resulted in the failure to understand the relationship between capital and labor in the fruit harvesting process, and design specifications priced the equipment out of the market. Another failure on the marketing side was that the machine was developed for the Israeli citrus industry, which had a ready supply of cheap Palestinian labor to sort the harvest, thus little incentive to purchase capital equipment to serve this function.

Fruitronics demonstrates the typical hurdles in conversion: lack of commercial market knowledge and over-specification in design leading to goods that are too expensive. Learning from this lesson, the commercialization project was removed from the defense unit and an independent firm was established (Fruitonics) in 1988. Commercially experienced management and marketing personal were recruited to run the operation, which identified the Washington State apple industry as a potential customer. Because of the tighter labor market and higher wages, and the relaxing of specifications regarding percentage of correct detections, commercial success followed. Following the success of Fruitonics, ELOP proceeded to establish other freestanding commercial enterprises that include OPGAL (surgical equipment) and SCD (lasers and detectors), which are joint ventures with Rafael via their stand-alone commercialization unit, Rafael Development Corporation (RDC).[48]

Can Israel consolidate?

Observers anticipate the need for consolidation in the Israeli defense industries and my interviews confirm a latent demand for mergers among firm management as

well as former and present MoD industry advisors. However, labor has aggressively resisted previous attempts to consolidate and/or privatize government owned firms (Office of Technology Assessment, 1991; Defense News, 1997; Klieman, 1998; Steinberg, 1998).[49] From a neo-liberal perspective, the political power of labor has made the firms inefficient and distorted the response to market demands. However, labor's political will has been influential in securing public funding for commercialization efforts that have reduced the defense dependency of the major firms and increased their commercial competitiveness. Thus these firms have become more attractive to private investment. Considering these facts, labor's call for a role in the decision-making process regarding consolidation should not be dismissed on the logic that their interest will only negatively distort the outcome resulting in economic inefficiencies.

Connected to this issue is the government ownership of the three largest firms, which makes them unattractive to private market actors who need more flexibility to respond to changes in the market place. Managers of both government-owned and private firms placed the ownership structure as a serious impediment to mergers. Despite these challenges, the government has privatized some of its firms – including some of the most technologically advanced firms such as Ashot Industries, Beit Shemesh Engines, Elta Electronic Industries, and Shekem – as a means of cutting its deficit and raising capital to service its debt, as well as a means for encouraging foreign investment capital in the companies (Office of Technology Assessment, 1991). Recent sales increases at IAI, Koor Industries purchase of 90 percent of Tadiran stocks, and the 1998 recommendation by a MoD-led panel to consolidate defense industries appears to have set the stage for intra-national, if not international, mergers of Israeli defense companies (Defense News, 1997; Rodan, 1998d; Opall-Rome 1999a, 1998c). Divr and Tishler (1998) caution, and I concur, that any reorganization needs to bring labor to the negotiation table to ensure an optimal outcome.[50]

Conclusion

In my estimation, the globalization of the economy, Israel's need to open more international markets for its goods, the reduction of regional tensions, and the increasing public participation in security related decisions should and will continue. The pressures to convert, from both shrinking markets and the high cost of production of platforms, will lead to more diversification and specialization in the Israeli context. Another major factor that will determine the size and character of the Israeli arms industry is the internationalization of weapons production. I agree with Dvir and Tishler (1998) who argue that Israel will continue to produce Israeli Specific Weapon Systems, reduce the size of its defense industries, while maintaining a competitive advantage in sophisticated subsystems and retrofitting\upgrades. Through partnering with defense giants in the United States and Europe in high-tech R&D for weapons development, continuation of its competitive advantage in human capital, and provision of sophisticated subsystems, Israel should be able to maintain access to necessary defense products that secure its borders.

Ultimately, the production units of government-owned defense firms will be privatized and a consolidation process will ensue, (though the R&D component of Rafael will remain government-operated), similar to the US national labs (Opall-Rome, 1999a,b). This should enhance the Israeli defense industries' international competitiveness and prevent future intra-Israeli competition in the international arms market (Defense News, 1997; Dvir and Tishler, 1998; Klieman, 1998; Rodan, 1998d), though this may result in the loss of capacity to innovate. Furthermore, as regional tensions are ameliorated, defense markets continue to shrink, and the Israeli economy grows, the relative importance of the defense sector to provide employment will decline (Dvir and Tishler, 1998). The probable response of firms will be continued diversification; individuals who leave the defense sector with high levels of skills will convert their technological capabilities into commercially beneficial activities.

The leadership of the central government has been key to the success in reducing the defense dependence of Israeli military contractors. Through integrating the development of its citizens, use of its industrial development policy, construction of an R&D infrastructure via its security policy and leveraging massive foreign aid (primarily from the United States), Israel has beat the odds in using defense industries as a catalyst to industrial development. Continued success will require further leadership from the central government working with firms, educational institutions, and labor to prevent market forces from dismantling the critical mass of technological capacity present in the citizenry, armed forces, and firms that has built an optimistic future for the Israeli economy. The lesson for other nations: a comprehensive industrial policy that stresses human capital development, integrated with R&D investment, is necessary but not sufficient condition to successful conversion. The other critical component of a successful conversion strategy is the leadership of central government through an integrated security, procurement and industrial policy, and one that invests in commercialization for the long run.

Notes

1 Felsenstein's mapping of the geography of the defense industry is based on 1985 data. Gradus *et al.* (1993), in their analysis of 1990 data, show little change in the geography of defense dependent sectors, and the interviews I conducted in 1998 suggest there has been limited relocation of production from core areas.
2 Nevertheless, some key functions, such as the R&D component of Rafael, will remain government-operated, similar to the US national labs, Opall-Rome, 1998a.
3 Israel does not have the luxury of allowing enemy troops to penetrate its territory or consider the strategy of sacrificing land for time as Russia did in the Second World War.
4 Czechoslovakia was the major supplier of weapons from 1951 to 1955, when the Soviet bloc relationship suddenly cooled. In addition, from 1948 to 1955, England, France, and the United States opposed arms sales to Israel. During the Six Day War the US began supplying Israel with military supplies and sold advanced weapons. The relation quickly evolved to the point that Israel became the recipient of the largest US aid packages, both military and economic. The two nations would embark on many joint high-tech research projects regarding defense technology.
5 Perimeter responsibility, defined as the protection of the borders from invasion, is considered the most fundamental duty of defense. Infra-frontier concerns are within the

nation's borders and include providing civilian air defense against bombings and preventing armed insurgencies within one's borders or behind the front of the perimeter army.

6 The remote category denotes commitments that require the use of military force in areas not directly contiguous to the nation or the front along which a nation's troops are stationed. It includes, though not limited to, intra-regional aerial bombardments of enemy forces.

7 In 1994, 60 percent of Israel citizens polled indicated that they would be willing to negotiate a land for peace deal, up 15 percent from 1984. Over the same decade, the number of those who vehemently opposed, preferring to annex the territories has remained stable at 23 percent. The percentage of Israelis willing to allow for a Palestinian state has risen from 16 to 37 percent in 1994, while those ardently opposed has declined by 10 from 52 percent to 42, this decade. In 1994, about 42 percent of the Arabs in the West Bank and Gaza approved of some form of peace with a treaty between the PLO and Israel (Arian, 1995).

8 Formerly, the Soviet Union as an arms supplier and international ally of Syria, Jordan, Lebanon, Iran, and Egypt till 1979, had counterbalanced US support of Israel in the region.

9 Intifada is the term used for the Palestinian Uprising in the Occupied Territories that began in 1987.

10 In addition, there are demographic pressures that are relevant to internal security. The Arab population is projected to exceed the Jewish population in Israel by the year 2010 as a result of Palestinian resettlement of the Israeli-occupied territories and PA-controlled territories and a higher birth rate among Arabs relative to Jewish Israelis (Curtiss, 1997).

11 For example, in a preemptive strike, Israel destroyed an Iraqi nuclear facility when international nonproliferation oversight failed to force compliance.

12 The Middle-East space race has accelerated since the Gulf War. While hotly debated, Israel has touted the doctrine of self-reliance on real time imaging from satellites. Many argue that the cost is too great considering the limited resources and that the US can provide necessary data. Others argue that the US satellite data was not available at critical points during the Gulf War. In the SIPRI Yearbook, 1996, Major General David Ivri stated that R&D spending is increasing when special projects are included in the reported figures. The advancement of the Jericho missile program is one such project.

13 There is evidence that Israel is also engaged in other missile programs that include Jericho 2B or maybe a Jericho 3 missile. The true size and nature of these programs are difficult to assess because of their top secret status (SIPRI, 1996).

14 The degree to which the IDF respects the democratic processes is one of great debate within the literature.

15 Within the MoD, the Director-General plays a key role in procurement decisions and is assisted by the Director for Procurement (MAFAT), the Director for Research and Development (MANHAR), and the Assistant to the Minister for Defense for Industries. The MANHAR is responsible for managing US military aid, which can be as high as $4 billion, as well as directing the procurement mission in the US. To some degree, the MANHAR is involved in domestic procurement, including directing orders to areas of the country deemed to be of national importance, though this policy of military Keynesianism has been abandoned in order to reduce the cost of procurement and increase the efficiency of the defense industries (see Klieman and Pedatzur, 1991). For purchases financed from the Israeli defense budget, and not from American aid, local producers are given preference, and may charge up to 15 percent above the equivalent CIF cost of similar imported systems. Similarly, under MoD regulation 40.06, a producer located in a development zone can receive a contract if the bid is up to 15 percent above the bid of non-development zone firms, but these discounts cannot be combined (Steinberg, 1998). Dvir and Tishler (1998) and Beenstock (1998) also cite the decline of military Keynesianism.

16 For more detailed analysis, see Cohen, 1995a,b.

17 Though, in the Israeli case, a representative is not assigned to a specific branch of the military, as in the US Joint Chiefs of Staff.

18 The effectiveness of the IDF planning is contended by Emanual Wald (1992). Wald argues that planning is sporadic and sometimes contradictory between procurement and R&D, while multi-year force structure and integration of long-range decisions appear nonexistent in the procurement process. This problem has been formally addressed with the implementation of the Merkam five-year planning process, though at the time of Wald's book it was too early to discern this policy's effectiveness.

19 Though there is a debate as to who actually pressured the Israeli government to abandon the Lavi project. Some argue that it was the Dotan Affair and public pressure within Israel (Steinberg, 1998) while the counter argument is that its was US political pressure that pulled the plug. The US had been a major source of funding for the project but, as costs continued to escalate and US defense budgets were declining, the Pentagon decided it was in the interest of both countries for Israel to purchase the American F-16C, ensuring more market shares for ailing US firms and saving both countries a substantial amount of money (Twing, 1996c). Another argument articulated in an interview is that "the decision was strictly economic and made solely by the MoD in response to anticipated cuts resulting from the escalating inflation." Decision-making around the Lavi combat aircraft failed on three fronts. First, evaluation of the cost of development and production versus licensed production of the American F-16C should have led to an earlier cancellation (SIPRI, 1993; Steinberg, 1997). Second, corruption surrounding the project in the Dotan Affair is attributed to the lack of public oversight of the procurement process (Steinberg, 1997). Finally, some argue that the project may not have been an achievable security objective, that it was inconsistent with long-range security plans and had measurable deficiencies in the IDF (Wald, 1992).

20 Israel cites the Iraqi nuclear program as the latest example of the failure of international monitoring organizations.

21 This marks the first time Israel has participated in any type of regional or international arms control agreement. Currently, the Israeli State Department has been actively participating in the Arms Control and Regional Security Working Group as part of the Oslo II agreements as well as bi-lateral negotiations with Egypt, Jordan, and Syria. It should also be noted that ratification has been delayed until all Arab nations sign off (Karsh *et al.*, 1996).

22 Israel also considers the need to retain scientists and engineers and defense industrial capacity when negotiating various bilateral and multilateral peace agreements. The state has developed the following general requirements as necessary but not sufficient conditions for all peace and arms control accords:

- They must contain both multilateral and unilateral Confidence and Security Building Measures (CSBM);
- As long as there is a perceived threat to its survival, the potential of mutual benefits will be weighed against the weakening of its deterrence capabilities;
- The process is dependent on regional mutual verification process; and
- The need to maintain the appropriate military capabilities to respond to unilateral abrogation of any signed peace or arms control agreements (Inbar, 1992; Steinberg, 1994a,c).
- In the case of arms control, the type and size of any arms limitation is inextricably linked to the peace process. The Israeli perspective on regional arms control agreements must include unilateral agreement by the Arab nations that Israel has the right to exist; arms control and reduction that begins with confidence and security building measures (not the reverse); and unilateral and multilateral regional bodies of mutual inspection and verification. The majority of the Arab community argue the reverse position.

23 In February of 2000 the Knesset discussed the nuclear weapons policy publicly for the first time (Sontag, 2000).

24 Although aggregate data exists regarding total military spending, there is limited data regarding procurement, and top secret R&D is often not included (Cohen, 1995a; Beenstock, 1998; Dvir and Tishler, 1998; Klieman, 1998). In addition, Israel stills maintains a policy of ambiguity regarding its internationally recognized nuclear capability, hampering an analysis of its size or its influence on changes in security policy. The analysis here relies primarily on interviews and secondary sources. Official statistics are used as guideposts for this section.

25 See Cohen, E., 1996; Office of the Secretary of Defense, 1996. The new military strategies in the post-Cold War period place a high degree of concern on being highly mobile and the ability to control airspace. Perhaps most important to the Israelis is being able to gather, transmit, and interpret battlefield data and to relay back this analyzed data to the forces engaged in battle or to remotely controlled hardware responding to present threats. The emphasis is on smaller, precision attacks with pinpoint accurate weapons as opposed to massive bombings to achieve some military objective.

26 The IDF 2000 Plan is to move to a more professional army, with enhanced deterrence against weapons of mass destruction via technological solutions and innovative tactics similar to the US Revolution in Military Affairs (Opall-Rome, 1999a).

27 By revamping the conscript and reserve guidelines, the IDF has been able to secure savings in labor and meet demands to professionalize the services (Cohen, 1992, 1995a,b).

28 There are over 16,000 scientists and engineers in Israel, which is approximately 69 per every 10,000 in the workforce. These figures are a reflection of the government's policies supporting the advancement of science and technology as well as citizens' high regard for individuals who enter the field. The ratio of scientists and engineers to the total population is continually increasing for two primary reasons: first, the ratio of scientists and engineers immigrating to Israel relative to the total number of immigrants is higher than the existing ratio within the current Israeli population; and second, the government subsidizes training and employment in theses fields, both in the public and military sectors.

29 In addition, Israel, on average, invests about 8 percent of GDP in education expenditures.

30 The significance of substantial US military aid can not be overstated when considering the accomplishments of the Israeli arms industry. In the 1980s, the US and Israeli military relationship was formalized and institutionalized with a signing of a series of Memoranda of Understanding. In 1994, the American FMA constituted 30 percent of the Israeli defense budget (Steinberg, 1997).

31 Equally paramount to expanding production capacity was the promotion of technological advancement in the defense sector which catalyzed Israeli Aircraft Industries' (IAI) production of the Kfir jet fighter (based on the French Mirage fighter air frame); a variety of missiles including surface to air, air to air, and guided missiles (Jericho I & II and others); RPVs as well as other non-aerospace platforms. Other high-tech systems of the Israeli defense firms include technology related to battlefield communications, surveillance, avionics, electro-optics, laser technology, anti-missile missiles, unmanned aerial vehicles, warfare electronics, satellites and launch vehicles, and highly sensitive long-range reconnaissance as well as other unknown "Israeli Specific Weapon Systems." These are still being developed. Furthermore, evidence suggests the development of nuclear and chemical weapons (Hersch, 1991; Dupuy *et al.*, 1993; Defense News, 1998a). More recently, there has been a major effort to improve capacity in satellite imaging, laser technology, anti-missile missiles, and satellite launch vehicles. Non-aerospace platforms include the missile boats Sa'ar 4 and 4.5, the Arava light utility vehicle, a series of main battle tanks, the Mekava Mark 1–4, and naval patrol vessels. For a detailed set of technologies by firm see Dvir and Tishler (1998). The Six Day War (1967) and the War of Attrition (1973) that followed increased the pressure to ensure the survival of the nation via a nuclear or other technological solutions to an allied Arab attack.

32 For more details of these relationships see Bahbah and Butler 1986 (Latin America); Hersch 1991 (South Africa); Rabie 1988 and Ben-Menashe 1992 (United States); Klieman 1985 (China, Latin America, and Africa); and Gill and Kim 1995 (China).

33 It should be noted that this figure is only military aid and includes loan, grants, and other types of assistance.
34 Given US aid, Israeli defense firms have been able to structure loan agreements that use US aid to cover the up-front cost of production of a weapons system or subsystem and structure favorable receipt payments based on this.
35 Wulf, in his text, uses this term to describe three levels of arms producing nations. Third-tier nations are defined as nations that cannot produce the full spectrum of military technology, but have significant capacity, and sophisticated high technology capabilities. Originally, this term was used by Kwang-il Baek and Chung-in Moon (1989) as means of describing the case of South Korea.
36 In 1996, there was a slight increase in arms expenditures to about $7 billion (SIPRI, 1996). With the adoption in 1999 of the IDF 2000 plan designed to modernize the armed service there is an anticipated short-term rise in procurement spending and long-run saving in overall military expenditures.
37 For a more in-depth discussion of the stabilization program, see Razin and Sadka 1993 or Rivlin 1992. Taxes increased partly through an increase in rates and a substantial portion as a result of the so-called Tanzi effect. The Tanzi effect is the increase in the real value of tax revenue as a direct result of a decrease in inflation and a real increase in the value of currency in the time lapse between the accrual of the tax liability and the payment of the tax.
38 There was also an IDF withdrawal from Lebanon – which Israel had invaded in 1982 – contributing to the stabilization program by helping to reduce government consumption and expenditures. This withdrawal is not complete. The IDF still occupies a security zone in southern Lebanon as a buffer against the extremist Islamic group, Hazballauh, which the Israelis believe is based in Lebanon and which the Lebanese central government either can not or will not prevent from attacking Israeli border communities.
39 Dvir and Tishler (1998) argue that the Israel firms also must merge to continue to compete in the international market, an opinion held by all firm representatives interviewed.
40 Watzman (1998) reports that Israel intends to double its already high output of high-tech graduates in five years.
41 Rino Prido directs the twenty-six technology incubators in Israel, which as a result of their success have had a budget increase from $1.5 million in 1991 to $32 million in 1996. Since the program's inception graduated firms have created 1,600 jobs for scientists and engineers (OCS: MIT, 1997).
42 Israeli industrial policy is also bolstered by the Board of Governors of the United States–Israel Science and Technology Commission which has decided to give preference to projects in Internet biotechnology, ecology, and commercialization of defense industries. Support for joint ventures by Israeli and American companies in these fields will total $20 million over the coming year (Israeli Consulate, 1999a).
43 Figures reported in this section are from the 1992–97 Tadiran Annual Reports and Company Profiles reports for the same years. The strategies and observation are responses to interview questions.
44 Dvir and Tishler (1998), Klieman (1998), and Carus (1986) also note the power of labor in the Israeli defense industries. The one point of consensus across all interviews was the impact labor made in the course of restructuring. In the 1992 elections, a leader of the IAI worker's organization (Yaakov Shefi) won a position on the Labor Party's list of candidates for the Knesset and was elected. It is difficult for any government to ignore such a large, powerful, and well-organized institution. Although there have been some reforms and reductions in force, these have come through costly early retirement and voluntary programs, subsidized through special government allocations. Also, workers from Rafael and Taas have blocked government plans to reduce the workforce of these firms. The employees of Israel shipyards sought to prevent the government from privatizing this enterprise (Steinberg, 1998).
45 Galaxy is partnership with the Pritzker family (Hyatt Hotels).

46 IAI is the only firm which is not an original manufacturer to hold the necessary certification from the US FAA to perform such structural conversion of aircraft in the United States.
47 In 1996, Elbit subdivided into three independent units (Elbit Systems 1996 annual report).
48 Data for this section are from company records provided to me at the time of my interview with upper-management. Additionally, interviews at Rafael confirm the use of freestanding independent units, nurtured with capital and tech-transfers while seeking the skills of individuals with commercial market knowledge as the new path to conversions.
49 The aborted merger of Elisra and Tadiran's System Division clearly demonstrates labor's power in the restructuring of the industry (Office of Technology Assessment, 1991).
50 See Dvir and Tishler (1998) for a well-reasoned analysis of what the future consolidation might look like.

Bibliography

Arian, A. (1995) *Security Threatened: Surveying Israeli Public Opinion on Peace and War*, Cambridge: Cambridge University Press.

Aronoff, M.J. (1989) *Israeli Visions and Divisions: Cultural Change and Political Conflict*, New Brunswick, NJ: Transaction Publishers.

AWST (2002) "Prime Contractor and Major Manufacture Profiles: America/Europe/Israel/Japan," *Aviation Week and Space Technology*, 156(2): 287–320.

Baek, K. and Moon, C. (1989) "Technological Dependence, Supplier Control and Strategies For Recipient Autonomy: The Case of South Korea," K. Baek *et al*. (eds) *The Dilemma of Third World Defense Industries: Pacific and World Studies No. 3*, Boulder, CO: Westview Press.

Bahbah, B. and Butler, L. (1986) *Israel and Latin America: The Military Connection*, New York: St Martin's Press.

Bancroft, E. (1997) "Israeli Polls Indicate Why Netanyahu is Moving Toward Center," in *Middle East Report: On Middle East Affairs*, March, pp. 38–9. http://www.washington-report.org (accessed June 5, 1997).

Beenstock, M. (1998) "Country Survey XI: Defence and the Israeli Economy," *Defense and Peace Economics* 9(3): 171–222.

Ben-Gurion, D. (1997) "Like Stars and Dust," The Ben-Gurion Heritage Institute Sed Boqer Campus, Israel: The Ben-Gurion Research Center.

Ben-Menashe, A. (1992) *Profits of War*, New York: Sheridan Square Press.

Bichler, S. and Nitzan, J. (1996) "Military Spending and Differential Accumulation: A New Approach to the Political Economy of Armament – The Case of Israel," in *The Review of Radical Political Economics*, 28(1): 51.

Brzoska, M. (1999) "Economic Factors Shaping Arms Production in Less Industrialized Countries," *Defence and Peace Economics*, 10(2): 139–69.

Brzoska, M. and Ohlson, T. (1986) *Arms Production in the Third World*, Stockholm: SIPRI.

Carus, S.W. (1986) "Israel: Some Economic and Social Considerations," in J.E. Katz (ed.) *The Implications of Third World Military Industrialization*, pp. 135–50.

Cohen, S.A. (1992) "Israel's Changing Military Commitments, 1981–1991: Causes and Consequences," *The Journal of Strategic Studies*, 15(3): 330.

Cohen, S.A. (1995a) "The Israel Defense Forces (IDF): From a 'People's Army' to a 'Professional Military' Causes and Implications," *Armed Forces and Society*, 21(2): 237.

Cohen, S.A. (1995b) "Small States and Their Armies: Restructuring the Militia Framework of the Israel Defense Force," *The Journal of Strategic Studies*, 18: 78.

Cohen, E.A. (1996) "Advanced Technology and the Future of Warfare," *Mideast Security and Policy Studies No. 28*, Ramat Gan, Israel: Began Sadat Center for Strategic Studies.

Cohen, S.A. and Inbar, E. (1991) "A Taxonomy of Israel's Use of Military Force," *Comparative Strategy*, 10(2): 121.

Cohen, J.S., Mintz, A., and Ward, M.D. (1996) "Defense Expenditures and Economic Growth in Israel: The Indirect Link," *Journal of Peace Research*, 33(3): 341.

Consulate of Israel (1999a) listserve: Consulate of Israel – New York, nycon@interport.net. Friday, March 19: 13:09:47.

Cordesman, A.H. (1996) *Perilous Prospects: The Peace Process and the Arab–Israeli Military Balance*, Oxford: Westview Press.

Curtiss, R.H. (1997) "Year-End Population Statistics Gloss Over Israel's Biggest Problem," *The Middle East Report: On Middle East Affairs*, March, pp. 38–43.

Defense News (1997) Moshe Keret, CEO IAI, interview, *Defense News*, September 8–14.

Defense News (1998a) Isaac Ben-Israel, Director of Research and Development, Israeli Ministry of Defense, interview, *Defense News*, August 24–30: 22.

Defense News (1998b) "Top 100 Worldwide Defense Firms," *Defense News*, July 20–26: 12.

Defense News (1998c) "Boeing–IAI Form Strategic Panel," *Defense News*, October 19–25: 30.

Defense News (1998d) "Elbit Rebounds: Profits, Backlog Rise," *Defense News*, March 16–22: 16.

Defense News (1998e) "El-Op Gains Half Share of Silver Arrow UAV Firm," *Defense News*, June 8–14: 36.

Defense News (1998f) Joseph Ackerman, interview, *Defense News*, June 29–July 5: 38.

Dupuy, *et al.* (1993) *International Military and Defense Encyclopedia, Volume* 3, New York: Brassey's (US), Inc.

Drori, R., Genut, B., and Brenowitz, L. (2000) "Poll: Majority of Jewish Israelis Support Returning the Golan," Israeli Line, listserve from the Israeli Consulate in New York. nycon@interport.net. Friday, March 10, 2000.

Dvir, D. and Tishler, A. (1998) "The Role of the Israeli Defense Industry," revised edition of paper presented at the Workshop on the Place of the Defense Industry in National Systems of Innovation, October 16–18, 1998, Cornell University, Ithaca, New York.

Elbit Systems (1997) Elbit Systems 1996 Annual Report, Tel Aviv: Elbit Systems.

Enginsoy, U. (1997) "Deal Nears on Israeli Upgrade of Turk M60 Tanks," *Defense News*, April 7–13: 23.

Enginsoy, U. and Rodan, S. (1996) "Under Pressure, Erbakan Frees Up F-4 Upgrades," *Defense News*, December 9–15: 9.

Felsenstein, D. (1986) *The Spatial Organization of High-Technology Industries in Israel*, Jerusalem: Hebrew University, Institute of Urban and Regional Studies.

Flamm, K. (1998) "The U.S. Defense Industry After the Cold War: Economic Pressures and Security Dilemmas," presented at the Workshop on the Place of the Defense Industry in National Systems of Innovation, October 16–18, 1998, Cornell University, Ithaca New York.

Fischer, S., D. Rodrik, and E. Tuma (eds) (1993) *The Economics of Middle East Peace: Views From the Region*, Cambridge, MA: MIT Press.

Flight International, (1998) "The Future of Israeli Air Power," *Flight International Supplement*.

Fulghum, D. (1999) "Reconnaissance, Missile Defense Deemed Most Crucial Israeli Needs," *Aviation Week*, February 1, p. 64.

Gill, B. and Kim, T. (1995) *China's Arms Acquisitions from Abroad: A Quest for "Superband Secret Weapons,"* Oxford: Oxford University Press for SIPRI.

Gradus, Y., Razin, E., and Krakover, S. (1993) *The Industrial Geography of Israel*, New York: Routledge.

Greenberg, J. (1997) "Israelis Turn Military Skills Into Software Export Boom," *New York Times*, August 18, Business Day, pages 1, 5.

Hersch, S.M. (1991) *The Samson Option: Israel's Nuclear Arsenal and American Foreign Policy*, New York: Random House.

Inbar, E. (1992) "Israel and Arms Control," *Arms Control*, 13(2): 214–21.

Israel Ministry of Finance – International Division (1997a) "General Advantages of Investing in Israel," http:www.mof.gov.il/beinle/mof 2a.htm1#advantage (accessed June 7, 1997).

Israel Ministry of Finance – International Division (1997b) "The Privatization Process." http//:www.mof.gov.il/beinle/mof 3.htm (accessed June 7, 1997).

James, A.D. (1998) "The Place of the U.K. Industry in its National Innovation System: Co-evolution of National, Sectoral and Technological Systems," presented at the Workshop on the Place of the Defense Industry in National Systems of Innovation, 16–18 October 1998, Cornell University, Ithaca New York.

Jane's Defense Weekly (1992) March 7: 395.

Kanovsky, E. (1995) "Middle East Economies and the Arab-Israeli Peace Agreements," *Israeli Affairs*, 1(64): 22–39.

Karsh, E., Inbar, E., and Sandler, S. (1996) "Arms Control and the New Middle Eastern Environment," *Defense Analysis*, 12(1): 33–52.

Kimmerling, B. (1984) "Making Conflict a Routine: Cumulative Effects of the Arab-Jewish Conflict Upon Israel," in M. Lissak (ed.) *Israeli Society and its Defense Establishment: The Social and Political Impact of a Protracted Violent Conflict*, London: Frank Cass and Company Ltd.

Klieman, A.S. (1985) *Israel's Global Reach: Arms Sales as Diplomacy*, New York: Pergaman-Brassey's International Defense Publishers.

Klieman, A. (1998) "Adapting to a Shrinking Market: The Israeli Case," in E. Inbar, E. Zilberfarr, and B. Zilberfarr (eds) *The Politics and Economics of Defense Industries*, London: Frank Cass.

Klieman, A.S. and Pedatzur, A. (1991) "Rearming Israel: Israeli Defense Procurement Through the1990s," *Jerusalem Post Publication*.

Krause, K. (1992) *Arms and the State: Patterns of Military Production and Trade*, New York: Cambridge University Press.

Landau, P. and P. Levinson (eds) (1985) *The Israel Economic and Business Review 1985*, Boulder, CO: Westview Press.

Levin, D. (1998) "Leading the High-Tech Revolution," *Detroit Free Press*, May 26, p. 1.

Lissak, M. (1984) "Paradoxes of Israeli Civil-Military Relations," M. Lisak (ed.) *Israeli Society and its Defense Establishment: The Social and Political Impact of a Protracted Violent Conflict*, London: Frank Cass and Company, Ltd, pp. 1–12.

Looney, R.E. and Winterford, D. (1995) *Economic Causes and Consequences of Defense Expenditures in the Middle East and South Asia*, Oxford: Westview Press.

Lovering, J. (1998) "The Defense Industry as a Paradigmatic Case of 'Actually Existing Globalization,' " presented at the Workshop on the Place of the Defense Industry in National Systems of Innovation, 16–18 October 1998, Cornell University, Ithaca, New York.

Markusen, A. (1998) "Should We Welcome a Transnational Defense Industry?," presented at the Workshop on the Place of the Defense Industry in National Systems of Innovation, October 16–18, 1998, Cornell University, Ithaca, New York.

Mintz, A. (1984) "The Military-Industrial Complex: The Israeli Case," in M. Lissak (ed.) *Israeli Society and its Defense Establishment: The Social and Political Impact of a Protracted Violent Conflict*, London: Frank Cass and Company Ltd.

Mintz, A. (1988) "Electoral Cycles and Defense Spending: A Comparison of Israel and the United States," *Comparative Political Studies*, 21(3): 368.

Mintz, A. and Stevenson, R.T. (1995) "Defense Expenditures, Economic Growth, and the 'Peace Dividend': A Longitudinal Analysis of 103 Countries," *The Journal of Conflict Resolution*, 39(2): 283.

Mintz, A. and Ward, M.D. (1989) "The Political Economy of Military Spending in Israel," *The American Political Science Review*, 83(2): 521.

Mintz, A., Cohen, J.S., Stevenson, R., and Ward, M.D. (1996) "Defense Expenditures and Economic Growth in Israel: The Indirect Link," *Journal of Peace Research*, 33(3): 341–52.

Mulholland, D. (1998) "IAI, General Dynamics to Market New Anti-Tank Round," *Defense News*, 19–25 October: 22.

Nitzan, J. and Bichler, S. (1996) "From War Profits to Peace Dividends: The New Political Economy of Israel," *Capital & Class*, Fall 1996, (60): 61.

OCS: MIT (1997) *Technology Incubators in Israel*, Tel Aviv, Israel: Office of the Chief Scientist, Ministry of Industry and Trade.

Office of the Secretary of Defense (1996) *The Revolution in Military Affairs*, Washington, DC: Strategic Assessment Center.

Office of Technology Assessment (OTA) United States, (1991) *Congress Global Arms Trade: Commerce in Advance Military Technology and Weapons*, Washington, DC: Government Printing Office.

Opall-Rome, B. (1997) "Interview with Lt. Gen. Amnon Shahak, Isreali Defense Forces," *Defense News*, 17(30): 77.

Opall-Rome, B. (1998a) "Israel Pushes Boost-Phase Plan," *Defense News*, November 2–8: 4.

Opall-Rome, B. (1998b) "Israel Officials Hint at Cracks in Nuclear Code of Silence," *Defense News*, September 14–20: 6.

Opall-Rome, B. (1998c) "Book Details Blunders, Aid That Let Israel Develop Nuke," *Defense News*, October 12–18: 46.

Opall-Rome, B. (1998d) "IAI Sales Could Speed Privatization, Investment," *Defense News*, June 15–21: 20.

Opall, B. (1998e) "Israel, U.S. Explore Space for R7D Cooperation," *Defense News*, January 12–18: 4.

Opall-Rome, B. (1998f) "U.S. Israel Lawmakers Forge Common Security Strategy," *Defense News*, September 14–20: 14.

Opall-Rome, B. (1998g) "Rada Eyes Growth through $10 Billion Boeing Investment," *Defense News*, July 13–19: 8.

Opall-Rome, B. (1998h) "Air Power Experts Emphasize Brains Over Brawn," *Defense News*, July 13–19: 11.

Opall-Rome, B. (1998i) "Israel, US Reach Aid Compromise," *Defense News*, May 11–17: 24.

Opall-Rome, B. (1998j) "Lockheed Martin, Rafael Pursue New Fighter Platforms for Python 4," *Defense News*, June 1–7: 20.

Opall-Rome, B. (1998k) "Israelis Broaden Missile Defense Role for Laser," *Defense News*, July 6–12: 3.

Opall-Rome, B. (1998l) "Israel Defense Battles Treasury," *Defense News*, August 3–9: 14.

Opall-Rome, B. (1998m) "U.S.-Israeli Team Wins Dual With Lockheed Martin," *Defense News*, August 17–23: 1.

Opall-Rome, B. (1998n) "Netanyahu Orders Israel Defense Budget Hike," *Defense News*, August 17–23: 3.

Opall-Rome, B. (1999a) "Israel Begins Revolution to Modernize Its Military," *Defense News*, March 22–28: 8.

Opall-Rome, B. (1999b) "Israeli Aircraft Industries Boasts Record Profits," *Defense News*, March 22–28: 20.

Opall-Rome, B. (1999c) "U.S., Israel Agree on Wye Accord Aid Package," *Defense News*, February 1–7: 3.

Opall-Rome, B. and Rodan, S. (1998) "Israelis Eye Dramatic Defense Consolidation," *Defense News*, July 20–26: 4.

Plessner, Y. (1994) *The Political Economy of Israel: From Ideology to Stagnation*, Albany, New York: SUNY Press.

Rabie, M. (1988) *The Politics of Foreign Aid: U. S. Foreign Assistance and Aid to Israel*, New York: Praeger Publishers.

Razin, A. and Sadka, E. (1993) *The Economy of Modern Israel: Malaise and Promise*, Chicago: University of Chicago Press.

Reiser, S. (1989) *The Israeli Arms Industry: Foreign Policy, Arms Transfers, and Military Doctrine of a Small State*, New York: Holmes and Meier.

Rivlin, P. (1992) *The Israeli Economy*, Oxford: Westview Press.

Rodan, S. (1998a) "Israel Looks to Technology to Fight Herbollah Guerrillas," *Defense News*, December 14–20: 18.

Rodan, S. (1998b) "Research, Development Cuts Concern Israelis," *Defense News*, November 30–December 6: 12.

Rodan, S. (1998c) "Israel Mulls Nuke Stance Amid New Threats," *Defense News*, June 29–July 5: 3.

Rodan, S. (1998d) "Koor's Move for Tadiran May Spark Israel Consolidation," *Defense News*, November 30–December 6: 24.

Rodan, S. (1998e) "Israel Approves First Defense Budget Hike in 15 Years," *Defense News*, September 21–27: 6.

Rodan, S. (1998f) "Boeing, IAI Discuss Low-End Alternative to AWACS," *Defense News*, July 20–26: 46.

Rodan, S. (1998g) "Israel Will Take F-15s, F16s in Next Generation Purchase," *Defense News*, October 12–18: 50.

Rodan, S. (1998h) "Israel's Rafael Looks to Widen Export Growth, Sales," *Defense News*, February 16–22: 30.

Rodan, S. (1998i) "Israel, Turkey to Conclude Cooperation Agreement," *Defense News*, March 9–15: 28.

Rodan, S. (1998j) "Tadiran Wind Major Breakthrough with Rescue System for US Navy," *Defense News*, July 6–12: 26.

Rodan, S. (1999) "Israeli Military Prepares Structural, Funding Plan," *Defense News*, January 25–31, 1999: 22.

Schmemann, S. (1998) "Israel Redefines Its Dream, Finding Wealth in High Tech," *New York Times*, 17 April, p. A1, 6.

Sennott, C.M. (1998) "High-Tech Homeland," *Boston Globe*, July 17, Business Section, p. 1.

Sharkansky, I. (1987) *The Political Economy of Israel*, New Brunswick, New Jersy: Transaction Books.

SIPRI (1991) *SIPRI Yearbook 1991: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

SIPRI (1992) *SIPRI Yearbook 1992: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

SIPRI (1993) *SIPRI Yearbook 1993: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

SIPRI (1994) *SIPRI Yearbook 1994: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

SIPRI (1995) *SIPRI Yearbook 1995: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

SIPRI (1996) *SIPRI Yearbook 1996: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute.

Sontag, D. (2000) "Israeli Lawmakers Hold Quick Debate on Nuclear Arms," *New York Times*, February 3.

Steinberg, G. (1994a) "Israeli Arms Control Policy: Cautious Realism," *The Journal of Strategic Studies*, 17(2): 1–16.

Steinberg, G. (1994b) "The Political Economy of Science and Technology in Israel: Mutual Interest and Common Perspectives," in Solongen *et al.* (ed.) *The Science Compact: Scientist and the State in Comparative Perspective*, Ann Arbor, MI: University of Michigan Press.

Steinberg, G. (1994c) "Middle East Arms Control and Regional Security," *Survival* 36(1).

Steinberg, G. (1997) "Accountability and Confidentiality in Israeli Military Procurement," presented at the Conference of Political Control of Bureaucracy in Democratic Systems, Research Committee on the Structure and Organization of Government of the International Political Science Association, February 16–18.

Steinberg, G. (1998) "Israel," in *Arms Procurement Decision Making Volume 1: China, India, Israel, Japan, South Korea, and Thailand*, in R.P. Sighn (ed.) Oxford: Oxford University Press.

The Economist, "Linking Arms: A Survey of the Global Defense Industry," 14 June 1997.

The Economist, "Aerospace on the Defense," September, 12, 1998a.

The Economist, "Lets Do Launch," September, 12, 1998b.

Twing, S.L. (1996a) "Special Report: Israeli Defense Contract Illustrates How US Aid Harms American Industries," *The Middle East Report: On Middle East Affairs*, October, p. 72.

Twing, S.L. (1996b) "Defense Intelligence: Congress Calls for Sanctions if Israeli Technology Transfer to China is Proven," *The Middle East Report: On Middle East Affairs*, November/December, p. 9.

Twing, S.L. (1996c) Review of Dov S. Zakheim's book, *The Flight of The Lavi: Inside a US–Israeli Crisis, (1996), The Middle East Report: On Middle East Affairs*, November/December p. 55.

Wald, E. (1992) "The Wald Report: The Decline of Israeli National Security Since 1967," San Francisco: Westview Press.

