FWC Sector Competitiveness Studies - Study on the Impact of Emerging Defence Markets and Competitors on the Competitiveness of the European Defence Sector

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Notice:
This publication was prepared for the European Commission. The views expressed are those of the authors[1] and do not necessarily express the views of the European Commission.

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Executive Summary

Context, background and purpose

In 2005 the EC set out for the first time an integrated approach to industrial policy with horizontal and vertical initiatives, to provide the right framework conditions for enterprise and innovation to succeed, and to drive the economy forward. The Mid-term Review of Industrial Policy in 2007 concluded that this approach had been successful and should be continued, with a focus on how best to respond to globalisation and climate change.

At the same time, this commitment to an integrated industrial policy is set within the context of dramatic changes in the security threats and challenges faced by Member States since the fall of the Berlin Wall. In response the European Union developed the European Security and Defence Policy (ESDP). The success of this requires a broad-based and competitive defence sector operating within the EU. In recognition of this, European Defence Ministers approved the development of a strategy for a more independent and more competitive European Defence Technological and Industrial Base (EDTIB).

The development of such a strategy, however, requires an up-to-date understanding of the global defence market. The work undertaken and presented here is concerned with the impact of emerging defence markets and competitors on the competitiveness of the European defence sector, where emerging defence markets and competitors are defined in terms of Brazil, Russia, India, China, and South Korea (collectively known as the BRICKs).

The European Commission intends to use the findings from the study to better understand the impact of the emerging BRICKs defence markets on the European Defence Technological and Industrial Base (EDTIB). It is not intended that the findings should be used to promote the general sale of EU arms to the world.

The current structure of defence equipment markets

- The EU defence sector

While the defence industry is present in most Member States, activity is concentrated in just a few. This is partly a reflection of the size of the military branches (in terms of personnel) and the defence budgets in the Member States. Around 60-65% of EU military personnel are based in just five countries (France, Germany, Italy, Spain and the UK). France typically accounts for the largest share (15-20%) of total EU military personnel; Spain accounts for 5-10%.

Historically, France and the UK spend the most on defence. In 2007 they spent €44bn and €50bn respectively and together accounted for 47% of total EU defence spending. Behind France and the UK, Germany and Italy are the next largest spenders on defence, typically accounting for 10-15% each of total EU defence spending. Given this, France and the UK are the largest employers in the defence sector, employing 240,000 and 200,000 respectively in 2003, and accounting for 57% of all employment in the EU defence sector. Thereafter, Germany (80,000), Poland (50,000) and Italy (26,000) have the next largest defence-sector workforces. Most of the major EU defence firms are based in France, Germany, Italy or the UK: 37 of the top 48 EU defence firms are based in one of these Member States.

Total EU defence spending remains smaller compared to US levels of spending. EU spending has been falling from 2% of GDP in the late-1990s to 1.7% of GDP in 2007. US spending has picked up from around 3% of GDP in 2000 to 4.5% of GDP in 2007. In 2007 total US military spending was 2¼ times greater than total EU military spending.

- Framework (regulatory and non-regulatory) conditions

Existing regulatory and non-regulatory frameworks for the global trade in arms can potentially be significant drivers of the defence sector, both internationally and nationally. Those framework conditions assessed as having the greatest importance to the competitiveness of the BRICKs defence industries are as follows:

1) Embargoes or the threat of arms embargoes are leading drivers of future self-reliance and indigenous production objectives emerging in the defence policy of BRICKs countries;

2) Membership of regional organisations whether economic, security, or defence focused, often provides a forum for the future development of defence-oriented cooperation and collaboration;

3) US technology content in the majority of EU produced defence equipment places EU defence equipment under US ITAR export controls. This 'reality check' with the US' 'right to veto' any exports can act as a barrier to EU trade in some circumstances;

4) Political developments and the policies/strategies that emerge from such developments is identified as the leading driver of all defence industries;

5) There is no level playing field in the export of defence equipment and dual use goods, enhancing/diminishing the competitiveness of some European producers in BRICKs countries; and,

6) Historical political, military, and economic ties/conflicts are key indicators of future opportunities for trade, technology transfer and investment in defence industries between nations.

- BRICKs global position

Data on military expenditure show that China is the largest-spending BRICKs country by some margin, with over double the expenditure of India, Russia and South Korea, with Brazil some way behind. This volume of spending is comparable with some of the larger European economies, but is dwarfed by the US which spent almost 10 times as much as China in 2008. As a proportion of GDP, spending is again broadly similar (perhaps slightly higher) compared to major European countries, and again behind the US (although not so far). Over time, this expenditure has tended to decline over time as a %

of GDP, with the exception of China, which has increased slightly, and the US which has increased more markedly since 2000.

Figure 1 Military expenditure (2008)

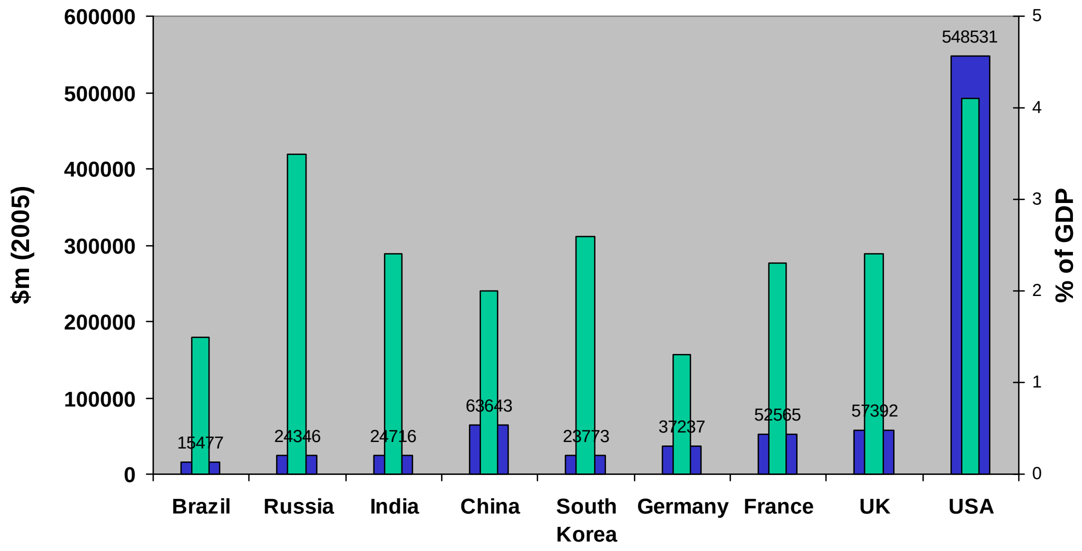
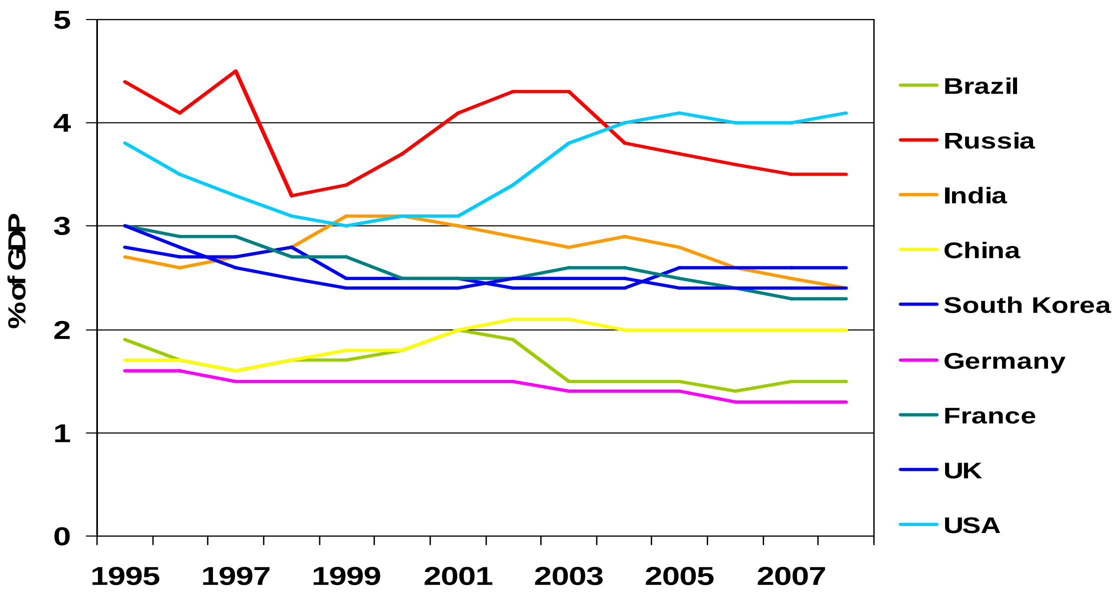
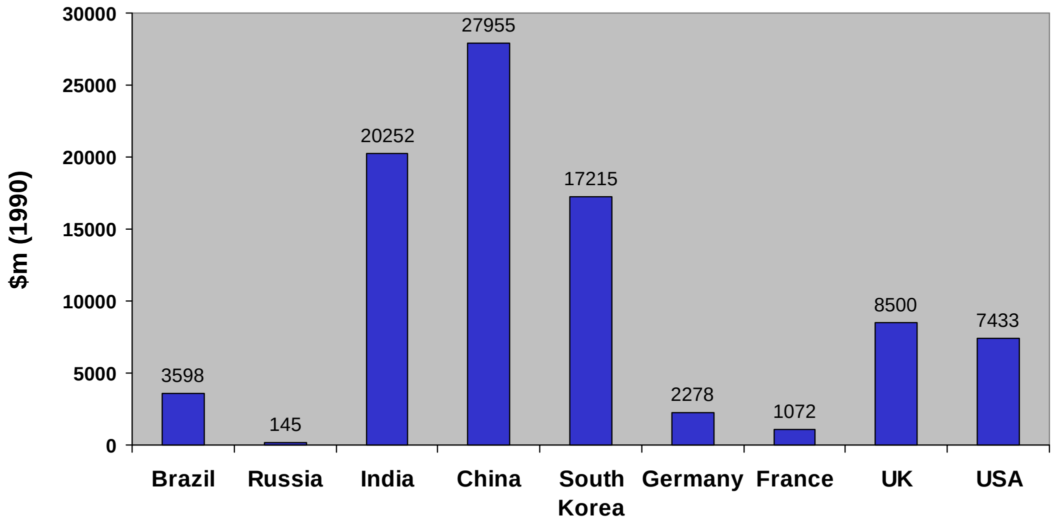


Figure 2 Military expenditure trends (% of GDP, 1995-2008)



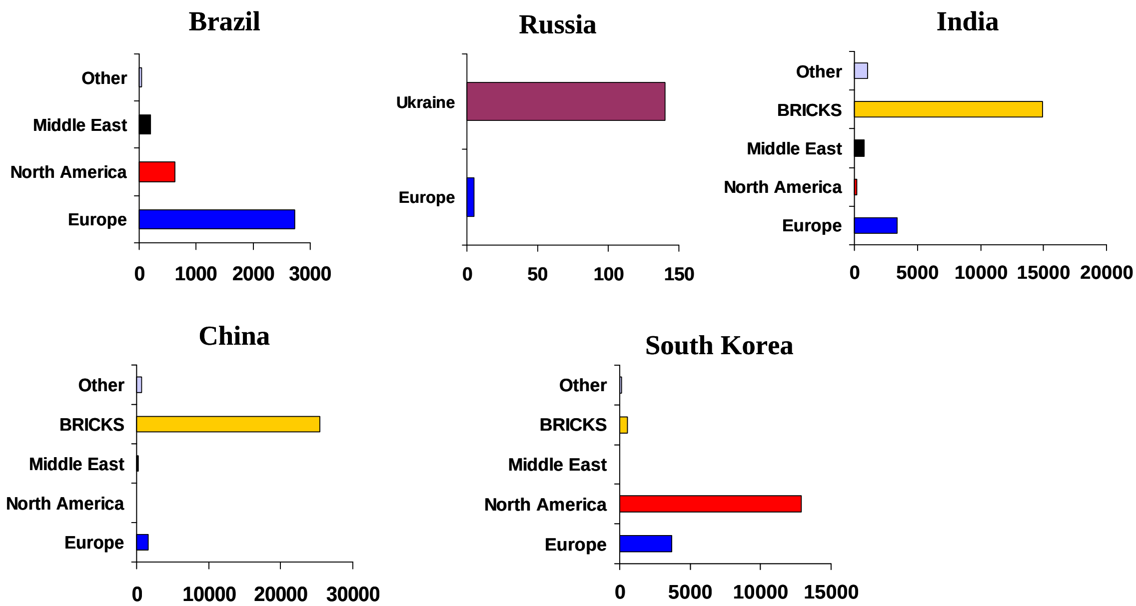
Total import volume over the period 1995-2008 gives a different picture on the size of the BRICKs markets, and arguably a more interesting one than that of expenditures because imports are mostly about procurement and not labour-related expenses, which typically make up the bulk of total military expenditure. Broadly speaking, BRICKs total imports are comparable to the volumes of military expenditure. The exception to the rule is Russia, where the import market is extremely small in comparison both to the scale of its defence expenditure and to the other BRICKs, underlying the closed nature of the country as an export destination.

Figure 3 Total military imports (1995-2008)



European companies do best (in terms of % of import market share) in Brazil (around three quarters), followed by South Korea and India (around a fifth market share), and then China and Russia (minimal exposure). It should be borne in mind that the Brazilian total import market for military equipment is small in comparison to that of China, India and South Korea, so that in terms of absolute size over the 1995-2008 period, South Korea has been the largest market, followed closely by India and then Brazil.