Walsh, M. and Denny, S. (1997) "UAVs Scout Missions: Emerging Civilian Markets Could Eclipse Military Use," *Defense News*, 12(14): 27.

Watzman, H. (1998) "Israel to Double Number of High-Tech Graduates," *The Chronicle of Higher Education*, VXLIV(42).

Wulf, H. (ed.) (1993) *Arms Industry Limited*, Stockholm: Stockholm International Peace Research Institute.

Zakheim, D. (1999) "Israel May Show Path to Successful Defense Review," *Defense News*, February 15–21: 23.

7 Defense downsizing in South Africa

Soraya E. Goga

Introduction

South Africa's defense establishment faced great challenges in the 1990s, as the nation's security situation changed radically and international sanctions against the previous apartheid regime were lifted. The defense budget decreased dramatically, stabilized and then began rising again in the late 1990s. Many defense firms, reacting to the falling defense budget, exited the market. Others downsized, restructured, and diversified both production and markets in the lean years. However, the absence of a coherent government policy on conversion and the recent increase in the defense procurement budget have meant that South Africa failed for the most part to move people and resources released from the defense industrial sector into other spheres of development.

Between 1980 and the late 1990s, South Africa passed through three national defense phases: militarization in the 1980s, disarmament between 1989 and 1994, and demilitarization from 1994 onwards (Batchelor and Willett, 1998). In the 1980s, South African national defense policy centered on eradicating the internal and external threat of the communist bogeyman and opposing the growing strength of the African National Congress' (ANC) political and military challenge. In the peaceful turnover of power to the ANC that dismantled the apartheid system in 1989, the ANC military arm, previously perceived of as the primary threat to national security, was absorbed into the new military establishment. In the subsequent period, the country entered a period of societal demilitarization, in which civilian oversight of the armed forces was greatly strengthened via the Cabinet, Parliament and the newly created Defense Secretariat. Ideological and financial priorities placed social welfare, housing and education above defense, depressing the military budget and precipitating a period of military disarmament within the country up through 1997.

By the late 1990s, a pro-armament position began to supersede the South African disarmament policy that had held sway since 1994, in part due to new regional security flare-ups. Southern Africa experienced increasing tension as Namibia and Zimbabwe joined the war in the Democratic Republic of Congo, the Angolan peace accord faltered and South Africa invaded Lesotho. These developments strengthened the "hawks" position within government.

The logic of the 1990–99 defense downsizing thrust was not unequivocally accepted either within or outside of government. Ideological support for the military remained strong even though the financial commitment was severely cut back. South African government leaders chose to maintain a technologically advanced defense force, attempted to maintain a portion of South Africa's investment in its arms industry, built up out of necessity during the international arms embargo of the antiapartheid period, and tried to promote South African arms exports where possible. More recently, the government as a whole and the Department of Trade and Industry (DTI) in particular have championed the industry as a productive sector of the economy. In 1999, a major new commitment (R29 billion) to expensive procurement projects signaled the financial shift towards rearmament.

South Africa's defense firms have reacted in various ways to the declining and subsequent rise in the defense budget. Smaller firms exited the market in droves, particularly in the late 1980s. Surviving companies undertook various offensive and defensive strategies in bids to survive. Almost all companies studied in this chapter undertook defensive staff cuts and divisional restructuring. These ranged from Armscor (the state company) dramatically "hiving" off its productive sectors into a separate company to the merging of "like" divisions within the private sector companies of Altech and Reunert. Companies began to focus on increasing their market and client base. Export orientation emerged as a major strategy. Joint ventures are also popular with all the studied South African defense companies in their bids to enter the international market.

Worker and community objections to South African defense downsizing process were surprisingly few and far between in the 1990s. Most protest came from within the industry itself. The geographic concentration of the defense industry in industrialized regions militates against community opposition to defense downsizing. Defense industries are located in the industrial hubs of South Africa, mostly in Gauteng, but also in Durban and Cape Town. These areas experienced defense downsizing as part of a broader manufacturing plant closure in the late 1980s and early 1990s, and thus no special attention was focused on defense downsizing facilities.

South African national security and economy

The security framework

The context of national security in South Africa has shifted remarkably during the last ten years. The security framework from the 1960s onwards focused on both an external enemy, and an internal enemy, personified by the ANC, the South African Communist Party (SACP) and other antiapartheid organizations. The government portrayed the perception of internal and external communist threat to the public as a "total onslaught" against apartheid ideology. The "total onslaught" terminology allowed a passive acceptance by most of the voting population of the subsequent political militarization of society and government.

> Botha and his total strategy and total onslaught continually generate considerable awareness among both the hard-liners and moderate white population. Their overall perceptions of the threat have been such that they have avoided any vigorous challenge of defense expenditure.
>
> (McWilliams, 1989: 63)

Increasing defense expenditure reflected the economic militarization of government policy. Such a policy benefited a military industrial complex, which enjoyed the participation of many of South Africa's business conglomerates. The formation of the National Security Management System (NSMS), an almost parallel state government, represents a third level of militarization (Batchelor and Willett, 1998). The period until 1989 thus represented one of societal militarization at an ideological, economic and political level.

The collapse of communism in the late 1980s resulted in a necessary rethinking of the "communist bogeyman" at an international level. The independence of Namibia in 1989, and the subsequent cessation of hostilities in Mozambique and Angola resulted in a regional dynamic that was far less threatening.

On the domestic front, community defiance and resistance, together with a declining economy, forced government and business into negotiation with the antiapartheid organizations. Old enemies were now becoming friends as the ideological basis of a "total onslaught" security framework crumbled. A new balance of power was imperative, one that included the "ANC elite and constituencies, together with big business and reform minded elements of the former apartheid regime and one that excluded the security apparatus as an independent actor" (Ohlson, 1995: 125).

South Africa then entered a period of disarmament between 1989 and 1994, which is reflected in a declining defense budget and a restructuring of the South African defense force (Batchelor and Willett, 1998). Between 1989 and 1993, the defense budget fell by 44 percent (SIPRI, 1995: 574). The defense share of the state budget fell from 13.9 percent in 1988 to 7.4 percent in 1994. Military expenditure as a percentage of GDP stood in 1998 at 1.8 percent, from a high of 4.2 percent in 1988 and 1989, exceeding the World Bank suggested standard of 2.0 percent (Table 7.1).

Nevertheless, the period after 1994 has subsequently seen a demilitarization of society (Batchelor and Willett, 1998). The association of the militarization of society with apartheid ensured the development of a moralistic antiwar sentiment within the old United Democratic Front structures, various nongovernmental organizations and a faction of the ANC. Coupled with the ANC's strong commitment, in 1994, to social housing and education programs, resulted in a further ideological shift away from militarization. Indeed, after 1994, the new Reconstruction and Development Program (RDP), designed to address the great inequalities created under apartheid, forced a reorientation of financial commitment away from securitization towards economic and social redistribution. Housing and infrastructure were major priorities. These departments witnessed a monetary increase in their budgets and an increase in relation to GDP of 0.2 and 0.4, respectively in 1996.

However, peace and disarmament were never hegemonic positions within the ANC. At an ideological level, the armed wing of the ANC, Umkhonto-we-Sizwe

Table 7.1 Military spending as a percentage of GDP

Year	*% of GDP*
1985	3.1
1986	3.1
1987	3.9
1988	4.2
1989	4.1
1990	3.8
1991	3.2
1992	3.0
1993	2.6
1994	2.7
1995	2.9
1996	2.4
1997	1.7
1998	1.8

Source: SIPRI, 1996: 438, 444, 450; http://www.finance.co.za

(MK), held a powerful position within the organization. Many of the leaders of the ANC were, at some point, members of MK and were more easily co-opted into the existing military industrial complex. The cutting of the defense budget was controversial. In the 1994/95 defense budget debate Joe Modise (Minister of Defense) sided with the South African Nation Defense Force (SANDF) Generals and Armscor against Jay Naidoo (the then Minister for RDP) and Cyril Ramaphosa (the then ANC Secretary General) in arguing against the cutting of the defense budget. Although this is a far call from the militarization of the previous decade, it is also very different from total downsizing.

The legacy of this ideology and the current period of regional instability are having a profound effect on South Africa. The early 1990s represented a period of relative stability within the Southern African region. Namibia peacefully received its independence, South Africa embraced democracy, and the UN had brokered and was now monitoring a peace process in Angola. However, even within this period Joe Modise, the Minister of Defense, still focused on regional instability.

> The immediate threat is that of instability around us. We cannot safely assume that it will not spillover to South Africa or affect our interests: nobody can prophesy which direction the situation in Angola will take; other areas of instability in our region include Mozambique and Lesotho. Further afield, we see serious instability in Sudan and Zaire. We need to be properly defended to ensure that any instability that spills over can be protected against.
>
> (Joe Modise, 1994: 39–40)

In 1977–98, the security outlook worsened in southern Africa. The deterioration of the civil war in the Democratic Republic of Congo and the subsequent

participation of South Africa's neighbors, including Namibia and Zimbabwe, became strong arguments for heightened military preparedness. South Africa invaded Lesotho in 1998, where the humiliation of the SANDF led to calls for a reexamination of the defense budget and the defense procurement process. In addition, there have been increasing calls by the United States for South Africa to act as the "policeman of Africa." This role, if accepted, will force the country to resolve complex and difficult militaristic issues within the region. This could lead to a further prominence of hawks at a political and ideological level, so that a defense agenda becomes more prominent.

A further important shift is the move from the RDP as an economic governing principle to Growth Empowerment and Redistribution (GEAR). The RDP focused on internal social housing and welfare issues. GEAR emphasizes fiscal responsibility and export promotion. It favors exports and thus defense exports and therefore the maintenance of the defense industry.

In the late 1990s, then, South Africa entered a period of rearmament, signaled by the passing of the R29 billion procurement package for the SANDF in 1998 and driven by both security and economic considerations. However, the current constitution and the ongoing reorganization of the civil–military relationship ensures that the nation will not experience societal militarization, as it did in the previous decade.

Civil–military relationships and procurement

Civil–military relations and the creation of a professional force have formed a major part of the debate on the restructuring of the armed forces (see Cilliers and Meitz, 1990). All parties acknowledge the benefits of a relationship where the civilian society, embodied by parliament, asserts hierarchical control over the military. Such a relationship guards against military control over civilian society. This concern is a real one given the controlling role that the security establishment played in South Africa throughout the apartheid history, and particularly in the 1980s through the NSMS.[1] The new order has successfully subordinated the military to civilian control after the 1994 elections. The crux of the subordination was a reorganization of the relationship at every level from the constitution, to the institutions and institutional relationships around defense and defense procurement.

A number of constitutional and legislative changes have occurred in pursuit of a civil–military relationship that sees "civil" as paramount. The Constitution states that the principles that govern national security include the resolve of South Africans to live in peace and harmony, to be free from fear and want and to seek a better life (Section 198). National security is pursued in compliance with international law and is subject to the authority of Parliament and the National Executive (Section 198). The primary function of the defense force is to "defend and protect the Republic, its territorial integrity and its people, in accordance with the Constitution and the principles of international law regulating the use of force" (Section 200(1)).

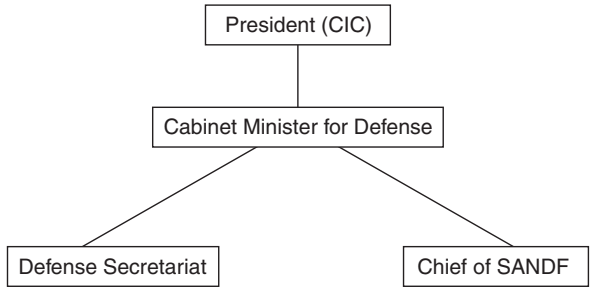


Figure 7.1 South African civilian–military command structure.

As with many democracies, the President is Commander in Chief of the defense force. It is the responsibility of the President to appoint a military commander of the defense force. However, command of the defense force is exercised in accordance with the directions of the Cabinet member responsible for defense, under the authority of the President, that is the Minister of Defense. Finally, the President is accountable to Parliament in the event that he/she declares a state of national defense.

The creation of a Defense Secretariat, established in 1995 under the Constitution, is the substantive institutional change in the civil–military relationship. The Secretariat sits immediately under the Minister of Defense, and at the same institutional level as the SANDF (see Figure 7.1). "This asserts the accepted constitutional principle that an effective democracy requires civilian control of the military" (Steyn, 1995: 32).

The constitutionally accepted roles and responsibilities of this body further subjugate the military to civilian control. The Secretariat advises and sets policy and programs for the SANDF; thus, strategic thinking about military issues no longer rests within the Defense Force. The Secretariat's responsibility in procurement further wrests financial control away from the SANDF. Although the SANDF is responsible for determining its armament requirements, the Secretariat undertakes programming, budget control and an audit of expenditure.

The Secretariat's role in the armaments acquisition process[2] further extends his/her power. This occurs through its membership of the Armaments Acquisition Committee (AAC) and its Chair of the Armaments Acquisition Steering Board (AASB). The AAC approves departmental industry and acquisition policy whilst the AASB coordinates the acquisition planning and technology development, and ensures long-term compliance with SANDF requirements. The reorganization means that "the force is no longer player and referee… as the Defense Secretariat acts as a check and balance in the defense accounting process" (Steyn, 1996: 28).

The political changes in the country, coupled with the institutional changes subjugating the military to civilian control have affected procurement and spending. The composition of spending has dramatically changed (Table 7.2). The operating

Table 7.2 Changing composition of the SANDF budget million (R)

Year	*Capital budget*	*Operating budget*	*Operating budget, as % of total budget*
1989	8,819	11,248	56
1990	7,860	9,934	56
1991	4,921	9,157	65
1992	4,340	8,719	67
1993	3,220	8,225	72
1994	2,694	9,548	78
1995	2,614	8,134	76
1996	1,854	9,462	83
1997	2,101	9,278	82

Source: http://www.amd.org.za

budget (which includes staff and administration costs) has vastly increased. This reflects the restructuring of the SANDF through the inclusion of the African National Congress, Pan-African National Congress and homeland government armies. The capital budget, which reflects procurement, has decreased.

A break in this trend in the defense budget occurred in 1998 when parliament approved a R29 billion procurement program. The procurement program will not affect the budget until 2001 as the government has sought a three year payment holiday from the preferred suppliers. The government will defer payment on work done between appointment and 2001. Nevertheless, the allocation to the Special Defense Account (SDA) increased to R1.8 billion in 1998, from R1.5 billion in 1997. This represents an 8 percent increase in real terms.

The country has also seen an increasing civilian control over arms exports. Armscors' arms export debacle hastened this change. The company, in a bid to increase the income of the SANDF through sales of its arms, fell foul of South African moral opinion through exports to "outlaw" nations including Yemen, Sudan, Rwanda, Angola, Lebanon and Northern Ireland (see Willett, 1995). The 1994 Cameron Commission (instituted in 1994), set up to investigate such sales, recommended the formation of the National Conventional Arms Control Committee (NCACC) to monitor the sales of arms. Parliament formed this committee in 1995 under the aegis of the "neutral" then Minister of Water Affairs, Kader Asmal, an avowed limitationist. The formation of the committee occurred in conjunction with further checks and balances in the arms export process. This includes a Directorate of Conventional Arms Control, departmental reviews, and scrutiny committees. Arms export permits are now also subject to strict controls. Thus, for the first time in South Africa,

> Armscor relinquished control of arms marketing exports to the defense secretariat, with the NCACC as ultimate decision maker – thus taking control of

> South Africa's arms sales and production beyond the exclusive domain of the defense community for the first time since Armscor's creation in 1977.
>
> (Financial Mail, October 20, 1995)

At the level of procurement the implications of the changed relationships is becoming visible through various mechanisms. The current (1999) procurement imperatives were determined through a Defense Review carried out by the Defense Secretariat and passed by Parliament.

The government has also opened defense procurement to the international market. The legacy of apartheid sanctions ensured that the South African defense firms previously received all procurement contracts for the SADF. The changing political parameters instituted a paradigmatic shift in procurement policy. Thus, procurement is no longer driven by secrecy, and thus complete local system development, but also by cooperative joint venture developments (Haywood, 1997: Attachment A). Civilian control over the defense force requirements, and overspending is now entrenched.

Finally, a "spin-on," policy has also allowed for greater civilian participation in defense procurement. The spin-ons relate to two parts of procurement.

> There has been a move away from using purely defense specifications in things like army shoes and shirts to commercial products. Some examples are shoes, shirts, tires for cars, parachutes, etc. Another move is the changing logistics base. Whereas previously military equipment was serviced within the military, we now outsource much of that. For example, the airforce now outsourcers 80 percent of second and third line maintenance to Denel aviation. Denel now does product support and maintenance and keeps the spares, instead of the military.
>
> (Interview with AMD CEO)

Although South Africa has seen a remarkable shift in budget and other priorities, supply side pressures (quite apart from security concerns) still hold some sway within the country. These actors focus mainly on economic arguments including income derived from arms exports and other contributions to the economy. Further, the supply side industry has inherent in it many characteristics from which it derived its strength. The next three sections discuss these three supply side arguments for the continuation of the defense industry.

Relationship of military spending to the economy

Proponents of the defense industry and, thus of increased military expenditure, argue that the industry is a major contributor to the economy of the country. They base their arguments on economic indicators including the contribution of the industry to GDP and to government income, contribution to export income and employment. They therefore argue that it represents a national asset that requires protection. "It is in the interest of the country to optimize the use of those assets and maximize the contribution it makes to the country's economic well being" (Hatty, 1996: 46).

However, they based many of their arguments on false logic. Although the defense industry does contribute to exports, most of its income is not from export capital but from the South African government. The government must coach the debate on defense contribution in terms of "opportunity costs." It should ask whether such state expenditure is the optimal use of state funds. The projected 4.4 percent (in 1993) contribution to total manufacturing output and their 1.4 percent contribution GDP (in 1993) should be viewed in this manner. This debate appears absent within government circles, particularly in the DTI.

The argument on "contribution to state income" is fallacious. Proponents projected that in 1995 the industry contributed more than R1 billion to state coffers (Table 7.3). However, in the same year the state spent R2.6 billion on defense. Industry returned only 40 percent of the state allocation for defense. This represents a subsidy of the sector. Other uses of the resources devoted to defense production (labor, technology, capital) would most likely generate a much greater share of sales in the private sector.

Defense proponents further argue that the defense industry contributes to employment. However, quoted figures for employment vary wildly, ensuring difficulties in calculating actual employment and losses. Armscor and Arms Control and Disarmament Agency (ACDA) quote a defense employment drop of 60,000 between 1990 and 1995 (ACDA Web Page and Interviews with Armscor officials). However, the Aerospace and Maritime Defense Association (AMD) quotes a much lower level of employment and employment losses (3,000 between 1993 and 1996), based on defense-dependent firms, rather than all firms involved in any aspect of procurement for defense. In the top four procurement companies, estimations on employment losses are at about 13,000 between 1990 and 1996 (based on Interviews with defense firms).

Some proponents argue that investment in employees is the strongest argument for a maintenance of the arms industry, with an average investment of about R190,000 per individual (Batchelor, 1995 in Financial Mail, October 20, 1995). Again, however, the government should examine such an argument in terms of the opportunity costs of such investment.

Finally, proponents of the industry use export figures to measure the industry's contribution to the country's economy. Supporters of the industry argue that the industry is the largest exporter of manufactured goods, earning the country needed

Table 7.3 Revenue to the state from the defense industry in 1995 millions (R)

	Sales	*State revenue*
Public sector companies	3,123	590
Private sector companies	2,927	527
Total for industry	6,050	1,117

Source: SADIA, 1996.

foreign exchange. At a microeconomic level, the leading companies do well from military related exports. This accounted for 25 percent (in 1994) of their output as opposed to 9.8 percent for the most technologically intensive industries (Financial Mail, October 20, 1995). The 1994 earnings from exports (R1.09 billion) made the defense industry the second largest exporter after the industrial machinery sector.

However, the 25 percent figure is relative. If internal markets shrink, as they did with the arms industry, the output for export automatically increases even with no real increase in exports. Arms exports have also proved erratic over the ten years of the study and have declined as a percentage of exports in recent years and in real terms from 1996 onwards. However, arms exports are also a very small percentage of total exports dropping to only 0.2 percent of total in 1994 (Table 7.4).

Government expenditure subsidizes exports both directly and indirectly. Indirectly, the government subsidizes initial development of products through R&D spending as well as through initial purchase orders for the product. More directly, the government subsidizes Armscor, which uses its operating subsidy for international marketing of South African arms. The ability to export relies on continued government investment in the industry, rather than through internal dynamics within the industry. Thus, "if government subsidies and other hidden costs are removed from annual sales the contribution of arms exports to the balance of trade and balance of payments is relatively marginal" (Peter Batchelor in Financial Mail, October 20, 1995).

Arguments on the contribution of the defense industry to the economy require further attention. The government must explore these to discern the actual (real) contribution in relation to government expenditure, and in relation to the opportunity costs for the economy. Batchelor and Dunne (1997) suggest using a neoclassical model with aggregate production function to support this conclusion and argue that "military expenditure does not have a significant impact on economic growth in South Africa."

Table 7.4 South African arms exports (1994 million US$)

Year	*Total exports*	*Arms exports*	%
1984	24,010	0	0.0
1985	22070	120	0.5
1986	24,000	39	0.2
1987	29,670	25	0.1
1988	26,150	158	0.6
1989	25,770	232	0.9
1990	26,210	56	0.2
1991	24,980	11	0.1
1992	24,420	94	0.4
1993	24,760	163	0.7
1994	24,990	50	0.2

Source: http://www.acda.gov

Post-Cold War cuts and arms exports

Despite the mixed record of success, both the defense industry and the South African government have made a concerted effort to increase South Africa's arms exports through political lobbying of external governments by the Department of Foreign Affairs and through participation in international shows. South Africa's leaders have also hawked South African arms on foreign trade trips. South Africa has further attempted to increase the number of markets to which it supplies arms.

Both strategies however, have proved problematic. The previous section discussed the sale of arms to "unacceptable" nations. More importantly, arms exports as a percentage of total exports have proven erratic and have actually declined which could be attributable to arms control by the NCACC. Most importantly, current exports are based on technology implemented in the late 1980s when R&D spending was high. Industry insiders argue that with the current low levels of R&D spending, the South African industry will be unable to compete in the export market in the next five years. This has serious implications for a defense industrial retention strategy based upon exports.

The Defense industry

The defense industry in South Africa has always been a powerful supply side actor affecting government policy. McWilliams (1989: 63) described the six sources of internal South African strength for Armscor, and by default, for the defense industry as a whole, as "interlocking corporate directorates, the State Security Council (SSC), the SADF, the arms embargo, the burgeoning defense budget, and P.W. Botha's 'total onslaught'." Of these, the SSC, the arms embargo, "total onslaught" and the large defense budget no longer exist, and the SADF is in transformation. The industry faced a painful period of restructuring in the 1990s. That its power and purview have survived is not due to its size but its oligopolistic nature, its relationship to industrial conglomerates within South Africa and to mergers and consolidation in this period.

Firms: size, distribution, ownership and specialization

In 1997, before major consolidations and international buyouts, South Africa's defense industry was comprised of approximately 800 companies (Interview with Armscor Officials). In 1996 alone, 460 companies applied for accreditation at Armscor, and 682 companies were awarded 4,438 contracts (Hatty, 1996). Some of these firms are crucial contributors to defense production and yet are not defense dependent; Iscor (the Iron and Steel Corporation of South Africa) being one example. Other firms sell products that are necessary for every manufacturing process. Firms that build platforms and systems are more defense dependent and are the major focus of this study. This group was already small and highly concentrated in the mid-1990s, and it became even more concentrated and globalized over the subsequent period.

The AMD, formerly South African Defense Industrial Association (SADIA), which restricts membership to those companies involved only in first and second level contracting, had fifty-three members in 1996, including research organizations and nonprofits. It represented all but four companies at this level (Interview with AMD CEO). AMD members supplied about 94 percent of local defense purchases of Armscor (SADIA, 1996). The industry was highly concentrated in employment, turnover and sales and procurement contracts. Only two AMD companies were 100 percent defense dependent in 1996; two others were more than 70 percent and another ten were more than 50 percent defense dependent. One defense company, Denel, has a staff over 10,000 workers, while five others employ between 1,000 and 10,000. Four firms won the vast majority of defense procurement contracts (Figure 7.2).

The growing concentration within the industry enhanced its power. Consensus within the industry can occur more easily. AMD found the industry easy to organize. It has thus been able to act as an extremely powerful supply side lobby group for the industry. The organization has close links to the Ministry of Defense and has had substantial input into the Green Paper on the Defense Industry and the policies that ensued.

Concentration meant that companies developed specializations. This decreased competition among them but increased their power in the market arena that is, over the government, their main market. For instance, Altech Defense Systems claimed that it holds 80 percent in all product markets within which it operates (Interview with ADS Official). It was in part a response to this domestic trend toward monopolization (and also to inefficiencies and inferior product lines) that the SANDF in the late 1990s decided to purchase a large number of new weapons systems from the Europeans (Dunne and Haines, 2001).

The ownership structure of firms also enhanced the industry's power. Denel, the largest company (in terms of employment, turnover and defense dependence), was 100 percent owned by the state. This gave it a powerful lobbying voice within government. Batchelor and Willett (1998) argue that it is this fundamental political

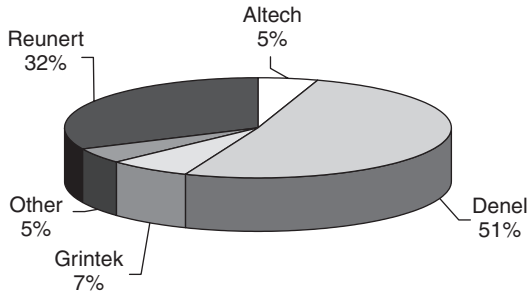


Figure 7.2 Structure of domestic defense market.

Source: Batchelor, 1998.

fact that resulted in the White Paper on Defense calling not for conversion but for the retention of the industry.

By the mid-1990s, the ownership of the private companies reflected the ownership structure of the South African economy. The vast industrial conglomerates that control the South African economy[3] own the largest defense companies. SA Mutual controls Reunert. Until last year, Anglo Vaal (3.6 percent of JSE) owned Grintek. In a recent reshuffling, Anglo Vaal sold Grintek to the Kunene Brothers who are fast emerging as a powerful black empowerment group with strong political connections to the current government. Altech Defense Systems is 100 percent controlled by the Venter family, the fourth wealthiest in South Africa (Turp, 1994: 52).

Such concentration and ownership made it difficult for the government to choose weapons systems that met military needs and kept procurement costs down, or to buy foreign. Also, it made it very difficult to pursue a vigorous conversion strategy. By the late 1990s, the inadequacy of conversion efforts and the persistence of a defense-dependent industry resulted in major changes in government procurement and defense industrial policy. International mergers and equity investment were welcomed, Denel was largely privatized, further consolidation (including vertical integration) was encouraged, and large orders were placed with European weapons makers offering extensive offsets that would maintain and extend employment in South Africa's domestic defense industry (Batchelor, 2000). By 2000, of the six firms accounting for 90 percent of South African defense industry sales, all had major foreign equity partners; one as much as 100 percent (Batchelor, 2001: 4).

Location

Unlike many other countries, including the United States, location of the defense industry in South Africa has not resulted in supply side pressures on the government. South African defense industry production plants are not located in outlying areas but in major cities. The majority are located in Gauteng province, more specifically in the Johannesburg, Midrand and Pretoria region. A few divisions are located in Durban (Mount Edgecombe) and in the Cape (Simonstown). This ameliorates the effects of defense downsizing, as the unemployed are more easily absorbed into diversified regional economies than in some other nations. However, many of the 60,000 workers in the defense industry whose jobs have been eliminated since the late 1980s have not found employment – total formal employment in South Africa has been declining since 1994 (Batchelor, 2001: 14). Local government's explicit concern about defense downsizing is minimal, since job loss in this sector is mirrored by losses across the board.

Government defense industrial and conversion policy

In the mid-1990s, the critical time for shifting defense technologies, manpower and capacity into other sectors was thwarted by the absence of clear signals from the central government. Official government policy on the defense industry was still absent well into the second post-apartheid administration. A White Paper on

the Defense Industry remained in draft form even in 1998. Financial policymaking dominated, with the national financial reprioritization program and a moratorium on SANDF spending, the latter quite detrimental for the defense industry. These should have stimulated conversion and diversification, and to some extent they did. However, the government simultaneously signaled its commitment to the maintenance of a domestic defense industry, in its 1997 Defense White Paper, in the promotion of arms exports by the Departments of Foreign Affairs, and in the energetic involvement of the DTI pursuing offsets as part of the 1999 Procurement Package.[4] Over the ensuing years, the government committed itself more fully to the industry, but only in the context of its decision to rearm and to buy major weapons systems abroad (Batchelor, 2001).

Social welfare programs, including housing, health and education, were the priority of the first antiapartheid government. To move massive resources into this developmental agenda, the government had to undertake military disarmament. In light of the implosion of orders for military equipment, the new ANC government actively called for industry diversification. "There was an unstated policy that the industry should diversify, but the diversification should be market driven" (Interview with Armscor Officials). Bachelor and Willett (1998) have argued that the government raised the prospect of conversion but left it at a rhetorical level. Because defense diversification policy was a by-product of fiscal reprioritization rather than a de facto defense industry policy, a subsequent reorientation of spending towards defense was possible, and emerged with the 1999 Procurement Package.

Political and financial considerations aside, the first antiapartheid government was also unprepared to consider an increase in the defense budget until a policy and a review guide to defense spending was complete (Interview with Defense Secretariat Official). The Defense Review (ending in 1998) produced a policy and vision for a future force through a strategic analysis of the SANDF and formed the basis of the current procurement policy. Sendall states that its final resolution was a "delicate balancing act between military, political and economic requirements."

At an ideological level, the 1997 White Paper on Defense implicitly accepted the maintenance of a defense industry through committing itself to four governing principles:

- a technologically advanced defense force;
- maintenance of core defense capabilities;
- the need for efficient domestic industry;
- approval of major weapons procurement projects at the prerogative of parliament – R80 million and above (1996 figures).

Meanwhile, a solid relationship persisted between the defense industry and the Ministry of Defense during the period of downsizing. In 1997 after the defense budget again plunged, Ron Haywood, Executive Chair of Armscor, stated of Joe Modise (the then Minister of Defense) and Ronnie Kasrils: "They know the

military product, they know the industry, they know the situation. I think the ministers are to be congratulated on a tremendous job of co-ordination. We have tremendous leadership" (AFJI, Jan 1997).

In yet another concession to the defense firms, government support for defense exports continued even as it cut weapons procurement. Armscor officials argued "it was decided in the interests of the Department of Defense (DoD) that exports were crucial to industrial survival as increased production runs also implied better prices for the DoD. Therefore it was economically justifiable" (Interview with Armscor Officials). Support for exports has been political rather than through expensive incentive programs. President Nelson Mandela promoted South Africa's arms in Malaysia and other parts of the world. Mandela argued that "arms are for defending the sovereignty and integrity of a country … From that angle, there is nothing wrong in having a trade in arms" (in Batchelor, Peter, 1998). Armscor devotes a portion of its operating budget to assist the industry in participating in international shows and in the arms sales process (Interview with Armscor Officials).

By the middle of the decade, the government, particularly the DTI, began to view the defense industry as an economic rather than a military asset. DTI officials articulated the economic benefits of the industry including its export income and offsets from the procurement package. An argument favoring the maintenance of the industry as an economic asset superseded any moral stance against the maintenance of the defense industry. Jackie Cilliers of the Institute of Security Studies commented as early as 1994 that "since coming to power, the ANC has changed dramatically from its pre-election stance. They have dropped their idealism and suddenly woken up to the fact that there is money to be made in the arms industry" (Cilliers in Willett, 1995).

Defense industry response and experience

Defense industries internationally have had to confront declining defense budgets in reaction to the end of the Cold War. The South African defense industry had the added stress of responding to a changing domestic economic environment. It had to not only respond to fiscal reprioritization but also to the considerable moral opposition to their existence. The following account surveys what the defense firms did up through 1998, before the new SANDF budget with its large European purchases and complex offsets deals came into force. It shows that many defense firms did diversify substantially, lowering their defense dependency, but they also shored up their military capabilities, through developing export markets, mergers, foreign investment, and positioning themselves for portions of the new SANDF budget and offsets work. This chapter does not address the post-1999 period, one of rearmament and insertion of the South African defense industry to a more fully articulated international division of defense industrial labor.

Many companies did not survive this period and exited the market. The remaining firms undertook both offensive and defensive strategies in a bid to survive financially. They restructured and reengineered defensively by cutting staff and divisions.

Table 7.5 Denel composition of turnover (1990 million R)

Year	*1992*	*1993*	*1994*	*1995*
Turnover	2,208	2,017	2,001	2,017
% Change		−8	−0.8	0.8
Domestic defense/total	63	53	48	45
Export defense/total	16	20	23	24
Domestic civilian/total	20	24	25	25
Export civilian/total	1	3	5	6

Source: Denel Annual Report, 1994, 1995.

Offensively they sought new products through the application of dual use technology, and new markets both internal and external to the country.

The public sector companies, Armscor and Denel, were effective in ensuring the political survival of the industry. Armscor's restructuring and Denel's economic viability reinforced political acceptance of the industry. Private sector companies also influenced the political terrain by supporting a black economic empowerment component of their ownership and through organizing themselves into a lobbying group. Denel managed to restore profitability in the mid-1990s from three sources: sales of assets, particularly from land and property; commercialization, especially in the information technology departments; and an increase in exports. Denel was able to counter falling government weapons sales with both military and civilian exports (Table 7.5). The private sector companies that survived this period were part of multinational holding companies.

Exit or remain?

At the onset of defense budgetary downsizing, many firms exited the market. A smaller defense industry emerged. Firm exit did not result in a supply side backlash. The reasons for this were twofold. First, defense downsizing occurred within a period of economic malaise in South Africa at the end of the 1980s and early 1990s. The country did not perceive firm exit as remarkable, but as part of a broader economic trend in South Africa. Second, these exits occurred in the early period of the South African transition. At this stage, there was minimal support in the ANC camp for the continued survival of the industry, and there was very little chance of successfully lobbying for government assistance.

The private firms that survived were largely those that could adjust easily to the new market conditions without recourse to political or government interference. Surviving firms were often larger firms that formed parts of industrial conglomerates. They could afford a more nuanced and offensive approach to the downsizing process. Further, most of these firms were already diversified, having both defense and nondefense divisions operating within the same company. Second, firms that were involved in high technology software production also found survival easier as they could more easily switch to civilian contracts. This was particularly important

since defense downsizing occurred within a period when South African markets were opening to international markets. Thus one saw some influx of the producer services sector, with subsequent demand for information technology.

Remaining firms and defensive restructuring

Firms used internal restructuring to defensively survive in the new economic arena of the declining defense budget. Internal restructuring was also used, particularly by the public sector firms, to garner political support. Both types of firms used internal restructuring to reorient their business practices to meet internationally accepted standards after years of sanctions.

Armscor's dramatic restructuring was the most significant in ensuring the continued political survival of the industry in the long term. The National Party Government established the company in 1977 after the UN-imposed arms embargo. Thus, it was always a significant supply side influence on government policy. As the only government player before 1992, Armscor exercised monopsonistic power over the arms industry. It acted not only as a procurement agent for the SADF but also as an arms producer. These roles were, at times, contradictory and led to accusations of favoritism from other industry players.

Armscor's contradictory role and its close relationship to government ensured that it entered the post-apartheid era as a much-maligned player. The arms industry and private business as a whole regarded it with suspicion due to its previous monopolistic power and contradictory roles. The ANC saw it as part of the old apartheid forces and thus regarded it suspiciously. Armscor had to confront each of these enmities as well as the economic impact of a declining defense budget in its bid to survive.

In 1991, Armscor adopted a three-point plan that included streamlining, commercialization and marketing. Unlike private sector companies that could seek out commercial and international markets, Armscor was constrained from acting commercially by its designation under the Defense Act. Thus, two of the three adopted points, commercialization and marketing, were impossible under that imposed structure. In its search for survival, Armscor eschewed privatization, commercialization, a sell off of affiliates or shut down, for a fifth, non-obvious solution – the splitting up of the organization into its respective procurement and manufacturing arms. On the April 1, 1992, the latter became Denel, a separate entity. Unlike Armscor, Denel did not fall under the Minister of Defense but under the Minister of Public Enterprise. It operated under the Companies Act, rather than the Defense Act. And, although it was 100 percent state owned until late in the decade, it received no money from the state and operated on a profit basis.

Shifting arms production capacity out of a purely military arena into an economic arena ensured not only Denel's economic but also its political survival. The government began to view the arms industry as a productive sector of the economy. Separating its production and procurement roles mitigated against accusations of unfair business practices. This was the first and most grandiose response from Armscor in response to the shifts in the political and financial climate.

Upon formation, Denel's first priority was defensive economic survival. It too restructured, reorganizing its original twenty-two divisions into eighteen. Denel began operating like other large private companies, in particular Altech and Reunert, who restructured and merged divisions as an economic survival strategy. Denel, Reunert and Altech were able to do this largely because they were part of industrial conglomerates that already owned not only multidivisional firms but also many defense-related firms producing similar products.[5] Altech's three software divisions, Teklogic, UEC and ISIS merged to form ADS. Interestingly, while the defense divisions became part of ADS, the commercial applications within Altech were moved from the defense component into UEC Commercial Party Ltd and subsequently transferred to the manufacturing division of the parent company. In restructuring, ADS also changed its ownership structure, and attempted to increase exports by entering a joint venture with Thomsons CCF in 1998. The firm plans to sell 10 percent of their shares to a black empowerment group in a bid to buy political acceptability.

Reunert has experienced the most difficulties in restructuring, likely due to its concentration in hardware production. Reunert began its restructuring in 1990. It acquired Sandcock Austral, a mechanical engineering firm, in a bid to build their specialization in that field. In 1992 the company restructured again, and Reumech gained all the mechanical engineering capacity. In 1996, Reutech and Reumech merged to form the Reunert Defense division.

The concentration of divisions within the companies made financial sense. As ADS argues "The merger promoted many synergies that existed between the companies, most significant being the technological client base, production facilities and skills" (Altech Corporate Report, 1997). Isolation and separation of the defense industry from the parent firm also allowed the larger parent firm to emerge from the "politically incorrect" wilderness of being an industry that was viewed not only as politically unacceptable, but also as not acting in accordance with accepted business procedures. This was important in a South Africa that was changing politically, and becoming increasingly open to the international business environment. For the most part South Africa's industrial concentration differed from those in other countries as it did not involve takeovers of other external firms. Reunert was the only company to undertake a strategy of concentration and monopolization by taking over other firms.

Grintek's organizational restructuring reacted largely to factors within its parent company, Anglo Vaal, but also strengthened the link between government and the industry. Anglo Vaals' internal restructuring focused upon concentrating on core competencies such as mining. It decided to sell Grintek to the Kunene Brothers – the Kunene Brothers having close ties with the ANC – so the supply side industry gained a closer link with government through the new Grintek ownership structure.

Beginning in 1994, a number of foreign firms, mainly European, made sizeable equity investments in all six of the largest South African defense firms. These investments accelerated after 1998, many linked directly to South African purchases of major weapons systems from the acquiring firm and the insistence upon offsets and industrial participation (Batchelor, 2001).

Defensive restructuring: staffing

The effect of divisional restructuring upon labor has been mixed. Most firms regarded staff as excess costs and treated them accordingly. Armscor attempted a slightly different approach in that it attempted to use its staff as assets and parlay their skills to garner political support.

Companies involved in hardware manufacturing were most hard hit. Total employment at Denel declined from its peak of 30,000 at the end of the 1980s to 13,000 in 1997. Reunert also experienced job losses, from a high of 15,323 in 1994 to 11,112 in 1997. However, it is difficult to measure these accurately due to the constant restructuring within that organization.

Companies involved in information technology and software production such as ADS and Grintek have seen minimal staff losses resulting from active downsizing. ADS's loss (550 at its height and 423 in 1998) was due to natural attrition and poaching of staff from the defense industry by the banking and financial sectors as South Africa opened to international markets (Interview with ADS Official). Also it is easier for companies in software and computer sectors to switch to civilian production and minimize job losses.

Armscor, now a procurement agency, also reduced its staff. The actual number is difficult to discern due to its reorganization into Denel. However, in line with its attempts to reorient itself within the new political climate, it also undertook a strategic hiring policy. It placed various senior MK cadres in management positions within the organization, even while reducing overall staffing. This guaranteed the ANC a modicum of control within Armscor, and also assured Armscor access to the highest-ranking ANC cadres. Even more tactically, it offered the use of its staff's skills to the RDP. However, the RDP rebuffed these offers: "Armscor had hoped that the government would accept our offered project management services for housing, transport etc. They (staff) would have been seconded to those organizations. But this was not accepted" (Interview with Armscor official).

The impact of defense downsizing on staffing has varied across the industry depending on the type of firm and the subsequent ability of that firm to switch markets or production. Apart from Denel, the firms that report the greatest success in this period are those that have had active diversification strategies.

Offensive strategies: exports and joint ventures

Even within this period of downsizing, companies did not eschew actual defense production. Most concentrated on retaining or expanding their defense market through exports, viewing exports as essential to their survival. Initially companies focused on direct exports and they report some success. Those interviewed stated that they had increased export sales. They also contend that exports generated a larger share of their profits. The future of military exports however is unclear, especially given the Cameron Commission's deliberations, which by 1996 put an end to exports to "undesirable" countries. A second problem is that current exports rely on technology developed 5–8 years back. The declining national R&D budget means that an export-oriented strategy is not viable in the long term.

To counter these trends, companies are entering into joint ventures with international firms. All companies interviewed reported existing joint ventures or current negotiations to enter into one (Table 7.6). Joint ventures operate in two ways: they involve joint ownership of the local company or collaboration on particular projects. In either scenario they guarantee access to international markets and can also ensure technology transfer to the local company, usually through joint projects.

Table 7.6 Development with international firms

SA firm	*International partner*	*Country*	*Project*
Aerosud	Westland	UK	Radio products
Aerosud	Marvol Group	Russia	Russian SMR95 engines for SA Mirage F1 & Cheetah Fighters
Atlas Aviation	IAI/EA	Israel	Aircraft upgrade for Cheetah
Atlas Aviation	Eurocopter	France/ Germany	Helicopters
Atlas Aviation	Sextant Avionique	France	New avionics suite for Rooivalk
Atlas Aviation	British Aerospace	UK	Electronics
Atlas Aviation	Marshall Aerospace	UK	C-130 Upgrade
LIW	GEC Marconi	UK	Marksman AA turret on G6 chassis
LIW	GEC Marconi	UK	Nemesis, the Glas 35 mm gun
LIW/Kentron	Bumar Labedy	Poland	T-72 tank w/SA fire control system
Eloptro	Malaysia Optronic	Malaysia	Night vision equipment
Kentron	GEC-Marconi	UK	Missile sub-systems
Kentron	Oerlikon Contraves	Switzerland	Missiles
Kentron	Siemans Plessey	UK	Air defense radar
Kentron	Pilkingtons	UK	Helmet-mounted sites
Mechem	Royal Ordinance	UK	Mine clearance
Mechem	Alvis	UK	Vehicle design
Reumech	ANI Corporation	Australia	Infantry vehicles
Reumech	Vickers	UK	Armored vehicles
Reumech	Alvis Vehicles Ltd	UK	Prod./marketing Mamba armored cars
Reutech	Royal Ordinance	UK	Electronics
Reutech	Daimler Benz Aerospace	Germany	Naval radar
Reutech	GEC Marconi	UK	Radar
UEC (Altech)	GEC Marconi	UK	Naval systems
UEC (Altech)	Mafra Wira	Malaysia	Naval systems
Teklogic (Altech)	FATS	UK	Simulation
Grinaker Avitronics	Vinten	UK	Reconnaissance pods
Grinel	British Aerospace	UK	Radio products
ATE	British Aerospace	UK	Electronics
ATE	Airod	Malaysia	Avionics
ATE	Integrated Technologies/Sys	Malaysia	Electronic warfare
TFM	Westrac Equipment	Australia	Infantry vehicles

Source: Batchelor, 1998: 33.

Most companies see joint ventures as their only means of survival in the current national and international context.

As stated earlier, ADS is 50 percent owned by Thomson CCF. Reunert entered into partnership with Siemans and acquired Africa Cable limited in 1991. In 1994, they entered the tractor market with Landini in Italy and the trailer market with Schmitz in Germany. Denel has been extremely active in joint ventures involving partnerships.

Diversification

Diversification into civilian product and service lines is a short-term response to what companies argue is the cyclical nature of defense spending. Diversification through the application of dual use technologies was an economic strategy attempted by all the large defense firms with varying degrees of success in this mid-1990s period. Some technologies and talent are more easily deployed in new markets than others. For example, information technology companies have found conversion easier than hardware producing companies. The extent of diversification, and the market for diversification differs widely from company to company.

Denel officials contend that they attempt to find a civilian market for all technologies that the firm develops. They report that they have developed 163 products for civilian use. Denel's dual use strategy has met with mixed success. PMP, the unit that produces ammunition, continues to produce metal casing for manufacturing. The propellant business of Denel has also found civilian applications. Across the board, Denel is operating its plants – it has no "ghost" facilities. But civilian output is not making up for lost military orders, so plants are operating at low capacity, and a large number of them are only partially opened. Some have succeeded in renting out space to other commercial businesses. However it is the building and infrastructure that is rented out, rather than the machinery itself, so workers are also displaced. Denel's managers report that civilian sales have increased steadily and by 1996–97 accounting for about 25 percent of production.

The private sector companies appear more measured in their application of dual use technologies, tending to specialize in one or other field. ADS, for instance, focuses on mass consumer markets. It produces the successful Netstar antitheft vehicle tracking system, and the even more popular DsTV, the current cable satellite television technology in South Africa. Grintek focuses on producer goods. They have developed remote electricity metering to counteract electricity meter fraud, and antennas for Vodacom, MTN and Telkom, the cellular and landline phone networks. Again, these are financially successful. Reunert's dual use production focuses on the production of ambulances for commercial purposes. However, Reunert reports that the commercialization process has been unprofitable: "Ventures into non-defense related business which were made in an attempt at diversification away from the military business have generally been a failure, and substantial losses have been incurred" (Reunert Annual Report, 1997).

By 1991, Denel had lowered its defense dependency to 55 percent and the other major firms had greatly reduced their defense dependency. All had reduced military

orders as a percent of total sales to less than 10 percent: ATE (9.2), Reutech (Reunert) (8.8), Grintek (8.5), Vickers OMC (4.4) and ADS (4.2) (Batchelor, 2001: 4).

While production companies turned to diversification for financial survival, Armscor attempted to expand its procurement and marketing mandate to include domestic civilian clients, other government departments and other governments. The company advertises that it can "procure suitable equipment and systems, if they are available for your use, it will assist with any or all aspects of the acquisition cycle according to your needs" (http://www.armscor.co.za). The Airports Company, which manages South African Airports, has taken advantage of this system and has used Armscor to acquire a fire engine. The company has had some work from other foreign governments including projecting managing maintenance contracts in Simonstown for the Indian Ocean French Naval Fleet, and for the Gabonese government. However, these have not replaced the lost procurement contracts from the Ministry of Defense. Armscor officials admit that they "are not making a big impact on the market" (Interview with Armscor Officials).

In addition to its continued procurement role, the company also attempted to consolidate its position as the champion of the defense industry. This was both a political and economic survival strategy. It focused on channeling information to and assisting the defense industry in its export drive. The company established at least five overseas offices. Initially assistance in exports occurred through its role in granting export permits. The company also assisted the SANDF with its sale of its surplus/obsolete stock. Armscor retained 5 percent of the income from these sales. However, since the Cameron Commission the government has curtailed this function. Armscor is now restricted to the promotion of South African exports at international defense and air shows. Armscor, with the DoD, also plays a coordinating and facilitating role in the export process by obtaining memos of agreement with other foreign DoD's (Interview with Armscor Officials).

A third strategic focus in the long-term maintenance of the industry is Armscor's support of the Industry and Technology Retention Fund. Started in 1991, the intention of the fund was to maintain essential defense industry technology in the current shock period (Interview with Armscor Officials). As part of this strategy, Armscor also maintained a number of divisions which could have gone to Denel but were not profitable. These operate as registered companies that contract out their services. They are often subsidized. These include the Alkantspan Artillery Test Range, the Institute for Maritime Technology and the Elandsfontein Vehicle Test Range (Interview with Armscor Officials).

The company has achieved mixed success in its diversification drive. Due to its role as the procurement agency for the SANDF, it can effectively continue to act as the functional channel between the industry and the Ministry. However, at a strategic level it has failed to adequately gain the trust of the defense industry. This is partially due to its favorable relationship with Denel; hence the formation, in 1996, of SADIA (now AMD).

Continued application of dual use technology and diversification is currently at risk, in reaction to the 1999 Procurement Package. Even those companies that have produced (through conversion) and marketed successful commercial products face

continued barriers. The development of the dual use technology is the easiest step in the conversion chain. The major obstacle for conversion is production of the end product within a defense firm. Production for a defense as opposed to a commercial market is fundamentally different. First, the manufacturing specifications differ greatly. Defense items are required to function even under great stress, so quality control standards are much higher than in commercial production. Second, marketing differs for the two. The defense market is usually a monopsony, products being specific to the one client. The commercial market is competitive and requires concentrated marketing and advertising. Companies report that their engineers experience difficulties in moving between the two different "mindsets" required for each type of production. Companies further contend that military and nonmilitary products cannot be developed and manufactured within the same business unit. Almost all had resorted to spinning off the nonmilitary production into separate companies. An Armscor official argues:

> the problem that they are experiencing is that they are finding it very difficult to do both civilian and military production in the same factory. Many companies tried to grow civilian production in military divisions, but they soon split them off and formed other companies and transferred people to these.

The problem with this is that these new divisions/companies and their products can no longer subsidize the defense divisions. When the commercial products are "hived" off, the defense division are left in the same (nonprofitable) position as before. This is the basic dilemma of conversion strategy that focuses on diversification and the application of dual use technologies, rather than full-scale conversion of production.

All companies mentioned that they were again starting to concentrate on what they referred to as their "core competencies." This was clearest in Denel, now implementing a second phase of restructuring. They will focus on artillery, combat helicopters and remote pilot systems as well as infantry systems, ammunition, propellant and heavy caliber artillery. Denel staff contend this does not mean that they will ignore commercial applications. Instead they argue, that only those applications, both military and commercial, that fit into what they recognize as core competencies will be taken forward. The question remains what amount of this will be commercial? For example, Denel officials say that in Naschem (their chemical production plant), they have done some commercializing, but now will concentrate on "core competencies," which will be exclusively in the defense sector.

It would appear that diversification and dual use technology development was a successful survival strategy when defense budgets declined but it is being reexamined in light of the 1999 procurement package and its myriad complex offsets agreements.

Worker response and experience

This section discusses three key labor issues, worker opposition to downsizing, shifts of workers within the industry and the reemployment of workers.

Labor in the South African defense industry was not unionized until very recently and is still not unionized at Grintek and ADS. Initial downsizing occurred with little or no worker protests. Recent experiences at Denel reveal that defense workers are no longer prepared to sit back and watch their jobs be whittled away. The original reduction of the workforce from 30,000 to 17,000 occurred without much reaction but a second phase of the downsizing met with increased worker resistance. The unions have forced Denel to reexamine the way in which it implements its "refocusing strategy." It does not appear that the unions will be able to stop the process – as one official put it, "Unions are in a dilemma, they realize the need to downsize, but also need to protect workers" — however, the unions have changed the way in which the restructuring is to occur. Because of the unions, Denel has been forced to recognize the National Framework Agreement, which dictates the process by which state assets are disposed. The refocusing will proceed with workers receiving assistance through the Restructuring and Training (R&T) Committees at the plant level. As the name suggests, the committees participate not only in restructuring decisions, but also assist in retraining of the soon to be retrenched workers. The story, at least at Denel, is one of defense workers taking advantage of the changing political circumstances to attempt to influence the downsizing process.

The shifting of workers to the diversifying parts of the company is strongly dependent on the type of work that the worker is engaged in. Workers in software production and programming were easily switched to other parts of the company. Engineers (other than software engineers) and shop floor workers did not usually find employment in other parts of the company.

What, then, has happened to the thousands of defense workers since 1994? There is no information on these people, except at an anecdotal level. ADS and Grintek state they have not laid off workers and that those who left have moved on to better paying jobs in the financial services industry. However, both companies employ predominantly software engineers and programmers.

Armscor officials say that the perception is that many have found other jobs. However, they also acknowledge that the economy is not growing, and therefore jobs are not easy to find. They admit that there is underemployment of, particularly, engineers. There is anecdotal evidence of engineers running video stores and corner-shops (Interview with Armscor officials).

Conclusion

Can we see a peace dividend in South Africa and was it reinvested in economy-strengthening measures? In some senses, the benefits of the switch from a militarized society to a demilitarized one are immeasurable. The political subjugation of the military to civilian rule can only have positive effects within the country. Similarly, the psychological benefits of the removal of the military from the townships, and of a changing conception of the military as a protector rather than a destroyer of communities, are also beyond our ability to evaluate. The shift of budget priorities toward social welfare, education and housing sectors has benefited the poorer sectors

of the South African community – and can surely be considered investments with large payoffs for human development. Thus, at the level of what Batchelor and Willett (1998) call the components of militarization, that is political, budgetary economic and societal, South Africa has seen a significant peace dividend.

At an economic industrial level, the benefits of a peace dividend do exist but are less clear. The fact that the government has never instituted a policy or programs for conversion has meant that the potential for rapid redeployment of redundant defense industrial assets for civil industry was squandered in three ways. First, the absence of a coherent policy created space for supply side actors to press successfully for the retention of the industry at considerable fiscal cost and longer term distortion of the country's economic structure (Batchelor and Willett, 1998). At a political level, the industry's restructuring has successfully ensured its acceptance by the national government. The change occurred via a reconceptualization of the industry as an economic rather than a military asset. Thus, at a political level the industry, through its restructuring, has retained some of its power to affect military policy and national budget-making.

Second, the industry has retained its armaments capacity even while diversifying, instead of opting for total conversion. Diversification has been used as a "holding pattern" strategy until new procurement commitments were garnered from the national government. If one measures the success of conversion in terms of continued sustainability and continued spin-offs to civilian use, then the industry conversion is less than fully successful.

Finally, the industry did downsize, but the lack of programs for conversion meant that the retrenched workers, machinery and even technologies were not integrated back into the economy in a productive manner. The government lost an opportunity to invest them in economic growth by providing interim support and encouragement during a period of abrupt change.

Some diversification did take place. All firms surviving in the industry have developed civilian product lines and have lowered their defense dependency. The commercial success of certain products has meant a retention of jobs in some sectors of the defense industry, most notably software, information and satellite technology, and electronics. Their ownership structures and parent company diversification have been key to this aspect of company survival.

In 1999, South Africa reached a crossroads in its disarmament process. The R29 billion procurement package will act as a lifeboat to those companies remaining in defense production. Indications are that commercial and dual use production will fall by the wayside as production for the SANDF and then for the export markets increases. As Peter Batchelor (2001) argues, the South African government has missed the boat for conversion. A peace dividend was generated and reinvested in the mid-1990s, but its size and persistence have been undermined by the decision to rearm, to buy European and to demand widespread industrial participation programs which will help the country's small and relatively uncompetitive defense industrial sector to limp along. Through reinforcing economic and political imperatives, the government will find it difficult not to continue large commitments to defense procurement in the future. South Africa, with the world's worst income

distribution and a terrible record of employment growth over the decade, must come to terms with its military industrial complex and make economic, rather than military, development its top priority, if it is to raise its people out of poverty.

Notes

1 The NSMS was created in 1979 by the then Prime Minister, P.W. Botha. At its head was the State Security Council (SSC), headed by the Prime Minister. The SSC wormed its way into the regional and local fabric of South African society through the establishment of the Joint Management Committees (JMC) which co-ordinated military action and infrastructure provision in the twelve regions of South Africa. Sub-JMC's were created for each of the sixty subregions and a mini-JMC in each of the 450 regions. Finally, a local committee (LMC) was created for every city and designated town. The LMCs reported to the mini-JMC's, these in turn to the JMC's and finally to the SSC (Seegers, 1996: 163). The NSMS system was well funded, and in addition to its intelligence gathering strategies embarked upon a "winning the hearts and minds" strategy (WHAM), that would provide infrastructure to African townships. Through the SSC and JMC the securocrats assumed alternative nonlegislative control over the country (Seegers, 1996).

2 The acquisition process involves all four components of the Department of Defense. These are the Ministry, the Secretariat, the SANDF and ARMSCOR. Within that process, the SANDF is responsible for determining its armaments requirements. The Ministry is responsible for the ultimate political responsibility and authority. The Defense Secretariat undertakes the high level programming, budget control and audit of expenditure. ARMSCOR undertakes program management and contracts the industry for the provision of armaments and materials. These functions are handled through two boards, the Armaments Acquisition Council (AAC) and the Armaments Acquisition Steering Board (AASB). The Minister of Defense chairs the AAC, and approves departmental industry and acquisition policy. The Council includes the Chief of the SANDF, Secretary of Defense and head of Armscor. The AASB is chaired by the Secretary of Defense. It coordinates the acquisition planning and technology development, and ensures long-term compliance with SANDF requirements. The AASB consists of senior personnel in the SANDF and the Defense Secretariat and the personnel of Armscor involved in acquisition (Cilliers, 1996: 44–5). At the level of procurement, therefore, there is a strong civilian control.

3 The South African economy is highly concentrated with the top four conglomerates controlling 76.5 percent of the Johannesburg Stock Exchange (Turp, 1994: 54). These are Anglo-American (43.3 percent), Rembrandt (13 percent), Sanlam (10.5 percent) and SA Mutual (9.7 percent).

4 Economic benefits of R70 billion from offsets have been suggested http://www.polity.org.za/govdocs/pr/1999/procurement.html. See Batchelor (2001) for an extensive analysis of the South African offsets situation.

5 The difference here was that one firm would concentrate on for example naval software, the other on airforce software and so on.

Interviews

Interviews with Altech Defence Systems Official A, June 18, 1998.
Interviews with Altech Defence Systems Official B, June 18, 1998.
Interview with AMD Ceo – Johannes Kriel, June 19, 1998.
Interview with Grintek Official, June 23, 1998.
Interviews with Denel Officials A, June 24, 1998.
Interviews with Denel Officials B, June 24, 1998.

Interviews with Denel Officials C, June 24, 1998.
Interviews with Denel Officials D, June 25, 1998.
Interviews with Denel Officials E, June 25, 1998.
Interviews with Armscor Officials A, June 26, 1998.
Interviews with Armscor Officials B, June 26, 1998.
Interviews with Defense Secretariat Official A, June 29, 1998.
Interviews with Defense Secretariat Official B, June 29, 1998.
Interview with SANDF Official, June 17, 1998.
Interview with Paul Hatty, Journalist, July 4, 1998.

Other interviews

Yacoob Abba Omar – ex-Publicity Officer ARMSCOR – Various.
Peter Batchelor – Researcher – Various.
Interview with Department of Trade and Industry Consultant – Various.

References

Altech Annual Report (1997) The Altech Group: Halfway House.
Anonymous (1995) "Survival of the Fittest," Financial Mail, October 20.
Armed Forces Journal International (1997) Interview with Ron Haywood, January. http://www//afji.com/ mags1997jan
Armscor, *Annual Report 1995/96*, Johannesburg: Armscor.
Batchelor, P. (1995) Financial Mail, 20 October.
Batchelor, P. (1998) Arms and the ANC. *Bulletin of the Atomic Scientist*, vol 54, no 5.
Batchelor, P. (2001) "Defence Industry Globalization: The Case of South Africa," paper presented at the conference on Defence Industry Globalisation, Atlantic Council of the United States, November 16.
Batchelor, P. and Dunne, P. (1997) "The Peace Dividend in South Africa," unpublished mimeograph, Cape Town: Institute for Democracy in South Africa.
Batchelor, P. and Willett, S. (1998) *Disarmament and Defence Industrial Adjustment in South Africa*, New York: Oxford University Press.
Cameron Commission (1995) *Commission Report on Illegal Arms Sales*. Pretoria Government of South Africa.
Cilliers, J. (ed.) (1996) "Consolidated Results of a Nation-Wide Opinion Survey on Attitudes to Selected Security Issues," Halfway House: Institute for Security Studies.
Cilliers, J. and Meitz, P.-B. (1990) "The Military in a Future South Africa," paper presented at conference on The Future of Security and Defence in South Africa, May 1990.
Denel Annual Report (1994) The Denel Group: Pretoria.
Denel Annual Report (1995) The Denel Group: Pretoria.
Denel Annual Report (1996) The Denel Group: Pretoria.
Denel Annual Report (1997) The Denel Group: Pretoria.
Dunne, P. and Richard Haines (2001) "Defence Industrial Restructuring and Economic Growth in South Africa," invited presentation to the South African Trade and Industry Policy Secretariat Annual Forum, Midrand.
Hatty, P. (1996) "Defence Industry Overview: Today and the Future," *African Security Review,* 5, no. 3: 43–55.

Haywood, R. (1997) "The Current State of the SA Defence Industry," Speech to SABRITA. June 12.
McWilliams, J.P. (1989) *ARMSCOR: South Africa's Arms Merchant*, London: Brassey's.
Modise, J. (1994) "Interview with Joe Modise," *International Defense Review*, vol 8, pp. 39–40.
Ohlson, T. (1995) "South Africa: From Apartheid to Multi-Party Democracy," in *SIPRI Year Book: Armaments, Disarmament and International Security*. Oxford: Oxford University Press.
Reunert Annual Report (1997) The Reunert Group: Pretoria.
Republic of South Africa (1997) "Defence in a Democracy: White Paper on National Defence for the Republic of South Africa," Cape Town: Republic of South Africa.
Seegers, A. (1996) *The Military in the Making of Modern South Africa*, International Library of African Studies, London: I.B. Tauris.
SIPRI (1996) SIPRI Year Book, Oxford: Oxford University Press.
SIPRI (1995) SIPRI Year Book, Oxford: Oxford University Press.
South African Defence Industry Association (1996) "Some Statistics on SADIA Members," South African Defence Industrial Association: Johannesburg, January.
Steyn, P. (1995) "Restructuring the South African Defence Force," *Jane's Defense Weekly*, 32.
Steyn, P. (1996) "The Defence Secretariat and the South African Army," *African Security Review* 5, no. 1.
TURP (1994) *The South African Economy*. University of Natal Press: Durban.
Willett, S. (1995) "The Legacy of a Pariah State: South Africa's Arms Trade in the 1990's," *Review of African Political Economy*, no 64, 199–225.

Web sites

The Arms Control and Disarmament Agency (ACDA) became part of the US State Department in April 1999. The old ACDA site formerly located at http://www.acda.gov, is now archived and maintained as part of the Electronic Research Collection of historic State Department materials by the federal depository library at the University of Illinois at Chicago:
http://dosfan.lib.uic.edu/acda/
http://www//afji.com/mags1997jan
http://www.amd.org.za
http://www.armscor.co.za
http://www.denel.co.za
http://www.finance.gov.za
http://www.grintek.com
http://www.polity.org.za

8 Diversification of defense-based industries in India

Sudha Maheshwari

Introduction

The end of the Cold War has not had a significant impact on either the level of India's defense expenditure or the country's commitment to its military industrial infrastructure. The regional security environment has not altered significantly – hostilities continue between India and its neighbors, Pakistan and China – and India has lost its long-term ally, the Soviet Union. If anything, the perception of threat has increased in the post-Cold War period. India continues to feel a need to assert its much-denied position in the world order, and there is strong public support for defense spending. India's defense budget has not undergone substantial changes and there are no significant policies for "conversion" or "downsizing" of defense industries to civilian applications. There is however a small effort to diversify defense-based industries to commercial or civilian applications and products.

India's defense industry is largely state-owned with very little private sector participation, mostly in the form of low-technology inputs. It is comprised of eight large Defence Public Sector Units (DPSUs) and thirty-nine smaller Ordnance Factories (OFs) that are administered under a centralized umbrella body called the Ordnance Factory Board (OFB). The growth of the defense industry was a direct outcome of India's need to be self-sufficient in order to maintain its non-aligned status and was in line with post-independent India's socialist principles of large-scale state-owned industrialization. Although India produces many of the major equipment systems that it needs, it has also imported a lot of military equipment from foreign suppliers. Most of the imports have been from the USSR because of historic political and economic ties and favorable trade agreements. Even where indigenization has been undertaken, there is a high proportion of imported inputs in finished assemblies of military systems.

Two factors have driven the diversification of defense industries in India. First, the performance of India's defense industry has been far from satisfactory in terms of profitability – unit cost of products, resource utilization, inventory control, and timely delivery of systems – and it has been adversely affected by fluctuations in the defense budget. A trend analysis of the growth of defense expenditure in India reveals spurts of spending in a few isolated years rather than a consistent growth, which points to a lack of long-term planning and modernization. Poor performance

is also attributable to the institutional setup of the industry having very little bargaining power *vis-à-vis* the military and bureaucratic personnel.

Second, India's debt burden increased dramatically in the late eighties leading to a fiscal crisis that persisted through the early nineties. Closer scrutiny of public outlays including defense, which constitutes the largest component of central government expenditure, resulted in a slower rate of growth of military spending in the nineties. Furthermore, the fiscal crisis forced a reassessment of India's development and industrialization policies. Significant attempts at restructuring were made and involved government disinvestments from many public sector undertakings. Although the defense industry has felt little direct impact, the restructuring has without question put pressure on these industries to perform more efficiently and has provided the impetus to diversify into civilian markets. Unlike other countries, where the end of the Cold War has driven conversion, in India, fiscal tightening and the poor performance of the defense industries have been the primary motivators.

The diversification process presents formidable challenges to an industry that historically has operated in a sheltered public sector environment. State ownership ensured job security for defense industry personnel and solidified the status quo. The nature of decision-making and bureaucratic inertia have retarded changes in management personnel and practices. Obstacles include limited product range, lack of marketing expertise, obsolete technology, inability to compete in an open market due to high overheads, and consequent low levels of exports. In a period of shrinking defense market worldwide for second-tier producers, efforts to export more weapons have been disappointing. Nor is India particularly adept at negotiating offset orders or buy-back options when finalizing imports from foreign vendors.

Few national policies are in place to guide or assist diversification. Some firms, however, have been able to enter new markets and increase the civilian share of total sales. Large DPSUs, depending upon their product lines, have been better at diversification than the smaller OFs.

This chapter aims to understand the prospects for and extent of diversification of defense-based industries in India in light of the security and institutional context that has guided foreign and defense policy. It analyzes trends in defense expenditure since India's independence in 1947, the relationship between civil and military institutions, the politics of procurement, and the relationships among military spending, spending in other sectors and the economy as a whole. It examines the basic structures and behaviors that shaped the need for diversification and those that posed obstacles to successful outcomes. Diversification of defense-based enterprises in India is essential in the future but difficult to achieve in the present environment because of the scarcity of relevant government policies and the lack of initiative on the part of firms that are ill prepared for diversification. Where firms have been successful, I probe the reasons why.

Field research for this chapter – interviews of key informants from the Ministry of Defence (MoD), defense production units, armed forces, and defense analysts – became a formidable task when the timing of the research – August 1998 – coincided with the political fallout of India's nuclear tests. As a result of this volatile situation,

most informants contacted were unwilling to talk with a researcher from United States, albeit a citizen of India. Under these circumstances, the most practical approach was to talk with defense journalists, defense analysts, and others knowledgeable about India's defense policies, including retired personnel from the MoD and from defense production units.

These sources provided excellent insights into defense planning in India, and invaluable material on India's past policies and strategies. This composite picture of the state of diversification in India is one that likely would not have developed from interviews with key informants. In addition, field research in country provided access to numerous documents not available elsewhere.

Security and institutional context

The security framework includes the nature of external threats and foreign policy that has shaped defense expenditure in the country. Although, military spending constitutes a large portion of India's public outlay, traditionally it has not been well planned, showing large fluctuations over time. Although the country invests heavily in indigenous production of defense needs, it also imports much of its military technology and weapons. Another issue with serious consequences has been the lack of power the defense production units have relative to the armed forces, or the bureaucracy.

Security framework

Two major factors have shaped defense expenditure in India: the changing nature of external threats and the formulation of foreign policies. Factors such as internal threats, the availability of resources, and bureaucratic pressures have also affected defense expenditure through the years.

After independence from British rule in 1947, Indian leaders decided to pay greater attention to development rather than defense. The foreign policy adopted by the nation was one of non-alignment in the emerging East–West conflict. An emphasis on morals and the adoption of *Panchsheela* (five principals governing the conduct of foreign relations based on mutual respect and non-interference) dictated defense policies, and defense spending never rose above 2 percent of GNP (Gordon, 1992). Over time, it was recognized that non-alignment required the development of an indigenous base to maintain the capability of withstanding external pressure (Gupta, 1995). Large-scale industrialization was embarked upon to make the nation self-sufficient in defense and was part of an overall strategy of state-supported production.

In 1962, while India and China were engaged in a war over territorial issues, India was poorly equipped to face China and suffered a humiliating defeat. Following the war, defense was given higher priority; initially defense expenditures rose to 3.8 percent of the GDP but settled to about 2.7 percent by the end of the decade (Table 8.1). India engaged in two more wars in 1965 and 1971, this time with Pakistan. The external environment became even more hostile.

Table 8.1 Trends of expenditure in India and their growth

Year	*Defense expenditure (in billion)*	*GDP (current market prices)*	*Defense forces (1,000)*	*Central Govt. Expenditure (CGE)*	*% Defense expenditure of GDP*	*% Defense expenditure of CGE*	*% Growth Defense Expenditure*
1961–62	2.9	172	490	14.8	1.7	20	
1962–63	4.7	185	562	23.5	2.6	20	64
1963–64	8.2	212	585	32.1	3.8	25	72
1964–65	8.1	248	867	34.9	3.3	23	−1
1965–66	8.8	261	869	39.4	3.4	22	10
1966–67	9.1	296	879	44.6	3.1	20	3
1967–68	9.7	346	977	45.0	2.8	22	7
1968–69	10.3	367	990	45.3	2.8	23	7
1969–70	11.0	404	925	42.9	2.7	24	7
1970–71	12.0	432	930	55.8	2.8	22	9
1971–72	15.3	463	980	67.1	3.3	23	27
1972–73	16.5	510	960	78.5	3.2	21	8
1973–74	16.8	620	948	81.3	2.7	21	2
1974–75	21.1	732	956	97.8	2.9	22	26
1975–76	24.7	788	956	120.4	3.1	21	17
1976–77	25.6	849	1,055	131.5	3	19	4
1977–78	28.1	961	1,096	149.9	2.9	19	10
1978–79	30.6	1,042	1,096	177.2	2.9	17	9
1979–80	35.5	1,144	1,096	185.0	3.1	19	16
1980–81	40.9	1,360	1,104	224.9	3	18	15
1981–82	46.5	1,598	1,104	254.0	2.9	18	14
1982–83	54.1	1,781	1,120	304.9	3	18	16
1983–84	63.1	2,076	1,250	359.9	3	18	17
1984–85	66.6	2,313	1,380	438.8	2.9	15	6
1985–86	79.9	2,622	1,515	531.1	3	15	20
1986–87	104.8	2,930	1,492	640.2	3.6	16	31
1987–88	119.7	3,332	1,502	703.0	3.6	17	14
1988–89	133.4	3,958	1,362	814.0	3.4	16	11
1989–90	145.0	4,568	1,260	950.5	3.2	15	9
1990–91	154.3	5,355	1,200	1,040.7	2.9	15	6
1991–92	163.5	6,168	1,200	1,127.3	2.7	15	6
1992–93	175.8	7,053	1,150	1,277.5	2.5	14	8
1993–94	215.0	8,010	1,100	1,380.3	2.7	16	22
1994–95	230.0	9,456	1,100	1,517.0	2.4	15	7
1995–96	279.0	10,700	1,100	1,830.0	2.6	15	21
1996–97	287.0	12,855	1,050	2,047.0	2.2	14	3

Source: Singh, 1996.

The US imposed an embargo on both India and Pakistan after the 1965 Indo-Pakistan War, but a military alliance emerged between China and Pakistan in 1965. Following the Soviet Union intervention in Afghanistan, the US adopted a policy of containment and established "Forward Defense Areas." Pakistan became a recipient of major military aid to modernize its defense force (Smith, 1994). This military build-up in Pakistan in the seventies was perceived as a threat to India. The intrusion of the Soviet Union and the United States further agitated the already tense regional security environment. Under these circumstances, India and the

Soviet Union became natural allies, and India was drawn into the China–USSR–US conflict (Smith, 1994).

As India became embroiled in the East–West conflict, its government leaders placed increasing emphasis on national security. With the end of the war in 1971, the signing of the Simla Agreement with Pakistan and signs of tranquility on the Sino–Indian borders, the decade of the 1970s witnessed a relatively low annual defense growth of around 13 percent. Much of this was concentrated in a few years when there were very steep increases in defense spending (Singh, 1996).

The high consistent annual rate of growth in defense expenditure in the eighties can be attributed to the heightening of the East–West conflict and to a long overdue re-equipment in the maintenance of the military inventory (Singh, 1996). Growth since then has generally declined and reached a low of 6 percent in 1991–92, a year of fiscal tightening and reforms. The nineties were politically tumultuous due to the political party in power and the perception of threats across the border. Defense budgets varied in response with periods of high growth in certain years.

In general, military spending reflects changes in the regional security environment rather than the end of the Cold War, which in fact ended India's relationship with its long-term ally, the USSR (Jha, 1994; Gordon, 1995). Any perception of threat or aggression from neighbors has been further heightened, the consequences of India's non-alignment means it has to rely solely upon its own military capabilities to defend itself.

Although India's relations with its neighbors have been improving, ruling parties have often used purported threats to advance their political self-interest. This has been facilitated by the fact that differences between India and Pakistan are so deep-rooted on issues of "religious antagonism, territorial claims, and other political differences…" (Thomas, 1992), that even the elite in India have supported strong military spending and the nuclear option (Cortright and Mattoo, 1996).

A review of India's defense expenditure over time reveals very little secular change. Growth has been sporadic, from 6 percent to 31 percent per annum in the span of a single decade, 1980–90 (Table 8.1). One reason is the absence of planned modernization and procurement. Large commitments to purchase have been made by making small down payments which necessitated obligatory payments in subsequent years. In other years, owing to threat perception, agendas of political parties, or a sudden need for modernization, extra funding became available, requiring much higher commitments to be sustained in future years (Ghosh, 1996). This has had a considerable and negative impact on the indigenous defense industry.

Civil military relations and procurement

Defense decision-making in India has remained in the hands of a select few. Although defense budgets are scrutinized by the legislature and annual defense debates take place in parliament, the latter tend to be perfunctory, non-directive and poorly attended. Mediocre participation has been attributed to the lack of information among legislators on defense-related subjects and to the indifference of the media to issues of defense spending. The dominance of the Congress Party

during much of the period since independence has also been instrumental in stifling debate, few politicians from within or outside the party have been willing to challenge the ruling elite with respect to military decision-making (Smith, 1994). National leadership has played a very influential role in defense expenditure in India and this remains the case today. Some increases in defense expenditure can be attributable to Indian leaders' and the elite's dreams of the emergence of India as a superpower.

In accord with the Indian constitution, responsibility for national defense is in the hands of the Union Government. The original defense decision-making process in independent India involved a three-cornered system comprising the Defence Committee of the Cabinet (DCC), the Defence Minister's Committee (DMC), and the Chiefs of Staff Committee (CSC). This system provided for input from the government (DCC), the bureaucracy (DMC), and the armed forces (CSC), respectively. After the war with China in 1962, the DCC was changed to the Emergency Committee of the Cabinet (ECC) to respond to the need for swift decision-making in wartime.

Implementation of defense policy is undertaken by the MoD, which is overseen by the Defence Minister, and his or her colleagues, who run the three major departments within the Ministry – Defence, Defence Production and Supplies, and Research and Development. The budget for the MoD and the armed forces is subject to annual approval by the legislature, which decides on the scale of defense operations and the level of military expenditure. Like many other countries, India has a separate energy budget for nuclear weapons and technology.

The Indian parliament, although constitutionally charged with governance, has been strongly influenced by the armed forces. Between 1947 and 1962, the armed forces were the sole institutions capable of defining the technological parameters of defense policy (Smith, 1994). Since the Sino-Indian war in 1962, the Cabinet and the MoD have become better informed, enabling them to make decisions on procurement and defense policies. The armed forces continue to exert influence on the policy-making process due to the inherent lack of military expertise of the bureaucrats. There have been few cases in which equipment demanded by the armed forces has not been made available (Smith, 1994). Interestingly, the defense industry itself has been the least influential in exerting pressure on the defense needs or capabilities of the country. Publicly owned, with few connections to private firms and having very low levels of exports, the defense industry has largely been the puppet of governmental policies, and has little bargaining power in the defense decision-making arena.

Although committed to producing its own weapons, India is in reality a leading importer of military technology and weapons. Most of its defense imports were from the USSR. Trade was beneficial to India, as the USSR allowed exchange under favorable terms, and in rupees, preventing the drainage of precious hard currency. India purchased equipment from other western suppliers including Anglo-French Jaguars, Dassault-Breguet Mirage F-1, and Saab-Scania Viggen aircraft. In spite of problems associated with the Indian defense industry – delays in production, variances in cost and quality, etc. – the procurement decisions have

often been political, and at times corrupt. Politicians as well as officials of the armed forces are known to have routinely accepted high kickbacks in return for orders placed.

Military spending, production and the Indian economy

India's investment in defense has siphoned resources away from development and social welfare, and has led to increased borrowing. High debt burdens further squeezed not only development spending, but future defense expenditure as well.

India's defense expenditure has stayed quite stable as a percentage of GDP (Table 8.1); but has increased by a factor of 19.5 in a period of 25 years (Ghosh, 1998a). After taking inflation into account, the amount still remains substantial (Ghosh, 1996). Defense consistently accounted for the largest share of national expenditure almost equaling the allocation for civilian activities. In 1954–55, and for the first time, a gap emerged as expenditures increased on "nation building and development services" (Ghosh, 1998a). In 1960–61 the defense spending surged due to the external threat from China. The seventies again saw a balance between social, economic services and general expenditure (which includes defense). In the eighties the annual growth rate of defense expenditure exceeded the growth rate in social and economic services (Ghosh, 1998a). In the nineties, again with the structural reforms and fiscal tightening, defense spending declined.

Military spending has contributed to, and subsequently been restrained by, accumulating public debt. Despite a post-independence commitment to balanced budgets, from 1979 to 1980, the government routinely engaged in deficit financing, and the burden of interest payments ballooned. The government slowed neither the pace of development expenditure nor that of defense expenditure. Without commensurate revenue growth, the Government had to rely on increased borrowing that ultimately led to the fiscal crisis of the late eighties and early nineties (Ghosh, 1996). Interest payments as a percentage of Central Government Expenditure more than doubled during the 1980s (Table 8.2).