Figure 4 Origin of BRICKs military imports ($1990m, 1995-2008)

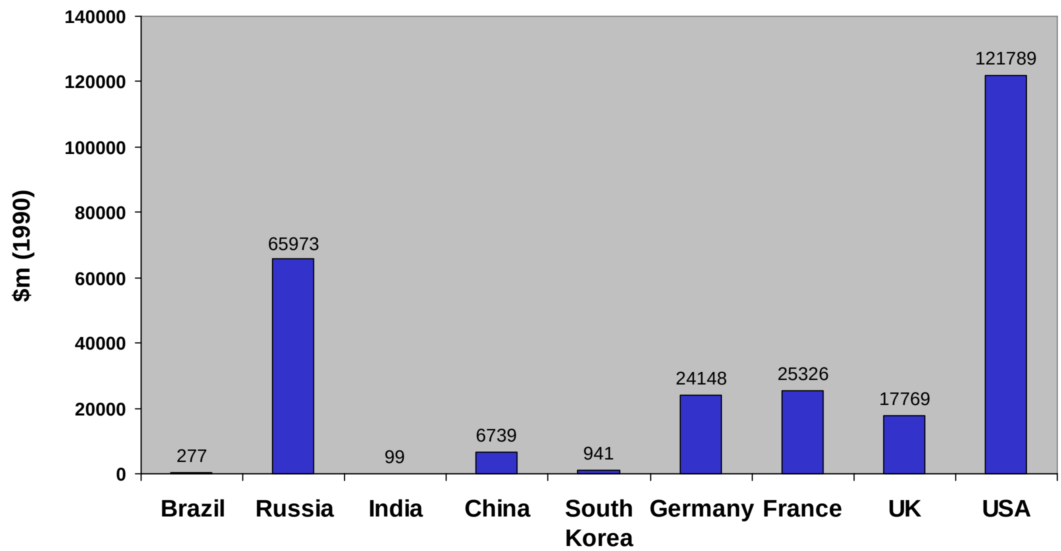


Intra-BRICKs trade is most important for India and China, where the majority of supplies comes from Russia. Indeed, the data show that Russia is the only country that has traded with the other BRICKs over the period of analysis, which again underlines how Russia is different from any other BRICKs country. Also of interest here is a changing pattern of trade between Russia, India and China, with India the more important destination in recent years - something that average period analysis can hide.

South Korea is the only BRICKs country dominated by North American imports (mostly from the US), which is as much a reflection of political allegiances and regulatory control as anything else.

In contrast to the size of the import volumes, exports are very small by comparison, indicating a huge trade deficit in most BRICKs - the exception is Russia, where export values dominate the other BRICKs, again underlining the difference between Russia and the rest. As noted from the import data, Russia exports quite heavily to the other BRICKs (mostly India and China) and also across a wide range of armament domains, making it an important competitor to EU suppliers. In contrast, most other BRICKs export mainly to a limited number of neighbouring areas or other developing countries, and in a limited range of domains (mostly Asia and Africa).

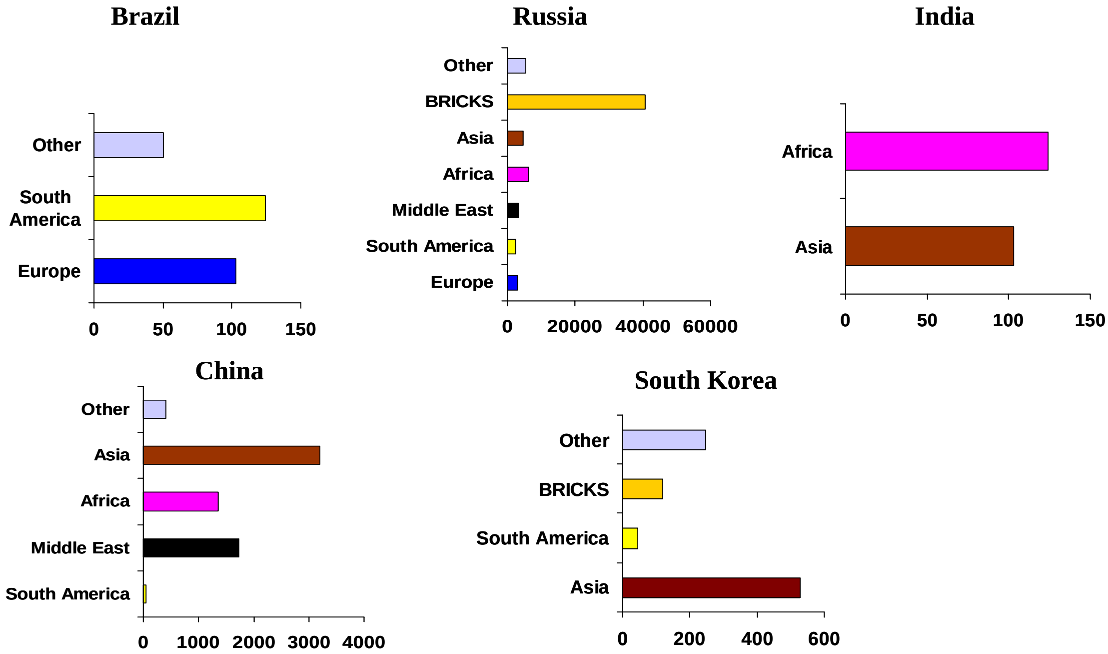
Figure 5 Total military exports (1995-2008)



Penetration into European markets has been very limited over the 1995-2008 period with only Brazil and Russia showing any export trade. Although the share of exports over this period was important to Brazil, the small value of its total military exports compared with Russia means that Russian exports to Europe were around 30 times the scale of those from Brazil, again underlying the importance of Russia as a competitor relative to other BRICKs.

A major limitation of the analysis has been lack of consistent data on R&D / procurement, and also on FDI relating to those sectors (e.g. aerospace) most closely linked to the defence sector.

Figure 6 Destination of BRICKs military exports ($1990m, 1995-2008)



- BRICKs summary position by arms domain

The main emphasis here is on the developing market situation, know-how, achievement and potential development by main armament domains, rather than presenting a BRICKs-by-BRICKs summary. The various arms domains analysed are as follows: Aircraft; Helicopters; Land armaments; Surface ships; Submarines; Missiles; and Electronic systems & optronics. The summary situation by BRICKs country is as follows:

Table 1 Summary Statement of BRICKs Current Competitive Position

Country	Summary Statement
Brazil and India	Possibility of competition in the future in some niche domain on the basis of an industry that is still more focused on serving its own domestic market. India in particular experiences some difficulties in maintaining its technical know-how.
Russia	Already a major competitor in all domains.
China	Potentially a major competitor due to the rapid development of its industry, possession of its own technology (including licensing) and its domestic market needs
South Korea	Already an aggressive competitor with a niche portfolio.

Radar charts (see Figure 1) showing a synthetic view of the competitive threat from each BRICK country for Western and European defence industries are presented, along with an indication of their global level of achievement by key indicators. The evaluation of the achievement and potential of each of the BRICKs is based on four indicators:

(i) industrial maturity: i.e. the capacity to develop and to manage independently armament programmes;

(ii) technical independence: i.e. the level of technological knowledge within the industry (especially in key technologies);

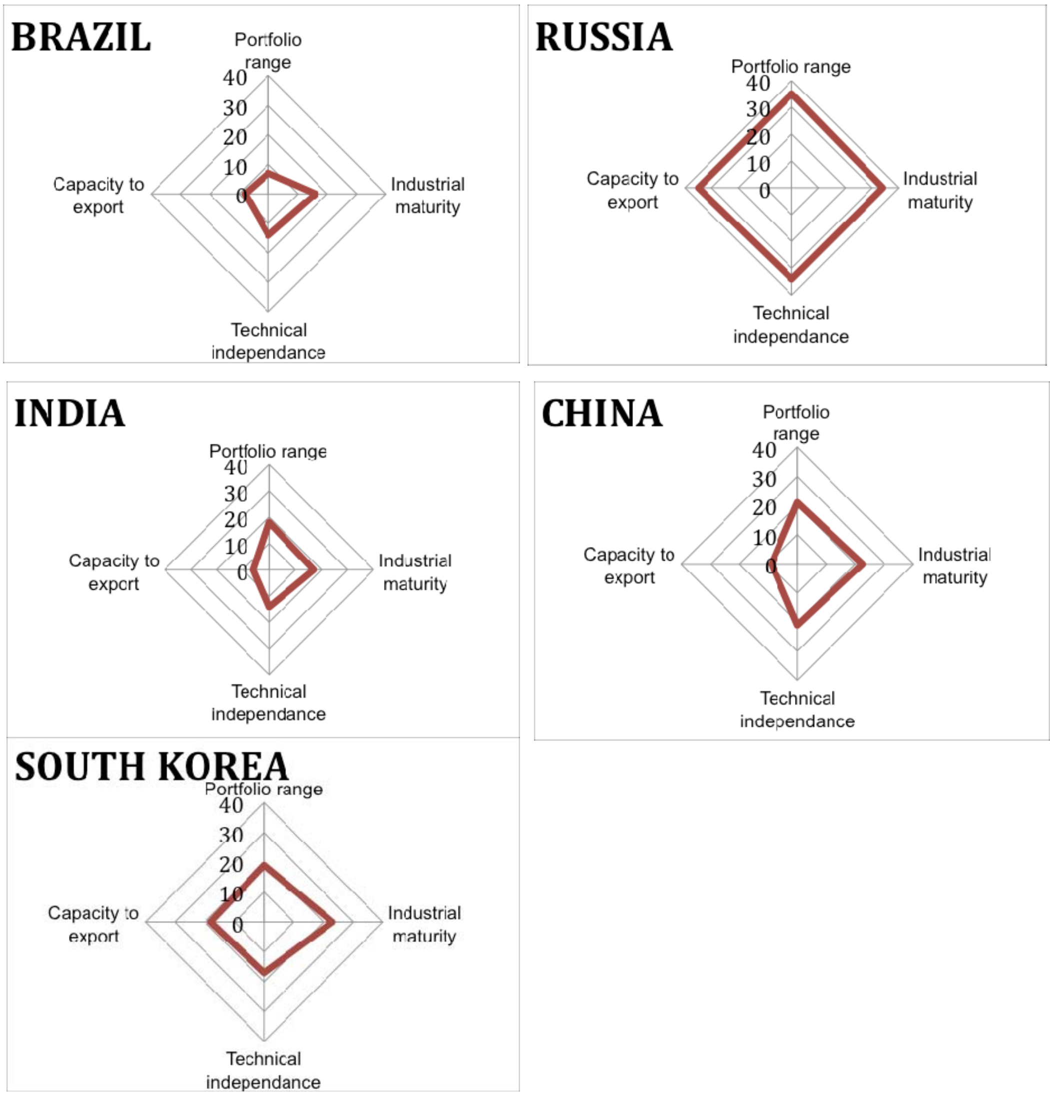
(iii) portfolio range: i.e. the level of presence in the different sub-segments of the market;

(iv) capacity to export: i.e. the capacity to offer not only a range of products for a customer but also training and support for these products.

The situation for Brazil is due to a limited presence to the aeronautical segment. This segment is the only one in which Brazil has significant knowledge and industrial maturity. Consequently the portfolio is limited and the capacity to export is very low.

As regards the defence industrial sector, Russia cannot be considered as an emerging country. Russian industry is, outside Europe and the US, the only one to have a state-of-the-art level of maturity combined with technical independence. Russian industry has a complete range of industrial capacity and a high level of knowledge in the key technologies necessary for a modern armaments programme. In terms of portfolio, Russia is able at present to offer products in every segment except UAVs (Unmanned Aerial Vehicle). Regarding export capability, Russia has a long record of arms sales and the industry has all the necessary components to manage export contracts.

Figure 7 Achievement stage and potential of each BRICKs country by key indicator[2]



[2] Note: for each indicator cross-referenced by domain, each country achievement level was given a mark. A figure in the charts refers to the total given by domain or indicator.

Stage of development assessment

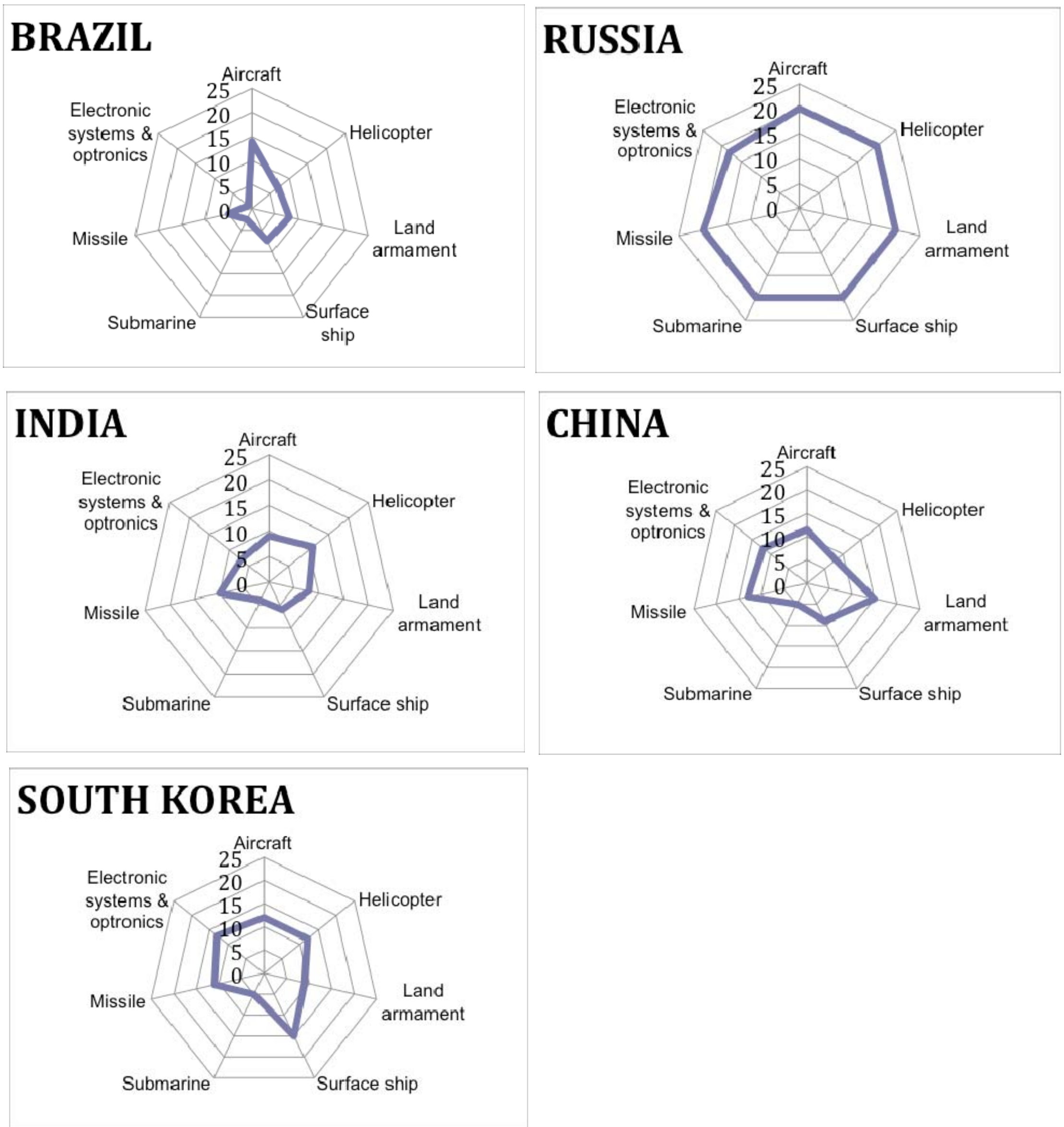
In India the industry presence is relatively large and they are developing several indigenous programmes in the aeronautical, land and naval segments. However, a major difficulty for Indian industry is its limited capacity to develop and to maintain a high level of knowledge and to manage major armament programmes. Consequently, the portfolio range is reduced in terms of mature products and the Indian industry organisation has not reached a sufficient level, especially in terms of product support and training; hence for the medium term the capacity to export will stay at a very low level.

China's defence industry is, in terms of size, one of the most important but it is mainly organised around licensed production or derivative versions of licensed products. The ability to manage indigenous programmes is improving but remains low in terms of state-of-the-art standards and access to key technologies. Consequently, the portfolio range of exportable products remains limited. Regarding export capability, industrial organisation and maturity have not reached European or US levels in terms of commercial workforce, product support and training. The capacity to export will stay limited for the short and medium terms. But the progress being made by the country in all these aspects will progressively improve its capacity to export.

South Korea, driven by the threat of its northern neighbour, has built up a very large defence industry in relation to the size of its country. This industry is not able to cover the whole range of armaments sectors, but it has reached a significant level of maturity in some sectors. Technical independence is limited and access to key technologies is not complete, as shown, for example, by the need to procure missile seekers from Russia. The portfolio range is limited and derives mainly from the operational needs of the Korean defence forces. Korean export capacity is only limited by the portfolio range and the presence of US technologies in most of its programmes; on the other hand, Korean firms are very aggressive in the export market.
Brazil cannot be considered as a real competitor except in the aeronautical segment for Airborne Early Warning and Control (AEW&C) aircraft or training and light counterinsurgency (COin) aircraft. The technical level and portfolio in the other segments remains very poor and Brazil has no intention of undertaking a large-scale investment programme in order to become a key competitor in the global defence industry. The country's goal is to maintain and develop a close link with foreign partners (e.g. Eurocopter in the helicopter segment) with a view to improving knowledge and industrial capability where this is realistic and possible. The choice of the next generation fighter after the current competition will be a key driver of the future strategic link for Embraer.

Russia is the only country that makes a complete offer across all domains at a state-of-the-art level. Russia is the main and only real competitor on foreign markets for the EU or US defence industries. In view of the lack of cooperation in major programmes between the EU and Russian defence industries, Russia proposes to customers, if necessary, to fit some Western equipment on Russian platforms.

Figure 8 Achievement stage and potential of each BRICKs country by domain



India is mostly an import market in which there is a possibility of developing some cooperation. The country wishes to develop a major defence industry covering most sectors. But this aspiration is counteracted by the dispersal of industrial activities and difficulties in consolidating knowledge and in achieving high standards of quality, organisation and production. The long-term nature of most of the Indian military programmes is another barrier to developing a major defence industry and to cooperation with foreign firms. In response to this, different strategies have been adopted: some companies help Indian firms via licensing or technical support; others decide to maintain their advantages.

China has a large industrial potential, greater than that of the South Korean industry, but is less organised and not at the same high standard. The Chinese industry is most advanced in land armaments but not at a state-of-the-art level and its position is not so good in the other sectors. There is a lack of knowledge in some areas, which is a handicap for export sales. In the near future and the medium term China will be in position to compete in markets needing basic or low technology products, but not in the upper part of the market. China will also probably develop cooperation in order to consolidate its knowledge and industrial maturity (in both the civil and the military markets).

South Korea is really a new competitor that has proved in other sectors (electronics, shipyards) an ability to build within a short period a state-of the-art and competitive industry at western levels. In some niche markets or specific large segments, such as advanced training aircraft, light combat aircraft, helicopters and missiles, Korea will become in the short or medium term an aggressive competitor.

Table 2 Summary Statement of BRICKs Current Development Potential

BRICKs	Summary Statement
Brazil	An industry and a country that is trying to maintain close relations with its traditional Western partners rather than trying to compete.
Russia	In a global competition with very few areas of cooperation.
India	An open market to all suppliers from Western countries, Russia, or others (Israel) with the willingness to develop but with no clear achievement.
China	Larger industry but with a smaller achievement in export markets; less mature, for example it does not have the capacity to qualify or certify aircraft.
South Korea	A new competitor, already active in the field of surface vessels and with important developments targeting rapid emergence in the field of light training combat aircraft and helicopters; very aggressive.

Likely future developments

- Developing a forward-looking perspective

Having reviewed the many features of the current situation regarding the structure and operating features of the BRICKs defence industry and markets, the next stage was to look forward and consider future developments. In doing so, one possible way of working would be to consider a whole range of possible developments around the world (some plausible, some less so) and attempt to weave together a convincing storyline for how the global defence sector might evolve. Such a task would be immensely difficult, however, as the defence sector is so closely entwined in geo-political developments that these scenarios would become overly complex and the implications and recommendations for the European defence sector would be dependent on very intricate assumptions about how the world might evolve, rendering them less useful if events unfolded in a different way.

Instead, it was considered a better plan to place more emphasis on the most likely outcome over the short-to-medium term, summarised through a Business as Usual (BAU) scenario. From this central view, certain significant events could be pushed outwards for each of the BRICKs countries to consider how they might affect developments in more detail.

- Key drivers

Government policy, along with other key economic and organisational factors, is a clear driver for the defence sector, both in terms of set up and subsequent development, as outlined in the table below. It should of course be stressed that none of the drivers are purely independent and reality usually presents itself as an interwoven set of factors that have different strengths and influences at different times.

Table 3 BRICKs Defence Industries - Summary of Leading Drivers

BRICKs Defence Industries - Summary of Leading Drivers	
Drivers for Establishing Defence Industry	**Drivers of the Future Development of Defence Industries**
• Defence and Security Policy • Foreign Policy • Political Pressures and Ambitions • Legacy	• Defence and Security Policy • Foreign Policy • Political Pressures and Ambitions • Industrial Policy (defence and civil) • Economic Growth • Availability of skilled workers and capital • Organisation (management and governance) • Procurement and open tendering (to improve standards and competition) • Structural Factors (i.e. ownership, vertical ties, lead times, market concentration, etc.) • Technological Factors

- Business as Usual (BAU) scenario

The future progression of each defence sector is therefore assumed to follow the trends in economic, political and technological drivers as described above, achieving the targets and policy objectives identified. To account for the long lead times, each scenario covers a period of 15 years from 2010 to 2025. This is intended to encompass both short and medium-term trends and impacts.

A summary of what each scenario assumes is provided below.

Table 4 Business as Usual Scenario - Summary of Assumed Conditions

Business as Usual Scenario - Summary of Assumed Conditions					
Factor	**Brazil**	**Russia**	**India**	**China**	**South Korea**
Principle Security and Defence Policy Driver	Increased Power	Regaining Power	Security	Increased Autonomy and Internal Security	Security
Principle Defence Industrial Policy / Strategy	Increased Production for Domestic and Export Markets	High Exports	Increased Indigenous Content in Arms Procurement	Increased Domestic Development of Military Technology	Increased Indigenous Content in Arms Procurement
Defence Industrial Policy Element		Seek New Export Markets	Diversification of Foreign Suppliers, Offsets	Dual-use Technological Development, Reverse Engineering	Offsets and International Co-production

Business as Usual Scenario - Summary of Assumed Conditions					
Factor	**Brazil**	**Russia**	**India**	**China**	**South Korea**
Offset Policy	Unofficial	N/A	30%	Unofficial	30%
FDI Policy	Unrestricted	Restricted	26% Limit	Restricted	Restricted
Priority Domains (Strengths)	Naval, Submarine, Small Aerospace	Land (Tank) , Aerospace, Nuclear	Aerospace, Naval, Land, IT	Aerospace, Naval, Space, Missile, IT	Electronics, Naval, Land
Domain Weaknesses	Land, Large Aircraft, Helicopter	Electronic, Naval	Submarine, Aerospace	Large Aircraft, Submarine, Land	Aircraft
Defence Budget in 2008 (*2009)	$23.3 Billion	$35 Billion	$30.8 Billion*	$61.1 Billion	$24.6 Billion
Forecast Defence Budget in 2025	$47.1 Billion	$56.2 Billion	$82.1Billion	$160.7 Billion	$43.7 Billion
Export Market Potential	Largely Regional	Focussed on Developing Countries and former Soviet States	Limited	International	International
Potential for Increased Indigenous Content[1]	Medium	Low	Medium	High	Low
Probability of Success in Attaining Policy Goals[2]	80%	50%	65%	99%	60%

[1] Highlights the relative ability of each BRICK to increase indigenous production of defence equipment. For example, BRICKs where a high proportion of defence equipment is indigenously produced, the potential to increase this level is likely to be low compared to those where the majority of defence equipment is currently imported.
[2] Based on defence expert opinion.

Having stated the BAU as a broad continuation of trends as previously described, it should be noted that at a stakeholder workshop held in Brussels the importance of not relying too much on the past to predict the future was stressed, particularly when it comes to the BRICKs. Previous difficulties in industrial development and technical advancement experienced by some BRICKs countries have largely been overcome, while on the other hand, some previous fast growth and development might in the future face bottlenecks such as skilled labour shortages.

- Other (event-driven) scenarios

Building on the BAU, additional scenarios have been developed to investigate the potential implications of political, economic and technological changes to the assumptions made in the BAU. Each scenario is built around a hypothetical event taking place, before assessing its implications for individual BRICKs in the field of defence.

The three scenarios are:

1) Korean-unification

Assumes a peaceful settlement is reached between North and South Korea resulting in de-militarisation in the region, including a reduced US military presence. This scenario is therefore intended to highlight the implications of changes to political and foreign policy on defence industries;

2) Economic stagnation

Highlights the importance of economic growth to two rapidly growing BRICK defence industries (Brazil and China) with different defence industry growth strategies, structures and budgets; and

3) Bi-polar World

Reflects the emergence of a bi-polar political and technological world, such that two types of incompatible defence equipment are available on the international market, each with a different approach to an identified military need. The Revolution in Military Affairs (RMA) increasingly requires technology to be interconnected for the purposes of communication and navigation between armed forces. This scenario intends to indicate the implications for the defence industry where interconnection and networking is not possible between defence systems, focussing on Russia which currently adopts a different technological approach to most other defence industries.

Table 5 provides a summary of the assumed conditions under each event driven scenario in relation to the BAU. For simplicity the same policy objectives are assumed to exist as in the BAU under each scenario.

Table 5 Event-Driven Scenario - Summary of Assumed Conditions

Event-Driven Scenarios - Summary of Assumed Conditions				
Scenario	Korean Unification	Economic Stagnation		Bi-polar World
Factor	South Korea	Brazil	China	Russia
Forecast Defence Budget in 2025 (relative to BAU)	Decreasing	Decreasing	Decreasing	No Change
Export Market Potential (compared to BAU)	No Change	Reduced	No Change	Bi-polar market, reducing export potential
Potential for Increased Indigenous Content[1]	Significantly Reduced	Significantly Reduced	No Change	No Change
Probability of Success in Attaining Policy Goals[2]	40%	40%	90%	70%

[1] Highlights the relative ability of each BRICK to increase indigenous production of defence equipment compared to the BAU scenario.

[2] Based on defence expert opinion.