The subsequent curtailment of public spending took place primarily in the mining, manufacturing, transport, energy, economic services, and public infrastructure, which in turn affects private investment and the country's economic growth. The

Table 8.2 Shares of Central Government Expenditure by category (%)

Item of expenditure	*1975–76*	*1980–81*	*1990–91*	*1992–93*
Interest payment	8.3	8.1	18.0	21.0
Defense	13.9	13.2	12.4	11.7
General administration	13.4	12.2	11.9	11.6
Economic services	42.4	41.6	33.4	29.8
Social services	21.3	24.0	23.5	25.3

Source: Ghosh, 1998a. Table in the article is sourced to Indian Economic Statistics, Public Finance, Ministry of Finance, Govt. of India quoted in the article Mundle & M. Govinda Rao "Public Expenditure in India – Trends & Issues."

interest burden not only restrained the growth of development spending, but slowly consumed defense expenditure as well (Ghosh, 1998a). As the trend continues, the Government will have to make tough choices and adopt stringent measures to control spending all around. It is unlikely that defense expenditure will go unquestioned in the future and evidence that this has already begun is suggested by lowered figures of defense growth.

It is under these circumstances that one has to analyze the growth and development of the defense industry in India and the prospects for conversion.

The defense industry

The evolution and character of the defense industry in India was a direct outcome of a foreign policy of non-alignment, the ambitions of achieving self sufficiency in weapons production, the changing nature of perceived external threats, and the overall policy of economic development planning and industrialization. Influenced by socialist principles, state-supported industrialization and development was chosen as the model after India's independence.

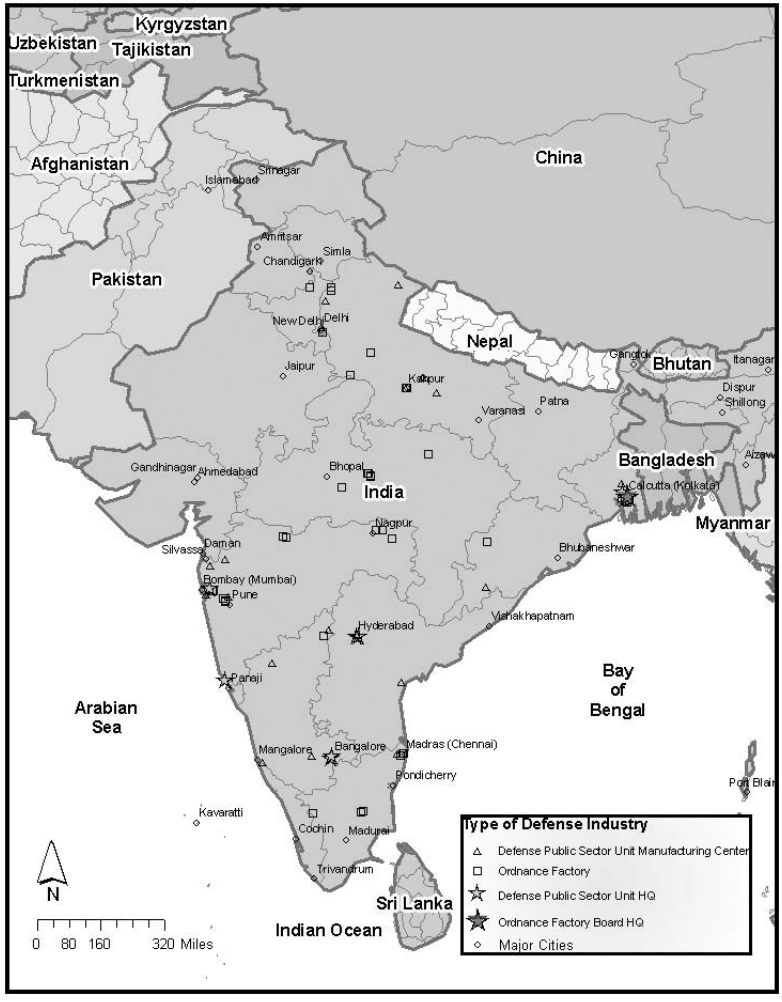
Defense industries were built wholly within the public (state) sector as the private sector at that time was considered by the nation's leaders to be inadequate to address the defense needs of the country. The defense industry today is still largely devoid of private firms (Gupta, 1990) constituting only 6–7 percent of domestic arms production and involved mainly in low-technology inputs (Skoens and Gill, 1997). The private sector has benefited little from direct defense demand. Some indirect benefits may include the building of human capital and spin-off industries, particularly in the aircraft, electronics, and software industries. The growth of high-tech and software-based industries in Bangalore and Hyderabad, both sites of high-tech defense industries, could be further proof. More difficult to determine is a direct causality between the movement of human capital from defense industries to technology based start-ups and venture enterprises, as other factors may have played a role. Recently, the Confederation of Indian Industries (CII) has been lobbying for greater private sector participation in defense production and for increased joint ventures between India's defense industry and the Indian private sector (CII, 1998, 1995).

Components of the Indian defense industry

The Ministry of Defense is politically and operationally responsible for defense production. The Department of Defense Production and Supplies in the Ministry of Defense directs and coordinates production of material and equipment required by the Armed Forces. Thirty-nine OFs and eight DPSUs operate under the Department of Defense Production and Supplies. The OFs are smaller facilities that account for about half of the arms production: comprised of small arms and ammunitions, vehicles, artillery, and other weapon systems. The DPSUs, are larger industrial units, and constitute the other half including aerospace, electronic equipment, and ships. Most OFs and DPSUs historically have been dual use in character. The amount of production in each unit for civilian purposes varies and

the commitment to the civilian sector market is not a core objective. The Defense Research and Development Organization (DRDO), established in 1958, serves the research and development needs of the ordnance factories. Currently there are fifty-one laboratories or establishments under its domain, engaged in the pursuit of self-reliance in critical technologies relevant to national security.

The thirty-nine ordnance factories are spread throughout the country (Map 8.1) and are administered by an umbrella organization called the Indian Ordnance Factory Board (OFB). The factories employ a skilled work force of 163,000. Five categories of OFs exist: weapons, materials, ammunition and explosives, equipment, and vehicles and armored vehicles. These factories produce a wide range of technologies and product mixes – field guns, anti-aircraft guns, mortars and munitions



Map 8.1 Location of defense industries in India.

for guns, rockets, bombs, grenades, mines, depth charges, demolition charges, infantry combat vehicles, optical and fire control equipment, engineering equipment, high altitude and combat clothing, parachutes, blankets, etc. The OFs are mere production centers for prototypes developed in the DRDO laboratories. The factories also engage in licensed production from foreign producers. The disconnection between production, and research and development, contributes to the inefficiencies of the OFs and has been a major reason why they find it difficult to diversify into other areas of production.

The eight DPSUs under the Department of Defence Production and Supplies work on advanced projects and have their own in-house research and development capability. The DPSUs have high labor costs, and relatively low profits (Table 8.3).

Hindustan Aeronauticals Limited (HAL) was established in 1964 with its corporate office at Bangalore. It now has twelve divisions located in six states. The company designs, manufactures, repairs, and overhauls various aircraft, helicopters and related aero-engines, avionics, instruments and accessories. The dual path to production as adopted by the Indian arms industry – the licensed production of equipment and the development of indigenous systems – is reflected best in the aircraft industry. HAL is currently manufacturing Jaguar, Dornier-228 and MiG-27M aircraft, Cheetah and Chetak helicopters, and various types of aero-engines under license from various collaborators. HAL has also been involved in the development of indigenous aircraft such as the Advanced Light Helicopter (ALH) and Light Combat Aircraft (LCA). In 1995–96, about 7 percent of its total sales was for the civilian sector.

Bharat Electronics Limited (BEL), the premier electronics organization in the country, was founded in 1954 and has nine manufacturing units located at Bangalore, Madras, Hyderabad, Machilipatnam, Pune, Taloja, Panchkula, Ghaziabad, and Kotdwara. It designs and develops sophisticated, state-of-the-art electronic equipment for defense services and other paramilitary organizations. In 1995–96 some 36 percent of its sales was to nondefense clients.

Table 8.3 DPSU–employment and performance

DPSU	*No. of employees 1992–93 (approx.)*	*Sales*	*Profit*	*% Defense to total sales (1995–96)*
		1995–96 (Rs million)		
Hindustan Aeronautics	43,400	15,669	706	93
Bharat Electronics	19,400	10,690	207	64
Bharat Earth Movers	15,800	10,111	145	14
Mazagon Dock	13,700	945	129	24
Garden Reach Shipbuilders and Engineers	10,300	829	145	63
Goa Shipyard	2,200	1,352	334	99
Bharat Dynamics	2,000	2,032	179	94
Midhani	1,500	841	61	52

Source: Roy-Chaudhury, 1993–94 and MoD, 1998.

Bharat Earth Movers Limited (BEML), with three modern production units in Bangalore, Kolar Gold Fields, and Mysore, designs, develops and manufactures earth moving machines, track laying equipment, heavy duty trucks, trailers, rail coaches, and diesel engines. It controls 70 percent of the market of earth-moving equipment. Although lodged under the Ministry of Defence, BEML primarily supplies the mining sector; about 80 percent of its turnover is for nondefense use.

Of the eight DPSUs, three are shipbuilding operations. Mazagon Dock Limited (MDL), has units in Bombay, Nhava, and Mangalore, and is the country's leading shipbuilding yard, producing warships up to 6,000 DWT displacement, and merchant ships up to 27,000 DWT. It constructs submarines, missile-boats and destroyers for the Indian Navy, and offshore supply vessels and well-head platforms for the Oil and Natural Gas Commission (ONGC). About 76 percent of its sales in 1995–96 was to nondefense clients.

Garden Reach Shipbuilders and Engineers Limited (GRSE), is a multiunit shipyard-cum-general engineering company with six units in and around Calcutta. It builds warships and auxiliary vessels for the Indian Navy and Coast Guard and repairs vessels for them. Other lines include high-tech ship-borne equipment, marine sewage treatment plants, turbine pumps, diesel engines, and dock-machinery items. In 1995–96, about 37 percent of its sales was for nondefense uses.

Goa Shipyards Limited (GSL), also constructs, repairs, and refits ships and vessels for the Indian Navy, Coast Guard and for the nondefense sector although only 1 percent of its sales in 1995–96 came from nondefense uses. It is currently building offshore patrol vessels of in-house design.

Bharat Dynamics Limited (BDL), was established in 1970 and has units in Hyderabad and Bhanur. It builds guided missiles and allied equipment and is the prime production agency for the manufacture of four new missile systems – Prithvi, Trishul, Akash, and Nag. About 6 percent of its sales in 1995–96 was for nondefense uses.

Mishra Dhatu Nigam Limited (MIDHANI), also located in Hyderabad, is responsible for the manufacture and development of super alloys, heat resistance alloys, tungsten, molybdenum, and other specialty steels. About 48 percent of its products was sold to the civilian sectors in 1995–96.

Five of the eight DPSUs (HAL, MDL, GRSE, BDL, and MIDHANI) are wholly owned by the Government. GSL, was until recently a subsidiary of MDL, but is now a Government company with 51.08 percent of the shares owned by the President of India, 47.21 percent by MDL, and the remaining by other parties.

The location of the defense industries in India has not followed any logical objective of agglomeration or economic development. Political objectives rather than strategic concerns have guided decisions regarding the location of most of the defense factories. Some locational decisions were so politicized that factories were constructed in unsuitable places. One person interviewed mentioned a study that showed the siting of an ordnance factory in Chanda, Maharashtra was entirely inappropriate due to local soil conditions. Likewise, a BMP vehicle factory was set up in Medak in spite of the fact that Jabalpur was ideal given that there was already

a vehicle factory there (Subrahmanyam, 1998). Both Chanda and Medak were constituencies of important political figures, the latter being one of Mrs Indira Gandhi's. Politicians justified factory sitings in backward areas as a strategy of economic development. This scheme worked where entire townships were created along with industrialization as in the case of Jamshedpur, but an isolated plant in an area with few amenities to attract highly skilled labor, has not served the desired objective. The aero-engine factory of HAL built in Koraput (again a politicized decision) required a highly technical staff that were reluctant to move to a totally rural area (Subrahmanyam, 1998). Some agglomeration of defense industries and laboratories can be seen in Bangalore, Kanpur, Jabalpur, Madras, and Calcutta (Map 8.1). However, each of these regions possesses a diverse industrial base and is not heavily dependent on military spending. There are no other regions that are highly reliant on the defense sector.

Performance of India's arms industry

India, with one of the largest arms industries in the non-Western world, is also one of the world's five largest importers of armaments. The dual path of production (i.e. licensed production of equipment and producing systems indigenously) has not yielded the results anticipated by defense planners. Indigenous development of arms has not been successful for several reasons. First, because defense expenditure was not pursued strategically, the production base suffered from sporadic orders and poor financial planning.

Second, without a sound industrial base, the country's military industrial architects were overly ambitious in their visions of self-sufficiency. The policy of isolated indigenization in complex areas such as aeronautics, where even advanced countries must collaborate (e.g. the Eurofighter), was unrealistic. Subrahmanyam (quoted in Gupta, 1990) argues that no country has tried to develop a combat aircraft industry without developing an adequate civil aeronautical industry. The same is true for the ALH, the LCA, and the Main Battle Tank. Even licensed production has fallen short of providing self-sufficiency, as in the production of MiG-21s from the mid-1960s to the mid-1980s. After twenty years of production, import content remains very high. Economies of scale have not been achieved, despite combined industrial and defense demand for alloys, instruments, accessories, and hydraulic system components.

Third, delays in design and production are caused not only by the inexperience of the team involved but also by the structure of decision-making in which production units have very little power. The role of the armed service employee *vis-à-vis* the civilian officers involved in production has contributed to inefficiencies. For example, the Chairman of HAL is a serving officer of the Indian Air Force. The armed forces are known to change requirements in the advanced stages of the product design process and often into the development stage resulting in escalating costs and delays in production. When the weapon systems are finally ready to be produced they are already outdated and the armed forces, used to more advanced technologies, are reluctant to accept them.

Furthermore, the armed forces are partial to the purchase of state-of-the-art weapons from abroad rather than indigenously developed ones as they consider the former superior. Delays in the production process are used as a justification for the purchase of the more desired weapons from abroad. The easy availability of such weapons from the Soviet Union exacerbated this tendency (Gupta, 1990). Gupta has argued that the reason for the success of the Indian missile program (in contrast with conventional weapon production) is largely attributable to the lack of options for reliance on other countries for the procurement of technology. This left the Indian military with no option but to whole-heartedly support the efforts of the Indian scientists. Imports of components have a political twist as the decision to import weapons and equipment is usually a political one. The role of bribes being received by political leaders and their parties should not be underestimated in the procurement process. Many major scandals involving corruption in the procurement process have captured the public and media interest in the recent past.

Finally, the Indian arms industry has been unable to export much for three main reasons: production delays, political considerations such as the sentiment that exporting arms is "immoral," and the lack of marketing strategy (Gupta, 1990). India has not been a very clever player in the negotiation of offsets and buy-back options when procuring weapons from international manufacturers. Even when offsets are involved, foreign manufacturers have dictated terms with regard to time of delivery, cost, and acceptability such that the Indian defense industry has not been able to deliver (Ghosh, 1996). The Indian industry's poor performance in this respect gives the foreign companies an excuse to not accept the buy backs that are manufactured locally.

Therefore, the domestic arms industry produces only about half of the weapons needed for the armed forces in India. In spite of the fact that many of the defense enterprises are running far below full capacity, India continues to rely on foreign technologies, either through direct purchase of systems or through licensed production, which also involves large import of components. The actual rate of self-reliance is 30 percent with ambitions of reaching a target of 70 percent by 2005 (Skoens and Gill, 1997). The latter may turn out to be yet another overly ambitious target. If so, it will entail further waste of enormous sums and crucial resources.

Conversion progress and barriers

The term conversion, so pertinent for other nations covered in this book, is not as applicable to the Indian context. India, never integrally involved in the Cold War, has not substantially changed defense budgets in the post-Cold-War period nor has it forced a restructuring of the industry. Because India's security problems are regional and border-related, and because it relies upon weaponry that has not undergone rapid generational change (Subrahmanyam, 1998), the defense sector is much smaller than in other countries, and as compared to Indian industry as a whole.

The performance of the Indian defense industry has been a subject of much discussion both within and outside the government. Reports of the Comptroller and Auditor General of India (CAG Reports) repeatedly point out idle capacity and

the very high costs of production. It is now recognized that to be viable, both the DPSUs and OFs have to become diversified and dual-use, maintaining a balance between civilian and military production (Subrahmanyam, 1998). Conversion in the Indian context involves restructuring the defense industry to produce more goods for the civilian sector while maintaining military capacities. Some countries would not include maintaining military capacity in their definitions (e.g. Argentina).

Although, the Indian defense industry has always been involved in some production for the civilian sector, it has done so without formal diversification policies at the national level. Most annual reports of the MoD, besides providing production figures for the defense and civil sectors, discuss the diversification needs and efforts:

> Diversification enhances versatility, minimizes unit costs and lends a commercial edge to operations. Surplus capacities are harnessed to address civil and export markets. The scope for diversification is high in the engineering and metallurgy factories. Arms, armament, munitions and explosives afford only limited opportunity though they constitute 80 per cent of the concern of the ordnance organizations.
>
> (MoD Annual Report, 1997–98)

Two forces are working in favor of diversification: (1) the declining growth in defense budgets due to fiscal crises coupled with debt burdens and (2) the poor performance of defense-based industries. The process of diversification is a complex one, OFs and DPSUs have unique organizational structures. While both face similar challenges, the DPSUs have a slight advantage because of their relatively autonomous administration. This is not to say either has been very successful. Some of DPSUs are more dependent on global changes in military spending and production than other DPSUs, or some of the OFs: the manufacture of aircraft and large ships obviously depends more on world markets than the manufacture of artillery or uniforms.

The extent of diversification also varies among DPSUs because of their product base, global market conditions for these products, and the existing composition of sales to the civil and defense sectors (Table 8.3). Bharat Earth Movers Ltd (BEML), for example, has always been primarily involved in civilian production, especially the mining sector. Less than 20 percent of its production has been for defense. For this reason, Ghosh (1996) has argued that BEML should not even be under the MoD. Conversely, BDL, manufacturer of guided missiles and allied equipment, is too specialized in its product to supply the civilian market. It now produces small arms for paramilitary forces of the country but its major client continues to be the armed forces. There is little scope for further diversification. Shipyards are also not well positioned to diversify in light of current excess capacity in the commercial shipbuilding market. To succeed, the Indian Government must prioritize public sector civilian production at units such as Hindustan Shipyards (Ghosh Roy, 1998).

At some DPSUs, diversification has been an imperative. HAL and BEL have been quite proactive in their diversification plans. In its annual reports, HAL

emphasizes diversification as a strategy for survival. Global conditions in the aviation industry after the end of the Cold War made diversification desirable. The company sees the nation's civil aviation sector as an ideal avenue for its products and has launched major initiatives in civil aircraft maintenance, subcontracting of airframe components for international companies, and manufacturing of small 50–70 seater commuter aircraft for commercial airlines. Bharat Electronics Ltd will potentially diversify in telecommunications and information technology based upon its strengths in these high-tech areas.

Although many OFs historically produced for the civilian sector, active diversification efforts can be traced to late 1980s when defense budget changes led to the creation of a new category for OFs. Prior to 1986–87, OFs budgets were part of a minor category of the army's budget. The motivation to drive productivity and contain costs was missing (Ghosh, 1996). Inefficiencies were lost in, and underwritten by, the army's budget. Separation of the OF budgets from the army's was effective in making OFs more accountable, more efficient, and it improved the quality of their decision-making and productivity (Ghosh, 1996). Other changes were instituted in OF organization and functioning due to the new budgeting, including diversification to civilian products. The diversification strategy involved both linear and lateral growth. Linear growth involved customer diversification, lateral diversification equated to product diversification (MoD Annual Report, 1994–95).

At present, the OFs are manufacturing numerous items for the civilian sector: machine tools, arms for paramilitary clients, industrial chemicals, explosives, optical instruments – binoculars, passive night vision goggles – clothing and leather items, and civilian vehicles (Dakshinamurthy, 1998). Efforts to diversify also include manufacturing cold rolling mills for steel plants, axles, armature-shafts, components for diesel locomotives, metal casting, machine components for other public sector units, sports weapon, ammunition-hardware, chemical filling, power generation equipment, and clothing (Basu, 1997a). The Vehicles Factory in Jabalpur decided to begin modifying and upgrading the Jonga, a high-speed military vehicle with gradient-climbing capacity, for introduction into the open market. Out of a captive capacity of 20,000, half are being released on the market, the other are reserved for the military and for export (Ministry of Information and Broadcasting, 1995). The target of these vehicles will be wealthy farmers and rural and urban users of heavy-duty high horse power passenger vehicles.

Diversification has been far from successful, only about 14 percent of the sales of OFs were to nondefense users in 1996–97 (MoD, 1998). High rates of idle capacity are endemic, some 60 percent of the defense industries in India are using just 50 percent of their production capacity. The remainder, running at partial capacity, have Rs 400 million worth of machines lying idle (Basu, 1997b).

Diversification has failed for a number of reasons foremost being the highly centralized decision-making structure of state ownership. The government in India cannot easily fire employees, once recruited, workers become an integral part of the establishment and cannot be removed. Most state employees have job security and are happy with the status quo. Any change is met with significant opposition.

Relatively simple changes, like defense budget reorganization, are met with heated opposition and are difficult to implement (Ghosh, 1996). For many, the state is a perfect employer.

To reduce the overhead costs in OFs, the government has implemented a gradual attrition in manpower through a policy of non-recruitment. Such policies are sometimes the only feasible solution but can be counterproductive because factories lack not only modernization in terms of equipment, but also increasingly the appropriate personnel necessary for upgrading and diversification. Because of organizational and managerial autonomy, the more technical DPSUs, such as HAL and BEL, enjoy greater freedom in hiring skilled personnel.

Ordnance factories are under the supervision of the OFB. Although the general manager of an individual OF runs his or her factory relatively independently, a decision for change of any kind has to be approved and sanctioned by the OFB. Individual incentive to be proactive, to secure civilian orders so as to use the existing facility in a more innovative manner, or to restructure existing capabilities, is stymied. Also, under the current structure, delivery of outside orders is very uncertain because each plant is dependent on the OFB for numerous decisions. One source revealed that a powerful disincentive to diversify and secure outside orders is the dishonor imputed to a general manager who is unable to deliver such civilian goods.

Marketing is another impediment to diversification. The long-term presence of a captive buyer and India's long-time policy on non-export of weapons made it unnecessary for the defense firms to engage in marketing. With recent changes in the budgeting system and the recognition of the need to diversify, the OFB created five Regional Marketing Centers located in Calcutta, New Delhi, Kanpur, Pune, and Chennai, each headed by a Regional Director (Basu, 1997a). At present, the OFB has more than 150,000 employees and a marketing division of only 150 employees. These positions are not sought after, and according to one source, are filled by employees who cannot be placed elsewhere. They have little marketing experience or aptitude (Anonymous, 1998). India's foray into defense equipment and weapons export, is met with resistance on the part of the senior managers pessimistic about getting into foreign markets (Clad, 1990). Without adequate marketing and servicing centers, ambitious attempts like the Jonga will not be successful and cannot compete with other products on the market. The absence of collaboration with the private sector within the country and with foreign companies elsewhere has hampered the development of marketing expertise. This is true for the DPSUs, apart from HAL and BEL, most have very little marketing expertise or foreign partnerships.

Being highly specialized, most defense industry products do not lend themselves easily to civilian applications. Lateral diversification is difficult to achieve and requires in-depth product studies. The OFB hired a consultant to identify products for diversification but the report is not available in the public domain so it is difficult to tell whether any changes have been implemented.

In factories that can be easily switched to civilian goods, such as clothing, diversification has not been successful because high overhead costs due to overstaffing

make it almost impossible for these factories to compete with the private sector. Even for the defense sector, the OFs are supplying products at a much higher cost than what can be procured from the private sector. Examples include socks for $1.28 that cost $0.63 on the open market, and jerseys produced for $6.38 as opposed to $3.10 (Kaushal, 1995). Ordnance factories undergo little modernization so most are using outdated equipment. Lateral diversification requires capital investment and equipping factories with qualified personnel.

Research and development support is also lacking for most defense enterprises, particularly the OFs. Historically operating under licensed production, the factories have never been involved in product development or improvement (Subrahmanyam, 1998). While this setup is somewhat workable with a captive buyer, it is infeasible for a competitive civilian market. It is responsible for delays in supply, and increases in the cost of weapons. Lateral diversification is a challenge to achieve under this organizational setup. Unless major structural changes are made, it will be difficult for OFs to diversify, or justify their existence.

To enhance the prospects for success, the government must thoroughly commit to organizational changes regarding decision-making; it must devise and enforce suitable policies and synchronize these with changes in global scenarios. In the context of India, these changes will not be affected overnight, it will be some time before the Indian defense industry can successfully utilize its excess and idle capacity.

Prospects for the future and recommendations for action

The fiscal crisis of the late eighties and early nineties and the poor performance of the defense industries are the motivators for the diversification of defense industries in India. The fiscal reality of the budget increasingly presses on the nation's policy-makers and planners. Plant closings and layoffs equate to political suicide for the party in power, so a policy of reducing personnel costs slowly through attrition has been adopted. Structural and economic reforms have also been instituted since the early nineties. Many public sector units have come under close scrutiny, and disinvestments from many units have already begun. This does not yet affect the DPSUs or OFs but could. It is difficult to say how events will unfold in the aftermath of the nuclear tests and in the light of increasing tensions on the borders with Pakistan and China. The historical trend of high expenditure in some isolated years of every decade may well continue in the future, extending the legacy of poor planning and management of the defense budget. Prospects for large-scale diversification appear uncertain but the "lumbering giant," as Gupta (1990) has termed the Indian defense industry, will have to be harnessed.

Diversification of defense industries toward dual-use products is an excellent opportunity to begin this process of optimizing limited resources. It provides an avenue not only for the maximum utilization of resources but also for the transfer of knowledge and high technology for the civilian good. It may be argued that large-scale diversification in the Indian context is neither feasible nor desirable because of the military volatility of the region. However, other countries such as Israel and South Korea, also situated in highly conflictual areas, have proactively

promoted conversion and diversification policies. Diversification does not imply outright abandonment of defense production, rather the utilization of resources while concomitantly maintaining military capacities. Diversification will require innovative thinking on the part of the policy-makers to devise solutions that are suitable for the Indian context. It can be successful only if planned and implemented wholeheartedly. Active public-sector leadership is required at the national level to achieve the transition from military to dual-use production. Countries such as Germany, Israel, and South Korea recognized the need for diversification and pursued it aggressively through long-term policies and strategies that caused minimal economic disruption or job loss. India can learn from these examples.

Two critical policy issues need considerable rethinking: privatization, and the decision to produce rather than purchase military equipment.

Privatization

Several options exist for the privatization of defense industries in India, one being the outright sale of some or all the defense units. This option is extreme and not likely to be feasible; some defense firms are of critical and strategic importance and cannot be privatized. Others do not have profit-making potential and are not likely to be sought after by the private sector. Hasty privatization is not an effective solution – if one views the Argentine experience. Countries such as Spain and Israel that embarked on long-term privatization with well-researched policies have had more success. India should also consider longer-term approaches to privatization, keeping in mind the role of joint ventures and spin-offs that result from privatization efforts.

A second option for privatization would involve making the public sector behave more like the private sector – an option adopted in some instances in South Africa and to a lesser extent in China. For those DPSUs and OFs where privatization is strategically untenable, this may be the solution. DPSUs such as HAL, BEL, and others could be made to behave like private sector firms, seeking joint ventures with private companies, and cultivating more nondefense clients.

Commercializing the high-tech products developed in the defense sector is another possibility. Suitable for defense firms and institutions whose products or research can be easily marketed, this plan could lead to technology diffusion into the private sector and would encourage private sector participation in creating products based on technology developed in the defense research and development laboratories. This will require in investment of capital that might not be available presently. Manufacture of clothes, and other goods should be left to the private sector when feasible. This would be in line with the Confederation of Indian Industry's attempts to increase private sector participation in defense production (CII, 1995). A recent willingness to transfer some defense-related research and development results for manufacturing by the private has been witnessed (CII, 1998). For the private sector to be interested, cost effective and timely delivery, better planning of procurement is essential.

A mixture of strategies will have to be carefully studied and analyzed. Those firms that produce goods readily available in the private sector could be privatized, or operated like a private sector firm. In cases, where industries are located in metropolitan areas with high real estate values, it could make more sense to close the plant and capitalize on the assets. Employees could be offered generous compensation plans. Firms that cannot be privatized for strategic reasons, must consider dual-use with commercial operations given the same level of importance as the defense operations. It is crucial that the country address privatization and increased private sector participation on a case-by-case basis and devise the most suitable strategy for each defense producer.

Make versus Buy

India urgently needs to reconsider its policy on domestic production versus purchasing foreign goods. Like other countries such as South Korea and Spain, India can buy from foreign producers and negotiate more lucrative offsets that will strengthen the country's industrial sectors. India can find its niche in the world weapons market and continue to focus on those technologies in which it has a strategic advantage, such as software development, high-tech components, and subsystems. India can continue to develop and produce items it will not acquire from the outside such as missiles, etc. There must be a reassessment of the country's policy of platform production, which has thus far been a failure.

A shedding of the moralistic attitude with respect to the export of defense products is under way in India. Exporting requires aggressive marketing, all the more so in the current environment of worldwide defense cuts and excess capacity. India must accept that its military products cannot compete in terms of price and quality with those of the first-tier producers. Where India can compete, such as in missile technology, it must calculate the risk that exported equipment could be used against itself. This would be particularly serious if an alliance of Islamic countries were to coalesce against India in the event of a war between Pakistan and India (Gupta, 1993).

All these changes will require active initiatives from the government to support better utilization of resources and to actively promote coherent policies and incentives to guide diversification efforts. The government needs to work with the industry and create a suitable infrastructure for diversification where it is a better alternative. In the case of HAL, the Indian government must provide the required backing to get substantial offset production orders against India's foreign procurement and purchases (HAL Annual Report, 1991). India as a whole has to believe that diversification is an opportunity and not a compromise of the nation's military capacity or national security. Lessons from other countries can provide justification for the need and benefits of diversification of defense industries in India. If India does not recognize this, and soon, the high debt and defense burdens will consume funds available for development. India would likely continue its relative downward trend, ranking in the bottom 25 percent of 174 countries in the Human Development Ranking in 1995 (UNDP, 1998).

As long as the perception of threat, real or perceived, remains in the region, the inefficiencies of defense production will continue. Defense expenditure will continue to be justified in the eyes of the public. In the future, it will be crucial to make every effort to reduce threats, especially through international confidence building. There is a likelihood that when this is achieved the country will be able to allocate its national resources judiciously.

Conclusion

The Indian case demonstrates the complexity involved for a developing country to be entirely self-sufficient in producing high-tech goods for its defense. It serves as an example for other countries aspiring to achieve defense industrial capabilities: total indigenization is a lofty goal for a large country like India and may be even more difficult for others. In the absence of partnerships between defense production and civilian sector industries, the development of high tech is not very useful for society, and does not warrant the channeling of scarce resources toward military production. Further, it creates a situation where resources are stretched thin – to achieve indigenization and to import from foreign suppliers – diminishing funds available for development and social needs. It is important for all countries to strategically assess their needs and limitations before embarking on large-scale investment in defense production.

For India's defense industrial investments and capacity to be diversified and/or converted into competitive civilian activities, major institutional changes will have to be undertaken. The current heavy hand of the state in defense industrial management thwarts creativity and frustrates efforts at reform. The government could also nurture greater entrepreneurial activity around talent and technologies emerging from but outside of the defense firms themselves. Some spin-off has taken place – Bangalore's software sector, for instance, has benefited from public investments in the Indian aerospace industry and the stimulation these have provided to new firms and industries in the region. Any effort at controling defense expenditure in India and freeing up resources for development would have to be accompanied by efforts to reduce the volatility of the regional security environment in South Asia and along the India–China border. With the three countries engaged in border conflicts and arms acquisition, both conventional and nonconventional, this region is likely to continue to have poor relations, dominated by military threats as cornerstones of foreign policy (Arnett, 1997). The end of the Cold War has not significantly altered the political or defense landscapes. If anything, it has created new associations between countries in the region and western states. India, having lost its long-term ally, the USSR, is looking to improve relations with other countries; Pakistan's relationship with the United States is troubled; and China is looking westward to make economic ties. The regional equation has altered slightly since the end of the Cold War, but animosity among these countries continues. With all three countries in possession of nuclear capability, the possibility exists for deterrence or for further escalation.

The international security environment can play a crucial role in confidence building and arms control and in creating a regional arms control arrangement. Any measures would require that the regional powers in South Asia be given their due recognition and be included in global security arrangements. Absolute western hegemony is not acceptable to any of the states. The threat of sanctions cannot override the popular support (based on religious and other historical events) for an arms build-up that is evident in this region.

Now that India and Pakistan have declared themselves as nuclear states, it will be difficult to contain hard-won capabilities through force (Gordon, 1994). Other approaches have to be explored to curb further nuclear competition in the region and may include the creation of a new international system in which states can be "accommodated rather than contained" (Gupta, 1993).

References

Anonymous (1998) Personal interview.

Arnett, E. (1997) "Beyond Threat Perception: Assessing Military Capacity and Reducing the Risk of War in Southern Asia," in E. Arnett (ed.) *Military Capacity and the Risk of War: China, India, Pakistan and Iran*. New York: Oxford University Press, Inc.

Basu, B.B. (1997a) "Trends in Defence Production: Case of Ordnance Factories," *Strategic Analysis*, 20(1): 133–43.

Basu, B.B. (1997b) "The Private Sector and Defense Production," *Strategic Analysis*, 20(3): 383–405.

Ministry of Information and Broadcasting (1995) "India," New Delhi: Ministry of Information and Broadcasting.

CAG Reports, Annual Report, Report of the Comptroller and Auditor General (CAG) of India, Union Government of India.

CII (1995) "AIP '95: Army Industry Partnership," in S. Singh (ed.) *AIP '95: Army Industry Partnership*. New Delhi: Confederation of Indian Industries.

CII (1998) "Defense–Industry Partnership: Harbinger of a New Era in Self-reliance," *Communique*, 7(7): 1–4.

Clad, J. (1990) "Power Amid Poverty," *Far Eastern Economic Review* 7, June: 47–51.

Cortright, D. and Mattoo, A. (1996) "Elite Public Opinion and Nuclear Weapons Policy in India," *Asian Survey*, 34(6): 545–60.

Dakshinamurthy (1998) Personal interview.

Ghosh, Amiya Kumar (1998a) "Defense Expenditure as Part of National Resource Allocation," seminar paper presented at the Institute for Defense Studies and Analysis, New Delhi, India.

Ghosh, Amiya Kumar (1998b) Personal interview.

Ghosh, Amiya Kumar (1996) *India's Defense Budget and Expenditure Management in a Wider Context*. New Delhi: Lancer Publishers Pvt. Ltd.

Ghosh Roy, M.K. (1998) Personal interview.

Gordon, S. (1992) "Domestic Foundations of India's Security Policy," in R. Gordon Babbage and S. Gordon Babbage (eds) *India's Strategic Future: Regional State or Global Power?* New York: St Martin's Press.

Gordon, S. (1994) "Capping South Asia's Nuclear Weapons Programs: A Window of Opportunity?," *Asian Survey*, 34(7): 662–73.

Gordon, S. (1995) "South Asia After the Cold War: Winners and Losers," *Asian Survey* 35(10): 879–95.

Gupta, A. (1990) "The Indian Arms Industry: A Lumbering Giant?," *Asian Survey*, 30(9): 846–61.

Gupta, A. (1993) "Third World Militaries: New Weapons, Deadlier Weapons," *Orbis*, 37(1): 57–68.

Gupta, A. (1995) "Determining India's Force Structure and Military Doctrine," *Asian Survey* 35(5): 441–58.

HAL (1997) "Hindustan Aeronautics Limited Annual Report 1996–1997," Hindustan Aeronautics Limited.

Jha, N.K. (1994) "Reviving US–India Friendship in a Changing International Order," *Asian Survey*, 34(12): 1035–46.

Kaushal, N. (1995) "India's Defense Budget: Can it be Reduced?," ACDIS Occasional Paper, Urbana, Illinois: University of Illinois.

MoD (1995) Ministry of Defense, Annual Report 1994–1995, New Delhi, India: Ministry of Defense.

MoD (1998) Ministry of Defense, Annual Report 1997–1998, New Delhi, India: Ministry of Defense.

Roy-Chaudhury, R. (1993–4) "Defense Industries in India," *Asian Strategic Review 1993–1994*, New Delhi: Institute for Defense Studies and Analyses.

Singh, J. (1996) "Trends in Defense Expenditure," *Asian Strategic Review 1995–1996*, New Delhi: Institute for Defense Studies and Analyses.

Skoens, E. and Gill, B. (1997) "Arms Production," in *SIPRI Yearbook 1996: Armaments, Disarmament and International Security*, Oxford: Oxford University Press.

Smith, C. (1994) *India's Ad Hoc Arsenal: Direction or Drift in Defense Policy?*, New York: Oxford University Press, Inc.

Subrahmanyam, K. (1998) Personal interview.

Thomas, Raju G.C. (1992) "The Growth of Indian Military Power: From Sufficient Defense to Nuclear Deterrence," in R. Gordon Babbage and S. Gordon Babbage (eds) *India's Strategic Future: Regional State or Global Power?*. New York: St Martin's Press.

UNDP (1998) Human Development Report, United Nations Development Program. Oxford: Oxford University Press.

9 Defense conversion in China

An economic review

Shaolin Chen

Introduction

As an emerging power, China's defense strategy and efforts at defense conversion have attracted attention around the world. Over the past two decades, a more pacific security environment and a quickening internal commitment to economic development encouraged Chinese leaders to downsize the nation's military-industrial complex. To avoid widespread displacement of workers, many of whom worked in plants located far from the growth centers of the new Chinese economy, the government diverted much of its defense industrial plant, equipment and manpower into making civilian products. This effort has had mixed results. While many people remain employed producing real goods and services, the efficiency of the converted facilities is often poor, and they remain uncompetitive with other producers inside China. This is the subject of this chapter.

Before and during the Cultural Revolution (1966–76), China's defense policies stressed ideology, isolationism, and the imminent danger of total war. To serve this purpose, China spent the bulk of its national investment to construct a comprehensive and self-sufficient defense industry, marked by low efficiency. After Deng Xiaoping's reform policies, the security emphasis became more pragmatic and less ideological. The government began to work more cooperatively within international economic and diplomatic arenas and considered a major conflict in the near future improbable. In early 1980s, China drastically cut military expenditures and procurement. Its defense industry was consequently plunged into crisis. The Chinese government responded by converting firms from military to civilian production (Shichor, 1997) and converting the economy from a planned system to a market system.

China's defense conversion has been characterized by some unique features. First, defense conversion was motivated more by domestic concerns, such as stabilizing employment and improving the availability of consumer goods, than by changes in the international security environment. Second, China has had a comparatively long history of defense conversion; the Chinese government invested heavily and publicly in the process and claimed early success. Third, conversion has not been confined to the defense industry. It should be regarded as a part of the broad economic reforms that have been ongoing throughout the state sector as

part of the change from a planned economy to a market economy. Fourth, China's objective in defense conversion has been not just to downsize military production, but rather to streamline and strengthen it: "swords to plowshares … and better swords." (Folta, 1992).

Defense conversion has been viewed in China as a process of transferring part of extent military capacity into civilian production. It has been successful. More than 80 percent of the output of the defense industry is now for the civilian market, up from only 8.1 percent in 1978 (Frankenstein, 1997). New and spin-off products of varying technological intensity have emerged, many of them widely used in the civilian economy.[1] The defense enterprises exported $7 billion worth of goods in 1997. But the converted plants are plagued with problems, including idle plant capacity, poor management, weakness in R&D and marketing, lack of capital and brain drain.

In this chapter, I begin the analysis of Chinese defense conversion by examining China's economic and security contexts. I explain why China abruptly changed its defense strategy in late 1970s and early 1980s, and I survey the macroeconomic environment in which conversion began. I then evaluate changes in military expenditures and arms imports and exports. I show that throughout the 1980s, China had undergone continuous military build-down and has just marginally reversed this trend in the 1990s. In order to understand the rationale behind Chinese defense conversion, I briefly introduce the history and structure of its defense industries. Particular attention is given to the "third front" – the arc of cities in the interior of the country where much defense industrial capacity was built, a unique and important part of the Chinese defense industry. I then document the defense conversion process, including government policies, industry responses and several interesting case studies. Here, I evaluate the overall results of Chinese defense conversion efforts and highlight existing problems. I close by analyzing the implications of defense conversion and providing policy recommendations for both government and industry.

In addition to other published accounts, the data for this chapter was gathered during extensive background and field research I conducted in China in 1998. Besides reviewing various publications, I interviewed officers in the Commission of Science, Technology and Industry for National Defense (COSTIND) and in various defense research institutes. I also visited several defense enterprises and talked with many firm representatives to learn their specific experiences with defense restructuring. Data is difficult to come by and its veracity cannot always be verified, but the picture conveyed here is generally accepted by both insiders and independent experts.

China's economic and security contexts

China's economic transformation

During the past two decades, China's economy has been transformed from a centrally planned to a market-oriented economy. It has enjoyed spectacular growth – about 10 percent annually. Between 1980 and 1990, GDP per capita doubled and is

expected to double again by 2000. In 1998, despite the adverse influence of the Asian financial crisis, the growth rate was still relatively high at 7.8 percent. Nevertheless, China's economy still has some severe problems. Economic development is geographically uneven, with coastal areas far ahead of inland regions where most defense enterprises are located. Another problem, perhaps more acute, is that although the macroeconomy is performing quite well, portions of the microeconomy is in chaos, especially the state-owned enterprise (SOE) sector.

After operating in a rigid planned economy for nearly thirty years, the SOEs were unprepared for the market system. Several kinds of enterprise level reforms have been tried ever since 1979. In the 1980s, reform focused on the "contract responsibility system" and on decentralization of decision making. In the early 1990s, the joint stock system was introduced into the SOE sector. Today, the "modern enterprise system" has become very popular. These reforms have solved some problems for the SOEs. Nevertheless, the SOE sector is still declining compared to other non-state-owned enterprises. By the mid-1990s, they accounted for only about one-third of industrial production, but provided two-thirds of urban employment and absorbed about three-quarters of investment. A 1997 World Bank report noted that SOE industrial overcapacity was more than 40 percent, with about 50 percent of SOE industries suffering net losses.[2]

In a desperate attempt to reverse this trend, the central government encouraged enterprises to downsize. In 1997, the official urban jobless rate was 4 percent, including some 8 million workers laid off from the SOE sector, which employed a total of around 110 million workers (Jin, 1997). In 1998, this figure continued to rise as millions more workers were either laid off or sent home without being officially fired (*xiagang*). Unemployment, which was unknown to most Chinese just ten years ago, has become the primary concern for both the government and the people.

The defense industries, as a part of SOE sector, shared its fate over the past two decades. The expansion of the domestic market was essential for their initial success. Defense industries took part in all the major economic reforms and benefited greatly from them. However, even after twenty years of reform and restructuring, the defense industries still exhibit all problems associated with China's SOEs, perhaps more severely than the average SOE.

Regional security and defense strategy

During the first thirty years of communism, China was involved in several regional conflicts along its borders. In the 1960s, China had serious conflicts with the two superpowers, the United States and Soviet Union, and was concerned with the imminent danger of major, even nuclear wars. By the end of the 1970s, China had set up a kind of strategic cooperation with the United States but was still encircled by adversaries such as the USSR, India and Vietnam.

Since the early 1980s, China's relationships with its neighbors have improved to some degree. China has reduced tensions along its borders and introduced confidence-building measures into bilateral relationships with former adversaries the USSR/Russia, Vietnam and India (Frankenstein and Gill, 1996). Yet despite the

collapse of the USSR and gradual retreat of the United States from the East Asia, the level of tension and potential for conflict is still there.

Taiwan's commitment to independence is a major source of tension in the region. The Chinese regard the issue of Taiwan as an internal affair and strongly oppose other countries' intervention. Although under pressure from the international community, China will be reluctant to use force against Taiwan unless it declares independence, the sustained tension encourages an arms race across the strait. In addition, contesting claims in the Spratly (*Nansha*) Archipelago have involved a number of states. Both China (Taiwan) and Vietnam claim the entire archipelago.

Fortunately, the security situation in East Asia has tended toward détente in the 1990s. Economic interdependence has deepened mutual reliance. Top Chinese leaders have recently stressed the will to settle disputes through peaceful negotiation in accordance with commonly accepted international laws. China also committed to co-exploit the Spratly Archipelago without specifying sovereignty.

The improvement in relationship with the United States and its land-based former enemies demonstrates China's changing perception of the macro-security environment as peaceful with little possibility of major war. In contrast, the uncertain relationship with its water-bordered neighbors (Northeast Asian and ASEAN countries) and the Taiwan issue encourage China to focus its defense strategy on small scale and locally limited conflicts.

Changes in China's military spending and arms trade

Military spending

Given ongoing tensions, it seems odd that China began its massive defense cuts in the early 1980s. The government was very much concerned with the very real need to develop the national economy (Moller, 1997). Without major economic growth, it would be impossible to maintain social and political stability. Chinese leaders switched their emphasis from defense to economic modernization.[3] Since then, they have opted pragmatic ally to work within the international system, seeking external assistance. A favorable security environment is valued chiefly for its contribution to the developing economy.

China reduced its military capacity continuously throughout the 1980s. From 1984 to 1994, China reduced the number of People's Liberation Army (PLA) military personnel by 30 percent, from 4.2 million to 2.9 million. The number of military area commands was reduced from 11 to 7.

According to China's official statistics, its military spending (nominal) dropped from RMB 22.27 billion in 1979 to 16.8 billion by 1981, and it remained at this low level throughout the 1980s.[4] The military's purchasing power fell by a quarter from the late 1970s to the early 1990s (Gurtov, 1993). The trend of military spending is more meaningful when expressed as a percentage of GNP, which show a more pronounced decline (Table 9.1). A significant new trend upward in real (inflation adjusted) military spending occurred after 1990. Since then, nominal defense

Table 9.1 China's military expenditure (1994 million US$)

Year	*Military expenditure*	*Military expenditure/ GNP* (%)	*Military expenditure/ central government expenditure* (%)	*Military expenditure per capita*
1984	53,220	5.8	26.1	51
1985	53,230	5.1	23.8	50
1986	52,010	4.6	19.3	49
1987	52,460	4.2	19.5	48
1988	53,110	3.8	20.0	48
1989	52,370	3.6	19.1	47
1990	52,610	3.5	18.8	46
1991	49,470	3.0	17.3	43
1992	51,210	2.8	16.9	44
1993	52,680	2.5	16.3	45
1994	52,840	2.4	18.0	44

Source: US Arms Control and Disarmament Agency, 1995.

Note
These estimates are higher than those published by the Chinese government. In 1986 and 1993, for example, official Chinese sources calculated Chinese military expenditures, respectively, at 2.0 and 1.2 of GNP. Information Office of the State Council of the People's Republic of China, 1998.

spending has grown by double digits every year and doubled in six years, which wipes out a large portion of the peace dividend from the 1980s.

It is common knowledge that official figures cover only a part of the total military spending. China's figures do not include spending on military research and development, military industrial construction and maintenance (Wang, 1996). Outside observers also argue that the PLA receives funds from such extra-budgetary revenue sources as arms sales and defense-related allocations in other government agency budgets. Although the size of these additional resources cannot be estimated accurately, it is commonly believed that actual spending is about 2–3 times the official figures. Some sources, such as the World Bank and IMF, publish much higher estimations for China's military spending, sometimes 7–8 times of the official figure (Montaperto, 1995). Aside from the aforementioned reasons, these discrepancies are largely due to adjustments for purchase power parity. However, the trend in defense downsizing is unambiguous since China has used the same budget system for decades, and there is no sign of significant change in its structure, regardless of the actual spending levels.

In recent years, there has been a lot of talk about off-budget revenues available from the profit of defense industries and PLA enterprises. Some have estimated that the PLA earns as much as $5 billion from their commercial activities (Wang, 1996). However, given the harsh economic environment of the recent years, it is unlikely that the PLA can make so much money – in 1998, the total net profit from all SOEs was less than $2 billion. In addition, the PLA's enthusiasm for moneymaking activities has diverted energy, fostered corruption and disrupted discipline. It has also had a negative impact on the army's reputation (Si, 1995). In late 1998, the central government passed a series of rigid regulations requiring the

army to withdraw from all commercial activities except perhaps farms. Thousands of army-owned enterprises were transferred to local governments.

Partly to compensate the PLA for its losses from cessation of commercial activities and partly to prepare for the potential conflict with Taiwan, military expenditure increased by about 13 percent in 1999. It is expected to increase further in the next decade, but it still may not be enough to support China's ambition as a world power and all its territorial claims.

Arms imports and exports

Until the early 1980s, China did not engage extensively in arms trading but simply transferred billions of worth (yuan) of conventional weapons to its allies without compensation. Pakistan, North Korea and Vietnam were among the leading recipients. There are two principal reasons why China sends weapons so generously. The first is ideological – that is to support world revolution. Perhaps the more important reason is to strengthen its vulnerable security environment and to win allies along its borders. Neither of these goals was achieved, which explains why China abruptly changed its strategy in early 1980s.

In late 1970s and early 1980s, China began to participate actively in the world arms trade and became one of the world's major arms dealers. China's arms exports boomed in the first half of 1980s and peaked in 1987 when it exported to both Iran and Iraq. Throughout the 1980s, Iranian and Iraqi purchases accounted for almost 50 percent of China's $21.7 billion in arms export earnings (Hyer, 1992). Throughout the 1980s, China was the fourth largest arms exporter to developing countries (Gill, 1992). Nevertheless it fell far behind the United States and the Soviet Union. While the top two combined provided nearly 60 percent of arms sales to developing countries between 1981 and 1991, China's share was just 3–7 percent (SIPRI, 1997).

The main motive behind weapon exports appeared to be commercial (Hyer, 1992). Occasionally, weapons were shipped under strong objections from the Ministry of Foreign Affairs or PLA. There exist two distinct systems engaged in arms sales. One is composed of the trading companies of the defense industries; the other is that of PLA. They compete with each other on the market. For the defense industries, arms sales were often the only way to survive sharp cuts in domestic orders. For the PLA, hard currency was badly needed to make ends meet (and to improve soldier's living standard). In most cases, the earnings stayed with the trading organizations, which made the government more difficult to detect sales, let alone control them.

Since the 1980s, China's arms exports have declined (Table 9.2). According to China's official data, military exports have never exceeded 1 billion US dollars in the 1990s. Although some of its arms deals have attracted much attention, China is losing share in the world weapons market. With its absence of advanced weapons technology, it has a difficult time competing in a world with considerable defense industrial overcapacity.

Compared with its arms sales, China's military technology transfer has caused much greater anxiety. It is widely believed by the United States that China transferred

Table 9.2 China's arms trade (1990 million US$)

	1980	*1982*	*1984*	*1986*	*1988*	*1990*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Import	0	15	54	81	59	177	1,176	1,097	341	697	1,102	1,816
Export	766	1,486	2,159	2,105	2,311	1,202	835	1,108	687	887	679	170

Source: SIPRI Arms Transfers Database, 1998.

nuclear and missile technology to Iran and Pakistan, although it is impossible to verify. Partly under pressure from the international community, China has changed its practice gradually. In the past several years, the Chinese government has issued strict regulations regarding nuclear and dual-use technology transfer, and for chemical and conventional weapons (including missiles and launchers). Whether these regulations can be effectively carried out is a big test for the Chinese government.

With the exception of the Korean War period, imported weapons have never been a significant part of the PLA's inventory. In the early 1990s, however, China has increased its weapons and technology acquisition. The purchase of Russian weapons (Su-27, Su-30 fighter and Kilo-class submarine) was a very important component in the Sino-Russian military relationship. This relationship may be strengthened in the next decade with the imports of more advanced weapon systems and carrying out of other military cooperation projects. There are also some rumors about Sino-Israel cooperation, though many claim these projects have not lead to significant breakthroughs in China's military R&D. A SIPRI research report concluded that China had only been able to get second-rate weapons and technology (SIPRI, 1995). In general, Chinese arms and arms technology acquisition should be regarded as modest compared to the size of PLA and of its defense industry.

The evolution of China's defense industry

China boasts a huge and comprehensive defense industry. Since the birth of communist China, the Chinese Military-Industrial Complex (CMIC) has formed an important sector of the state-owned industries. In the late 1950s, with help from Soviet Union, the central government set up several "machine-building industries" (MBIs), each with the administrative status of state ministries: nuclear, aircraft, electronics, ordnance, ballistic missiles and naval vessels which were quite similar to Soviet Union's defense industries' system. Military R&D and production were monitored by two independent organizations: the PLA National Defense Science and Technology Commission (NDSTC) and State Council National Defense Industry Office (NDIO). By the late 1960s, the CMIC had evolved into several huge, vertically integrated industrial systems with their own plants, suppliers, research institutes and colleges. Before the onset of defense conversion in early 1980s, the CMIC had a total of more than 4 million employees, 2,000 large pillar enterprises, 200-plus major research institutes, and over 300,000 engineers and technicians.[5]

The CMIC is composed of two distinct systems – ministries and corporations under the state council on the one hand (usually called "defense industries"), and

Table 9.3 Evolution of the defense industries

Ministry/Corp. (1982)	*Ministry/Corp. (1988)*	*Ministry/Corp. (1995)*
Nuclear Energy Ministry	Ministry of Energy Resources	China National Nuclear Corp.
Aviation Ministry	Ministry of Aerospace (MAS)	Aviation Industries of China (AVIC)
Electronics Ministry	Machine Building and Electronics Industry Ministry (MMBEI)	Ministry of Electronics Industry
Ordnance Ministry	MMBEI	Ministry of Machine Building Industry (China North Industries Corp.)
Ship Construction Corp.	No change	No change
Space Industry Ministry	MAS	China Aerospace Corp.

Source: Frankenstein and Gill, 1996.

the PLA enterprises on the other, which mainly produce and maintain light weapons (usually called "military industries"). Due to their decisive role in both military and civilian production and conversion efforts, the defense industries are the focus of this chapter. Unless otherwise indicated, the CMIC data in this chapter are all for the defense industries.

Since the economic reform of late 1970s, the CMIC's organizational structure has undergone sequential major changes (Table 9.3). One key organizational change occurred in August 1982 when the NDSTC and NDIO were merged to form the COSTIND. COSTIND is responsible for the coordination of military R&D, production and defense industry conversion. It directly reports to the State Council.

Since 1997, structural adjustment has accelerated. In late 1997, a fourth general department, General Armament (the three other original departments were General Staff, General Politics and General Logistics) was set up under the leadership of the Central Military Commission (CMC). It is obvious that it will share part of the power enjoyed by COSTIND. In March 1998, the last two ministries of defense industry – the Ministry of the Machine Building Industry and the Ministry of the Electronics Industry – were dissolved, their management functions transferred to other purely civilian commissions. On July 1, 1999 China's five major defense industry groups (except the Electronics Ministry) were each divided into two independent corporations. They are no longer under the direct regulation of COSTIND and are supposed to compete with each other for contracts (Xin Hua News Agency, 1999).

The third front

The interior and scattered location of China's defense industry makes defense conversion more difficult. For security reasons, a large part of the defense industry

was relocated in the late 1960s and early 1970s to the remote, mountainous areas of southwestern and northwestern China to build the "third front" (*sanxian*) industrial base. Facing the threats from the United States (escalation of the Vietnam War) and souring Sino-Soviet relations, China found itself confronted with the possibility of hostile action by either or both superpowers. The Chinese government considered it too risky to concentrate its entire defense industry in a few coastal cities.

The third front region includes all or part of the provinces of Sichuan, Guizhou, Yunnan, Gansu, Qinghai, Ningxia, Hunan, Hubei, Henan and Shannxi. The objective of the third front construction was to create an entire industrial base with defense industry as its pillar within naturally remote and strategically secure regions. The effort and investment to build the third front were enormous, since both the factories and the infrastructure had to be built from scratch. According to the Encyclopedia of the Chinese Economy, the scale of the project included a total investment of about 200 billion RMB, employing 16 million people to build about 29,000 factories. Through 1971, with the exception of petroleum exploitation, the third front construction received the highest priority in the national development plan. Approximately two-thirds of national industrial investment went to the third front during its prime construction period, of which 20 percent was directly devoted to the military industries (Naughton, 1988). Much more money was put into the construction of the necessary road, railway and living facilities.[6] By the end of 1970s, third front defense enterprises accounted for about 50 percent of the total production capacity of the CMIC. They also accounted for over one-third of state-owned industry in the third front region.

From a strategic point of view, the remote location made the defense industry much more "secure." However, from the perspective of economic efficiency, the third front has cost China a great deal. Even today, the third front areas are still performing far behind other, especially coastal, regions. Because this industrial development strategy failed to take into account the needs of the civilian sector or the overall national deployment of human and capital resources, these huge public investments resulted in relatively deformed and dependent local economies.

By late 1970s, the far-flung interior locations of about half of China's defense industrial base were one of the leading problems facing the CMIC. Reports from both within and outside China identified the problems of the third front industries – insufficient infrastructure, redundant construction, idle productive capacity, poor living conditions, brain drain and remoteness from the economic boom in urban and coastal areas.

Yet the central and local governments also looked upon the third front enterprises as possessing unusual assets – they are large in scale and utilize comparatively advanced technology and skilled personnel. Many of these resources, it was determined, could be shifted to civilian production. With the deep cut in military expenditures and procurement in the early 1980s, it became clear that whether the third front could be successfully converted was a crucial question for both the region and the defense industry as a whole, and arguably, for the entire Chinese economy.

Conversion progress and problems

The Chinese defense industry was facing severe cuts in military procurement by the early 1980s. Although it had experienced several ups and downs since 1949, the CMIC was unprepared for such a drastic loss of production. It had always enjoyed privileges that made it immune to market forces and business cycles. Since its only object was to fulfill the commanded production plan, its profits or losses were fully borne by the central government. Defense enterprises had never cared much about markets or costs.

Starting in the early 1980s, coincident with the cut in military procurement, CMIC managers were suddenly expected to be at least partly responsible for the profits and losses of their operations. Most managers had never heard of "profit" or "management." The problems that had accumulated during the command economy era became more acute: huge overcapacity and over-employment, irrational geographical distribution, outdated management styles, stagnant technology, isolation, compartmentalization and insensitivity to market competition. These conditions required a policy response.

Government policy

China's response to these problems was official defense conversion, which was incorporated into the overall economic reform from the late 1970s onward. The government encouraged – sometimes commanded – the defense enterprises to switch part of its capacity to produce civilian goods, especially consumer goods, to keep millions of workers employed, make use of idle plant capacity and maintain social stability (avoid unemployment). In the late 1970s and early 1980s, China was experiencing a "shortage economy," and the supply of consumer goods could not keep up with market demand. The defense enterprises were expected to fill this gap.

Chinese government considered defense conversion a double-edged sword – it could aid in national economic development as well as address the weakness of the defense industry and achieve military modernization (Gurtov, 1993). Gan (1994) sums up the ultimate goal of Chinese defense conversion as follows:

> After satisfying military needs, use main strength to service the national economic construction. Rationalize the (defense industry) structure and resource allocation, concentrate strength, ensure core projects, enhance the development capability for new high-tech weapon systems, integrate the civil and military, strengthen the interchangeability between civilian and military production.

China's defense conversion should thus be looked at as both a dual use and a reversible process. Production facilities and human resources can be used for civilian output in peacetime. In face of war, they can be easily converted to military priorities.

Defense conversion has been highlighted in national economic plans since its inception, with central and local governments crafting favorable policies and coordinating the conversion process. From 1986–95, the defense industry received

11 billion RMB in special loans for civilian production and R&D. In late 1995, it was reported that Beijing was considering setting up a 50 billion RMB fund to underwrite defense conversion efforts. Although somewhat released from the state's embrace, CMIC still enjoys some privileges and special treatment, especially for its enterprises in nuclear and aerospace sectors. However, the government's defense conversion policies have never been clearly specified. The defense enterprises are giving relative freedom to interpret the policies to their advantage and to use their judgements in implementing conversion efforts.

Although privatization of state-owned defense enterprises has proceeded quite far in many countries as part of global liberalization, it was not yet common in China in the late 1990s. The state still owned most of the major enterprises and research institutes. Thousands of small firms have been transferred to local governments, because it became impossible for the state council or COSTIND to effectively control them. In the last couple of years, the local governments have sold many former CMIC enterprises – most of them produce no military products to speak of any more. It is reported that the Chinese government plans to privatize all except the 1,000 biggest SOEs in the near future. This policy, once implemented, will have profound impact on the defense industry.

Since approximately 55 percent of defense enterprises are located in the third front area, their performance affects the entire health of the CMIC. Helping them has been a major objective of conversion policy. A state council office was set up to deal with the problems of the third front industries. Third front enterprises were offered preferable treatment in the form of tax exemptions and subsidized loans. As of 1995, the central government has already spent over 8 billion RMB on third front adjustment (Ding, A.S., 1997). Local government expenditures doubled this figure. Billions more were slated to be spent from 1996 to 2000.

The central government encourages third front enterprises to make a "triple jump" – "jump out of the backwater, skip to coastal areas, pole vault overseas" (Frankenstein and Gill, 1996). It has given them incentives to set up branches or joint ventures in coastal areas, where they are expected to absorb information and management skills and to apply them back to their third front enterprises. For the third front enterprises located in remote, mountainous areas, central and local governments try to help them to relocate to nearby urban areas by sharing the relocation costs. Since the late 1980s, hundreds of large enterprises and research institutes have been relocated. From 1995 to 2000, China planned to relocate another thirty-eight enterprises. The overall performance of these enterprises is expected to improve, and it is hoped that most of them will be able to make profits.

Industry responses

Forced to convert by the severe environment, the defense industries had little choice. Supply-side resistance to moving toward civilian product lines is rather weak on the part of both enterprises and their workers. These firms are small in size compared to the whole defense industry and are weak in political influence. As a result, they do not have the ability to contact policy-making departments and

personnel directly, let alone influence them. The defense ministries and COSTIND have attempted to lobby for defense enterprises, but they have met with little success. Furthermore, defense conversion is welcomed by ordinary workers because pay is better on consumer goods production lines and, in the 1980s and much of the 1990s, their employment has been guaranteed.

In the early 1980s, facing the dual pressures of an abrupt cut in military procurement and overall economic reform in the civilian sectors, the defense industries adapted "spontaneous" conversion. This stage can be called the "trial and error" period. They produced anything that might generate cash, with almost no long-term strategies. Their main products were consumer goods, especially home appliances in strong demand. For most firms, the civilian products were poor matches for their military technologies. Soon the markets for most of these goods were saturated, and output ended up in warehouses rather than households.

During the initial period, both the government and the defense industry obtained some market experience. Defense firms found out that they could no longer sell whatever they produce and that many of their products were high in price and low in quality compared to those of their civilian competitors. Starting in the mid-1980s, institutional reforms were undertaken to decentralize and integrate defense enterprises into the civilian economy. These included managerial, legal, financial, price, labor and foreign trade reforms (Folta, 1992). As in the civilian sector, the "responsibility system" was the central in this stage. It contained two important components – the contract system and profit incentives. Contracts were signed between government departments and firm managers at all levels and between managers and workers. As a result, the defense enterprises enjoyed more freedom but also bore heavier responsibilities. Also in this stage, defense industries tried hard to develop core products which had good market potential. Many of the products were closely related to their technological advantages, such as motorcycles, automobiles, civilian airplanes, satellites, cargo vessels and nuclear generators. Some defense firms captured high shares in these markets and obtained considerable profits. Finding new products has been difficult, though, and China admitted that by the end of 1997, "60 percent of the defense enterprises had not found suitable products and didn't have independent R&D ability."[7]

Defense conversion has encouraged the opening of China's defense industries to the international market and attracted foreign investment. Defense factories turn to foreign investors for capital, advanced technology and management and marketing skills. The ordnance industry alone attracted foreign capital of $0.63 billion from 1991–95 and had set up more than 300 joint ventures by 1995 (Zhu, 1996). By 1997, about 1,200 defense enterprises had absorbed $4.5 billion in foreign investment from Western companies (Pomfret, 1998). The CMIC also tries energetically to export its products, both military and civilian. Each ministry or general corporation has set up its own trading companies specializing in import and export. In recent years, arms sales decreased dramatically from their peak in mid-1980s but the export of civilian products increased rapidly. In 1997, the defense industries exported $7 billion worth of goods (Pomfret, 1998).

The joint stock system, which was a new phenomenon just a few years ago, is now very popular among defense industries. It allows firms to obtain capital funds and also helps to replace the antiquated management system with new market-oriented system. Joint stock companies report directly to the shareholders and are pressed to improve their performance. In 1998 more than forty defense firms were traded on the Shanghai and Shenzhen Stock Exchanges. Many of them were very successful, with high and growing profits, especially those from the electronics, aviation and ship construction industries. For these firms, civilian products usually compose over 90 percent of the sales value. Most common shareholders treat them exactly the same as other nondefense firms. Compared with other defense firms, joint stock companies enjoy more freedom and are only loosely controlled by COSTIND. In private interviews, some managers from these firms claim that they are responsible only to the market and the shareholders. After the demise of the last two ministries of the CMIC in early 1998, this may be increasingly the case.

China has claimed great success in defense conversion. In 1975, only 6.9 percent of the gross output value of the CMIC came from civilian products. In 1990, this figure was 70 percent and in 1994, it reached 80 percent (Table 9.4). The figures are even higher if we consider the electronics and ship construction industries. In two decades, the CMIC's civilian production increased at an average annual rate of 20 percent. CMIC's core consumer products include motorcycles, minivans, mid-range civilian airplanes, telecommunication satellites, cargo vessels and nuclear generators.

Along with civilian production, converted defense enterprises and institutes also undertake research for principal state projects and key equipment. Such projects include the "863" and "Torch" programs that aim to enhance China's high-tech capacity. By 1997, there were nearly 70,000 civilian applications of military technology items. About 65,000 "bottle neck" technical barriers have been overcome with the assistance from the military industries.[8]

In the 1980s, Chinese defense industrial conversion made it possible to avoid the enormous economic and social costs incurred by massive plant closing and layoffs.

Table 9.4 The civilian share of Chinese defense industry output

Year	*Percentage*
1975	6.9
1978	14.9
1980	23.0
1985	45.0
1988	66.0
1990	70.0
1992	76.0
1994	80.0

Source: Fu and Li, 1997.

As one Chinese official said, "Defense conversion stabilized a total population of 20 million." This is regarded as an important achievement from the Chinese point of view. Until early 1990s, bankruptcies and layoffs were rare in the CMIC, even as the civilian sector laid off millions of redundant employees. In the past couple of years, however, this situation has changed abruptly. The central government has become more and more impatient toward the heavy fiscal burden of the defense industries. Since 1997, it has encouraged, even required, the defense enterprises to shrink to survive. Laying off redundant workers and privatizing small enterprises have become two important practices in the CMIC.

All managers interviewed agreed that defense conversion has multiple goals: produce marketable civilian goods, make profit, and maintain and upgrade (if possible) military-industrial capacity with the money, technology and management skills earned in the civilian market. Yet most of them complain that the central government had no clear-cut, stabilized conversion strategy, and they do not expect this to change.

Some successful examples

Harbin Aviation

Harbin Aviation (HA), a major producer of H-6 (Tu-16) mid-range jet bombers in the 1970s, is located in Heilongjiang province, a northeast province heavily dependent on the SOEs. HA's leadership was forced to convert just to survive. In 1971 the company manufactured 200 planes with a claimed output value of 1.5 billion RMB. With the deep cut in military procurement, its total output value fell to 70 million RMB in 1982. For the first time in its history, not even one aircraft was ordered.

HA was very active in looking for alternatives. From the early 1980s, they began licensed production of the French Dauphin II helicopter (Z-9). At the same time, the company raised its own funds to develop a new passenger jet plane, the Y-12, which started production in 1986. The Y-12 obtained several international certifications, including one from the US Federal Aviation Administration. Its reliability and low price led to a flood of orders. In 1995 alone, HA signed export contracts for more than 100 Y-12s. It has become the most successful export in China's civilian aircraft industry to date.

Nevertheless, the market for Harbin's low-cost aircraft is not big enough to keep its 30,000 employees engaged. After careful market research, HA decided to establish itself in another niche market – minivans. The company borrowed money from state banks with the help from the provincial government and the Aviation Ministry and used its own idle workforce to construct a new plant in Harbin. After three years of hard work, the Songhua River minivan was finally on the market in 1994 and soon became a hot buy. In 1995, its output surpassed 60,000 (with production capacity of 100,000), and Songhua River is now a household brand name in China.

HA's output is now 80 percent civilian. Ten percent of production is military (spare parts and repairs) and 10 percent consists of components and assembly work

for multinational companies, a common practice among major aircraft companies (such as Shanghai, Xian, Chengdu and Shenyang). In 1997, HA's total output value was 4 billion RMB, with profits and taxes paid above 500 million RMB – more than half from minivan sales. Unlike many defense enterprises, HA avoids "brain drain" successfully by offering competitive compensation. The company has expanded one aircraft research institute and set up two civilian product research institutes in Harbin since 1988, with more than 1,200 engineers and technicians.

Xian Aircraft Company (XAC)

Although not located deep in the mountains, the Xian Aircraft Company in Shaanxi province is a large third front enterprise that employs 17,000 workers and is affiliated with the Aviation Ministry. XAC has a very strong R&D capacity. About one-quarter of its employees are categorized as "professional," much higher than ordinary defense enterprises. XAC is a major producer of military aircraft. In November 1998 it successfully developed China's most advanced all-purpose fighter. In the 1970s, it began development work on a passenger jet plane, the Y-7, a copy of the Boeing 707. More recently, in addition to mass-producing the Y-7 and other civilian aircraft, XAC also produces aluminum products, radar, satellite and microwave antennae, and diving boards (Gurtov, 1993). Most of its civilian products are based on existing technologies and human resources, with little need for new production facilities. XAC also produce components for Boeing and for the French and Italian 626 (Han, 1998). It has set up a joint venture with Volvo of Sweden to produce luxury coaches, with annual sales of 4,000 by the mid-1990s (Mao, 1997).

Despite its admirable growth record, XAC confronts problems. One is poor overseas sales, which account for only 3–4 percent of total sales, lower than other aviation enterprises (Gurtov, 1993). Its civilian products, with the exception of Y-7, are mainly labor-intensive and small scale and lack market potential (Han, 1997). Most of its thirty-eight companies are only breaking even. Unlike HA, XAC's strategy involves focusing on civilian aircraft, which is difficult. In September 1998, the once widely publicized Air Express 100 project was abandoned due to bleak market prospects. This was a major blow to XAC, since it was expected to play an important role in the project and had done a lot of work for it. Given prevailing market conditions, it is unlikely that there will be another major passenger jet plane project in the near future. Thus Xian Aircraft Company will have to find other products to maintain its growth rate.

Changhong Joint Stock Corporation

As a third front enterprise located in Mianyang, a mountainous area in Sichuan province (northeast of Chengdu), Changhong Machinery Factory (affiliated with the Electronics Ministry) was a major defense electronic components producer in the 1970s. Changhong began television production in the early 1980s. From the beginning, it drew upon local government assistance to obtain capital and to market products. As a model factory in the Sichuan province, it benefited from local market

protection in the 1980s when its scale was small compared with other domestic producers. In the late 1980s, it began massive expansion with the help of both the local government and the Electronics Ministry. In 1990, it became the largest color television manufacturer in China.

In 1994, the Changhong Machinery Factory spun off its civilian production to form the Changhong Joint Stock Corporation, listed on the Shanghai Security Exchange (SSE). The Changhong Machinery Factory is now the holding corporation, with a little less than 50 percent of the total stock. With 2.7 billion RMB raised by issuing stocks to the public, Chenghong invested in a large-screen color television production line and in R&D to enhance the company's competitive strength. From 2 billion RMB in 1993, before its listing in the SSE, Changhong's total capital surged to 11.5 billion by 1996. Its color television sales rose from 1.4 million sets to 4.9 million, and its sales value and profits from 2.4 billion RMB and 0.5 billion, to 12.5 billion and 2.0 billion, respectively. These figures increased by a further 30 percent in 1997 (Chen, 1998).

In 1998, Changhong took over two television producers in other provinces (with its main production plants remaining in Mianyang) and increased its annual production capacity to 13 million sets. It has now moved into the rapidly expanding VCD and PC markets in order to diversify its operations and plans to be a major player in the world market in the next decade.

Jialing Machinery Factory

Jialing Machinery Factory, affiliated with the China North Industries Group (NORINCO) is a third front defense enterprise located near Chongqing, Sichuan province. Unlike many defense enterprises in the early stages of conversion, which produced anything to generate cash, Jialing chose the motorcycle as its unique focus and put all its effort into it. The market for motorcycles is huge in China, and Jialing had the technology and production capacity to do well. It began motorcycle design and production in 1979. With few competitors in the domestic market its sales increased rapidly, from around 2,500 motorcycles in 1979 to more than 1 million in 1995.

In order to obtain urgently needed capital and to reform the old management system, Jialing separated its military production from the rest of the firm. The civilian production part was transformed into a joint stock corporation, with NORINCO as the holding corporation (Chai, 1997). Jialing has been able to cut its reliance on government funding, drawing upon government aid only when launching new projects that requires coordination among enterprises and research institutions affiliated with different ministries. More than 90 percent of its financing comes from bank loans at market interest rates.

Since the early 1990s, Jialing has taken over dozens of local machinery factories and has formed the Jialing Group Company, a conglomerate composed of more than 300 enterprises, some private, belonging to different ministries and various provinces (H. Ding, 1997). It is now one of the pillar enterprises of the country and enjoys almost full independence.

Despite the strengths and sales success of Jialing, its managers acknowledge problems. The domestic motorcycle market has become increasingly competitive in recent years. Jialing's growth rate has dropped from 30 to 40 percent in the early 1990s to less than 10 percent, and its profits have stagnated in the past couple of years. Rigid regulations in some big cities have restricted the motorcycle market. Jialing, although still the biggest motorcycle producer in China, needs new products and markets to sustain its development.

Although each of the cases profiled above is unique, the lessons drawn from their experiences are similar. Some of them are common to all successful enterprises – the need for good leadership, trained personnel at all levels, thorough market research, advanced management skills, high quality products, international cooperation, technology and capital acquisition. Others are unique to defense enterprises: a motivated leadership that seeks change (especially the way of thinking), separation of civilian and military activities, full use of existing technology and production resources, concentrating investment on civilian products, and help from central and local governments.

Potential challenges to successful conversion

It has been difficult for researchers and analysts to evaluate China's defense conversion due to restricted and unreliable data. China has claimed great success based on the percentage increase of civilian output in the total output value of the defense industries. Official data also show that the value of the total output and the value of civilian production grew continually.

However, relying on gross output figures is misleading. Profiles of individual defense enterprises reveal a less rosy picture. In the 1990s, from one-third to two-thirds of defense enterprises were losing money. Their plant capacity utilization rates were between 10 and 30 percent (Cheng, 1992). Among the defense enterprises, fewer than 50 percent have the ability to develop suitable civilian products, and most of them have no pillar products at all.[9] The Chinese government has acknowledged the principal obstacles faced by defense firms: poor understanding of market system; organization and management problems; brain drain, inability to achieve economies of scale; low quality and high price of products made in converted enterprises; lack of capital for conversion and drag on the entire conversion effort from subsidies required for converting the third front (Blasko, 1994).

Compared with other sectors, defense industries have lagged behind in economic reform because of their traditional overdependence on government demand and guidance. There appears to be about a three to five year lag before new practices implemented in the civilian enterprises are adopted in defense firms. In 1998, when civilian SOEs were laying off millions of employees, the defense enterprises were reluctant to do so. This disguised the fact that idle workers account for around half of the total defense industrial labor force. One reason is that firms are required to maintain ample production capacity in case of need. Another more realistic reason is that since most defense enterprises are located in defense-dependent regions far from major cities, it is almost impossible for laid off workers to find

other jobs. Mass layoffs in these regions would lead to turmoil, and social stability has been the top priority for China.

If it is not easy to lay off underemployed workers, it is much more difficult to retain capable engineers and technicians. Before economic reform, college graduates were assigned to defense firms and were not allowed to change jobs. They now have the freedom to choose whatever jobs they like. Compared with civilian enterprises, defense enterprises have little attraction. Many managers confessed that brain drain was completely out of control, and it severely hurts their ability to develop both civilian and military products.

Some managers also cite the lack of capital as a major difficulty. They complain that although the state banks are required by the government to support the defense conversion process, they are reluctant to do so. However, given the fact that nonperforming loans are already high, the state banks are understandably reluctant to take on further risk. I was told that loans lent to the defense enterprises have mainly ended up in stored inventories. Unable to sell the goods, the enterprises cannot repay their loans.

Defense industries were once regarded as possessing superior technologies. If this was the case, they largely failed to utilize them properly, with some outstanding exceptions as described previously. In the defense conversion process, most defense enterprises produce whatever may be sold, not what they are good at. Indeed, for the small and medium-sized defense enterprises that constitute the majority of CMIC, their technological level is quite low, and their products (civilian or military) are mainly labor intensive. Unless annexed by other firms, they have little chance of survival.

Even for the large firms that possess relatively advanced technology, parlaying these into civilian products is difficult. Their specialized military production facilities are difficult to revamp for the production of civilian goods. In the early stages of conversion, market competition was weak, and thus defense enterprises made a lot of easy money despite their high costs. As more and more newcomers cut into the market, competition intensified. After two decades of evolution, several large-scale, low-cost firms (some of them multinationals) dominate markets for most civilian products. Compared with these "professionals," defense enterprises are amateur players with inferior technology and marketing skills. In the past several years, the defense industries' share in some previously dominant markets, such as motor vehicles and home appliances, has declined precipitously. Also, technological spin-off has been disappointing. Military institutes usually find out that their technologies are not directly usable in the civilian market, and even where they might be, they lack the capacity to transfer them. The situation is worsened by traditional segregation between civilian and military sectors.

Since 1997, the economic slowdown in China has further intensified the defense firms' quandary. They find it increasingly difficult to sell their products, since both international and domestic markets are not expanding as rapidly as before. The financial turmoil in East Asia has restricted their overseas markets, while they face greater competition from countries that have devalued their currencies, particularly in electronics and shipbuilding sectors.