Implications for the EU defence sector

- Background

From the possible outcomes as described in the scenario analysis it is possible to derive the likely implications for the EU defence sector, at least based on an assumption of no significant changes in government or EU policy.

Assuming BRICKs countries trends in defence spending would at least remain the same and so their defence industries can continue to be able to develop local programmes and develop know-how, implies a potentially positive scenario for the EU defence market. It also requires that the BRICKs countries remain a good market, to the extent that they buy imports directly, use import offset deals and cooperative projects to develop indigenous capabilities. Relations and trade with individual countries do of course differ and prospects will depend upon political and strategic constancy and the EU companies remaining competitive.

On the other hand, the BRICKs anticipated development could imply increasing competition for the EU companies as these countries develop capabilities and move into their markets. The future of the European industry depends mainly on its position compared to the US industry, which will also remain the main competitor for Europeans according to BAU assumptions. To a lesser degree it will depend on the strategy of emerging non-BRICKs countries already present on the armament market (Israel, South Africa, Turkey, etc).

On the whole, the BAU assumptions do not imply a rosy future for the European defence industry. It is still facing a major funding issue, due to the size of its local market and overcapacity in a number of areas. There is likely to be some form of restructuring of procurement and production across Europe at some time in the future and the pressure to export to continue to support its technological and industrial base (EDTIB) is likely to remain.

- The BRICKs as competitors

The country analyses implied that not all of the BRICKs defence industries could enter into global competition. By being focussed on serving their own domestic market, various emerging defence suppliers are not, or will not be, really in a position to seriously enter in competition with other suppliers on export markets. Though they may be able to compete in lower-tech markets in developing countries, it is also worth noting that what is not developed in the BAU scenario, namely the role played by the European Defence Industry during the emergence phase of the BRICKs industries notably through offset and cooperation.

In general, for countries with an ambition to maintain a national defence industrial base, theoretically there are four major options, as summarised in the table below.

Table 6 Main options for BRICKs defence industry

Main options for BRICKs defence industry	
Option	**Description**
Comprehensive	With the changes in the nature of the market there is no country that can really maintain a comprehensive defence industrial base.. Even Russia and China would struggle to maintain a presence in all segments of the defence equipment market and keep pace with technological evolution without the cooperation of other countries.
Specialisation	Countries are likely to need to specialise in particular segments and so make decisions on whether to develop the industry to ensure a degree of autonomy for their armed forces (maintenance, servicing, spares); to provide strategic equipment not available on the market; or to focus on niche products with a view to exports.
Cooperation	Defence industrial cooperation between European and BRICKs countries, in the production of complete systems or components, or indeed in joint ventures. Such programmes of international cooperation could be similar to those in commercial aircraft.
Segmentation	Defence production not at the boundary of technological development, but lower tech alternatives. Target different markets to the major producers, both types and location. They may then rely on US and/or European manufacturers for imports of high tech equipment.

Concerning the capacity to export and compete head-to-head with the EU defence sector, clearly all of the BRICKs countries have some capacity to develop exports and some (Brazil, Russia and South Korea) have highlighted a role for exports in their defence industrial policy.

Table 7 Summary Implications for each BRICKs Country

Summary Implications for each BRICKs Country	
Country	**Implications**
Brazil	Brazil has been more focussed on particular sectors than India, with its development of its aerospace industry and its cancellation of the development of armoured vehicles, and is keen to further develop an offset policy and technology transfer requirements, to help domestic industry develop further. The EU defence industry is certainly in a position to help develop capability, to partner local firms in certain areas (combat aircraft, submarines) and to act as a complementary player on others (early warning and light tactical transport). Plans to develop a nuclear reactor and to produce nuclear-powered submarines present opportunities for European companies, some of which are already being exploited by France. Europe is already the principal exporter to Brazil, ahead of the US, suggesting that many opportunities are already being taken advantage of. Also, the risk in terms of third or home-market competition from Brazil is minimal in most domains.
Russia	Russia’s defence industry is already a global player. It is mainly focused in maintaining its military position and possibly reducing the technological gap with the US, though it is more likely to be able to prevent the gap from widening than reduce it. A major concern for Russia is the sustainability of its capacity to produce across all domains, and this might present a market opportunity/weakness for the EU defence sector to exploit, or an avenue to explore collaboration with the Russian defence sector, and capitalise on Russia’s share of the export market and the strength of demand to modernise Russia’s own forces. Certainly, Russia lags behind in electronics & optronics and this presents an opportunity for EU producers, given that Russia has shown some

Summary Implications for each BRICKs Country	
Country	**Implications**
	willingness to allow collaboration in this area. With strong government support for exports Russia could be an important and extremely competitive (even aggressive) competitor to the EU defence sector in the medium term, both in other BRICKs countries and third markets. It's most important markets are China and India, but their increasing independence means Russia is likely to continue to seek new export markets in the medium term. Russia's strengths and main sources of export revenues are the aircraft and missile sub-sectors. These are areas in which the EU industry will need to compete or collaborate. Though Rosobornexport has no official offset policy, it appears to be willing to negotiate very hard to secure orders and market share on behalf of the Russian defence market. Stakeholders at the Brussels workshop suggested, however, that the impact of Russian defence industry development is likely to have limited impact on the European industry and it may well have difficulties enlarging its area of influence in markets targeted by European industry.
India	India seems able to achieve various objectives but not to develop a comprehensive production capability. It is focussing upon developing domestic capabilities, but remains a major customer for a range of countries, including not only the EU, but also Russia, Ukraine, China, USA, Israel, etc. If recent reforms, outlined in the India Defence Procurement Policy 2008 achieve their objectives, a much stronger domestic defence industry could emerge which may push European companies out of the Indian market over time. Indian state rules prohibit more than 26% Foreign Direct Investment (FDI) in the national defence industry, but joint ventures are considered on a case by case basis . Certainly Europe is likely to retain India as an export market, but the major problem is likely to be the competition from other countries as much as India's growing domestic capability.
China	China could become a third global competitor beside Russia and the US but, at the moment, there is no evidence to suggest it is aiming for this. Certainly China is looking to further reform its management system of defence related science, technology and industry, specifically with regards to investment for arms companies. Procurement gives priority to the Chinese private firms and domestic scientific research institutions and universities. However, the Chinese policy also encourages foreign investment, particularly through joint ventures. This nevertheless presents enormous opportunities for EU firms, especially given that these firms are most likely able to provide weaponry, equipment and technological support that China's main export supplier Russia has not been able to provide. Even on exports China might be a minor threat to European producers, but a larger one for Russia, as they share similar potential markets e.g. Africa.
South Korea	South Korea is already a competitor with Europe in high-end civil products and military components, matching Western standards for quality and performance. Procurement in South Korea is openly biased in favour of domestic firms, and there are strong offset (30% for purchases over $10m) and technology transfer rules. Given the high levels of technology and expertise among South Korean companies, this requirement seems likely to encourage potentially rewarding joint ventures and other forms of cooperation. This suggests that the EC's best action lies in encouraging joint ventures and creating a more level playing field by lobbying against offsets. South Korea possesses a real capacity to integrate faster or develop new technologies and in some areas is the most important competitor for European industry, targeting similar customers.

Overall, it would appear that only Russia has any hope of developing substantial export presence – which indeed it already has. Within the 2010-2025 timeframe, however, China may also have the capability to do so, even if they may not have the intention. It really depends upon strategic changes and the general development of the international arms market. For the other BRICK countries the development of their industry is more a consequence or an expression of new economic prosperity and/or willingness to gain more independence in terms of their defence capability. They are unlikely to be in a position to offer comparable products and to enter the markets that are usually targeted by the European defence industry.

The potential consequences of the BAU scenario for European industry are firstly, the possible appearance of China as a competitor, to add to the US and Russia. Second, the other BRICK countries are likely to act as competitors on some niche products, but also provide outlets for products and provide new opportunities for cooperation. In respect of the variants on the BAU scenario that would impact on particular BRICKs countries, it is not obvious how these would change the impact on the European industry, though economic stagnation might compound the problems faced in Europe and lead to more rapid consolidation within Europe.

- The BRICKs as collaborators

In developing their defence industry capability, all of the BRICKs seem committed to using some form of foreign direct investment and technology transfer and in some cases strong offset requirements. Thus, offsets may at present be important for EU competitiveness in exports, but there are also opportunities to collaborate with these countries, through joint ventures, by acquiring firms and perhaps through dual-use technology transfers.

  - Brazil is keen to further develop an offset policy and technology transfer requirements and the EU industry is already the most important player and well placed to help develop capability in certain areas.
  - Russia is likely to show more resistance given its strengths, but it does lag behind in some important areas, such as electronics & optronics and this may provide opportunities for future collaboration for the EU defence sector.
  - India is likely to become an increasing source of collaboration as it strives to develop its indigenous industry and move away from its dependence on Russia.
  - China's encouragement of foreign investment, particularly through joint ventures, creates enormous opportunities for EU firms[3].
  - While South Korea is openly biased in favour of domestic firms, and there are strong offset and technology transfer rules. The technology and expertise of the local companies suggest successful joint ventures and other forms of cooperation.

It is important to emphasise collaboration does not simply lead to the benefits of exports, with the downside of developing potential future competitors, but provides lower cost sources of components and subsystems for EU industry. It might also prevent them from developing separate products, with the BRICKs companies becoming integral parts of the international supply chains that the prime international contractors are developing as part of the globalisation of the industry. This could be an important development in Europe's competition with the US defence industry.

- The BRICKs as export markets

In the BAU scenario the assumption that the BRICKs countries' trends in defence spending would at least remain the same implies real export opportunities for the EU defence, assuming that they buy imports directly and/or use import offset and cooperation

[3] This collaboration refers to the civil sector at present, but from this there is potential for defence sector developments.

to develop their indigenous capabilities. The US industry will remain the main competitor though there may be some competition in specific niches from emerging non-BRICKs defence industries (Israel, South Africa, Turkey, etc). The likely importance of the BRICKs for exports does vary:

- Europe is already the principal exporter to Brazil, ahead of the US. While this suggests that many opportunities are already being taken advantage of, there are likely to be further opportunities as the country develops its indigenous capability.
- Russia is not an important export market for the EU and this is unlikely to change in any significant way. There are possibilities that declines in sub-sectors and continuing willingness to engage in co-operation will lead to the opening up of the Russian market and provide future opportunities.
- Europe is likely to retain India as an export market and there are likely to be opportunities to develop exports, but the major problem is likely to be the competition from other countries as much as India's growing domestic capability.
- China's move away from a dependence on Russian exports could well provide opportunities for EU exports, though the magnitude of this will depend upon how EU policy towards China changes, in particular the embargo on lethal military sales.
- South Korea provides export opportunities, tied in with the development of cooperative projects.

Recommendations for the EU defence sector

- Background

A clear conclusion from the analysis is that there seems likely to be little direct effect on competition for the European defence sector of the emergence of the BRICK countries as defence producers. This does not mean that the BAU scenario implies stable market conditions for the European defence industry, which will continue to face funding concerns, as procurement reforms take place and industrial restructuring continues. While extra-European exports are often seen to play an important role in the maintenance of the European defence, technological and industrial base (EDTIB), direct export sales may face increasing concern in domestic European constituencies, foreign sales from market presence is a more viable route towards maintaining, or increasing, market shares in a potentially shrinking international arms market.

The nature of the industry and the importance of political and strategic drivers, mean that recommendations are limited and likely to be more general than for other industry studies.

- Promoting the provision of improved data and analysis

A major problem in analysing the defence sector is the paucity of information that is available, so an important recommendation would be to promote the provision and reporting of improved information.

- Better data on FDI which captures bilateral flows, would allow an evaluation of the extent of collaboration between the EU Member States and the BRICKs. UNCTAD may have this information, but were unable to supply anything more detailed than what is currently in their World Investment Report. Eurostat trade

data are better, in that they capture bilateral flows, but without sufficient detail to identify the defence sector or even related areas such as aerospace.
- Improved data on defence R&D across countries.
- Improved data on defence procurement. At present it is often necessary to rely on total military expenditure which includes salary and pension payments - not something of particular strategic importance.
- Improved data on trade by, for example, encouraging improved reporting to UN Register on Conventional Arms.

Better data would allow improved understanding of the developments in the sector and the implications for the EU. A related recommendation would be to promote further research as the data become available.

- Promoting investment in European R&D

The Business as Usual (BAU) scenario illustrates the most likely evolution of each BRICK defence industry in the future. The BAU predicts that by 2025, each BRICK country will have the capability and capacity to produce the 'bricks and mortar' of most defence equipment, while competing with Europe in the international defence market within specialised niches. However, this scenario also predicts that BRICKs will rely to varying degrees on foreign suppliers for more advanced technologies in the short to medium term. In the longer term, if the European defence industry is to continue to be a leading producer and supplier of more advanced technologies to the BRICK and other states it must maintain its technological 'edge' in engineering, design, research, etc. The 2007 European Commission's Strategy for a stronger and more competitive European defence industry[4] acknowledges this as an important objective, suggesting there are important technology spillovers generated by the defence industry[5]. However, it is important to recognise the changing nature of defence production and the increasing importance of developments in advanced commercial technology, such as in information and communication industries for the defence sector. Thus, the importance of future R&D in the European defence industry highlighted in this study should be seen in the context of overall R&D. One recommendation would be to promote increases in R&D investment and intensify efforts at collaboration, within European industry in general.

The European strategy for a stronger and more competitive European defence industry has already made suggestions to Member States on how they could pool demand and R&D investment and supporting legislation to improve the functioning of the internal market for defence products has been introduced. It is recommended that further measures be promoted by the Commission to encourage coordinated activities, by Member States, the EDA and the security related research programmes of FP7[6]. The

[4] EC(2007): COM(2007) 764 final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Strategy for a Stronger and More Competitive European Defence Industry, Brussels 5/12/2007.

[5] Though this is contested by some commentators who see 'spin in' from the civil sector becoming increasingly important and 'spin off' from the defence sector waning. This cross-fertilisation is also important for Europe's Lisbon Strategy for Growth and Jobs EC(2005): COM(2005) 330 final – Communication from the Commission to the Council and the European Parliament: Common actions for Growth and Employment – The Community Lisbon Programme, Brussels 20/7/05, available at Lisbon Strategy Website: http://ec.europa.eu/growthandjobs/documentation/index_en.htm.

[6] Indeed Article 163 (a)1 of the Lisbon Treaty suggests that there may be an opportunity for the Commission to have a greater input into how R&D is funded and implemented. Article 163 (a)1: "the Union shall have the objective of strengthening its

Commission can play important roles in facilitating dialogue and debate, encouraging Member State collaboration and making clear the importance of considering the health of the civil sector R&D in the modern global defence market[7]. Joint research in areas such as electronics, communications, and nanotechnology in the civil sector is likely to have knock on consequences for defence oriented R&D.

- Promoting understanding of the changing nature of the international defence industry

The international defence industry has undergone considerable change, with considerable consolidation and internationalisation (though companies still rely on domestic support through procurement and support for exports). The costs of high technology R&D, combined with smaller national production runs led to the pursuit of economies of scale through international collaboration, the development of international supply chains and industrial restructuring. At the same time civil innovations are increasingly ‘spinning in’ to arms production, increasing the links with the civil sector and bringing in new types of company. Companies in the electronics and IT sectors that in the past had little involvement with arms production are finding themselves part of the defence industrial base. This trend could lead to a reduction in the defence specialisation of all but the major contractors and further cuts in defence spending resulting form the global economic downturn could lead to further consolidation[8]. Certainly the EU defence sector is likely to see further restructuring and consolidation of the industry, with ever more complex cross-border supply chains.

In order to prepare for the potential impacts of these developments, it would be valuable to better understand the changing nature of the industry and its relation to the civil sector and the EC should encourage further research. At the same time the EC should encourage Member States to cooperate with EDA and industry to plan necessary restructuring and consolidation in areas of overcapacity and to plan the application of structural funds to assist regions to move from dependence on defence production[9]. As highlighted in 12.4, the BRICKs have not been seen as an important competitive threat and they provide potentially important purchasing or partnering opportunities, to lower production costs, acquire niche technology and access markets. The EC might consider cooperating with the EDA in establishing a defence industrial monitoring service and organising, together with ASD, conferences and forums with industries and customers from BRICK countries, such as India, South Korea and Brazil.

- Promoting the establishment of a level playing field

Offsets are an important component of trade in the international defence market. As seen in the individual country studies many of the BRICKS are increasing their offset

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scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry,..."

[7] Article 28 a(1): "Member States shall undertake progressively to improve their military capabilities. The Agency in the field of defence capabilities development, research, acquisition and armaments (hereinafter referred to as “the European Defence Agency”) shall identify operational requirements, shall promote measures to satisfy those requirements, shall contribute to identifying and, where appropriate, implementing any measure needed to strengthen the industrial and technological base of the defence sector, shall participate in defining a European capabilities and armaments policy, and shall assist the Council in evaluating the improvement of military capabilities".

[8] Skons and Dunne (2008).

[9] Efforts at further collaboration or consolidation should probably be aimed at the land or naval sector, rather than the aerospace sector. Cross-border, cross-firm collaborations in the land or naval sectors have not been as successful as those in aerospace.

requirements. This presents a significant challenge for European industry, as offset demands can affect the competitiveness of European industry in the event that other competitors can offer more generous offset arrangements. Consequently, “there is a danger that buying states are less concerned about the competitiveness of the product than the attractiveness of the proposed offsets”[10].

This suggests that the EC should advise on the benefits of establishing a ‘level playing field’ internationally with more equitable, non-discriminatory procurement regimes, by lobbying against offsets and emphasising the opportunities offered by co-production and cooperative industry activity. Developing a Code of Conduct through discussions with the US and other major competitors would be extremely valuable. Alternatively, the EC might support the EDA policy outlined in their Steering board’s EDTIB Strategy document (14/5/07) which states that they “share the ultimate aim to create market conditions, and the EDTIB structure, in which this practice may no longer be needed”.

Certainly, to meet the challenges identified it would be valuable for the EC at this stage to facilitate discussions between Member States and industry to encourage collective behaviour in creating a ‘level playing field’, continuing developments within the EU and promoting developments outside the EU. Creating an EDEM, with stringent implementation of procurement and transfer directives, possibly complemented by an initiative on Security of Information might be a good starting point, followed by dialogue with Member States on how to come to a more harmonised arms export policy, using the Code of Conduct and between the US and Member States on a coordinated approach to arms export control linked to the Arms Trade Treaty initiative that the UK and French governments support and is in the process of negotiation within the UN.

Specific recommendations

In the context of,

- government policy being a clear driver for the defence sector;
- the EU Code of Conduct on Arms Exports and the arms embargo concerning China;
- the success of EU contractors in many cases being the result of the US failing to meet the needs of the BRICK countries;
- overcapacity in the EU market; and,
- realistically, EU contractors having to provide their most advanced systems to be able to win orders,

we highlight the option of developing European collaborative projects as a way of competing more effectively with US and other third country competitors in the BRICK markets. We also make some specific recommendations concerning opportunities in the

[10] EC(2007): COM(2007) 764 final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Strategy for a Stronger and More Competitive European Defence Industry, Brussels 5/12/2007.

areas of aerospace, land equipment, naval and electronic sectors. The recommendations for these domains included the following common themes:

- Encourage Member States to develop a cooperative and transparent approach for dealing with all BRICKs countries;
- Assist in knowledge sharing between EU contractors on internationalisation of supply chains and the potential for cooperation;
- Develop an EU-wide policy on the technology transfers involved in the deals;
- Support the EDTIB in each of these domains to explore and exploit opportunities for collaboration with producers in those BRICKs markets which offer the best opportunities;
- Make offsets deals transparent and encourage cooperation between contractors.

1 Introduction

1.1 General

1.1.1 Background

Policy context

The general context for the Framework Contract for Sectoral Competitiveness Studies is the growing awareness among European policy-makers of the need to adopt policies to respond to structural weaknesses in the European economy.

In 2005 the EC set out for the first time an integrated approach to industrial policy with horizontal and vertical initiatives, to provide the right framework conditions for enterprise and innovation to succeed, and to drive the economy forward. The Mid-term Review of Industrial Policy in 2007 concluded that this approach has been successful and should be continued, with a focus on how best to respond to globalisation and climate change.

The Commission has committed itself to an integrated approach to industrial policy but, nonetheless, recognises that the effectiveness of policy needs to take into account the specific context of individual sectors:

- Firstly, by understanding those changes and challenges facing industry that are of a general nature, in that they have important implications across a broad sweep of sectors, and that may be the concern of cross-sectoral policy initiatives;
- Secondly by understanding those changes and challenges facing industry that are of a more specific nature, or of a general nature but with sector specific implications, and that may warrant the development of sector specific policy approaches.

Changing security landscape

At the same time, this commitment to an integrated industrial policy is set within the context of dramatic changes in the security threats and challenges faced by Member States since the fall of the Berlin Wall. In response the European Union developed the European Security and Defence Policy (ESDP). The success of this requires a broad-based and competitive defence sector operating within the EU. In recognition of this, European Defence Ministers have approved the development of a strategy for a more independent and more competitive European Defence Technological and Industrial Base (EDTIB).

The development of such a strategy, however, requires an up-to-date understanding of the global defence market. Before analysis can be conducted, an understanding of developments and likely future trends in key defence markets is required. The purpose of this sectoral competitiveness study, therefore, is to produce an up-to-date understanding of key international defence markets and competitors, and their impact on the EU defence sector.

1.1.2 Scope and sector characteristics

Geographic scope

The geographic scope of this study is principally the BRICKs countries – that is, the defence market and industry in Brazil, Russia, India, China, and South Korea. In addition to this, an understanding of the structure and functioning of the EU defence sector is required to assess the impact of developments in the BRICKs markets. This will form the core of the analysis. However, some of the analysis will extend to other countries in order to get an overview of main third markets where the EU and BRICKs defence industries compete.

Sector scope

The Terms of Reference contain no NACE classification codes to define the sector, but they do request that:

'*The study should focus on those countries whose defence budget and/or growth in budget/production makes them of particular interest to the EU. With this in mind the study should look in detail, at least, at the following countries; China, India, Russia, South Korea and Brazil'*

and that:

'For each of the above identified countries the study must provide a detailed market overview that covers the three main fields of naval, land and air'.

A preliminary review of NACE classification codes suggests that, where possible, the following activities need to be considered:

Table 1.1 Activities of the defence sector by NACE classifications

NACE Rev. 2 code	NACE Description	Activities covered
20.51	Manufacture of explosives	Includes: - manufacture of propellant powders - manufacture of explosives and pyrotechnic products, including percussion caps, detonators, signalling flares etc.
25.40	Manufacture of weapons and ammunition	Includes: - manufacture of heavy weapons (artillery, mobile guns, rocket launchers, torpedo tubes, heavy machine guns) - manufacture of small arms (revolvers, shotguns, light machine guns) - manufacture of air or gas guns and pistols - manufacture of war ammunition
30.31	Manufacture of air and spacecraft and related machinery	Includes: - manufacture of airplanes for the transport of goods or passengers, for use by the defence forces, for sport or other purposes - manufacture of helicopters - manufacture of gliders, hang-gliders

NACE Rev. 2 code	NACE Description	Activities covered
		- manufacture of dirigibles and hot air balloons - manufacture of parts and accessories of the aircraft of this class: • major assemblies such as fuselages, wings, doors, control surfaces, landing gear, fuel tanks, nacelles etc. • airscrews, helicopter rotors and propelled rotor blades • motors and engines of a kind typically found on aircraft • parts of turbojets and turboprops for aircraft - manufacture of ground flying trainers - manufacture of spacecraft and launch vehicles, satellites, planetary probes, orbital stations, shuttles - manufacture of intercontinental ballistic missiles (ICBM)
30.40	Manufacture of military fighting machines	Includes: - manufacture of tanks - manufacture of armoured amphibious military vehicles - manufacture of other military fighting vehicles
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	Includes: - manufacture of mine detectors, pulse (signal) generators; metal detectors - manufacture of search, detection, navigation, aeronautical, and nautical equipment, including sonobuoys - manufacture of radar equipment - manufacture of GPS devices
26.70	Manufacture of optical instruments and photographic equipment	Includes: - manufacture of optical mirrors - manufacture of optical gun sighting equipment - manufacture of optical positioning equipment - manufacture of optical magnifying instruments - manufacture of optical comparators - manufacture of optical measuring and checking devices and instruments (e.g. fire control equipment, photographic light meters, range finders) - manufacture of lenses, optical microscopes, binoculars and telescopes - manufacture of laser assemblies

Sector characteristics

The arms sector has some very specific characteristics that it is important to be aware of when undertaking and interpreting analysis of this sort:

i. It is usually a monopsonistic market in which the national government is the main customer and regulates exports.
ii. This means its size, structure, and trade are all determined by government policy.
iii. As a result of the structure of the market there are both barriers to entry and barriers to exit which can result in the remarkable stability of the composition of the main contractors.
iv. These barriers, market, technological and procedural, mean that not only has it been difficult for companies to enter into the defence sector to

produce weapons systems, or to upgrade from subcontractor status, but also that it is difficult for the defence companies to leave the industry.

v. The emphasis on performance and the large scale of R&D programs are associated with a trend of rising costs of research and development (R&D), which in turn has made it increasingly difficult for single companies or even single countries to develop new advanced weapon systems.

vi. This has created a pressure in the arms industry toward concentration into fewer and larger companies, and toward international collaboration in arms production.

1.2 Objectives

The purpose of the study is to provide the EC with a clear and up-to-date understanding of current and likely future developments in the defence markets and industries in the BRICKs countries and the implications of these for the EU defence sector. Specifically, this includes:

- providing a snapshot of the structure of defence equipment markets and competitors in the key emerging BRICKs countries that are having, or could have, a potential impact on the EDTIB[11];
- highlighting likely future developments in the BRICKs markets (both production and demand); and
- setting out the competitive implications of such developments for the EU-based industry.

The likely future developments in the BRICKs markets are set out in a series of scenarios, which are used to explore potential implications for and responses from the EU defence sector and EU policymakers.

The Commission will use the study and its findings to understand the impact of the emerging defence markets on EDTIB. It is not intended that the study should be used to promote the general sale of EU arms to the world.

1.3 Caveats on data and literature

1.3.1 Data availability

For the collection of data and literature, an understanding of the definition of the defence sector is required. However, the defence sector is not a well-defined, stand-alone industry. It is spread out across several industries which makes defining the defence sector more challenging, in terms of what should be covered and what shouldn't. Furthermore, the strategic importance of the defence sector means that it can be difficult to get some data, particularly detailed sectoral information.

[11] EDTIB = European Defence Technological and Industrial Base.

An annex at the back of this report discusses the various data sources available and what each contains. For the final version of the study, an electronic annex containing all data used in the construction of the report will also be available.