Prospects for the future and recommendations

The future of defense conversion in China depends on the future of the whole reform program, especially the restructuring of the SOE sector. Since the break up of the last two ministries of the defense industries in early 1998, it has been widely expected that the defense sector will undergo major adjustment. The old vertical structure will give way to a more flexible organizational structure. Even the general corporations (ministry level) will lose much of their influence over the defense enterprises. They will cease to exercise government authority, and their ability to directly control and manage defense enterprises is highly doubtful.

Defense enterprises will follow their civilian counterparts in enterprise reform. Although it is unlikely that China will begin mass privatization in the foreseeable future, small and medium-sized defense enterprises, especially those that have long ceased military production, may be privatized. These firms are absorbing the bulk of the subsidies from both the Ministry of Finance and the state banks. For the large defense enterprises, the state will retain some control. Nevertheless, most of them will be transformed into joint stock companies and will be listed on domestic or overseas stock exchanges. Firms with similar products will be encouraged to combine, to form conglomerates, which will enhance their poor and sparse R&D capacity and increase their competitive strength in both the military and civilian markets.

Based upon a system with deeply rooted conceptual and systematic weaknesses, and facing bleak prospects in both the military and civilian markets, CMIC faces an uncertain future. Even if real military expenditures increase slightly in the next decade, as expected, it is hard for defense enterprises to match the output growth rates of civilian sectors that are increasing at an annual rate of about 8 percent. The CMIC is now losing its political influence and may cease to be an important player in the Chinese economy in the next decade. The old term of "defense industries" (*jungong*) will need to be redefined.

Defense conversion in the minds of many top Chinese officials means not only aiding the civilian economy but also enhancing military production capabilities. However, the reforms meant to support and invigorate military production may in fact be detrimental to it (Gill, 1996). Before defense conversion, managers of defense enterprises put all their energy into military production. They now have much more to worry about. China has not set up a proper military procurement system which would encourage defense enterprises to provide high quality military products at low cost. Compared with civilian production, a growing segment essential for these firms' survival and development, the quantity of the military orders is small, and the quality requirements are high. Defense enterprises see little profit in these contracts. Many have transferred superior production resources to civilian production and have left military production unattended. It is occasionally reported that funds for the development of major weapon systems were utilized for civilian production or extra bonuses for employees.

Given this situation, the development of new weapon systems is not going smoothly (SIPRI, 1995). Recently, China has begun to increase the budget for military R&D slightly which is likely to continue for the next decade. China plans to

make considerable headway in some specially selected fields, such as aerospace, guided missiles and telecommunications. In general, however, its major weapon systems will remain far behind those of other major powers.

Briefly put, defense conversion has had a profound impact on the entire CMIC. It has and will continue to benefit the commercial operations within the defense industries, where they can become competitive, while in the near- and medium-term, it will have negative effects on China's military production. In the long run, if the problems addressed previously can be properly handled, readjustment in the defense sector may make a significant positive contribution to Chinese defense capacity and may eventually enhance its military production. Nevertheless, Chinese defense firms should expect an already difficult period to worsen before it gets better.

To help the defense industries to cope with their problems, the central and local governments could make a difference. More attention should be given to increase the profitability and competitive power of defense enterprises by helping them overcome the disadvantages of being both SOEs and defense-oriented firms, such as unfair social burdens. Central and local governments should further encourage the defense enterprises to introduce Western management methods. If it is premature for mass privatization, profitable defense enterprises should be transformed into joint stock companies. This is a kind of privatization that would reduce the government's role in the enterprises and give greater power and responsibility to stockholders. A major problem in the process is corruption and "state capital drain" due to "under-the-table" transactions. The government must set up rigid, transparent and practical procurement regulations and make the process more transparent to avoid this problem.

From the successful defense enterprises' conversion experience, it appears uniformly better to separate military and civilian activities within defense enterprises. Civil–military integration by defense enterprises was not successful in China. Unlike some Western multinationals, individual defense enterprises in China are small in size and possess very limited resources. It is not efficient to develop and produce civilian and military products in the same plant. In almost all the successful enterprises I visited, complete separation of military and civilian activities is a common practice. Firms that produce few military products should be released from military assignments and orders transferred to other defense enterprises.

China may have the most complex defense industrial system in the world. This was largely the result of security considerations in the 1960s. It is time for rationalizing and "shrinking smart." To do so, the central government should introduce competition into the old mandatory procurement system. The result will be that military orders will gradually gravitate to a few large-scale, low-cost producers that will have the incentive and ability to improve their military products. These firms can concentrate on the production of military products, and in the long run, their performances can be improved. It will also be easier for COSTIND to monitor since there are fewer firms.

In the face of tough competition, the government should not encourage lag-behind defense enterprises and research institutes to dive into the civilian market. These firms have no marketing experience and stand little chance of survival. But

they still possess relatively rich human resources and technologies. The government may help them merge with larger civilian firms or research institutes, thus easing the military technology spin-off.

As more defense enterprises are transferred to local governments, the latter will play an important role in the conversion process. Up to now, local governments have not been enthusiastic about conversion and have not provided defense firms with much help. Nevertheless, the health of defense enterprises is sometimes vital to local economies, especially in third front areas. Local governments can help the defense enterprises integrate into the local economy and release them from improper social burdens, such as hospitals, kindergartens and schools they are now supporting. These enterprises may act as engines for local economic development. Their relatively advanced technology and skilled labor force can be used to help other, more backward local enterprises. It is beneficial to look at them as a treasure rather than a burden.

One important result of economic reform is that it provides more "spin-on" opportunities. A Xinhua News Agency commentary, dating from January 1995, noted a number of "spin-on" developments. Civilian industry "solved a large number of sophisticated technology problems crucial to the production of nuclear weapons, nuclear submarines, guided missiles and satellites (and) new materials" (Frankenstein and Gill, 1996). It is often reported that a technology breakthrough by a civilian institute has broad military implications. China's defense industries have yet to fully exploit such spin-on potentials. Given its insufficient resources, CMIC needs to be more flexible and more open to learning from the civilian sector. As one promising instance, COSTIND is considering subcontracting more military research projects to selected civilian research institutes and universities.

One negative tradition within the defense industry is the overwhelming stress on secrecy and self-reliance, a legacy of the severe security environment. These hindered international cooperation and learning from others. Since the onset of reform, this attitude has been partly changed, but not enough. China needs to open up more of its military projects to international cooperation. Given China's technological capacity, it is very difficult to develop advanced major weapon platforms wholly independently. In the future, it will also be beneficial for China to be more active in international military cooperation to obtain technology and hasten its defense modernization.

Given opaque and sometimes contradictory evidence, it is hard to reach a general conclusion about China's defense conversion. China has two decades of conversion experience with some successful outcomes. However, the process is subject to severe problems, and future prospects are far from certain. This is a subject worthy of further research and experimentation, since the defense industry is very important to the China's future regional security and economic development. In order to pursue the dream of becoming a world economic and military power by the middle of the twenty-first century, China needs an enduring, peaceful environment, just as its neighbors do. What is more, compared with international affairs, internal affairs are certainly more vital to the Chinese government (Taiwan may be an exception since it is regarded as an internal affair). Defense conversion, if it succeeds, would contribute a great deal to China's economic and military power,

and it should be looked as a positive factor for both the Chinese economy and for world peace.

Notes

1 Information Office of the State Council of the People's Republic of China. "China: Arms Control and Disarmament." Beijing, November 1995.
2 World Bank (1997). "China's Management of Enterprise Asset: the State as Shareholder." Economic Report #1-6265-CHA. June 5, 1997. Country Operations Division. China and Mongolia Department. East Asia and Pacific Regional Office. Document of the World Bank. p. xi.
3 In the famous "four modernizations," defense modernization is the last one.
4 These figures are much lower than the estimations by the US, see Table 9.1.
5 Due to its extremely complex structure and lack of accurate data, these figures are only rough estimates.
6 Even so, many third front enterprises are short of necessary supporting facilities.
7 Interviews with officers in COSTIND, July, 1998.
8 This is also interviews with officers in COSTIND, July, 1998.
9 Interview with officers from Chinese Association for Peaceful Use of Military Industrial Technology, a think tank for COSTIND.

References

Blasko, D.J. (1994) "An Introduction to the Chinese Defense Industry Military to Civilian Conversion Process," US Army Attaché in Beijing, unpublished manuscript.

Chai, B. (1997) "Conversion and Restructuring of China's Defense Industry," in J. Brommelhorster and J. Frankenstein (eds) *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, Boulder, CO: Lynne Rienner Publishers, Inc.

Chen, Y. (1998) "Joint Stock Reform and Capital Operation – Case Study of Changhong," in F. Chi (ed.) *Case Study of Joint Stock Reform in SOE*, Foreign Languge Publishers (in Chinese).

Cheng, T. (1992) "On Civvy Street: China's Lumbering Arms Markets Face Market Rigors," *Far Eastern Economic Review*, February 6: 40–3.

Ding, A.S. (1997) "The Regional Implications of Defense Conversion: The Case of the 'Third Line' and Guizhou," in J. Brommelhorster and J. Frankenstein (eds) *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, Boulder, CO: Lynne Rienner Publishers, Inc.

Ding, H. (1997) *China Defense Industry*, November 7: 1 (in Chinese).

Folta, P.H. (1992) "From Swords to Plowshares – Defense Industry Reform in the PRC," Westview Press.

Frankenstein, J. (1997) "China's Defense Conversion: A Strategic Overview," in J. Brommelhorster and J. Frankenstein (eds) *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, Boulder, CO: Lynne Rienner Publishers, Inc.

Frankenstein, J. and Gill, B. (1996) "Current and Future Challenges Facing Chinese Defense Industries," *The China Quarterly*, vol. 146.

Fu, Feng-Cheng and Li, Chi-Keung (1997) "An Economic Analysis," in J. Brommelhorster and J. Frankenstein (eds) *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, Boulder, CO: Lynne Rienner Publishers, Inc.

Gan, Z. (1994) *China Defense Industry*, September 30: 1 (in Chinese).

Gill, B. (1992) "Chinese Arms Transfers: Purposes, Patterns and Prospects in the New World Order," Westpoint, CT: Praeger Publishers.

Gill, B. (1996) "The Impact of Economic Reform upon Chinese Defense Production," in C.D. Lane, M. Weisenbloom and D. Liu (eds) *Chinese Military Modernization*, Kegan Paul International.

Gurtov, M. (1993) "Swords into Market Shares: China's Conversion of Military Industry to Civilian Production," *The China Quarterly*, vol. 134.

Han, J. (1997) *China Defense Industry*, July 11: 1 (in Chinese).

Han, J. (1998) *China Defense Industry*, June 19: 1 (in Chinese).

Hyer, E. (1992) "China's Arms Merchants: Profits in Command," *The China Quarterly*, vol. 132.

Information Office of the State Council of the People's Republic of China (1998) "China National Defense," Beijing, July.

Jin, J. (1997) "China Privatization – Jobless Army Threatens Beijing," Reuters, December 9.

Mao, J. (1997) *China Defense Industry*, October 21: 1 (in Chinese).

Moller, K. (1997) "An economic Analysis," in J. Brommelhorster and J. Frankenstein (eds) *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, Boulder, CO: Lynne Rienner Publishers, Inc.

Montaperto, R. (1995) "China as a Military Power," Strategic Forum, INCC of the National Defense University, December, No. 56.

Naughton, B. (1988) "The Third Front: Defense Industrialization in the Chinese Interior," *The China Quarterly*, September.

Pomfret, J. (1998) "China's $7 Billion Secret," Washington Post Foreign Service, January 19: A19.

Shichor, Y. (1997) "Peaceful Fallout: The Conversion of China's Military-Nuclear Complex to Civilian Use," BICC, Brief 10, November.

Si, S. (1995) "The Military's Interest in Money Cannot be Stopped," no. 209, Hong Kong: Zhengming (in Chinese).

SIPRI (1995) "Military Technology: The Case of China," SIPRI Year Book 1995: Armaments, Disarmament and International Security.

SIPRI (1997) "SIPRI Arms Transfers Database," Arms Transfers Project.

SIPRI (1998) "SIPRI Arms Transfers Database," Arms Transfers Project.

US Arms Control and Disarmament Agency (1995) *World Military Expenditures and Arms Transfers*.

Wang, S. (1996) "Estimating China's Defense Expenditure: Some Evidence From Chinese Sources," *The China Quarterly*, vol. 147.

World Bank (1997) "China's Management of Enterprise Asset: the State as Shareholder," p. xi.

Xin Hua News Agency (1999) Beijing, China, July 1.

Zhu, E. (1996) *China Defense Industry*, October 18: 1 (in Chinese).

10 The South Korean defense industry in the post-Cold War era

Yong-Sook Lee and Ann Markusen

Introduction

South Korea, despite the persistence of Cold War hostilities on its border, has done relatively well in downsizing its defense industry while moving people and facilities into other civilian activities in the 1990s. This achievement is paradoxical, because South Korea's procurement expenditures increased up through 1997, leading some to conclude that the country has been committed to enlarging and modernizing its military industrial complex (BICC, 1996). The paradox is explained by a growing insistence on the part of its security patron, the United States, that South Korea shoulder an increasing share of the military "burden" of readiness *vis-à-vis* North Korea.

South Korea has downsized a considerable portion of its defense industry despite the rise in spending.[1] Rather than continuing to invest in its domestic industry, begun under the Nixon doctrine in the 1970s, the government has been shifting toward buying from foreign suppliers, principally US firms. South Korea engages in a "dual procurement" policy. While it buys esoteric and defense-specialized high-tech equipment abroad, the government continues to subsidize and foster growing technological expertise in aerospace and electronics segments of its defense industrial complex, principally in "dual use" components that South Korea firms hope to sell on the international market. This strategy is encouraged by the current international trade regime, which prohibits industrial policy but exempts the defense sector.

Cuts have occurred in all defense industrial segments, though they are deeper in heavy equipment like tanks and ordnance where government demand is sated, subsidies have been eliminated, and international markets are too competitive and saturated to permit exporting. The shift of workers and capacity into new civilian activities was facilitated by a robust national economy up through 1997 and by the structure of the Korean defense industrial sector. Two aspects of the latter help to explain relatively rapid redeployment of human and physical assets.

First, the South Korean industry was heavily shaped by the top-down industrial planning of the Park government, which more or less dictated that the large, private sector chaebol[2] would each assume a portion of the defense industrialization project. However, none of the large conglomerates was encouraged or permitted to specialize

in military production. Thus, with few exceptions, the industry is populated by large firms whose defense commitment is relatively small and who have considerable resources, both financial and administrative, to move people and assets into other activities. Our interviews confirmed that these firms were generally successful in doing so. This is true even in mature segments such as tanks and ordnance, where firms have shifted into construction equipment.

Second, Korean firms have mainly been engaged in activities with considerable dual-use potential, especially in the automotive area and more recently in aircraft and electronics. Indeed, the commitment to building a defense industrial sector initiated the shift to capital-intensive activity in Korea, as the chaebol used their military-subsidized accrual of expertise to move into civilian automobile, shipbuilding, and other related sectors, keeping their defense dependency rates relatively low. Such versatility has helped firms to transcend the geographical isolation of large portions of the defense industry, originally concentrated in a stand-alone complex in Changwon, far from Seoul and from the border with North Korea (Markusen and Park, 1993). Firms pursuing dual-use strategies enjoy special access to skilled labor under the Korean military draft system, and until recently, they could take advantage of prohibitions against labor unions in defense-related establishments.

The South Korean case is not without its downside. Smaller firms tend to be more defense-dedicated and rigid, and several have gone bankrupt in the 1990s. The government has administratively and geographically segregated military R&D from civilian R&D in its government institutes, undercutting innovation and dual-use potential. Industry structure has its rigidities as well. Although the chaebol are able to move people and financial resources around inside their networks, the barriers between the firms are quite high. More producers remain in a number of weapons systems than the market can support. Mergers among them are difficult to achieve, although this is beginning to change. Nor can defense workers and expertise easily move between firms.

Government policy in this period has played a mixed role. On the one hand, the willingness to buy foreign and the elimination of defense industrial subsidies for segments without civilian promise have helped to eliminate excess capacity. On the other, the government has no adequate mechanism for helping workers and technologies transcend individual firm boundaries. Until 1998, a robust labor market and strong unions, which had emerged over the past couple of years, ensured that workers found work either inside or outside of the corporation rather quickly. But as the Korean economy slowed dramatically in the late 1990s, the absence of worker adjustment programs and interfirm barriers to technology diffusion exacerbated inefficiencies in the economy.

We found surprisingly little resistance from the chaebol, their workers, or host communities to defense procurement cuts or even to buying foreign goods. The chaebol are generally convinced that civilian markets are more profitable and offer greater long-term export potential, and as dual-use organizations, they have the know-how and financial heft to move easily into new markets. Workers have only recently been organized in these sectors, and their focus is on alternative

employment within the firm. Communities are not well organized in South Korea, which has only recently begun to develop local government capability.

The next section of the chapter examines South Korean security, military spending, and procurement strategies. In the section "The defense industry," we briefly trace the evolution of the military industry. The section "The post-Cold War South Korean defense industry," analyzes the impact of the post-Cold War defense cuts on South Korean defense industry. In the section "Military industrial conversion progress and barriers," we evaluate progress and barriers encountered in the conversion process, focusing on the role of internal defense-related actors in defense restructuring. In the final section, we conclude by offering policy recommendations for the ongoing South Korean defense conversion process and speculating about the lessons for other developing countries.

The South Korean national security and institutional context

South Korea is one of several smaller countries on the front lines of the Cold War. Its military and industrial policies have been heavily shaped by the protracted standoff with North Korea and the special relationship with the United States. However, the uniqueness of the South Korean defense industry lies just as much in the character of the country's corporate structure and activist industrial policies.

National security strategy and force structure

Despite the demise of the global Cold War regime, military confrontation between the North and South continues on the Korean peninsula (Cumings, 1997; Ministry of National Defense White Paper, 1997). Technically, both South and North Korea are still in a state of war because the armistice agreement of 1953 between North Korea, China, and the United States led to a cessation of hostilities but no formal peace agreement (Lee, 1989). To deter North Korea, South Korea has sustained a solid military and defense alliance with the United States since that time.[3] The United States is the most important external actor in Korean security, maintaining a large contingent of troops and extensive military infrastructure in South Korea. The United States is also the primary source of modern weaponry for the South Korean military forces (Lee and Drifte, 1995).

The security order in Northeast Asia also affects the South Korean defense posture. After the 1991 collapse of the Soviet Union and world Communism, South Korea established diplomatic and trade relations with China and Russia (Pak, 1993). However, the security order in Northeast Asia is still marked by Cold War friction and confrontation. Since the end of the Cold War, Japan has made continued efforts to expand its status and role in the international community with the size of its economy. China is pursuing continuous military modernization, and China–Taiwan tensions and disputes have become quite acute (Ministry of National Defense White Paper, 1997).

South Korea's security policy is to defend the nation from armed aggression by North Korea and other potential adversaries, support the nation's effort for peaceful

unification, and contribute to the security and peace of the Northeast Asia. Its security policy posture is peace-oriented, based on nonintervention (Pak, 1993; Ohn, 1994). For national defense, South Korea maintains 690,000 troops in total, comprising 1.6 percent of its population. It also maintains 3,080,000 reserve forces, 2,050 tanks, 2,250 armored vehicles, 4700 artillery, 690 fighters, and 4 submarines (Ministry of National Defense White Paper, 1997).

Military spending and procurement in the Cold War era

US defense strategy, the security environment, and the political will of the national state in South Korea shaped defense spending and procurement in the Cold War era (Sutter, 1996; H.K. Kim, 1997). Since the signing of the US–Korean Mutual Defense Treaty in 1954, the United States has influenced the patterns of defense spending and procurement in South Korea in two ways: by providing military assistance and by exerting pressure on South Korea to shoulder an increasing share of the defense burden within the US–South Korean military alliance (Hong, 1993; H.K. Kim, 1997).

Although South Korea's military spending has continually risen over time, the rate of change has varied quite substantially, from slower growth in the 1960s, to rapid increases in the 1970s, and a return to slow growth in the 1980s. In the face of heightened North Korean military hostility and diminishing US commitment, the Park military regime abruptly doubled military spending from $716 million in 1975 to $1.5 billion in 1976, while its share of GNP jumped from 3.9 to 6.3 percent (Moon and Hyun, 1988).[4] Sustained through 1981, the share of defense spending in GNP began to decline thereafter.[5]

The post-1982 shift reflected the Chun regime's political priorities. To justify his seizure of political power, Chun sought to bolster social and economic stability rather than national security. This prompted a corresponding shift from a "make," or buy domestic, procurement policy to "buy," or import policy. To increase his legitimacy, Chun abandoned the defense military buildup plan that had caused tremendous conflicts with the United States in the approval process. As a result, the defense industry lost its prominent place in the national policy agenda (Hong, 1993).

Simultaneously, the responsibility for promoting defense industrial policy shifted from the Blue House, the South Korean Presidential residence, to the Ministry of National Defense (MND). Management organizations for the South Korean defense industry at MND and the Ministry of Trade and Industry were drastically downsized. Investment for R&D was significantly reduced. The Agency for Defense Development (ADD), which was commissioned to serve as a defense-related technical center, acquire foreign defense technology, and engage directly in defense product development, merged or eliminated divisions with overlapping funding and dismissed about 800 researchers in April 1981 (Shin, 1993; Oh, 1996). Several core members of guided weapons teams and other high-tech systems R&D teams lost their jobs (Hwang, 1996a). Since 1980, the South Korean regimes have not aggressively pursued as robust an arms industry as they might have for fear of damaging US–South Korea defense and economic ties (Hong, 1993).

Table 10.1 South Korean military expenditures, share in GNP and total expenditures (million US$)

Year	*Military expenditures*		*Percent of GNP*	*Percent of government expenditures*
	Current	*Constant (1995)*		
1985	6,507	8,919	5.0	26.6
1986	7,065	9,430	4.7	27.5
1987	7,356	9,522	4.2	25.5
1988	8,131	10,150	4.0	25.2
1989	9,337	11,190	4.1	23.8
1990	10,780	12,390	4.2	22.3
1991	10,820	11,950	3.7	19.6
1992	11,840	12,740	3.7	19.8
1993	12,450	13,050	3.6	19.5
1994	13,930	14,280	3.7	17.4
1995	14,410	14,410	3.4	13.6

Source: US Arms Control and Disarmament Agency (1996).

Although the share of South Korea's defense spending in GNP has declined since 1982, the drop was modest. Compared with other Third World countries, the share remained relatively high through the late 1980s, mainly due to US pressures for burden sharing. Moreover, defense spending steadily increased in real terms, and it accounted for more than 20 percent of total government expenditures, up through 1990 (Table 10.1). Responding to its domestic fiscal crises in the mid-1970s and 1980s, the United States demanded defense burden sharing from its allies, and as a result, South Korea entered into an informal agreement to allocate 6 percent of GNP to the defense sector (Moon, 1986).

The post-Cold War era and democratization

The continued stalemate with the North, burden sharing, and democratization in South Korea are the three main shapers of South Korean defense spending and procurement levels in the post-Cold War era. Military expenditures, holdings of selected weapon systems, armed forces personnel, and employment in arms production remained more or less constant in real terms between 1985 and 1994 (Bonn International Center for Conversion, 1996).[6] But with the waning of the Cold War and the waxing of democracy in South Korea, military priorities have lost ground relatively. The military share of GNP has fallen from 5 percent in 1985 to 3.4 percent in 1995, and its share of overall government spending has decreased from 27 percent in 1985 to 14 percent in 1995 (Figure 10.1). The gap between defense spending and social development spending has been narrowing (Moon and Hyun, 1988).

Disaggregating defense spending by category reveals that personnel and defense-related R&D spending has decreased while spending on new investment in and maintenance of equipment escalated in the post-Cold War era. Moreover, foreign purchases of defense equipment have been increasing.[7] These compositional

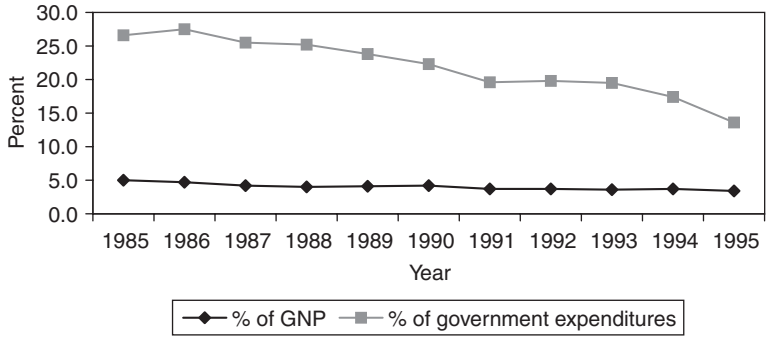


Figure 10.1 Share of military expenditures in GNP and government expenditures.
Source: US Arms Control and Disarmament Agency, 1996.

changes in spending and trade reveal the success of US burden-sharing policy. South Korea's major weapon systems are imported chiefly from the United States – purchases via US Foreign Military Sales (FMS) and from private American companies accounted for about 70 percent of total foreign procurement in 1995 (Ministry of National Defense White Paper, 1997).

The defense industry

The unique features of the South Korean defense industry date from the 1970s, when it was developed under the Park regime.

The evolution of the South Korean defense industry

In 1970, following a renewed threat from North Korea and the Nixon Doctrine, the South Korea State began to build a self-sufficient defense industry (Nolan, 1986, 1987; Markusen and Park, 1993; Hwang, 1996a).[8] It blended defense policies with economic policies for overall development, favoring capital-intensive sectors such as heavy machinery, iron and steel, shipbuilding, and electronics (Moon, 1986; Markusen and Park, 1993). The state financed the rapid buildup with a National Defense Tax, a 10 percent income and sales tax surcharge, which persisted until 1990. A nationwide fund-raising campaign was launched to fund special defense projects, especially in R&D (Hwang, 1996a). Over two decades, a total of 31.5 trillion won or 32.2 percent of total defense spending was invested in building military industrial capability (Ministry of National Defense White Paper, 1997).

During the buildup, President Park made all major decisions, his views determining the characteristics of the defense industry (Hong, 1993; Markusen and Park, 1993; Bitzinger, 1995). For speed, he drafted the chaebol, already large, private business conglomerates, to manage production. The state strategically allocated various credits and incentives for this purpose, distributed mainly to the chaebol.[9] As a result, most defense production is heavily concentrated in just a few large

firms (Hong, 1993; Markusen and Park, 1993; Bitzinger, 1995). At the same time, the Park regime limited military work to no more than 30 percent in any one firm (Hwang, 1996a; Choi, 1996). As a result, South Korea's military contractors evolved as dual-use producers, in contrast to US-style defense-specialized corporations (Markusen, 1998).

By choosing a company-owned, company-managed (CO–CO) system, the Park government rejected public production (Choi, 1996; Oh, 1996). But it engaged in active oversight, was heavily involved in military industrial planning and development, and entirely controlled military research and development via ADD. Government-conducted defense R&D meant that military production was organizationally separated from defense R&D, which hampered efficiency (Bitzinger, 1995; Choi and Han, 1993). Spatial segregation reinforced this disadvantage, because the state elected to concentrate much of the new defense industrial activity in the south, building for this purpose a defense industrial complex in Changwon (Markusen and Park, 1993).[10]

Despite its strong desire for and concerted efforts to develop an indigenous industry, the South Korean state remained heavily dependent upon the United States for both weapons and direct provision of security. Except for the brief post-Vietnam war period, the United States committed large amounts of military aid and maintained a considerable contingent of military personnel on South Korean soil. It also provided South Korea with a wide range of defense-related technology via technical data packages, manufacturing license agreements, and coproduction agreements.[11] Under the US mantle, the power and influence of a newly emerging military industrial complex in South Korea was fundamentally limited (Kim, 1997).

In sum, the dominance by chaebol, defense contractors' dual-use capabilities in production, the CO–CO system, organizational separation of defense R&D from the manufacturing base, geographical concentration in Changwon, and dependence on the United States are unique characteristics of the South Korean defense industry. These features deeply influence the strategies and responses of firms to recent contract cuts.

South Korean weapon systems, sectors, firms, locales

South Korea possesses a dualistic military industrial firm structure. In 1996, 83 defense contractors produced 319 defense items in 7 sectors; guns, ammunition, mobility, communication/electronics, vessels, aircraft/guided weapons, and other (Table 10.2).[12] Some 30 firms employ more than 1,000 workers each, while just 9 employ fewer than 100 (Table 10.3).[13] But regardless of size, most firms are not heavily defense-dependent.

Large firms dominate the market but are somewhat less specialized than small firms. The share of ten major defense contractors in national defense sales is 75 percent (Defense Industrial Companies Association, 1997). Most defense work is concentrated in a few large conglomerates – Samsung, Hyundai, Daewoo, and Lucky-Goldstar (LG). Defense contractors employed approximately 45,000 workers at the beginning of the 1990s (Office of Technology Assessment, 1991).

Table 10.2 Defense contractors and sales by sector

	Defense contractors		*Defense sales*		*Growth rate (%)*
	1989 total #	*1996 total #*	*1989 (billion won)*	*1996 (billion won)*	
Aircraft/guided weapons	3	7	150	937	524.0
Guns	10	14	244	350	43.5
Ammunition	8	10	276	410	48.3
Mobility	10	12	303	593	95.4
Communication/electronics	11	13	56	103	85.6
Vessels	5	5	180	326	81.1
Others	32	22	150	294	96.3
Total	79	83	1,359	3,013	974.2

Sources: South Korea, Ministry of National Defense (1997); Defense Industrial Companies Association (1997).

Table 10.3 Firms' characteristics by employment size

Employment	*Number of firms*	*Total sales (billion won)*	*Defense sales (billion won)*	*Defense/total*
Over 1,000	30	70,010	2,658	3.8
500–999	10	967	191	19.8
100–499	30	873	146	16.8
Under 100	9	41	16	39.2
Total	79	71,891	3,012	4.2

Sources: South Korea, Ministry of National Defense (1997); Defense Industrial Companies Association (1997).

Defense plants are clustered in three locales. Of 130 defense plants, 53 (41 percent) are located in the Kyungnam Province, many in Changwon (Tables 10.4 and 10.5). There are 40 defense plants (31 percent) in the Seoul metropolitan areas, drawn by agglomeration economies. A third cluster of 17 defense plants (13 percent) is in Choongchung Province, 7 of which are in Daejon, the home of ADD, the defense R&D institute (Table 10.5). Considering the size of Changwon as a small city built from scratch, the agglomeration of defense production there is quite remarkable. Of the 10 largest defense contractors, 5 have their defense operations in Changwon and are among the more specialized in terms of defense sales and employment (Table 10.4).

Evaluation of defense industrialization

A defense industrial base strategy is costly and risky for developing countries due to their small market size, diseconomies of scale, lack of capital and technology, and late start. South Korea's defense policy was integrated into economic policy, and defense industrialization was closely related to the development of capital-intensive sectors (Moon, 1986; Cheng and Chinworth, 1996; Oh, 1996). However, in spite

Table 10.4 Ten major defense contractors in South Korea

Company	*Size of employment*		*Defense plant locations*	*Major products*
	Total	*Defense*		
Samsung Aerospace	8,633	3,972	Changwon (Kyongnam), Sachon (Kyongnam)	Jet engine parts, engine overhaul
Daewoo Heavy Industries	12,614	2,822	Changwon (Kyongnam), Inchon, Keoje (Kyongnam)	Motor assembly, 106 mm rifles, M16 rifles, submarines
Hyundai Precision	8,515	1,412	Changwon (Kyongnam), Ulsan	Type-88 tank, frigates, corvettes, fast-attack boats
LG Precision	1,782	1,639	Kumi (Kyongbuk), Pyoungtaek (Kyongki)	Defense electronics, missiles
Pung San Co.	4,778	2,820	Kyongju (Kyongbuk), Busan, Ulsan, Inchon	Ammunition
Han Hwa Co.	3,526	1,886	Changwon (Kyongnam), Inchon, Yeosu (Jonnam), Daejon, Boeun (Chungbuk)	Explosive and propellants, mines, shells, grenades
Korean Air Co.	15,410	1,887	Busan	F-5 fighter, MD-500
Samsung Electronics	56,999	636	Kumi (Kyongbuk), Suwon (Kyongki), Buchon (Kyongki), Yongin (Kyongki)	Transformers, communication electronic components
Asia Motors	9,192	464	Kwangju	Military trucks
Ssangyong Heavy Industries	1,705	443	Changwon (Kyongnam)	750 hp diesel engines for M-48 tank

Source: Defense Industrial Companies Association, 1997.

Table 10.5 Geographical distribution of defense plants in South Korea, 1997

Area	*Number of plants*	*%*
Seoul Metropolitan (Seoul, Inchon, Kyongki Province)	40	30.8
Kyongnam (Busan, Ulsan, Kyongnam Province)	53	40.8
Changwon	22	16.9
Kyongbuk (Daegu, Kyongbuk Province)	8	6.2
Choongchung (Daejon, Choongchung Province)	17	13.1
Others	12	9.1
Total	130	100.0

Source: Defense Industrial Companies Association, 1997.

of its importance, little research has been done on this topic. Public debate in South Korea on the pros and cons of the defense industry buildup has been restricted for national security reasons.

The military establishment, defense-related research institutions, and defense contractors have advocated defense industrialization while economic ministers and advisers and small and medium firms have been skeptical (Moon, 1986). All agree that defense industrialization has not damaged the economy. Defense industrialization triggered the transformation of the South Korean economy from labor-intensive to capital- and technology-intensive industries. The transfer of defense technology contributed to upgrading of the civilian machinery and precision tool industries, in particular, in the 1970s (Oh, 1996; H.K. Kim, 1997), though it is debatable whether there have been other spin-offs. Nor has defense industrialization undermined macroeconomic performance, except during economic crisis periods in the late 1970s and 1990s. Aggregate military industrialization and economic growth have been positively correlated (Moon, 1986). Perhaps the most important military industrial contribution has been the experience gained by scientific and engineering manpower, both in ADD and in the Korean Institute of Science and Technology (KIST) (Swinbanks, 1993; Oh, 1996). In the early 1980s, many of ADD project managers left for private industry and played crucial roles in civilian R&D projects (Shin, 1993; Hwang, 1996a).

Heavy defense spending for military industrialization has had negative effects as well.[14] At times, it caused sporadic disruptions in macroeconomic performance. It deepened South Korea's dependence on foreign credit. Via the relatively high defense tax, it heightened the overall tax burden. It competed with other types of public expenditure, crowding out welfare functions of the state in particular. It intensified an uneven sectoral allocation of resources, and concentrated control of productive assets in the hands of the chaebol, undermining the development of small- and medium-sized firms (Moon, 1986; Moon and Hyun, 1988).

The post-Cold War South Korean defense industry

Since the end of the Cold War and despite the continued standoff with North Korea, South Korea has rather dramatically altered its procurement and military production activities. Losing ground in export markets and acknowledging the relative superiority of some imported weapons systems, the government has moved to abandon certain domestic weapons production lines while intensifying its investments in and patronage of higher tech, dual-use facilities, especially in aerospace. Bitzinger believes that the country's recent economic difficulties have led to "a stronger emphasis on 'domestic weapons first,' in an effort to protect foreign currency reserves, save jobs and aid local industry" (Bitzinger, 2002).

Export market uncertainty, increasing imports and excess capacity

South Korea had built up a satisfactory stock of conventional weapons by the early 1980s. The domestic defense market subsequently stabilized and began to shrink, so that military industrial capacity became underutilized (Bitzinger, 1995). To overcome this market saturation, South Korea actively engaged in military exports, which

increased rapidly after 1977, due to the growing demand for conventional arms and the country's surplus capacity and price competitiveness.[15] By 1982, South Korea was the fifth largest arms exporter in the Third World, the People's Republic of China included (Bitzinger, 1995).

But with the waning of the Cold War and intensified major power competition to sell arms, South Korea's arms exports decreased rapidly from the early 1980s onward. Aggressive US arms export policy was a major factor. In the interests of its oligopolistic domestic producers, the United States implemented the United States Arms Export Control Act and the International Traffic in Arms Regulations which severely restrict third-country sales of defense articles produced with US assistance (Moon, 1986; Moon and Hyun, 1988). Meanwhile, reflecting changes in the "make-buy" calculus, South Korea's arms imports increased sharply, creating a growing arms trade deficit (Figure 10.2). These international trade shifts compounded the poor capacity utilization rate of South Korea's defense sector, which fluctuated between 54 and 59 percent between 1990 and 1995 (Figure 10.3)

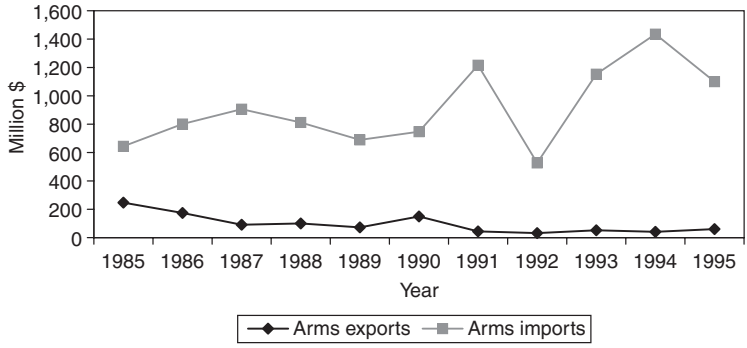


Figure 10.2 Arms exports and imports in South Korea. (Constant values, 1995.)
Source: US Arms Control and Disarmament Agency, 1996.

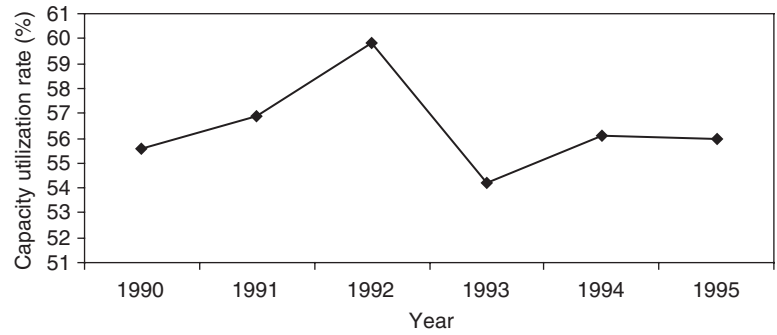


Figure 10.3 Capacity utilization rates for South Korea's defense industry.
Sources: South Korea, MND (1996); *Monthly Journal of National Defense and Technology* (1996).

(Ministry of National Defense, 1996, cited in *Monthly Journal of National Defense and Technology*, 1996).

The military industrial shift toward aerospace

Although South Korean defense contractors' sales increased by 43 percent in real terms from 1989 to 1995, all of the growth was concentrated in the aircraft and guided weapons sector, which more than tripled while other sectors either declined or remained stagnant (Table 10.2). Sectoral structure in the defense industry thus shifted markedly in favor of aerospace, a sector that continues to require foreign involvement and technology.

Growing defense sales in the aircraft are the result of the KTX-1 (basic training aircraft) and KTX-2 (advanced training aircraft) development projects pursued by the central government. For example, for the KTX-2 project, the MND and the Ministry of Finance and Economy paid for 50 and 20 percent, respectively, of total development expenses, while Samsung Aerospace Co. and Lockheed Martin underwrote 17 and 13 percent, respectively (*Chosun Daily News*, July 1997). The aircraft industry is responsible for a large portion of the trade deficit, due to its imports of components, licensed production system, and low level of technology – domestic content remains quite low (Pak, 1996; S.B. Kim, 1997).