1.3.2 Additional caveats

In the process of investigating, presenting and interpreting the data contained in the subsequent chapters of this report some important caveats should be borne in mind:

- In an industry as complex as the defence industry, the interactions between the issues of governance, strategy, security, technology and restructuring, combined with the move from a relatively well defined Cold War model, make it extremely difficult to look forward with any certainty.
- Problems of data availability mean that some of the types of data requested are not be available for some of the countries, and in particular not for China.
- There are also issues of data definition and comparability to bear in mind, whereby different sources can yield quite different results and interpretations. In particular, the issue of trade data is discussed in subsequent chapters.
- It is not only the strategic importance of the sector that make it difficult to get some data, but also, and perhaps even more so, the increasing difficulty to make a strict separation between the production of defence and civilian equipment, due to the increasing use of civilian components in defence equipment.
- This means that some of the requests stipulated in the original Terms of Reference are too optimistic given the data availability. The intention has been to obtain the best and most available data, but some are simply not available.
- The same statement applies to the information about the regulatory and other framework conditions in these countries.
- Scenarios are be conditional on political and strategic assumptions that are, of course, rather uncertain.

1.4 Remaining key sections of the report

The key remaining sections of this report are as follows:

- Key aspects of the EU defence sector

This chapter draws on a report already carried for the Commission, to provide an overview of the EU defence sector/market and highlight key findings/producers/sub-sectors. It provides a snapshot of the sector to provide as up to date an understanding as possible on the sector's position and role in the EU/global defence market, and its sub-sectoral and geographic structure. Recent trends in the sector's structure, performance and its relationship with the global defence market will also be presented. This chapter also presents an overview of EU and Member State regulatory conditions that affect the EU defence industry.

- Overview of international framework conditions

This chapter sets out the existing international regulatory and non-regulatory framework for global trade in arms and the specified nature of this business. It analyses how this has evolved, the key drivers for change and how this has affected the global defence market. It considers such controls as: the EU code of conduct for arms exports; trade embargoes; national preference systems; and regional co-operation agreements. More detail, and other (less directly relevant) conditions are presented in an Annex at the end of the report.

- The global position of the BRICKs countries

This chapter provides an overview of the BRICKs position in the global defence sector, both in relation to the EU, each other, and third countries. It answers a number of key questions:

- How large is each BRICKs country in relation to its defence market / expenditures?
- How relevant are the BRICKs for global trade?
- How important are the BRICKs for the competitiveness of the EU defence sector?

- The defence market and sector in the BRICKs countries

These chapters (one for each BRICKs country) provide a snapshot of the defence sector in the relevant BRICKs country to provide as up to date an understanding as possible on the sector's position and role in the global defence market, and its sub-sectoral and geographic structure. Recent trends in the sector's structure, performance and its relationship with the global defence market are also presented. These chapters also present an overview of national regulatory conditions that affect the defence industry in the given national market.

- Future developments in the global defence market

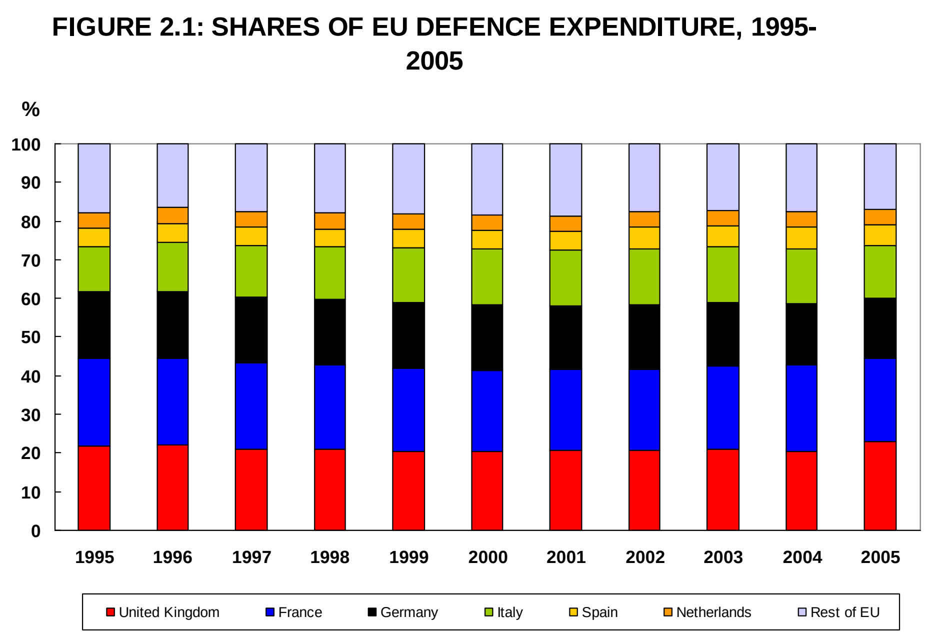
Two following chapters discuss likely future developments in the BRICKs markets and their implications for the EU defence industry. Thoughts about future developments are first developed through a series of scenarios - a business as usual scenario (BAU) is discussed, along with three alternatives. The drivers behind these scenarios will then be used to explore potential implications for and responses from the EU defence sector and EU policymakers.

2 Key aspects of the EU defence sector

2.1 Defence spending

WMEAT (World Military Expenditure and Arms Transfers) data from the US Department of State show that military expenditure in the EU over the last fifteen years has been dominated by a few Member States.

Figure 2.1 Shares of EU Defence Expenditure, 1995-2005



Note(s): Based on current dollar prices.

Source(s): WMEAT.

Over 1995-2005 France and the UK each accounted for around 22% of EU defence expenditure. The next largest spenders on defence were Germany and Italy, accounting for 15-17% and 11-13% of EU defence expenditure respectively. Together, these four Member States accounted for 70-75% of total EU defence expenditure in any one year. Following behind these Member States, Spain and the Netherlands each accounted for 4-5% of EU defence expenditure over 1995-2005. This means that 80-85% of total EU defence expenditure took place in just six EU countries. More recent data from the European Defence Agency (EDA) show that this is still the case. In 2007 the EU spent €204bn on defence, with France accounting for 25% and the UK 22%. In the same year, the US spent €454bn, more than twice as much as the EU. This means that as a percentage of GDP, US defence expenditure (4.5%) was almost three times that of the EU (1.7%) in 2007. This gulf has been widening since 1999, when the US spent just 3% of GDP on defence and the EU spend 2% of GDP.

2.2 Strengths and weaknesses

2.2.1 Land equipment sector[12]

Strengths

The EU land sector has the capability for delivering and sustaining key military capabilities in such areas as main battle tanks and armoured fighting vehicles, as well as being able to sustain and upgrade platforms.

Foreign-ownership has been introduced into the EU and US land sector industries: e.g. General Dynamics has created a GD European Land Systems company comprising Steyr-Daimler (Austria), MOWAG (Switzerland), and GD Santa Barbara (Spain) and GD Santa Barbara (Germany). Similarly, BAE has made major acquisitions in the US land sector through its acquisitions of the US Defense Holdings and Armor Holdings companies.

There are examples of new technology being applied by land sector firms: examples include new munitions technology; the development of lightweight armour protection; and mine protection technology.

Weaknesses

It lacks European collaborative programmes. However, the sector has developed joint ventures and collaborative research with third parties. For example, Nexter (formerly GIAT, France) has a 50/50 joint venture with BAE Land Systems (CTA International based in France).

Low R&D spending as share of sales; less research intensive than the aerospace sector.

Labour productivity is lower than in the European aeronautics sector.

Complexity of the supply chain in some areas: e.g. For the UK Warrior AFV there were over 200 first tier suppliers with substantial concentration within the supply chain.

Industrial capabilities are concentrated in only a few countries, namely, France, Germany and the UK. Furthermore, compared with the US land sector, the EU has many more producers: e.g. four producers of main battle tanks compared to one in the US.

Despite notable export successes (German Leopard tank,; the UK armoured vehicles), there are reservations about the sector's competitiveness. This is due to the sector's lack of competitive export products and on the scope for improving efficiency in general munitions in some regions/sub-sectors. Moreover, it has to be recognised that parts of the EU land sector might be prevented from adjusting to change through the prevalence of state-ownership in some nations (so preventing the operation of capital markets in promoting efficient change).

[12] Taken and adapted from TNO Final Report: *Development of a European Defence Technological and Industrial Base*.

2.2.2 The naval sector[13]

Strengths

The EU naval sector has the requisite industrial capabilities to design, develop, produce and maintain modern complex warships over their life-cycle. France and the UK have a complete range of design and support skills for the production of modern aircraft carriers, nuclear-powered submarines and complex warships (e.g. destroyers; frigates).

European firms are in the world top four suppliers of warships, comprising France, Germany, the UK and the USA.

There have been recent changes with more national re-structuring and internal rationalisation removing some excess capacity, along with more joint ventures and acquisitions.

Opportunities exist for technology transfer where naval firms are part of an aerospace group (e.g. BAE).

Produces competitive products meeting foreign requirements at 'modest prices’.

Weaknesses

A fragmented sector with a large number of relatively small firms and excess capacity.

It lacks European collaborative programmes. The naval sector has only limited experience with European collaboration of the type so prevalent in aerospace (e.g. the Horizon and FREMM frigates of France and Italy, several frigate classes of The Netherlands and Germany).

The EU has too much capacity operating at a relatively small scale. Compared with the US naval sector, the EU has many more producers: e.g. twelve major warship builders compared to two in the US. This means a sacrifice of learning economies and the need to spread fixed R&D costs over small production runs (average learning curves for warships have been estimated at 87%). The result is costly and wasteful duplication of industrial capability using scarce resources with more attractive alternative uses.

The position of nuclear-powered submarines means that both France and the UK have to maintain and support a costly submarine industrial base providing vessels for only one customer and in small quantities, an expensive exercise (in terms of both the direct and the opportunity costs).

Lack of efficiency: some projects are characterised by substantial cost overruns and delays. Some EU shipyards focus on supplying their national naval requirements so that there are major doubts about their international competitiveness.

Lack of cooperation/collaboration: often, the major EU shipyards are rivals in world export markets.

[13] Taken and adapted from TNO Final Report: *Development of a European Defence Technological and Industrial Base*.

There are few export markets for the most advanced and complex warships. Limitations include nations which build their own high capability warships and the fact that some nations cannot afford the high capability warships.

2.2.3 The aerospace sector[14]

Strengths

European aerospace is an economically strategic industry characterised by decreasing costs, high R&D intensity and technology spin-offs. It is a leading defence sector around the globe.

The sector is competent and has the capability to deliver key cutting-edge technologies, provide complex solutions, upgrade platforms and sustain national sovereignty, as demonstrated by its involvement in a complete range of combat aircraft, trainer aircraft, helicopters, missiles, strategic air-lifters and air tankers.

It has made a distinctive contribution to the development of European collaborative defence programmes. The sector has considerable experience of international collaborative projects. This involves the sharing of total R&D costs and the pooling of production orders between the partner nations. Aerospace has been involved in collaborative programmes for military and civil aircraft, helicopters, missiles and space systems. Some have led to the formation of European companies, namely, Airbus, MBDA, Eurocopter and ESA.

It is less dependent on defence sales than the US.

Its move towards increased internationalisation. The major EU aerospace firms are seeking new market opportunities, especially in the US defence market, but also in Asia

Weaknesses

Typically, the EU is characterised by too many relatively small firms. Thus, there are considerable opportunities for creating larger EU aerospace firms.

Lack of efficiency: some data suggest that in some fields US firms exploit greater economies of scale and learning. Opportunities remain for improving the efficiency of European collaboration on military projects. Typically, work-sharing arrangements and the bureaucracy associated with these projects leads to costs and delays.

Too much capacity: the US has three major combat aircraft firms compared with six European firms in this market.

While the sector has the capability to deliver key military capabilities, providing complex solutions, upgrading platforms and sustaining national sovereignty, they are nationally-based (e.g. France; UK) and not necessarily available on an EU-wide basis.

There are gaps in its capability for building modern strategic bombers and inter-continental ballistic missiles and anti-ballistic missile defence systems.

[14] Taken and adapted from TNO Final Report: *Development of a European Defence Technological and Industrial Base*.

2.3 Drivers

It is not the objective of this study to provide a detailed assessment of the European defence industry and market, but rather to provide a summary of its structure, conduct and performance, including future trends in order to provide a context for the remainder of the study. This is important, as it is difficult to ascertain the impact of BRICKs nations on the competitiveness of the EU industry without knowing the state of the European industry and market independent of BRICKs nations.

2.3.1 Regulatory and Framework Conditions

Overview

For simplicity, the geographical scope of the European defence sector can be defined by the borders of the European Union Member States[15] (EU-27), incorporating numerous industry players with different historical backgrounds, ownership, defence sector involvement and technical expertise. For these reasons, to some extent, the European defence sector is often described as a fragmented sector[16], which results in less than efficient outcomes due to: *"…the massive duplication and excess capacity in the national EU defence industries [and] lack of a collective defence EU effort"*[17].

Consequently, the regulatory framework of the defence sector is equally difficult to define, due the plethora of national, European and international influences, which are often conflicting and are themselves partially driven by exogenous political and social factors. Based on a recent study on the European Defence industry by TNO for the European Commission[18], hereafter referred to as the TNO study, the following regulatory and framework conditions were highlighted:

EU policy driving factors – policy trends developed within the political context of the EU, primarily by the European Commission and European Defence Agency (EDA);

National (Member States) driving factors – these mainly comprise national defence policies, budgets and export regimes, and

Societal driving factors –include changes in societal norms and values, as well as more structural societal trends which are of importance to the development of the EDTIB and defence market.

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[15] It should be highlighted that European countries outside the EU-27 such as Norway and Switzerland have established defence industries with significant capacity and competence in some product segments.

[16] EC (2007*):* ***COM(2007)764 final -*** Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions – ***A Strategy for a Stronger and more Competitive European Defence Industry***.

[17] TNO (2009): **Development of a European Defence Technological and Industrial Base – Main Report** (Final), report completed for the European Commission DG Enterprise, 09/04/2009.

[18] As referenced in previous footnote.

EU Policy Factors

The EU Defence Package launched in December 2007, included proposals for the restructuring of the European Defence market and industry[19], primarily focused on creating a well functioning internal market for defence goods and service within the EU. This is to be achieved by establishing open and competitive procurement[20], in addition to making transfers of technology and exports of equipment easier and less burdensome[21]. The EDA has contributed to these developments by instigating its own initiatives, namely a voluntary Code of Conduct on Defence Procurement, a Code of Best Practice in the Supply Chain, and supporting the development of European Handbook for Defence Procurement (EHDP)[22] to encourage standardisation and transparency in the supply chain. With the recent ratification by the European Parliament of the Defence Package, these measures have collectively established the future regulatory framework for the European defence industry and market.

Within this framework, EU policy papers and directives can influence the future direction and prospects of the defence industry in a number of ways. Based on the TNO study, these can be summarised as follows:

Coordination of European Policy: The establishment of a common European Security and Defence Policy (ESDP) should lead to the coordination of Member State activities. Although the ESDP is already established and the trend is moving in an upward direction, implementation has been slow with little coordinated European procurement of defence equipment;

Future Operations and Priority Threats: The demands placed on the military to combat any number of threats (e.g. terrorism) and increasing involvement in peacekeeping and humanitarian operations can have a consequent knock-on impact on demand for defence equipment as military needs and budgets change. Current trends include increasing multilateral involvement of EU Member States in a combination of humanitarian and security/military exercises;

Consolidation of demand: Coordination of procurement by MS in order to increase interoperability and to benefit from economies of scale in production has long been a European objective[23]. In order for this goal to be realised, significant consolidation of demand is likely, helping to drive structural changes within the industry to achieve a more efficient and effective sector;

Intra-EU trade of defence equipment: Positive steps in the direction of a common European market have taken place through the Defence Package, most notably the controls imposed on the use of Article 296 of the EC Treaty to open up the market to

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19 EC (2007): ***COM(2007)764 final*** - Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions – **A *Strategy for a Stronger and more Competitive European Defence Industry*,**.

20 EC(2007a): ***COM(2007) 766 final*** - Proposal for a Directive of the European Parliament and of the Council: ***on Defence Procurement***, Brussels 5/12/2007

21 EC(2007b): ***COM(2007) 765 final*** – Proposal for a Directive of the European Parliament and of the Council: ***on Simplifying Terms and Conditions of Transfers of Defence-related Products within the Community***, Brussels 5/12/2007

22 Available at www.defence-handbook.org

23 See EC (2007): ***COM(2007)764 final*** - Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions – **A *Strategy for a Stronger and more Competitive European Defence Industry*,**

competition and encourage the participations of SMEs in the supply chain. This is a trend which is likely to continue;

EU-US trade of defence equipment: Cooperation and coordination with the US, specifically in relation to R&D could be an important driver within the EU for change. The increasing role of some European primes in the US market (e.g. BAE and EADS/Northrop Grumman tankers consortium) and vice versa are therefore likely to be important in the future as more international projects evolve.

European coordination of Research and Development: This driver refers to efforts to coordinate R&D within Europe, as this can often lead to closer cooperation in the eventual production and procurement of the equipment developed, helping to reduce costs and increase competitiveness. At present, many projects are developed on a national basis. Therefore significant improvement is likely in the future driven by cost and budgetary pressures at the national level.

Future EU Enlargement: Possible expansion of the EU to include Turkey, Iceland, Georgia and the Ukraine could have repercussions for the EU defence industry, in terms of greater competition in some cases, a larger customer base for EU companies and greater investment within the EU.

National Political Factors

Although the measures described above and in chapter 3 of this study have contributed to the progress made to further coordinate European security and defence policy, national policy still dominates in many policy spheres. National factors driving the European defence industry and market, based on the analysis of TNO, include:

National Defence Budgets – as the defence sector is largely funded through national defence budgets, spread between R&D expenditure, procurement, capital investment and operational costs. The division of expenditure between these activities is consequently a key driver of the defence industry. Since the end of the Cold War, defence budgets within the EU have generally fallen while R&D development and equipment costs have risen due largely to changes in technological content. In recent years, some MS such as the UK have seen expenditure increase in response to military involvement in Iraq and Afghanistan, although this is limited compared to increasing US budgets. As an indication of future trends, the French government forecasts a 1% above inflation increase in expenditure from 2012[24]. Collectively, the UK, France and Germany account for over 60% of defence expenditure in the EU, a pattern which is unlikely to change substantially.

Bottom-up Cooperation between MS – this refers to cooperation between Member States emanating from the initiatives taken by individual nations to organise joint and collaborative defence programmes. This may be due to budgetary pressures within a MS or the inability to go it alone on individual projects due to the level of technical expertise and industrial capacity required. Again, this is a trend that is likely to continue.

The Role of NATO – NATO is an important international defence organisation, which establishes a variety of goals for its members as well as providing a platform where MS can cooperate and coordinate defence policy and implementation. Target expenditure on

[24] Défense et Sécurité Nationale (2008): Livre Blanc de Défense et Sécurité Nationale, June 2008

defence of 2% of GDP and NATO standardisation efforts are examples of where NATO-related activities are likely to influence the development of the European industry and market.

Offset Policy – a key aspect of the trade in defence equipment and cooperation in research is offset agreements, connecting national procurement to industrial orders. Offsets are widely used within the EU but the precise nature of their use will vary from country to country (and, possibly, from contract to contract). For example, France does not have a formal policy and Germany does not accept offsets. As the European market opens up, more efficient instruments are likely to emerge, and, as a result, the role of offsets is likely to diminish, at least within Europe.

Policy Integration – as both defence and security policy are strongly linked, changes to the objectives, budget and cooperation within the security sector is likely to have knock-on consequences for the defence industry and vice versa, in terms of the technology developed and budgets allocated by individual nations. This is currently a growing trend, with the defence sector interacting with many dual use sectors, for example, body and equipment armour. This is developed and sold by the military and security sector.

Integration of General and Defence-specific Industrial Policy – due to the special role of government in the defence industry (as owner, buyer and investor in the sector), defence policy has traditionally been developed independently within government. Increasingly, the opening up of defence markets to competition, the increasing importance of dual-use technology and the involvement of more companies from civil sector in the supply chain has driven an integration of defence and general industry policy at national level. This trend is likely to continue.

Public-private Partnering - ownership and investment in defence has traditionally been an exclusive government activity. However, rising defence costs and the commercial potential of some equipment developed in the defence sector (e.g. the internet) has encouraged the private sector to take a much more active role in the industry as investors, promoted in many cases by government. Again, this is a trend which is likely to continue where opportunities for government and investors can be aligned.

Defence Industry Ownership – in some MS, the national government still owns a significant proportion of some defence companies. This can act as a barrier to future collaboration and consolidation within the European market, as governments through procurement have a strong desire to maintain employment and protect domestic industry, often driven by security of supply concerns.

Socio-Economic Factors

The link between socio-economic changes and developments in the defence sector are often difficult to define and separate from other driving factors as they often have an indirect impact. For example, changes to social fabric of a country and the demands that society places on public expenditure can result in significant changes occurring to the political and economic landscape, which can have important implications for defence policy, military engagement and budgets.

The following trends and challenges posed by socio-economic developments can be summarised as follows:

Aging population, declining birth rates and demographic changes – general European trends show a decline in birth rates, leading to fewer citizens entering military service, while a much older population is likely to put pressure on national budgets in areas other than defence. The skilled workforce available for the defence industry could also be under pressure. Consequently, automation in production, un-manned defence equipment and population migration are likely to be driven by such factors.

The development of global migration – linked to the above demographic factors, the migration of populations, skills and expertise to Europe could prove a benefit to the defence sector as new skills can often bring new ideas and cooperation.

Societal acceptance of defence operations – political commitments and allocated defence budgets can often be influenced by society's acceptance of the need for a defence industry and military engagement. These influences are likely to follow random patterns depending on current world events and the degree of safety citizens feel on a day-to-day basis. For example, the current economic recession may make people feel more insecure and encourage support for measures that promote employment, thus the defence sector may benefit. In other cases, the involvement of some MS in certain conflicts may have a negative impact on future defence expenditure.

Sustainability and Competition for Resources – in world with limited resources and an increasing desire for technologies that promote sustainability (e.g. green technology) competition exists across all industries for materials, energy resources and R&D funding from government. With current targets already established for investment in green technology within the EU and US, and increasing oil, metal and mineral prices, the defence sector is likely to face stronger competition for resources in the future.

Pressure on healthcare – one of the most significant costs for many governments is the provisions of healthcare to an ever aging population and its increasing technological demands. Pressure on the healthcare sector in coming years, is therefore likely to require continued and substantial expenditure, potentially at a cost to the defence sector.

2.3.2 Defence and Industrial Policy

Overview

Defence and industrial policy incorporates both economic and general industrial drivers which contribute to the establishment and future functioning of the EDTIB and EDEM. These factors can emerge from the economic environment that can pressure or encourage change within the market, or these factors can be driven by government through general industrial policy development and expenditure in areas such as R&D. Thirdly, companies involved in the security and defence sector can have a strong influence determined by their interactions within this sector and other industries. For simplicity these factors can be grouped in to:

- Demand conditions;
- Defence related and supporting industries, and
- Strategy and rivalry.

Each of which is now summarised it what follows to describe current and future trends and their impact on the EDTIB and EDEM.

Demand Conditions

Domestic (European) and international demand for defence products and services are a key driver of future development, competition and competitiveness. At a national level, the dominant role of the government is the leading factor, as it not only invests in the industry, but it also determines the specification of the equipment demanded, the budget for defence procurement and the regulatory framework in which the industry and market must function. These demand conditions are covered in the previous sections on national and European drivers of the EDTIB and EDEM.

Focussing on the international aspects of the industry/market, the globalisation of defence supply chains (which mirrors the experience of many general industry sectors), is an important driver of future evolutions. For example, where defence prime contractors need to cut costs, they may allocate production to an overseas supplier or source specific technology from where it is economically viable to produce each individual technology, rather than undertake production in-house (unless security of supply concerns demand it). The influence of globalisation is therefore likely to increase over time, and could be regarded as a drive for cooperation, particularly amongst the US, BRICKs nations and the EU.

Defence Related and Supporting Industries

The two key drivers identified as important in this category, are the degree of cooperation, consolidation and integration between the defence industry and other sectors, and the barriers to companies entering or exiting the market.

Increasingly, the defence sector uses Commercial Off The Shelf (COTS) solutions including software, communications and electronics equipment as it is often more cost effective, reliable and user friendly than dedicated systems (although a certain degree of modification or upgrade is often required for defence use). In some cases, where the technology is shared between commercial and defence uses, it is advantageous to conduct joint research and production to benefit from economies of scale and from learning by doing. Partially, for these reasons, the large defence primes such as EADS, Thales and Finmeccanica, all derive a large proportion of their turnover from commercial activities, the most obvious being Airbus, the EADS subsidiary manufacturing civilian aircraft. These companies can be referred to as dual-use in character and represent an increasing trend amongst many companies in the defence industry. Exceptions in Europe (e.g. BAE) and the US can be found which are largely reliant on the defence sector.

In terms of innovation, the lead times of commercial products may be much shorter than in the defence sector. Similarly, commercial products must generally change more rapidly to market conditions, where as defence products are often developed to respond to predicted threats in advance of 10 years ahead of the present day, therefore it is not clear to what extent cooperation and coordination is likely to develop in the future. However, it is safe to say that consolidation and cooperation within supply chains and with associated industries is likely to continue and will be an important driving factor in the future of the EDTIB.

The steep technology curve for many defence products, the economies of scale in production necessary to be competitive, the regulatory restrictions (i.e. Article 296) and the demands for greater interoperability are all examples of barriers that prevent the entry of new firms in to the market. Many of these characteristics are inherent in the defence sector and are likely to follow an increasing trend. From a regulatory perspective, the measures contained in the EU Defence Package, should help open up the defence market and alleviate some barriers to entry and exit, however, the underlying barriers are likely to remain due largely to market forces and demands of customers.

Strategies and rivalry

The strategies adopted by defence prime contractors in areas of competition, technology leadership, collaboration and merger and acquisition activity are important factors driving the European defence industry in both direction and speed of progress. This includes an assessment of how firms want or need to compete, the degree of cooperation and integration they adopt in or across supply chains, and level of competition.

As discussed above, defence primes have become polarised between those focussed only on the defence sector and those with dual-use strategies. Either way, the TNOSstudy highlights that "*… the European defence primes have concentrated on their core competencies, as they do not appear to favour diversification in to new business or technology areas, unless there is an already defined strong demand…"* Due to the high technology content of many products, issues of security of supply and often limited production runs, the emphasis of competition strategies appears to focus on quality and reliability over price. For the same reasons, innovation strategy is often geared towards achieving technology leadership, resulting in a competitive advantage over rivals.

Regarding collaboration and merger and acquisition strategies, the European primes are often driven by a need to enter international markets with their products or the desire to acquire technology and expertise they cannot otherwise generate themselves. This is often a reason for vertical integration within specific supply chains as it also maintains security of supply for the defence primes over emerging technologies. Although some segments of the defence market have witnessed significant consolidation, other have not, therefore it is likely that market concentration and integration among the defence primes will likely increase in the future (particularly for land and naval segments if European concentration is follow the US example).