The South Korean aircraft industry remains plagued with problems. It is widely criticized as supporting duplicative research and production facilities. Too many contractors – their numbers increased from 3 to 7 between 1989 and 1996 – means excess capacity and failure to achieve economies of scale. Two R&D institutes, the Korea Aerospace Research Institute (KARI) with the mission to advance the civil aircraft industry and the ADD, the defense R&D institute, operate independently with little interaction and synergy between them or with production managers (Hwang, 1996a,b; Bitzinger, 1995, 2002).

Military industrial conversion progress and barriers

By the early 1990s, the military industrial drag on the economy began to prompt new discussions about defense dual use and conversion. However, the strategy, motives for, and politics of discourse on conversion in South Korea differ from those in the United States, Russia, and other major Cold War powers, for several reasons.

First, the level of defense industrial capability and technology in South Korea is much lower, limiting the potential for spin-off or dual-use applications from defense R&D.[16] The bulk of South Korea's defense industrial activity is concentrated on "hot war" capabilities such as small arms, ammunition, mortars, patrol boats, tanks, and artillery.[17] Even though South Korea assembles some sophisticated aerospace, communication, and electronics systems, most of its military equipment is produced under license and relies heavily on imported components and subsystems. Less than 20 percent of South Korean arms purchases are truly indigenous. The country has not been very successful in developing and designing major weapon systems,

despite its considerable investment of money and human capital. Its military research and production complex has experienced continued technical setbacks (Bitzinger, 1995). These have been compounded by military planners' tendency to favor foreign weapons systems and military technologies over local ones (Choi and Huh, 1994).

Second, unlike United States' and other developing countries' military industrial contractors, South Korean contractors are not heavily defense-dependent. They already possess dual-use capabilities in production, so that they are easily able to exit from military sectors. Indeed, civilian activity has been more profitable for the chaebol, who might have ceased military production long ago in the absence of the government's mandate. They do not, therefore, constitute a major source of supply-side resistance. These structural factors combine with South Korea's relatively unique politics to shape conversion debate and progress.

Central government policy

Since the 1990s, the central government has pursued three major policies to downsize and restructure its defense industrial sector: R&D programs, dual-use technology policy, and defense contractor's designation policy.

Government R&D programs

Akin to advanced industrial nations' government-led R&D policies for high-technology industries, South Korea has embarked upon six major government R&D programs, only small portions of which address national defense needs.[18] They cover the range from electronics, aerospace, and energy to information and communication sectors. They are designed to introduce and acquire leading-edge foreign technology especially in semiconductor, computer, wireless communication, aerospace, atomic energy, and alternative energy sectors and to develop the indigenous technologies in these sectors. These have been, however, criticized for multiple reasons, including the significant bias toward commercial technologies rather than basic (fundamental) technologies, ineffective program management, overlap among initiatives, and shortsighted time horizons (Hwang, 1997).

A major structural barrier to an R&D-led high-tech route is South Korea's segregation of civilian from defense R&D and self-defeating competition between the respective lead agencies. Beginning in the 1970s, KIST and ADD built mutually exclusive networks for science and technology missions (Shin, 1993).[19] Severe restrictions on the defense R&D process deterred the participation of research institutes of universities and private companies in military R&D decision-making. Poor linkage between the civilian and defense sectors resulted in inefficiency and duplication (C.H. Kim, 1995). However, the ADD was drastically downsized in 1980, and its power was curtailed in the democratization process in the 1990s. The MOST and MOTIE have played leading roles in the development of government R&D since the 1990s.

These structural problems have become the target of new initiatives. The central government is modifying regulations to incorporate research institutes of

universities, the government, and private companies in R&D decision-making. The ADD will specialize in acquiring the advanced weapons systems but will be compelled to transfer the technologies of its own development to civilian firms. Currently, it is spinning out twelve technologies including software techniques for retrieving and displaying the information in digitized maps (Ministry of National Defense White Paper, 1997).

Dual-use technology policy

A central tenet of current South Korean military procurement policy is to increase foreign purchases and thereby strengthen the US–South Korean military alliance. However, the South Korean procurement policy is not completely a "buy" policy – it aims to build an advanced defense industrial base in aerospace, electronics, and communication sectors that have greater potential for dual-use capabilities. For these sectors, the MND plans to prompt defense contractors to develop technologies, which can be used by both civilian and military customers (MND, 1995; Bitzinger, 2002).

The motive for pursuing dual-use technology policy in South Korea is quite different from that in the United States. Here, it is envisioned principally as a means for interministerial coordination rather than to quicken the spin-on of civilian technology for defense applications or to minimize the barriers between defense contractors and civilian firms (Oden *et al.*, 1995). Dual-use technology policy has precipitated debate between MND and MOST over its suitability.[20] Because the policy was initiated in 1995 by MOST with exclusively MOST funding, the MND remains a passive implementer, while the MOST actively pursues a dual-use policy. MOST's goal is to eliminate "high cost and low efficiency" in government public institutions and interministerial conflicts over roles and missions. MND is somewhat hostile toward the policy:

> The MOST is not an appropriate agency to pursue this dual use technology policy, because its funding for this policy is too small. Its real intent is to use national defense expenditure for the civilian sectors.
> (A research fellow in the Korea Institute for Defense Analyses (KIDA), an agency of the MND)

In 1996, to overcome the discord between the two agencies, the national state formed the National Advisory Committee for Science and Technology, chaired by the Prime Minister. However, it meets only once or twice a year and does not have the power to arbitrate interministerial conflicts over turf.

South Korea's dual-use initiatives show some promise and build on past success. Domestic development of machine tools and fuel injection systems utilized precision machine capabilities developed in rifle making. Electronics and communication technology developed from fire control systems, while communication and laser-ranging equipment contributed to the development of video tape recorders, copy-machine drums, microwave devices, cordless telephones, navigational radar, and marine electronics (Kim, 1993; Hwang, 1996a). Technology for producing tanks

and military vehicles could be applied to railcars, trucks, and special engines for civilian applications.

Designation policy

South Korean defense industrial base practice has traditionally "designated," or earmarked certain contracts for specific defense contractors (Choi, 1996; Choi and Han, 1993). In the future, the central government plans to "cancel the designation of defense items that can be replaced with civilian products so that such items can be produced through free competition" (Ministry of National Defense White Paper, 1997). In practice, however, the shift from a "protection principle" to a "restricted competition principle" is in the chaebols' interests, because they will now be able to bid for systems and components currently allocated to small and medium defense contractors.[21] This policy will thus tend to enhance the future market power of chaebols.

Private sector response

In the post-Cold War era, South Korean firms are less and less interested in maintaining their military industrial capacity given plunging utilization rates and diminishing government subsidies. During the sudden downturn of the late 1990s, there was some backtracking in this regard (Bitzinger, 2002), but for the longer term, this attitude persists. However, the chaebol cannot exit from the defense sectors without special permission from the central government (Choi, 1996). The most common response to defense cuts is to concentrate on producing more civilian goods, so that the defense share of contractors' output has fallen by around 7 percent (Choi, 1996). Specific strategies for defense restructuring vary from small firms to large firms and among sectors.

Unlike large firms in the United States and Europe, the South Korean chaebols often find it easier to diversify than their smaller counterparts. Their dependence on defense production is generally much lower, so that they are less vulnerable to defense cuts. Under the chaebol structure with its far-flung network of subsidiaries, contractors have greater leeway to convert both manpower and financial resources. Within these giant corporate empires, small numbers of defense workers can be more easily absorbed into other civilian activities or subsidiaries during defense sector recessions. Through intersubsidiary loan guarantees, large defense contractors tend to be financially less volatile. Their higher dual-use capabilities in production enable them to avoid idle equipment. In contrast, smaller defense contractors, generally more dependent on defense production than large firms, have two choices – beg the central government for more defense orders or go bankrupt (Pak, 1996). Smaller firms oppose the cancellation of designation policy and emphasize the need for stronger defense specialization through designation. Without designation, competition with large defense contractors is unavoidable, and small firms would likely lose. Yet, they cannot exit from the defense sector, because the government will not permit them to do so. Thus, some small defense

firms that already have higher dual-use capabilities continue to do new product development that can be applied to more common uses through diversification.[22]

While each chaebol is flexibly positioned to convert within its conglomerate empire, there are rigid barriers between conglomerates that hamper defense restructuring. The chaebol are very competitive with each other in bidding for military contracts. In this context, it is almost impossible to form consortia among large defense contractors for business collaboration. They are also extremely reluctant to engage in divestiture, mergers, and consolidation among themselves as a way to reduce redundant capacity. Such reduction can only occur if there is strong state intervention.[23]

In late 1999, the Korean government forced a merger between three of the largest aircraft companies: Samsung Aeropsace, Daewoo Heavy Industries Arospace division, and Hyundai Space and Aircraft Company, forming the new Korea Aerospace Industries (KAI). According to Bitzinger (2002), this merger is not promising as a means for improving the industry's performance. In our view, it replicates some of the worst features of the recent American defense merger phenomenon, creating a more defense-dependent firm, separating defense divisions from the larger chaebol parent with its managerial and financial resources, and with the promise of exclusive defense contracts in the military aircraft arena. These features diminish the chances that the considerable resources of this sector will be applied to other forms of industrial development.

There are significant differences among firms and sectors in defense industrial restructuring. Overall, the shipbuilding industry has had the best experience, able to rely principally on civilian sales and the efficient co-location of civilian with defense production, while the aerospace industry posts the worst record (Bitzinger, 2002). For a better understanding of these differences and those among firms in the same industry, firm-specific experiences are elaborated on in the following section.[24] In deference to our interviewees, the identities of individual firms are protected in the following account by naming each as company "A …," "B …," and so on, where the alphabetical prefixes connote chaebol membership.

High potential dual-use technology sectors

The higher tech military industrial sectors encompass aerospace, electronics, and communications equipment. These are sectors that in advanced industrial countries like the United States have yielded considerable spin-offs historically into civilian sectors (Markusen and Yudken, 1992). Such experience, however, is not easily replicated by latecomer industries in developing countries. In South Korea, we found that military industrial firms in the electronics and communication sectors are less adversely affected by defense cuts than are firms in other sectors because their defense shares of total output are relatively modest, they possess considerable dual use and their weapons systems continue to be favored by contemporary military strategy. The aerospace industry is more problematic.

In our interviews, we found that firms in the electronics and communication sectors were growing rapidly by implementing diversification strategies. Many

planned to recruit additional skilled labor, especially if financial encouragement from the central government were forthcoming. A Electronic Co. Ltd is a typical case. This company, which produces radar, missile, fire control systems, electro-optical devices, and telecommunication systems, does not have an explicit defense restructuring strategy not only because it has pursued diversification from the beginning but also because its defense share is extremely small – less than 5 percent. Its rapid growth has been led by its civilian divisions, and its R&D investments are concentrated in civilian markets.

B Aerospace Ind. Ltd is another successful case. B Aerospace began by producing military aircraft engine parts in 1977, and its principle contemporary projects are the Korean Fight Program (KFP) and KTX-2. This company assembles the KF-16 (integration, manufacturing parts, assembly) and manufactures aerostructures such as wing and empennage assemblies, frame assemblies, structural subassemblies and parts. It also manufactures engine parts for the J85/PW4000 as a subcontractor to Lockheed-Martin, Northrop, and Boeing. In spite of the post-Cold War defense market implosion, its defense sales increased rapidly from 49 billion won in 1985 to 600 billion won in 1995, and between 1990 and 1995, it amplified its defense workforce from 1,500 to 4,000. In recruiting workers, it drew from other subsidiaries within its group as well as externally. Despite its expanding defense sales, the company is actively pursuing diversification, reducing its defense share from 70 percent in 1985 to 52 percent in 1995. According to one staff member, its priority is on its incoming civilian aircraft project and other civilian products such as cameras and factory automation (FA) systems, hedging against a changing security environment and preparing for possible reunification with North Korea. The company is also actively reorganizing internally by implementing management information systems (MIS) for high productivity. Its technology and R&D center was recently moved to Sachun, the newly emerging aerospace industrial complex, to take advantage of testing facilities there, including an airport and landing strip. It is unclear how the recent creation of KAI will affect the priorities and prospects for this division.

Another aerospace company demonstrates the difficulties of restructuring. C Heavy Industries Ltd, is struggling to overcome a string of negative returns. The company entered the aerospace field in 1984 as a subcontractor for F-16 fighter fuselages for General Dynamics. It has been designated as a prime contractor for the Korean trainer program (KTX-1) and the Korean scout helicopter program. The company delivers F-16 airframes and Boeing 737, 742, and 767 main fuselage parts as well as helicopter airframes, rotor hubs, and transmissions within the international division of labor. It built an aerospace plant in Sachon to begin mass-production of the KTX-1 in 1999. Despite growth in sales, C Heavy's aerospace division sustained heavy losses because it has had to import expensive and technologically complex parts. Its losses in 1996 amounted to 20 billion won. According to a manager, efforts to reverse these losses are unlikely to succeed because of the central government's decision to retard the pace of its helicopter program and decreasing international demand due to global defense cuts. When we interviewed the management in 1997, diversification and merger strategies were being weighed

at the conglomerate group level. It is unclear how the KAI merger will affect operations in this division also.

Despite huge losses for some, companies stay in the aerospace sector because the central government continues to encourage and subsidize the sector and because they hope to obtain access to advanced military technology which might be transferable to civilian markets (Bitzinger, 1995). An emerging international division of labor in weapons systems explains some of growth of aerospace firms in South Korea. US aircraft companies have shifted their subcontracts from Japanese or Taiwanese firms, which have already achieved certain levels of technology, to the lower tech South Korean firms to avoid technology transfer to firms in the former two countries who might become their competitors. As subcontractors to US aerospace firms, several South Korean firms were able to win subcontract bids due to conflicts between the United States and both Japan and Taiwan in the 1990s. In addition, astute use of offsets demands by the South Koreans has enhanced the shares of defense-related work performed in the country (Cheng and Chinworth, 1996).

"Hot war" equipment sectors

Defense firms producing "hot war" equipments such as tanks, ground fighting equipment, ships, and ammunition are planning to downsize their defense-dedicated equipment and personnel. They are keen to diversify, but in spite of their efforts, they face formidable obstacles due to their fragile and noncompetitive corporate structures and the relatively effective opposition to layoffs from strong labor unions.

C Heavy Ind. Ltd, for example, produces naval and special ships and ground fighting equipment as well as aerospace products. Its strategy for defense restructuring at the group level is constrained by its place within the larger corporate structure. This company became a member of the "C Group" in 1976 and established a solid foundation by merging with "C Shipbuilding" and "C Heavy Machinery Ltd" in 1994, creating five major business divisions: heavy machinery, shipbuilding, special projects, public motors (mini-vehicles), and civilian vehicles. Its share of defense to total sales was just 9 percent in 1997. Its defense downsizing problems are concentrated in its special project division, where since the early 1990s, its ground fighting equipment operations have experienced low capacity utilization rates. Because of US exports regulations, it has not been able to absorb capacity by exporting products created under license from US firms. The company is trying to convert its production line from fighting equipment to construction equipment such as wheel loaders, bulldozers, cranes, and concrete pump trucks. It is also attempting to reduce personnel, but because its active union has made layoffs difficult, it is doing so chiefly by postponing new recruitment.

D Precision Ind. Ltd, an affiliate of the "D Business Group," also faces barriers to diversification and active resistance to layoffs from its labor union. A dual-use producer since its establishment in 1977, its main civilian products are rolling stock, 4WD utility vehicles, auto parts, transmission and axles, containers, NC machines,

and environmental facilities. Its defense products include the K1 (105 mm), K1A1 (120 mm), main battle tanks, K1 armored recovery vehicle, and K1 armored vehicle launched bridge. With a steady diet of military contracts and R&D infusions from the central government, its defense business was quite lucrative, and its capacity utilization rate was 100 percent until 1997. But in 1998, its tank production line closed because the South Korean army had achieved a level of tank inventory sufficient far into the future. The company began to produce excavators, similar in size and function to tanks and matching well the firms, technical capabilities.

It has proved difficult for D Precision to win market share in excavators for several reasons. For one, the company had evaluated technical compatibilities but understood little about the competitive conditions in the excavator market. The company must compete against other chaebols, which already have skills, know-how, and marketing capabilities in this product line. It also ran into problems with differences in customers' requirements in technologies such as welding and oil pressure gauges. Furthermore, D Precision's conversion initiative brought about conflicts with another D group affiliate, which already produced excavators. Even though it is within the same business group, the affiliate is reluctant to transfer their technology and know-how. Even if the excavator initiative succeeds, the company faces surplus labor problems. Currently, it employs 1,200 defense workers in tank production, only 400 of whom will be needed for the production of excavators. However, layoffs are impossible and rearrangement of workers' posts very difficult because of its strong labor union. In order to solve the excess labor problem, the company is simultaneously trying to win market share in integrated logistics support systems for tanks, but this effort creates friction with Group D's ground arsenal division.

The conversion experience of E Heavy Industries and Construction Co. Ltd as a state-run company is unique. E Heavy's main civilian products are power plants (nuclear, thermal, and hydro), diesel engines, and gas turbines, and it also produces military products such as ribbon bridge systems and marine diesel engines. Defense to total sales is less than 1 percent, with only 120 workers working on military projects out of a total of 8,000 workers. The company has not had to adopt any specific plan to restructure its defense business, despite the end of the ribbon bridge project. It has coped easily with its surplus labor problem as its other business segments absorb defense workers. Enjoying stable labor–management relations, it has benefited from the cooperation of its labor union in the rearrangement of workers' posts. The company wants to exit the defense sector because of the latter's unprofitability, but it has not made any formal decision to do so because it is a state-run company.

These accounts cover many of the larger and more successful South Korean military industrial facilities. There are other firms, especially smaller and more defense-dedicated contractors, which have fared poorly. From 1990–94, nine defense contractors went bankrupt. During the worst of defense downsizing in 1997, dovetailing with the more general economic crisis, Sammi Special Steel Ind. Ltd, Asia Automotive Ind.Ltd, Kia Motor Ind. Ltd, Taesan Precision company, and several small defense firms went bankrupt. It is not clear, however, that military contract cancellations caused their bankruptcies. As of 1998, six more firms were

on the verge of collapse and hoping that the government would extend financial rescue packages to them.

The relative willingness and ease with which the larger firms shifted gears over this period attests to the advantages of a dual-use military industrial sector without large defense-dedicated firms. It also affirms the advantages of the conglomerate structure within which groups can allocate personnel and financial resources across divisions and companies as market demand shifts. Rigidities between conglomerate groups counteract this agility to some extent. Mixed signals from the government on defense requirements and a culture in which it is difficult to lay off workers mean that there is still excess capacity on the defense side, which could be rationalized. On the other hand, the prohibitions on layoffs have helped induce these firms to move into civilian product lines where otherwise they might not.

Community and workers' response

Unlike the United States and China, which are burdened by strong military industrial constituencies, politically mobilized defense-dependent communities have not emerged in South Korea in spite of the concentration of military industrial activity in the Youngnam region, especially in Changwon. Because most military industrial activity has relied on "hot war" technologies, these sectors were from the start dual use in nature and thus able to serve automotive and other civilian markets as an alternative. Even with Changwon, there is no South Korean region whose defense to total sales share exceeds 50 percent. Although the Changwon complex produces about 52 percent of national defense output and employs 41 percent of the national defense industrial workforce, its defense to total sales share is under 11 percent. In addition, until recently, South Korean provinces and localities have had little power or political infrastructure. The Changwon complex, for instance, was developed and is still run by a central government agency (Markusen and Park, 1993). In national security matters in particular, local governments have been excluded while the central government dominates defense restructuring.

Worker opposition to defense industrial downsizing is relatively insignificant because the chaebol are committed to absorbing defense workers within the business group, as they have historically done through past defense industrial downturns. Nor do defense industrial workers, accounting for only 0.13 percent of the labor force, constitute an effective source of resistance at the national level (National Statistical Office, 1998). However, it is important to distinguish between worker resistance to layoffs in general, where unions have become a very active source of opposition since their legalization in the late 1980s, and resistance to defense-related cuts in particular. Resistance to layoffs has contributed to the active search for diversification on the part of the larger defense conglomerates.

It is worth recounting here the unique history of labor recruitment and labor/management relations in this heavily state-regulated sector, for it helps to explain recent dramatic changes in worker posture toward industrial restructuring. The South Korean government has traditionally pursued a distinctive and rather harsh labor policy toward this group of workers for national security reasons.

It facilitated defense firms' recruitment of manpower by exempting young men from obligatory military service if they worked for five years in a defense-related industry or research institute (Markusen and Park, 1993). This exemption afforded defense firms greater flexiblity during military industrial fluctuations because many workers' employment contracts extended only five years, a de facto form of contingent labor. The policy emphatically did not allow workers in defense industries to organize trade unions, even after workers in other sectors could legally do so. If a worker or technician who was hired as an exemption case from military service joined a union, his exemption was immediately canceled, and the law required he be drafted into the army, suppressing labor organizing in defense facilities until the late 1980s.

These policies affected workers in civilian sectors as well, due to the ambiguous definition of "military sector" and "defense worker" in a relatively military/civilian integrated sector. All workers, if they were even tangentially related to military production, could be regarded as defense-related, and for recruitment and labor peace reasons, employers had every reason to do so. Indeed, the prohibition of labor unions in defense facilities created an incentive favoring dual-use production, because in this way management could take advantage of favorable wages, work rules, and lack of work stoppages. This motivation complemented the exemption of defense goods from international trade regulations as inducements to dual-use strategies.

By the late 1980s and early 1990s, rooted in the broader labor rights and democratization movement in South Korea, conflict over these conditions emerged. Samsung Heavy Industry, Daewoo Precision, Daewoo Heavy Industry, Poongsan Metal, and Hyundai Heavy Industry Corps fired defense workers who participated in the newly invigorated labor movement, and those workers were drafted into the army forcibly (H.K. Kim, 1997).[25] This enforced draft occurred mainly in the Youngnam region (Kyoungnam Province and Busan), where defense industries and national key industries are concentrated. To counter this labor control strategy, workers in 1997 in military sectors organized the Youngnam Region Labor Committee for the Abolition of the Enforced Draft. Subsequently, similar firings brought about more serious turmoil than management could tolerate. By the early 1990s, defense-related workers were able to participate in strikes more easily with the help of unions already organized by nondefense workers in the same corporation, and as contracts terminated, defense firms were required to maintain an idle labor force when they faced a strong labor union. In 1997, labor law was finally revised following the successful 1996 workers' General Strike. Among other things, the new law defined a defense firm more specifically.[26]

In sum, despite the existence of the military industrial complex in Youngnam, a defense constituency actively resisting national defense industrial spending cuts has not been emerged in South Korea in this period. For different reasons, firms, labor unions, and local communities have not organized around spending cuts *per se*, though union resistance to layoffs has been a major impetus for firm-level diversification. Furthermore, because of the dilution of negative defense impacts via shifts to dual-use products and markets and the absence of worker and

community pressure, the central government in South Korea has not to date provided adjustment programs for displaced defense workers. This, however, may change in the future.

Conclusions and policy implications

The South Korean experience is at once unique and prototypical. Precipitated by north/south stalemate and a policy shift on the part of its major Cold War patron, the United States, the government's effort to build an indigenous military industrial sector and use it to jump-start a capital goods sector is at best a mixed success. On the one hand, despite its head start and close economic ties with industrial high performers, Japan and the United States, South Korea has not made it into the ranks of high-tech arms exporters. Even its effort to identify and fill niches in the international division of labor in arms has yet to be clearly successful. On the other hand, it was able to gain expertise early on, which it parlayed into machining, automaking, and civilian shipbuilding capacity. Furthermore, its decision to spread responsibility for producing arms among the major chaebol without rendering any one firm highly dependent on government spending resulted in a relatively flexible and "dual-use" industry which has relatively easily moved people and capabilities into civilian activity in the 1990s.[27] The Korean financial crisis of the late 1990s, however, hit the defense sector hard, so that the chaebols' flexibility in reassigning people and capabilities, and success in reducing redundant capacity have been curbed.

A number of conclusions can be drawn from our analysis of the complex's political and economic history. First, as competition intensifies in the international arms market, South Korea may be well advised to pursue specialization and excellence in nonmilitary sectors, buying arms on an international market where it will be able to play one supplier off against another. Its ability to do so is unfortunately likely to be conditional on US acceptance of such a strategy, including South Korean purchases from European and other suppliers as well as American firms. Although unification, when it comes, will offer South Korea an opportunity to alter its relationship with the United States, the South Korean defense industry may remain subordinated to US defense policy and US defense firms. An effort to shed this singular relationship should be made.

At the same time, South Korea might be well advised to continue to pursue a select number of defense technologies, especially those that offer dual-use potential for civilian sales. This is more or less what Japan ended up doing with its military aircraft program, never successful as a full-fledged industry but highly successful as an aircraft components exporter (Samuels and Whipple, 1989). Such technologies will have to be chosen carefully, as competition from Japan, Israel, and various second-tier European producers, not to mention the major producing countries, may be fierce. Furthermore, pursuit of expertise in sectors such as aircraft and communication equipment requires that South Korea import expensive one-of-a-kind components from abroad. High and persistent levels of such imports may obviate

any gains from an acquired ability to assemble the high-tech product. In-depth studies on dual-use technology, based on the other nations' concrete experiences, should be conducted by both civilian and military research institutions for accurate and appropriate selection of dual-use high sectors. Simultaneously, South Korea should welcome a public debate on the pros and cons of defense industrial investment as an economic development strategy.

One factor militating against rational South Korean discussion and planning in this regard is the persistence of a double standard in evolving international trade rules. Defense sectors are currently exempt from free trade practices under World Trade Organization (WTO) auspices, on the grounds of national security, while closely allied civilian sectors are not. Thus, a nation that wishes to use defense production as a way of amassing high-tech industrial expertise with civilian potential (following in the footsteps of the United States in the postwar period) must dissemble. It cannot publicly reveal such a strategy for fear of violating WTO and inviting scrutiny and complaints. Since defense industrial expertise is heavily concentrated in the most industrialized nations, contemporary trade practice discriminates against countries like South Korea. Along with other nations profiled in this book, South Korea has a large stake in levelling this particular playing field. Inevitably, progress on this front will require collaboration among second- and third-tier producers and consumers to make an explicit issue of the overweaning comparative advantage and market power of the United States and European producers. Successful worldwide arms reduction would be well served by such an initiative.

South Korea faces other barriers to efficient dual-use development, principally the segregation of its military and civilian publicly funded, publicly conducted high-tech R&D efforts. Surmounting this historical and bureaucratic division of labor is well within the government's power and should be pursued energetically. We recommend greater cooperation between defense and civilian sectors, between the MND and the other ministries, and between the ADD and other civilian R&D institutes. In particular, the function and role of the National Advisory Committee for Science and Technology should be strengthened.

The industrial structure of South Korea's defense manufacturing capability offers much for other developing countries to emulate, especially those such as India, South Africa, and Argentina who are trying to overcome the rigidities of defense-dedicated and/or public-sector operated industrial complexes. With purely private sector responsibility and management of the complex, the South Korean government has found it much easier to alter the composition and level of defense procurement – its role is clearly that of a purchaser and user of military equipment, not also a producer. The modest share of chaebol output dedicated to defense has enabled rapid movement of people and technologies in and out of defense production as the times have warranted. Furthermore, the lodging of much of defense production in large, successful civilian firms means that financial, management and marketing resources are more readily mobilized to bridge the gap than they are even in more highly developed complexes, such as in the United States (Oden *et al.*, 1996; Oden, 1999).

Not all aspects of South Korea's military industrial complex are worth emulating. It retains features, which present ongoing policy problems. One is the extraordinary rigidity that prevents labor, know-how, and divisions from migrating from one chaebol to another in ways that might enhance diversification. This is a larger South Korean industrial restructuring project, but recent defense downsizing may demand greater government action in overhauling corporate regulation and antitrust practices. A second difficulty is redundancy of military industrial capacity, a counterpart to the decentralized structure. We have no good published data on the extent of redundancy.[28] It is difficult to judge just how much of it exists and the extent to which its elimination might result in greater monopoly and thus higher prices, lower quality, and a penchant for political corruption (Markusen, 1997).

One proposed solution to both these problems is that South Korea permit large multinational arms firms to buy up selected South Korea capacity. Recent pronouncements by the government include defense capacity in a more liberalized stance toward international mergers and acquisitions. In 1999, Samsung Electronics entered a joint venture with the French Thomson-CSF, but efforts to find a foreign investor for the newly merged KAI has not been successful (Bitzinger, 2002). Our research cautions against this solution. Defense industrial capability is increasingly concentrated in the hands of a few firms that reach beyond the boundaries of any one individual government, with adverse consequences for both efficient arms production and international security (Markusen, 1999). For developing countries, as the case of Argentina shows clearly, multinational firms may choose to shutter local facilities and abandon innovation in favor of a strategy of exporting from "first-world" excess capacity. South Korea may be better off maintaining domestic ownership of defense-capable plant and equipment, using offsets as a way of ensuring local content and technology transfer.

While we conclude that South Korean military industrial structure has much to be said for it, we caution against an interpretation that gives it too much credit for the relatively rapid and nimble way in which the sector has downsized in the 1990s with minimal worker displacement. Its relative flexibility and success were due in part to an underlying robust economy, but the economic crisis of 1997 changed the situation. Had the chaebol not had other attractive markets to which to turn, they might have pressed for maintenance of "buy domestic" procurement practices. Second, the low incidence of displacement of personnel in this period is due in large part to relatively new and militant labor unions that vigilantly defended the right of workers to a job. Given this inescapable responsibility, the chaebol were compelled to diversify, where their counterparts in other nations might simply lay off workers. South Korea may be industrially stronger for this mechanism in the longer run. Since the 1997 economic crisis, however, the chaebols have attempted to layoff more workers not only in the defense but also civilian sectors. The industrial restructuring led by the government under the IMF bailout program also expedites displacement of workers.

Our research on the South Korean experience suggests that much could be learned by South Korean government, industry, and labor leaders and their counterparts in other "second-tier" defense industrial producing countries by comparing

their experiences with each other. Thorny issues of make/buy, dual-use versus defense dedication, regional and industrial structure, strategic partnerships with "first-world" nations, defense-led industrialization, and arms trade practices would comprise a rich agenda with considerable future payoff.

Notes

1 Our analysis is based on field research in South Korea in 1997 before the financial crisis. In addition to reviewing publications at the defense-related research institutes and government documents published by the Ministry of National Defense (MND), we interviewed research fellows in the Science and Technology Policy Institute (STEPI), Korea Institute for Defense Analyses (KIDA), Research Center for Peace and Unification of Korea, and Agency for Defense Development (ADD). To understand the defense firms' specific restructuring experiences, we visited the Changwon Industrial Complex, a defense industrial complex, and the Defense Industrial Companies Association and also interviewed managers at 3 defense firms in Seoul, 4 in Changwon, and 2 in Ulsan.

2 The chaebol is the Korean term for the relatively unique conglomerate business group that evolved in South Korea in the postwar period. Each chaebol has a highly complicated system of corporate control and governance involving cross-shareholdings among member companies. Each chaebol has no formal hierarchical structure but at the top, it has an owner-chairman with almost unlimited power. This person makes all major strategic decisions concerning member companies (Shin and Kwon, 1999). In our chapter, we equate a chaebol with a large conglomerate or business group with both domestic companies and overseas subsidiaries.

3 The original American interest in the peninsula's security was the protection of Japan from Communist aggression in the post-Second World War era, and after the US-led UN intervention in the Korean war the support of the Republic of Korea became part of its overall confrontation with the Soviet Union (Lee and Drifte, 1995).

4 Park regime was established by the military coup in the early 1960s and seized power for over twenty years.

5 The relative share of defense spending in total government expenditures shows a similar pattern as the share of defense spending in GNP. Defense spending accounted for less than 30 percent of government expenditures until 1975. It began to exceed 30 percent from 1976, but this figure has gradually declined since 1982 (Moon and Hyun, 1988).

6 The BICC survey found that a number of the Association of Southeast Asian Nations (ASEAN) member countries were continuing to expand their military sectors, including Indonesia, Thailand, and Malaysia as well as South Korea (BICC, 1996: 29). As a result, South Korea received negative score (−17) in the BIC3D Index, which gauges the level of disarmament or rearmament (BICC, 1996: 29). See also Willett (1997). However, the negative BIC3D Index did not result from an expansion of the military industrial base but from its assuming a larger burden for joint operations and equipment following the American "Bottom-Up" review (Stuart and Tow, 1995: 13).

7 Defense procurement is categorized into domestic and foreign purchases. In principle, defense procurement is conducted by the Defense Procurement Agency. In 1995, some 3,721 billion won was paid out for domestic purchase through the DPA, accounting for 79 percent of the total defense procurement. Foreign purchases of military suppliers are conducted in two ways, one by the US FMS (Foreign Military Sales) process and the other through other foreign private companies (Ministry of National Defense White Paper, 1997).

8 In the late 1960s, North Korea accelerated its military hostility through a series of attacks. On January 21, 1968, North Korean commandos attacked the Blue House, the South Korean presidential residence. Two days later, North Korea seized the USS Pueblo and shot down a US EC-121 reconnaissance plane a year later.

9 Encoded in the "Special Law for the Promotion of the Defense Industrial Supply," these incentives included financing at four percentage points below market rates, 90 percent of the sales contracts, excise, and value-added tax credits, exemption from import tariffs, free plant sites, sole source contracts, procurement guarantees, the promise of bailouts if companies had difficulty, and a military draft exemption for skilled employees in the defense industry.

10 The choice of Changwon reflects strategic considerations, the desire to decentralize economic activity, and the exercise of discretionary preferences by state leaders. Refer to Markusen and Park's work (1993) about the Changwon industrial district.

11 A total of 881 free technical packages were transferred to Korea, mainly from the United States, to support Korean security in the early 1970s. About 14 percent of them (124 cases) were used by the Korean defense industry to establish a domestic production base for conventional weaponry. The Unites States has transferred through sales or licensed production M-48 and K-1 tanks, and F-16 fighter aircraft to South Korea (Lee and Drifte, 1995). In terms of total defense purchases, 76.4 percent local content was achieved in 1992, but imported components represented 40 percent of component costs. The newer the weapon the lower the local content. US foreign military assistance funding to South Korea, totaling about $2 billion between 1971 and 1984, eased the financial burden on the defense industry (Hwang 1996a: 154).

12 Major defense articles are small arms (M1 rifle, K1 submachine gun, K2 rifle), artillery (105 mm howitzer, 155 mm howitzer, self-propelled howitzer, multitube rocket launchers, 90 mm and 106 mm recoilless rifles, 60 mm, 81 mm, and 4.2" mortars), aircraft (500 MD helicopter, F-5E/F fighters, UH-60 helicopters, F-16E/F fighters), naval vessels (landing craft destroyers, munitions supply ships), and a wide range of ammunition. Short-range surface-to-air guided missiles, training and support aircraft, advanced training aircraft, C3I systems, electronic warfare equipment, and submarines are under way (Hwang, 1996a).

13 The number of the defense contractors designated by the national state is eighty-three. Four firms are excluded here because of the difficulties in the survey due to their bankruptcy and new entry to defense sector (Ministry of National Defense White Paper, 1997).

14 See Moon (1986) and Moon and Hyun (1988) for a review of the pros and cons of military spending.

15 Since 1979, South Korea has not only increased the dollar value of its military exports, but has also shifted its export items from soft goods (uniforms and other nonlethal equipment) to conventional weapon systems.

16 Interviews with research fellows in KIDA, July 1997.

17 See Markusen's work (1991) for the distinction between hot and cold wars and their differential demands on industry.

18 The Highly Advanced National (Han) Project is designed as the interministerial initiative in order to acquire both product and basic technologies and provide interministerial coordination. The Ministry of Science and Technology (MOST), the Ministry of Trade, Industry, and Energy (MOTIE), the Ministry of Information and Communication (MOIC), the Ministry of Construction and Transportation, the Ministry of Environment, the Ministry of Health and Welfare, and the Office of Rural Development are participating in Han. For this project, 154.6 billion won was allocated in 1995. The MOST has pursued the National R&D Program since 1982 for the purpose of the development of core industrial technology and technology related to the public welfare, ocean, and aerospace sectors. Its funding was 200 billion won in 1995. The MOTIE has run the Industrial Generic Technology Development Program (IGTD) and the

Alternative Energy and Energy Conservation Technology Program (AEECT) since the late 1980s. The IGTD program provided some of R&D costs to the corporations for the self-sufficiency of technology, and its funding in 1995 was 188.8 billion won. The AEECT program was designed for the achievement of efficient energy use and the development of the alternative energy. Its funding was relatively low, 42.6 billion won in 1995. The Information and Communication R&D Program has been pursued by the MOIC since 1986. In 1995, its funding was 106.7 billion won. The Defense R&D Program by the MND began from 1973 with the establishment of the ADD (Hwang, 1997).

19 In the 1970s, the ADD played a leading role in development of R&D, and for national security reasons, it was given exclusive control over military R&D.

20 Interviews with staff members in both the MND and MOST, July 1997.

21 Interview with a research fellow in KIDA, June 1997.

22 Interview with a research fellow in KIDA, June 1997.

23 Interviews with research fellows in both STEPI and KIDA, July 1997.

24 Officials in the Defense Industrial Companies Association, research fellows in defense-related research institutes, and managers at each defense firm were interviewed for this purpose.

25 In total, 12 workers in Poongsan, 13 workers in Hyundai Heavy, 8 workers in Tong-il, 2 in Hyosung Heavy, 1 in Hanhwa Co., and 25 in Daewoo Precision were drafted into the army by compulsion due to their labor union activities (H. K. Kim, 1997).

26 A defense firm is confined as a firm, which produces guns, ammunition, vessels, military aircraft, and military vehicles, and whose production stoppage strikes a fatal blow (damage) to national security. Only a department to take in-charge of producing these military items is regarded as a defense firm. The other departments in this defense firm are excluded (Ko, 1996).

27 Our conclusions are somewhat more favorable than those of Bitzinger, whose research concentrated on South Korea's defense industrial strategies in the 1990s in the context of an emerging international division of labor. His evidence is very useful on the market niches Korean firms have pursued in the current period and the extent of remaining excess capacity in defense divisions of firms. Because we pursued a different line of inquiry, our results show considerable evidence of the shift of defense capacity into civilian product lines. Furthermore, our interpretation of government as well as chaebol strategy finds greater emphasis on the pursuit of civilian technologies and their payoffs in their own right, and not just as dual-use activities pursued for military spin-on.

28 Bitzinger (2002) suggests that in the aerospace sector, excess capacity could be anywhere from 30 to 50 percent or even higher.

References

Ahn, B.J. (1993) "Arms Control and Confidence Building on the Korean Peninsula: A South Korean Perspective," *The Korean Journal of Defense Analysis*, 5(1): 117–139.

Bitzinger, R.A. (1995) "South Korea's Defense Industry at the Crossroads," *The Korean Journal of Defense Analysis*, 7(1): 233–249.

Bitzinger, R.A. (2002) "Toward a Brave New Arms Industry? The Decline of the Second-Tier Arms-Producing Countries and the Emerging International Division of Labor in the Defense Industry," Adelphi Paper, London: International Institute for Strategic Studies.

Bonn International Center for Conversion (BICC) (1996) *Conversion Survey 1996: Global Disarmament, Demilitarization and Demobilization*, Oxford and New York: Oxford University Press.

Cheng, D. and Chinworth, M. (1996) "The Teeth of the Little Tigers: Offsets, Defense Production and Economic Development in South Korea and Taiwan," in S. Martin (ed.) *The Economics of Offsets: Defense Procurement and Countertrade*, London: Harwood, pp. 245–98.

Choi, S.B. (1996) "Toward Restructuring of Production and Ownership of the South Korean Defense Industry," *The Quarterly Journal of Defense Analysis (Kukbang Nonjip)*, 36, Winter (in Korean): 204–223.

Choi, S.B. and Han, N.S. (1993) "The Role and New Attempts of Defense Industry in Transition," *The Quarterly Journal of Defense Analysis*, 21, Spring (in Korean).

Choi, S.B. and Huh, J.H. (1994) "Acquisition Reform for the Advanced Defense R&D," *The Quarterly Journal of Defense Analysis*, 27, Fall (in Korean).

Chosun Daily News (1997) July 4 (in Korean).

Cumings, B. (1997) "Where the Cold War Never Ends," The Bulletin of the Atomic Scientists, January/February. 40–46.

Defense Industrial Companies Association (1997) internal document.

Defense News (1998) January 5–11, 13(1).

Han, N.S. and Im, K.S. (1998) "A Study on the Introduction of Greater Competition in Korean Defense Procurement," *The Quarterly Journal of Defense Analysis*, 41, Spring.

Hong, S.B. (1993) "South Korean Defense R&D and Policy Implications," *Economy and Society*, 20, Winter (in Korean).

Hwang, D.J. (1996a) "The Role of Defense Industry in Innovation and the Development of Dual-Use Technology," *The Korean Journal of Defense Analysis*, 8(1): 153–176.

Hwang, D.J. (1996b) "New Policy in Upgrading the South Korean Defense Industrial Base," *Monthly Journal of National Defense and Technology*, February (in Korean).

Hwang, Y.H. (1995) "Defense Science and Technology Policy in the WTO era," *The Quarterly Journal of Defense Analysis*, 31, Fall.

Hwang, Y.S. (ed.) (1997) *An Assessment of Government R&D Programs*, Seoul: Science and Technology Policy Institute (STEPI) (in Korean).

International Institute for Strategic Studies (IISS) (1996) *The Military Balance 1995–1996*. Oxford: Oxford University Press.

Kapstein, E. (1994) "America's Arms-Trade Monopoly," *Foreign Affairs*, 73(3): 13–19.

Kim, C.H. (1993) "Utilization of Defense Technology for Commercial Production," *Technology Management*, Korea Industrial Technological Association, October (in Korean).

Kim, C.H. (1995) "Weapon System Acquisition and Research Development Policy," *Defense Management Policy Annual*, Seoul: Military Operations Research Society of Korea.

Kim, H.K. (1995) "The Circumstance and New Attempt of Korean Military Industry in Post-Cost War Era," *Studies on Social Survey*, 10(1) (in Korean).

Kim, H.K. (1997) *Sociology of Military Industry*, Seoul: Sejong (in Korean).

Kim, S.B. (1997) "R&D in the South Korean Military Aircraft and its Upgrading Policy," *The Quarterly Journal of Defense Analysis*, forthcoming, 38, Summer: 46–77 (in Korean).

Ko, Y.J. (1996) "Labor–Management Relations in Public Sectors," Seoul: Presidential Commission on Industrial Relations Reform (in Korean).

Lee, C.M. (1989) *The Emerging Strategic Balance in Northeast Asia*, Seoul: Research Center for Peace and Unification of Korea.

Lee, H.S. and Drifte, R. (1995) "The Internationalization of the Korean Security Issue: A Way Forward?," *The Korean Journal of Defense Analysis*, 7(2).

Markusen, A. (1991) "The Military Industrial Divide: Cold War Transformation of the Economy and the Rise of New Industrial Complexes," *Environment and Planning D: Society and Space*, 9(4): 391–416.

Markusen, A. (1997) "The Economics of Defence Industry Mergers and Divestiture," *Economic Affairs*, 17(4): 28–32.

Markusen, A. (1998) "The Post Cold War Persistence of Defense Specialized Firms," in G. Susman (ed.) *The Defense Industry in the Post-Cold War Era: Corporate Strategies and Public Policy Perspectives*, Oxford: Elsevier, pp. 121–46.

Markusen, A. (1999) "The Rise of World Weapons," *Foreign Policy*, March.

Markusen, A. and Yudken, J. (1992) *Dismantling the Cold War Economy*, New York: Basic Books.

Markusen, A. and Park, S.O. (1993) "The State as Industrial Locator and District Builder: The Case of Changwon, South Korea," *Economic Geography*, 69(2): 157–81.

Ministry of National Defense (MND) (1995) *Defense White Paper 1994–1995*, Seoul: The Republic of Korea MND.

Ministry of National Defense (MND) (1996) *Defense White Paper 1995–1996*, Seoul: The Republic of Korea MND.

Ministry of National Defense (MND) (1997) *Defense White Paper 1996–1997*, Seoul: The Republic of Korea MND.

Monthly Journal of National Defense and Technology (1996) *Monthly Journal of National Defense and Technology*, December (in Korean).

Moon, C.I. (1986) "South Korea: Between Security and Vulnerability," J.E. Katz (ed.) *The Implication of Third World Military Industrialization*. Lexington, MA: D.C. Heath.

Moon, C.I. and Hyun, I.T. (1988) "Muddling through Security, Growth, and Welfare: the Political Economy of Defense Spending in South Korea," in S. Chan and A. Mintz (eds) *Defense, Welfare, and Growth*, London and New York: Routledge.

National Statistical Office (1998) *Report on Economically Active Population Survey*, Seoul.

Nolan, J. (1986) *Military Industry in Taiwan and South Korea*, New York: St Martin's Press.

Nolan, J. (1987) "South Korea: Ambitious Client of the United States," in M. Brzoska and T. Ohlson (eds) *Arms Production in the Third World, 1971–1985*, Oxford: Oxford University Press: 215–31.

Oden, M. (1999) "Cashing-in, Cashing-out and Converting: Restructuring of the Defense Industrial Base in the 1990s," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations.

Oden, M., Bischak, G., and Evans-Klock, C. (1995) "The Technology Reinvestment Project: The Limits of Dual-Use Technology Policy," New Brunswick, NJ: Rutgers University, Project on Regional and Industrial Economics.

Oden, M., Markusen, A., Flaming, D., Feldman, J., Raffel, J., and Hill, C. (1996) "Managing Growth to Reversing Decline: Aerospace and the Southern California Economy in the Post Cold War Era," New Brunswick, NJ: Rutgers University, Project on Regional and Industrial Economics.

Office of Technology Assessment (OTA) US Congress (1991) *Global Arms Trade: Commerce in Advanced Military Technology and Weapons*, OTA-ISC-460, Washington, DC: US Government Printing Office, June.

Oh, W.C. (1996) *South Korean Economy Build-Up*, vol. 5, Seoul: Kia Economy Institute (in Korean).

Ohn, C.I. (1994) "South Korea's New Defense Policy and Military Strategy," *The Korean Journal of Defense Analysis*, 6(1).

Pak, C.H. (1993) "The ROK Defense Manpower Policy: Problems and Perspectives," *The Korean Journal of Defense Analysis*, 5(2).

Pak, S.K. (1996) "Survey on the Defense Subcontractors and its Improvement Policy," *Monthly Journal of National Defense and Technology*, April–July (in Korean).

Park, T.W. (1993) "America's Role in Korean Arms Control: Some Policy Options in the New Triangular Relationship," *The Korean Journal of Defense Analysis*, 5(2).

Samuels, R. and Whipple, B. (1989) "Defense Production and Industrial Development: The Case of Japanese Aircraft," in C. Johnson, L. D'Andrea Tyson, and J. Zysman (eds) *Politics and Productivity: The Real Story of Why Japan Works*, New York: Ballinger Publishing.

SIPRI. (1996) *SIPRI Yearbook 1996: Armaments, Disarmament and International Security*, Oxford: Oxford University Press.

Shin, D.H. (1993) "Power of Korean Science and Technology Society: ADD Faction," *Shin Dong-A Monthly Magazine*, June: 509–25 (in Korean).

Shin, K.Y. and Kwon, K.H. (1999) "Demystifying Asian Business Networks: The Hierarchical Core of Interfirm Relations in Korean *Chaebols*," in F.J. Richter (ed.) *Business Networks in Asia*, Westport and London: Quorum Books.

Stuart, D.T. and Tow, W.T. (1995) *A US Strategy for the Asia-Pacific*, ADELPHI Paper, 299, London: International Institute for Strategic Studies.

Sutter, R. (1996) "US–South Korean Relations: Issues and Options," *The Korean Journal of Defense Analysis*, 2(2): 141–58.

Swinbanks, D. (1993) "What Road Ahead for Korean Science and Technology?," *Nature*, 364, July 29.

US Arms Control and Disarmament Agency (1996) *World Military Expenditures and Arms Transfers*. Washington, DC: US Arms Control and Disarmament Agency.

Willett, S. (1997) "East Asia's Changing Defence Industry," *Survival*, 39(3): 107–34.

Yim, K.S. (1996) "A Study on the Changing US Defense Technology Policy," *The Quarterly Journal of Defense Analysis*, 35, Fall (in Korean).

11 From defense to development

Learning from comparative experience

Sean DiGiovanna and Ann Markusen

Introduction

The case studies in this book analyze the experiences of eight second-tier countries and that of the United States in restructuring their defense industries. All of these countries expressed a desire to reduce the drain of unnecessary military production on government coffers while freeing human capital, technology, plant, and equipment for other sectors in the economy, a search, in other words, for a physical, not just a fiscal, "peace dividend." As the case studies illustrate, these countries met with varying degrees of success. Our case studies, which investigate this drama "on-the-ground," demonstrate where governments went wrong and what these and other states might do to take better advantage of future opportunities in this sphere. Our results complement the macroeconomic studies of other scholars in assessing the degree to which governments were able to lower their defense budgets and why (Gleditsch *et al.*, 1996; Brömmelhörster, 1999) and governments' military industrial policy decisions in positioning their industries in the new global defense market (Bitzinger, 2003).

The differential success posted by our case study countries can be ascribed to two types of causal forces – internal structures and strategies, and external pressures. The former encompass extant industry structure and product mix (degree of enterprise and firm defense dependency, degree of conglomeration, platform versus component production, location of industry), and public versus private management arrangements. The latter include national security threats, United States, and North Atlantic Treaty Organization (NATO) defense policies and the internationalization of the defense industry. In this final chapter, we visit each of these forces, summarizing across the countries in the set, with some reference to Europe and Russia as well. We conclude with some lessons for these countries and others who aspire to apply redundant defense industrial assets to productive civilian sector activities.

Degree of defense dependency

The extent to which firms and enterprises were dedicated to military production was a major factor in determining their managements' ability to survive cuts in

defense expenditures and their willingness to accept defense reduction goals. The United States is an outstanding example. Most major US defense firms have historically been heavily dependent on military contracts. As US military expenditures declined, this defense dependence increased through a spate of "pure play" mergers and the exit of less defense-dedicated and smaller firms from the military market. The result has been an aggressive pursuit of "core competencies" whereby the major US defense firms have lobbied the US government for increases in procurement and an easing of export restrictions – with considerable success. On the other hand, German defense firms, which were much less defense-dependent than their American counterparts, were less resistant to defense cuts and more successful at converting resources to commercial use.

We found similar tendencies in the second-tier case study countries. In South Korea, privately held commercial firms took the lead in defense production, but only a small part of their capacity was devoted to military products. Due to state directives, these firms were required to maintain this defense capacity – even if it was not in active use. Thus, many South Korean firms viewed their military industrial obligations as an opportunity cost, believing they could be much more successful if allowed to concentrate fully on commercial production. As a result, Lee and Markusen show that many of South Korea's larger defense producers have welcomed the reduction of military orders and have compensated by increasing output in their civilian markets (Chapter 10).

Many Polish firms that had traditionally produced both military and commercial goods attempted to compensate for cutbacks in defense expenditures by increasing commercial output. Although these firms have not always been successful at maintaining Cold War levels of employment and output, Nelson demonstrates that shifting more capacity to commercial products has enabled some firms to survive that might otherwise have gone under. Although many of Poland's defense producers prefer military markets, these firms are willing to pursue commercial production if provided with the appropriate assistance and incentives. As a result, the commitment to a reduced level of military production is at least on the table in Poland (Chapter 4).

In China, the story is similar. Continuing a long tradition of dual-use aspirations, many Chinese military factory managers have turned to the production of civilian goods. Because of poor management training and long distances to markets, however, most of these remain unprofitable and would fail without government subsidies. Chen shows that the historical defense orientation of the Chinese military industry has left large segments of it uncompetitive, especially when compared with China's burgeoning commercial goods sector (Chapter 9). Furthermore, when defense plant managers are successful in producing civilian goods, military leaders put pressure on them to reinvest their revenues in the defense rather than civilian side of the business. Nevertheless, with enough time, the changeover to civilian goods is bound to pay off for some portion of the complex.

In second-tier countries where firms were highly defense-dependent, the military industrial complex either strenuously resisted cuts in defense expenditures or faced severe disruption. Goga shows that South African defense firms, which are strongly

defense-dependent[1] and highly organized, aggressively and successfully pursued increases in national military outlays at the end of the 1990s (Chapter 7). *In Argentina, the majority of defense enterprises was highly dependent on military procurement (even those producing commercial products, such as steel) and was poorly prepared for the dismantling of the Argentine defense industrial complex*. Cavicchia describes how with no ability to shift production into more lucrative commercial uses and a lack of government leadership, Argentina's defense firms all but disappeared in the 1990s (Chapter 5). In both the South African and Argentinean cases, the severe dependency of defense firms on military contracts resulted in very poor records in defense conversion. Little is known about where workers and managers leaving the industry ended up, and few new products developed with defense expertise have been truly successful, especially in Argentina.

The role of conglomeration

Managers and policymakers found it easier to move personnel, technology, and idled capacity into new activities where the enterprises in question belonged to larger, mediating firms or conglomerates. The larger parent institution was able to offer management expertise and financial "bridging" support to individual enterprises, even those highly dependent on defense markets.

This was the case in South Africa. Goga shows that the association of South Africa's largest private defense firms with national conglomerates (e.g. Teklogic, UEC, and ISIS within Altek) and family holding companies (Grintek in Kunene Brothers) helped managers in a number of ways (Chapter 7). Since each conglomerate encompassed more than one defense firm within its ownership structure, reductions in military procurement were rationalized through internal reorganization and the mergers of military divisions. Altek, for instance, combined Teklogic, UEC, and ISIS into the newly formed Altek Defense Systems. This proved a relatively effective way of managing increased competition. In addition, the conglomerates' commercial divisions helped absorb idle defense capacity and workers. Finally, South Africa's conglomerates were able to use their extensive resources to market new commercial products produced by defense firms, thus increasing their chances for success.

The chaebol performed similar functions for defense enterprises in South Korea (Chapter 10). Playing the role of patient capital, the chaebol provided the bridge financing and internal-to-the-conglomerate expertise that is generally not available to American defense contractors – where Wall Street practices discourage conglomeration, encourage "pure play" companies and look skeptically on intrafirm reallocation of resources.

While public sector overseers might perform the same functions that a private sector conglomerate does, our case studies show that they are not particularly successful in this regard. In China, those at the top of the hierarchy send out confusing signals about whether they want their enterprises to favor defense or civilian activity, while there are few resources to commit to bridge financing and little managerial expertise to share. In India, the government is leery of

dedicating any of its defense enterprises to commercial activity, thus blocking dual-use potential.

Product lines: platforms versus components

In all countries, some firms serve as platform makers, integrating all the systems that go into military aircraft, missiles, naval vessels, military vehicles and tanks, and ordnance, while others make components thereof. We identified a tendency for firms concentrated on component production rather than complete weapon systems to both more readily reposition themselves in an emerging transnational defense industry and to parlay defense technology into commercial uses. It is not difficult to see why. Planes, ships, and tanks produced by second-tier producers face increasing difficulties competing with those produced by American and European defense firms. Nevertheless, an increasing international defense industry (Chapter 1) does offer opportunities for second-tier countries to compete in subsystems and niche market production, especially where their governments are willing to purchase the full platform and bargain aggressively for offsets in the process.

Subsystem production is also more likely to be dual use in nature, so that firms operating in these markets have greater flexibility in shifting between sectors when the military industrial cycle is out of synch with economywide cycles. Indeed, in the United States and Europe, some dual-use component makers are outpacing the defense giants in sophistication and quality, forcing the Pentagon and Ministries of Defense to turn to them for new technologies.

In South Africa, defense firms seem intent on maintaining their capacity in platform production developed during the embargo period. To offset 1990s cuts in domestic procurement, South African defense firms attempted to boost sales abroad. In the short term, some firms were somewhat successful – although not often choosy about their buyers. Nevertheless, Goga reports that firms have had greater difficulty more recently as South African weapons systems (based on increasingly outdated technology) fail to compete against United States and European products. Despite this trend, some of South Africa's defense firms (particularly Reunert) remain focused on platform production.

In contrast, Casellas concludes that Spain has been able to capitalize on niche markets open to its aerospace (CASA) and electronics (INDRA) divisions (Chapter 3). CASA, recently merged with Germany's DASA (together holding a 42 percent share in Airbus), was able to secure contracts to provide components to Boeing, Eurocopter, McDonell Douglas, Northrop, and Saab. INDRA has had even more success in finding international component contracts – particularly in the telecommunications, transportation, health, energy, and finance industries. As a result, over two-thirds of INDRA's production is now for commercial markets.

Although the Israeli defense industry has had great success in some platform production (particularly missiles and aircraft), Israel has aggressively pursued excellence in high-tech componentry. Lewis shows that Rafael, ELOP, Tadiran, and Israeli Aircraft Industries all have created successful commercial spin-offs based on subsystem technologies (Chapter 3). In addition, the Israeli government has used

its close relationship with the US military to ensure that Israel will remain a high-tech supplier to US defense firms for the foreseeable future. Although these agreements have actually increased the value of Israeli military exports, defense firms' commercial exports have risen faster than their military exports, lessening their dependency on military production.

In Poland, where the defense industry historically consisted of both platform and component producers, the latter have been relatively more successful in regearing for new markets. Nelson describes how WSK PZL Swidnik, a platform producer of military helicopters, has successfully pursued dual-use component and subsystem contracts with foreign producers (Chapter 4). This strategy has enabled the firm to focus on its most competitive areas of production while reducing its dependency on sales of a helicopter that faces stiff international competition.

Public *vis-à-vis* private sector ownership and management

Most of the second-tier arms-producing countries maintained postwar defense industries that were wholly or partially owned by the state. Public ownership of military industries is by no means uncommon, even in more industrialized nations (e.g. United States and European arsenals and naval shipyards.) Nevertheless, state-owned defense firms often face unique challenges in periods of military downsizing and restructuring. First, public sector firms usually operate in a noncompetitive environment. Without strong leadership from the state, their managers are ill prepared to transition to commercial product development and marketing. Second, public sector defense firms are often hampered by political – and sometimes legislative – limits on workforce size, investment, suppliers, and location. Third, despite decreases in military procurement, public sector defense firms are often required to maintain defense production capacity – further stretching limited resources that might otherwise be used to develop competitive commercial applications. The challenge for public sector defense firms is to meet their obligations as state institutions while trying to develop and maintain conversion aims. Among the case studies presented in the book, national governments have pursued two important strategies for doing so, often in combination – privatization and organizational restructuring.

By cutting defense production units loose from public sector ownership, governments hope to eliminate fiscal drag by shedding highly subsidized units while improving defense enterprises' ability to compete in commercial markets and improving the quality and efficiency of their military output. The experience of our case study countries, however, indicates that privatization in and of itself does not ensure the realization of fiscal peace dividends or net contributions to economic development. Cavicchia illustrates how the rapid and wholesale privatization, undertaken without regard to potential resource wastage, of Argentina's defense industry resulted in millions of dollars in government losses as well as massive job losses. This "fire sale" resulted in the almost complete dismantling of Argentina's military production capacity and the loss of a great deal of industrial capacity. Nelson shows that while the Polish government and defense firms recognize

the need for privatization, it is the fear of just such outcomes that has led the Polish government to move very slowly on the privatization project.

Some countries have reaped benefits from privatization, particularly where they have taken a long-term approach. Casellas documents how Spain successfully privatized CASA and INDRA, simultaneously increasing the proportion of commercial products and preserving advantages in defense subsystem market niches (Chapter 3). However, concerns over the competitiveness of BAZAN and SANTA BARBARA have led the Spanish government to hold off on privatization until the survival of these firms' industrial capacity can be assured. Israel has taken an even longer term approach. Lewis finds that privatization of Israel's defense firms has been slow and accomplished through joint ventures and spin-offs, which for the most part have been successful (Chapter 6). In other countries, such as India and China, Maheshwari and Chen show that privatization is politically untenable, and governments have had to try other diversification and conversion strategies (Chapters 8 and 9).

Privatization is not the only route to go. Critics of extensive privatization in the United States and elsewhere argue that the difficulty of creating true competition, the innovative and sensitive nature of military products and services, and the potential for corruption and distortion of defense policy and national budgets support continued public ownership in important segments (Sapolsky and Gholz, 1999; Sapolsky *et al.*, 1999; Markusen, 2001b). Furthermore, as the Russian experience demonstrates, privatization without adequate capital, managerial skill, and incorruptible government oversight may lead to the worst form of inefficient and government-dependent capacity.

Some second-tier governments have attempted to restructure public sector units to act in private sector ways – expecting them to seek out civilian markets and to make profits or at least cover their costs of operation. Sometimes, public sector units are asked to compete with private sector venders, as in the American A-76 process (Markusen, 2001b). South Africa has followed a "middle road" by maintaining public ownership in Denel, but treating it as an independent corporation. Goga reports that ARMSCOR, the parent company of South Africa's Denel, is 100 percent state owned but receives no money from the state and operates on a for-profit basis. Company profits have been substantial, although Goga indicates that much of this is through sales of assets and property, which will not sustain the company in the long term. Of course, Denel will benefit from the recent decision of the South African government to again increase military procurement.

As alluded to earlier, military factories in China have also been subject to increasing private sector competition in their civilian product lines despite their continued public ownership. Chen asserts that some of these firms have been successful at transforming their management structures and developing viable products for commercial markets, although he is doubtful that these successes will improve the quality of military production, as hoped for by the Chinese government.

Other second-tier countries have instituted comprehensive conversion initiatives designed to commercialize technologies and products developed in public sector defense units. Of the countries studied, Israel has by far had the most success in this

regard. Through a system of technology incubators, joint ventures, spin-offs, and licensing agreements, Lewis shows that Israeli public sector defense firms have greatly increased their proportion of commercial production without massive job cuts or loss of military capacity (Chapter 6). This success is tied to the Israeli government's decision to pursue high-tech component production for American and European weapons platform producers while giving firms incentives and bridging finance to develop and strengthen civilian products and services. Spain and South Korea also have used targeted conversion strategies, although these have been tailored to suit private (or privatized) firms.

Regardless of the over-arching strategy pursued, the public sector is an important instrument in defense industry restructuring. The actions of national governments either help or hinder the ability of defense firms to successfully reallocate resources to commercial production and to undertake retraining, renovation, and other activities that might ensure that labor and capital released in the downsizing process are reused elsewhere in the economy. In those countries where governments simply maintained the status quo (India) or in cases where governments opted for rapid privatization without regard to resource conservation (Argentina), the results were very disappointing. On the other hand, where governments took the time and care to develop strategic conversion plans involving gradual privatization (Spain, Israel), organizational restructuring (China, Poland, South Africa), and focused conversion policy (Israel, South Korea, Spain), defense conversion has achieved positive results.

Location of defense industries

In many countries, defense industrial capacity was located in relatively new or remote regions, either for strategic reasons or as a device for prompting regional development. One goal in our research project was to determine whether the location of defense production units impeded easy defense conversion and/or led to the emergence of regional conversion policies. Our working assumption was that defense capacity located in less industrialized, undiversified, and more remote regions would face a difficult conversion challenge, evoke greater manager, worker and community resistance to workforce reductions, and engender regionally specific adjustment strategies on the part of either central governments or localities. Nations in which defense production was concentrated in major industrial agglomerations would have greater freedom to reduce capacity and less need for regional policy.

Research results from our case study countries do support the latter thesis. Workers and communities in Spain and South Africa mustered little resistance to conversion and downsizing due to the high concentration of defense production in the Madrid and Johannesburg regions, respectively. This also might explain Spain's failure to take advantage of the regionally focused KONVER program (Casellas, Chapter 3). Similarly, the Changwon region of South Korea accounts for 52 percent of military production, but this encompasses only 11 percent of the region's industrial output (Lee and Markusen, Chapter 10). This helps to explain

why there has been relatively little resistance to reductions in defense production in South Korea (though the historic prohibition against defense workers' unions might also have contributed to this outcome).

Evidence for the emergence of regional conversion strategies is more modest. In China, where defense production was isolated in the "third front" region, regional governments have aided local military factories with subsidies. Many military enterprises have even been transferred to local or regional government ownership (Chen, Chapter 9). Nevertheless, despite infusions of cash to cover operating losses, there appears to be very little in the way of strategic regional policy. The best evidence for regional policy development comes from Poland, where local and regional governments have attempted a number of adjustment and conversion initiatives (Nelson, Chapter 4). Nevertheless, these efforts are intermingled with general economic reform and are often hampered by frequent changes in national governments and policy.

The role of national security strategy

Conceptually, international relations scholars argue that security strategy should dictate whether a nation decides to "make or buy" its own weapons. In practice, whether we are speaking of the United States, Europe, Russia, or South Africa, we know that questions of national pride and economic benefits associated with defense industrial activity (profits for defense firms, jobs for defense workers, and impact aid for communities) often have a strong feedback effect on budgetary decisions and military policy. Although generally such distortions are not in the interests of the nation as a whole, a segment of the society may benefit from a particular defense policy and associated expenditures, lobbying mightily to ensure its maintenance. Much has been written on the expensive and outdated maintenance of US Cold War weapons systems, for instance, and linking this persistence of political and economic pressures at cross-purposes with security needs (Mayer, 1991; Bischak, 1999).

Nevertheless, we would expect, reasonably, national security considerations to play an important role in whether nations might be able to realize a peace dividend. Countries embroiled in regional conflicts and concerned about the territorial ambitions of neighbors would be less apt to reduce military production capacity, unless they decided to import rather than continue to make equipment domestically. In contrast, the cessation of regional conflicts or tensions provides an opportunity for countries to rethink their defensive requirements and reallocate scarce resources to civilian production or social welfare.

Our authors show, however, that the relationship between security policy and commitment to defense conversion is not so straightforward. Those nations that have arguably achieved the greatest success in the sustainable reduction of the military capacity (Israel and South Korea) are located in regions that were marked by sustained high levels of tension and conflict throughout the 1990s. Although the Middle East peace process might create the political opening in Israel to begin

discussions of disarmament, Israel's conflicts with its Arab neighbors are not yet fully resolved. Yet, Lewis reports that the Israeli government views defense conversion as part of an overall security strategy whereby an increasing focus on high-tech component production will improve the technological capability and flexibility of the Israeli Defense Forces and secure the country's partnership with the United States (Chapter 6).

In South Korea, reductions in domestic procurement have been partially overshadowed by increases in arms imports – particularly from the United States. Thus, although tensions between North and South Korea remain high, Lee and Markusen argue on the basis of extensive evidence from firms and government analysts that the South Korean government has explicitly opted for a shift toward more importing of a larger share of its equipment. There is some suggestion that the United States has brought pressure on Korea to do so in negotiations over the trade imbalance between the two countries. But it is also true that Korean policymakers and firm managers have concluded that there is little viability market for Korean defense-related exports (Chapter 3).

China provides another exception. Chinese officials initiated an extensive conversion strategy in the 1970s – at the height of regional conflicts with India, the Soviet Union, and Vietnam. Although the Chinese government was concerned with protecting its borders, it was also concerned with internal economic instability. Defense conversion formed a key element in a larger strategy to improve economic efficiency and increase the Chinese standard of living. In designing its conversion policy, the Chinese government linked the increase in civilian output with a desired increase in the quality of military production – "swords into plowshares, and better swords." While this second aspect has not been realized, Chen illustrates that many military factories have opted for commercial production (Chapter 9), albeit with mixed results.

On the other hand, some nations that have experienced a reduction in regional tensions have moved very slowly in dedicating redundant defense industrial resources to other development sectors. Nelson explains how Poland has had to increase defense procurement in recent years in order to meet the military requirements of NATO membership (Chapter 4). In South Africa, hawkish politicians have used instability in neighboring African nations to convince the government to abandon conversion aims and increase military spending, Goga reports. This in spite of the fact that South Africa now enjoys a much more secure environment than it did in the Apartheid era (Chapter 7).

On the basis of these anomalies, we conclude that a country's national security environment is *not* in and of itself a reliable indicator of either the potential for successful conversion or of a nation's willingness to commit itself to a concerted effort to move resources from defense to development. In some instances – Spain, Argentina, India – the end of the Cold War and the diminution or persistence of regional conflict do appear to have produced the predicted behavior. But other countervening variables, including the desire for healthy nondefense development that will permit a country to afford national defense (Israel, South Korea), weaken the direct link between the two.

Cooperative defense, military industrial and arms trade policies of major world powers

The decisions of second-tier governments' *vis-à-vis* their defense industrial capacity are not made in a national vacuum. The activities of the US government, NATO, and American and European defense firms have played an important role in restructuring choices and outcomes. With the ascendance of the United States as the only superpower, the expansion of NATO into former Warsaw Pact territory, and the rapid increase of transnational military production and trade, defense industries in second-tier countries are facing a greatly altered economic and political environment.

With the end of the Cold War and the decline in military spending, American, European, and Russian defense firms began to search more aggressively for foreign markets. The marketing and sale of military goods abroad was in all cases encouraged by a liberalization in arms trade policies and aggressive marketing at public expense (Hartung, 1994, 1996). Among the case studies, South Korea provides a good example. Although domestic production of military goods declined in South Korea, Lee and Markusen show that total military spending actually increased during the 1990s (Chapter 3). South Korea greatly increased its import of American military equipment, spending dollars, which might otherwise have gone to social welfare spending. The silver lining for South Korea was the fairly easy transition of its domestic defense production to commercial goods, thereby increasing its productive returns on capital through exporting nondefense goods to civilian markets particularly to the United States.

In the case of Poland, NATO expansion has had a powerful effect on decisions regarding military productive capacity. Nelson demonstrates how many Polish defense firms put off investments in commercial production in the hopes that Poland's inclusion in NATO would require renewed military expenditures – both through the need to bring the Polish military up to NATO standards and through offsets negotiated with American firms (Chapter 4). With NATO's aggressive plans for expansion, the ability of any of the former Warsaw Pact countries to free up defense-tied resources for civilian development remains in doubt.

The internationalization of the defense industry through mergers, strategic alliances, offsets, and joint ventures has resulted in the complete dominance of a handful of American and European firms in military platform production (Bitzinger, 1994; Markusen, 1999). As Bitzinger shows in his monograph (2002), this has forced many second-tier countries to abandon autarchic defense industries and search for market niches within the global division of labor in weapons (2000, 2003). The fact that the arms trade is excluded from free trade rules under the World Trade Organization regime has encouraged many of these governments to negotiate arms trade offsets as a means of ensuring a domestic share of the work. On the other hand, some governments prefer to take their offsets in nondefense product or service lines, believing there are superior long-term prospects in higher growth sectors (Markusen, 2001a).

It is our view that second-tier countries' governments would be well advised to consider the opportunity cost of maintaining defense industrial capacity in a stagnant

world market when resources might be more productively devoted to development in other spheres of the society. In particular, among those countries studied here, we believe that India, Poland, and South Africa could benefit from shifts in this direction. Spain and Israel have already demonstrated how a mixed approach, where military offsets and returns to military market niches have been used skillfully to develop and expand in civilian product lines.

Conclusion: the significance of national policy, planning, and leadership

Evaluations of country's success in securing and reinvesting peace dividends cannot be conducted solely at the macroeconomic level. Our studies demonstrate that the tracking of labor, capital, and technology released from redundant defense industries can only be adequately understood on a firm-by-firm, sector-by-sector, region-by-region basis, taking into account the various structures and constraints within which policymakers and managers work.

Our most valuable conclusion is that the conversion of a potential peace dividend into real economic growth in other sectors requires a concerted and smart investment of time and money on the part of national governments. Without a coherent, strategic, and consistently supported defense restructuring policy, second-tier nations are apt to approach one of two extremes – the wholesale dismantling of military industrial capacity without regard to the reuse of national assets (as occurred in Argentina) or the maintenance of an outdated, inefficient, and resource-consuming complex that acts as a drag on national development (which appears to characterize many sectors in the Indian military industrial complex).

Defense industrial downsizing is a formidable challenge. Most governments, including that of international powers like the United States, have little built-up expertise in how to skillfully manage this kind of transition, especially in an era where the cuts were so large and so rapid after such a long period of defense buildup and stasis. Where governments outlined a detailed policy (e.g. technology transfer in Israel), supported it with legislation and resources (e.g. conversion in China) and provided adequate income, retraining, and placement assistance to displaced workers and managers (e.g. Germany), defense capacity has been reduced and development benefits realized in other sectors of the economy. While we have not ignored pressures from external sources (the United States, NATO), ongoing regional conflicts (India, South Korea) or resistance from within countries (defense firms, workers, communities) in our analysis, we believe the opportunity exists for most nations to realize greater benefits from a peace dividend even within these constraints. Great gains could be made up learning curves if nations shared more readily with each other their experiences and expertise and if international organizations would place higher priority on this project.

What can arms producing nations do to free up more defense-related resources for development? First and foremost, second-tier arms-producing nations should take a hardheaded look at their position in global arms markets and determine whether heightened dependence on foreign (and superior) arms imports is worth

the savings in domestic resources. This is especially true in weapons platforms. As time passes, the attractiveness of a South African tank or a Polish helicopter against American and European competitors will continue to fade. As trade opportunities decline in the "legitimate" market, some nations might be tempted to sell outmoded weapons systems to less reputable parties (as South Africa has already done). This is a losing game in the longer run. Not only are national resources locked up in a declining and inefficient industry, but also peace and security in other regions of the world may suffer as a result. Furthermore, a virtue of importing rather than producing weapons locally is that governments are free of domestic profits and jobs pressures, removing an important distorting factor in national resource allocation.

Second-tier governments should not only evaluate platform systems and capacity objectively. They should also assess side by side the advantages of future development paths in which they specialize in arms-producing sectors, on the one hand, versus specializing in civilian markets with greater growth potential, on the other. For instance, in what seems like a very bad choice for the long term, South Africa chose to sell military helicopters to Malaysia in the late 1990s in return for offsets ensuring Malaysian electronics full access to the South African market. South Africa could have, instead, committed its resources to developing its own consumer electronics industry (as Japan, South Korea, and Malaysia did before it) with an eye toward serving the entire African continent. Most second-tier countries still pursue industrial policies (as do Europe and the United States less conspicuously), and this kind of calculus should be used in deciding where to commit educational, research, financial, trade, and regulatory resources for industrial development.

Countries could also follow the lead of Spain and Israel in planning for commercialization and privatization of defense industries with adequate transitional assistance and ample time for adjustment. India, in particular, would benefit from this process. Since the Indian government has found that it increasingly needs to purchase its weapons abroad, it can begin to plan for the conversion of its ordnance factories. The experiences of Israel and South Korea demonstrate that, despite India's regional security concerns, conversion strategies can be successful without diminishing defensive capabilities.

Finally, countries can learn from each other strategies and policies for encouraging greater local and regional involvement in the conversion process. Although national governments might at times be unable to focus on one sector among many, officials and organizations in regions hit hard by defense cuts are looking for ways to aid their flagging industries. Evidence from the United States and Europe illustrates that regional policy can have an important impact on conversion outcomes and the tenor of worker and community adjustment (Markusen and Brzoska, 2000).

What can international agencies and aid donors do to reinforce these pro-development actions? International aid agencies should develop policies that discourage the maintenance and proliferation of platform production around the world. They should, instead, provide resources and technical assistance to help second-tier nations capture the technologically sophisticated and commercially viable components of production for use in subsystems and civilian markets.

Countries that dismantle military capacity should be rewarded with resources and technical assistance to aid in the adjustment of workers and communities to defense downsizing. Countries that persist in investing in antiquated defense industries and/or selling into regions of conflict could be discouraged through aid and loan decisions. Since the reduction of military capacity benefits the world as a whole, rewarding nations for conversion efforts and success sends an important message and would encourage more countries to follow suit.

The richness of the possibilities for comparative learning cannot fully be expressed in this brief conclusion. There are many other avenues to be explored. For instance, many of our countries (Argentina, Poland, South Africa, and Spain) have undertaken military restructuring within a larger framework of democratic reform. What is the relationship between democratization and conversion? How do radical changes in the relationship of the armed services to civilian governments and privatized defense industries encourage (or retard) the movement of resources from defense to development? As defense firms in most of these countries enter into joint ventures with American and European firms, what are the common characteristics of these arrangements? Have some nations worked out better deals than others? These are important topics that can be addressed through comparative analysis. We hope to continue our work in this vein and to encourage others in various government, private sector, nonprofit, and academic communities to do the same.

Note

1 Although South African defense firms were often part of larger conglomerates with commercial holdings, these defense units were highly dependent on military production.

References

Bischak, G. (1999) "Contending Security Doctrines and the Military Industrial Base," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations Press, pp. 37–73.

Bitzinger, R. (1994) "The Globalization of Arms Industry: The Next Proliferation Challenge," *International Security*, 19(2).

Bitzinger, R. (2000) "Problems and Prospects Facing Second-Tier Arms-Producing States in the Post-Cold War Era: A Comparative Assessment," paper presented at the Council on Foreign Relations, Study Group on the Arms Trade and the Transnationalization of the Defense Industry, December.

Bitzinger, R. (2003) *Towards a Brave New Arms Industry?: The Decline of the Second-tier Arms-producing Countries and the Emerging International Division of Labour in the Defence Industry*, Oxford: Oxford University Press.

Brömmelhörster, J. (ed.) (1999) *Paying the Peace Dividend: Declining Military Expenditures after the Cold War*, Bonn: Bonn International Center for Conversion.

Gleditsch, N., Bjerkholt, O., Cappelen, A., Smith, R., and Dunne, P. (1996) *The Peace Dividend*, Amsterdam: Elsevier.

Hartung, W. (1994) *And Weapons for All*, New York: HarperCollins.

Hartung, W.D. (1996) *Welfare for Weapons Dealers: The Hidden Costs of the Arms Trade*, New York: World Policy Institute, June.

Markusen, A. (1999) "The Rise of World Weapons," *Foreign Policy*, no. 114: 40–51

Markusen, A. (2001a) "The Arms Trade as Illiberal Trade," Working Paper # 99, Project on Regional and Industrial Economics, the Humphrey Institute, University of Minnesota, March.

Markusen, A. (2001b) "The Case against Privatizing National Security," Working Paper # 91, Project on Regional and Industrial Economics, Humphrey Institute, University of Minnesota, January.

Markusen, A. and Brzoska, M. (2000) "The Regional Role in Post Cold War Military Industrial Conversion," *International Regional Science Review*, 23(1): 3–24.

Mayer, K. (1991) *The Political Economy of Defense Contracting*, New Haven: Yale University Press.

Sapolsky, H. and Gholz, E. (1999) "Private Arsenals: America's Post Cold War Burden," in A. Markusen and S. Costigan (eds) *Arming the Future: A Defense Industry for the 21st Century*, New York: Council on Foreign Relations Press, pp. 191–206.

Sapolsky, H., Gholz, E., and Kaugman, A. (1999) "Security Lessons from the Cold War," *Foreign Affairs*, 78(4): 77–89.

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