2.3.3 Production processes

The factors driving production in the European defence industry cover a wide range of resources and skills. These can be summarised as follows:

Access to human resources/skilled labour - This factor includes the essential elements from the labour market, such as the quantity, skills and cost of personnel. Each is required for a sustainable and successful defence sector. Consequently, some defence capacity and capability within Member States is often maintained at significant cost to ensure that the necessary skills and expertise are maintained and passed on to the next generation of the workforce. Although demographic changes may affect this driver, the position of Europe regarding the skills of its workforce would appear strong, a trend which should continue through migration and education.

Access to capital resources - Being an important factor in the actual industrial activity, access of the defence industry to financial capital for investments and other aspects are also important. The increasing role of the private sector in partnership with government discussed earlier is one factor which should maintains Europe's strong position in this area.

Access to knowledge – the third production factor is access to knowledge on scientific insights and technologies. Being a high-tech industry, this is crucial for performance. Centres of Excellence (CE) located across Europe due to MS initiatives and NATO involvement, in addition to strong academic research in Europe are likely to maintain a positive trend in this area.

2.4 Trade

2.4.1 Importance of BRICKs countries as export markets and competitors

Imports

There has been virtually no transfers of major weapons from the BRICKs countries to the five major EU defence producers (France, Germany, Italy, Spain, UK). SIPRI data indicate that between 1995 and 2008 there were transfers (from BRICKs countries) only to France and the UK. There were no transfers to Germany, Italy and Spain over the same period.

For France, Brazil was the only BRICKs country from which major weapons were transferred. Over 1995-2008 the US was the main source of transfers to France (54%), while all of the other major suppliers accounted for 1-10% of arms transfers into France. Thus, Brazil's 7½% share means that it was a significant supplier of major arms and a larger supplier to France than Italy, Belgium or the UK over 1995-2008. The presence of Brazil among major weapons suppliers to France is based on one order for 50 trainer aircraft, which were delivered over 1993-97.

The UK, meanwhile, major weapon transfers were made up of 31 portable Gimlet SAMs from Russia in 2005 and 2006. However, with a value of just \$2-3m (in constant 1990 prices), these transfers from Russia accounted for less than 1% of total transfers into the UK over 1995-2008. The UK did not import arms from any other BRICKs country over this period.

Outside France, Germany, Italy, Spain and the UK, there were several other EU countries involved in the transfer of major weapons from the BRICKs countries over 1995-2008.

The only other EU country to import major weapons from Brazil was Greece, which took receipt of two AEW&C (airborne early warning and control) aircraft in 2008. This accounted for less than 1% of total arms imports into Greece over 1995-2008.

There were eleven other EU countries that imported major weapons from Russia over 1995-2008, although not all were EU Member States at the time. Eight of them (Bulgaria, Cyprus, Czech Republic, Hungary, Latvia, Poland, Romania, Slovakia, Slovenia) acceded to the EU in 2004 or 2007, while the other two (Finland and Greece) were established members of the EU (members of the EU15 before expansion in 2004 and 2007). In terms of shares of total Russian arms transfers over 1995-2008, none were large. With a 1½% share of total Russian arms exports over 1995-2008, Greece was the largest EU recipient of major weapons from Russia. However, there have been no transfers to Greece since 2005. Of the other Member States, they typically accounted for ¼-¾% of major Russian weapons transfers over 1995-2008, with Cyprus accounting for ¾% of Russian major arms exports over 1995-2008 at one end and Bulgaria and Romania accounting for ¼% or less at the other end. In terms of timing, most of the arms transfers were in the late-1990s or early-2000s. Since 2005, only Cyprus (2006), the Czech Republic (2006) and Poland (2008) have received major arms from Russia.

Looking at the importance of Russian arms imports to these countries, the dependence on Russia varies substantially. At the top end, the most dependent Member States are Slovakia and Cyprus. Over 1995-2008 Russian arms accounted for 95% and 81% of major weapon transfers into Slovakia and Cyprus respectively. In the case of Slovakia, these came in 1995, 1996, and 2002, with most coming in 1995. Cyprus, meanwhile, imported arms in several years between 1995 and 2006, with the major import flows occurring firstly in 1996, then 2001 and then 1999.

Behind these two Member States, Bulgaria, Hungary and the Czech Republic were the next most reliant on major weapons imported from Russia. In each case, Russian arms accounted for 21-28% of total arms imports over the period 1995-2008. In the case of the Czech Republic, where Russian weapons accounted for 28% of major weapon imports, these imports came in 2003, 2005 and 2006, with most coming in 2005. In Bulgaria, Russian arms imports accounted for 25% of all major arms imports over 1995-2008, although virtually all of this came in one year, 1996. There have been no Russian arms imports since. In Hungary, the arms imports were received over 1996-99 and there have been no further transfers since then.

For the other Member States, major weapons from Russia accounted for 8% or less of arms imports over 1995-2008. For Finland, Greece, Latvia and Poland, the share was in the region of 7-8%. In the case of Finland, arms were imported from Russia in 1996 and there has been nothing since. Greece, meanwhile, imported arms in several years between 1998 and 2005. The largest flows came before 2002, with the largest ones in 1999 and 2000. Poland imported arms from Russia in almost every year over 1995-2008, with over half coming in 1995. It's most recent arms imports from Russia, in 2008, were relatively small. Latvia received Russian arms imports in 2004 and 2005.

In the case of Romania and Slovenia, Russian arms accounted for 4% and 1% of total arms imports over 1995-2008 respectively. The most recent imports in either case were in 2000 and 2003 respectively.

Exports

There has been a greater transfer of major weapons from the five major EU producers (France, Germany, Italy, Spain, UK) to the BRICKs countries. All five exported major arms to one or more of the BRICKs countries over 1995-2008, as did several other EU Member States.

In terms of absolute and relative size, the BRICKs countries vary enormously as export markets. The largest is China, with $28bn (constant 1990 prices) worth of major arms brought in over 1995-2008. By contrast, just $145m (constant 1990 prices) worth of arms were transferred into Russia over the same period, making it the smallest of the BRICKs markets. India was the second largest, taking receipt of around $20bn worth of arms transfers. This was followed by South Korea ($17bn) and Brazil ($3.6bn) as the third and fourth largest markets respectively.

The importance of arms transfers from the EU to these markets also varied. In Brazil, for example, arms imports from the EU accounted for 76% of all arms imports over 1995-2008. By contrast, in Russia, which is the smallest export market among the BRICKs countries, EU arms imports accounted for just 3½% of all arms imports over 1995-2008. The EU has declared an arms embargo on China. In India and South Korea, it was 16½% and 21% respectively.

In terms of value to the EU, the most important market over 1995-2008 was South Korea, with $3.7bn (constant 1990 prices) worth of major arms received from the EU. This is followed by India on $3.4bn worth of arms imported from the EU, then Brazil on $2.7bn. Transfers of major weapons from the EU to Russia amounted to just $5m over the same period.

The main EU exporters to South Korea were Germany and France, which accounted for 11% and 7½% of total arms transferred into South Korea over 1995-2008. South Korea also imported major weapons from Italy, the Netherlands, Sweden and the UK, although none of them accounted for more than 1½% of major arms imports into South Korea.

The main EU exporter to India was the UK, which was responsible for 5¼% of all major weapons received by India over 1995-2008. Behind the UK, France and the Netherlands both accounted for 3% of weapons imports into India over 1995-2008; Germany and Poland both accounted for 1¾% and 2¼% respectively.
There were also arms transfers from Italy and Slovakia, although neither accounted for more than 1% of total arms imports into India.

The main EU sources of major weapons transfers to Brazil over 1995-2008 were the UK and France, with 27% and 22% of arms imports into Brazil respectively. Meanwhile, 13% of Brazilian arms imports over the same period came from Germany. Brazil also received arms from Austria, Belgium, Italy, the Netherlands, Spain and Sweden over 1995-2008, but they accounted for smaller shares of total Brazilian arms exports, with Italy the largest on 4¼%.

The only major weapons transfer to Russia over 1995-2008 was from Germany, which exported $5m (constant 1990 prices) worth of arms to Russia in 2006.

Examples of international collaboration & partnerships with BRICKs

Table 2.1 provides a summary of various examples of international cooperation between the EU defence sector and the BRICKs.

Table 2.1 International collaborations & partnerships with BRICKs

International collaborations & partnerships with BRICKs
Brazil
Involvement of Latecoere (France), Aernnova (Spain), Sobraer (Belgium), Pilkington Aerospace (UK) and Gamesa (Spain) in Brazilian aerospace cluster in San Jose de Campos
Commercial partnerships between IMBEL (Brazil) and Nitro Nobel AB, Chematur Engineering AB, Bofors Explosives AB

International collaborations & partnerships with BRICKs

(all Sweden); and agreements of technological cooperation between IMBEL and Electronic Research S/A (Portugal) and Thomson-CSF (France)

Supply of three Scorpene-class submarines by DCNS (France) to Brazil

Helibras the Brazilian helicopter manufacturer is 76% owned by Eurocopter

Brazilian army supplied with tanks from Germany (Leopard I); artillery from UK, Italy, Sweden; and missiles from France

Supply of five German designed submarines, equipped with European combat systems

The development of an anti-tank missile by Otobreda (Italy) and Brazil

The production of surveillance aircraft by Embraer in cooperation with: Ericsson (Sweden) and Thales (France)

Russia

EADS cooperates with Irkut Corporation (and owns a 5% share), and various space launch and helicopter manufacturers in Russia

Some Russian T-90 tanks are equipped with Catherine thermal cameras produced by Thales of France

The acquisition of Sagem’s (France) SIGMA inertial navigational unit by the Russian defence industry; and the co-operation between JSK RPKB (Russia) and Sagem in inertial navigation

Joint venture between Rosoboronexport and Thales, and UOMZ and Safran in thermal imaging cameras

Purchase by Russia of Thales DAMOCLES laser designators and the Topsight helmet

China

Training and industrial partnerships between Europe and China in relation to the Galileo global positioning satellite system

India

Jaguar and Hawk aeroplanes are produced under licence in India

BAE Systems’ joint venture with Mahindra Defence Systems

The licensed production of Aerospatiale helicopters in India

Indian armoured vehicles equipped with Thales night visioning systems

Indian army equipped with Bofors guns from Sweden

In India, production of MBDA Milan missiles by Bharat Dynamics under licence

Partnerships between BEL of India and Thales (France), Rhode & Schwarz (Germany) Ericsson MW (Sweden) and Alenia (Italy) of the EU

South Korea

Collaboration between KAI of South Korea and Eurocopter in the transfer of technology and production of helicopters

The supply of aerospace components by KAA of South Korea to Airbus

Supply of missiles by France to South Korea since the early-1990s; and the licensing of the assembly of French Crotale missiles in South Korea in 2009

Joint venture between Thales (France) and Samsung (South Korea) since 1999 to develop automated fire control systems

Supply by Germany to South Korea of diesel engines for frigates, tanks and self-propelled guns, as well as sonar and torpedoes; and the supply of missiles. The licensed production of twelve light helicopters and nine submarines since 1897; with six more submarines due over 2012-20

Supply to South Korea: of naval guns from Italy to South Korea; transport aircraft from Spain; Lynx helicopters from the UK; and radar systems from the Netherlands

Supply of navigation systems by LITEF (Germany) to Doosan DST (South Korea)

Supply of Rolls Royce (UK) turbines for South Korean KDX and KDX III destroyers

South Korean FFK frigates equipped with Thales combat system

2.5 Conclusions

EU defence sector

While the defence industry is present in most Member States, activity is concentrated in just a few. This is partly a reflection of the size of the military branches (in terms of personnel) and the defence budgets in the Member States.

Around 60-65% of EU military personnel are based in just five countries (France, Germany, Italy, Spain and the UK). France typically accounts for the largest share (15-20%) of total EU military personnel; Spain accounts for 5-10%.

Historically, France and the UK spend the most on defence. In 2007 they spent €44bn and €50bn respectively and together accounted for 47% of total EU defence spending. Behind France and the UK, Germany and Italy are the next largest spenders on defence, typically accounting for 10-15% each of total EU defence spending.

Given this, France and the UK are the largest employers in the defence sector, employing 240,000 and 200,000 respectively in 2003, and accounting for 57% of all employment in the EU defence sector. Thereafter, Germany (80,000), Poland (50,000) and Italy (26,000) have the next largest defence-sector workforces. Most of the major EU defence firms are based in France, Germany, Italy or the UK: 37 of the top 48 EU defence firms are based in one of these Member States.

Total EU defence spending remains smaller compared to US levels of spending. EU spending has been falling from 2% of GDP in the late-1990s to 1.7% of GDP in 2007. US spending has picked up from around 3% of GDP in 2000 to 4.5% of GDP in 2007. In 2007 total US military spending was 2¼ times greater than total EU military spending.

Domains

European aerospace is an economically strategic industry characterised by decreasing costs, high R&D intensity and technology spin-offs. It is a leading defence sector in both the EU and the US and it has made a distinctive contribution to the development of European collaborative defence programmes. The distinctive features of the EU naval sector are its large number of relatively small firms, excess capacity and a lack of European collaborative programmes; while, in contrast to the EU aerospace equipment sector, the EU land equipment sector is smaller, less technically-progressive and lacks European collaborative programmes.

The aerospace sector has the capability to deliver key military capabilities, but there are gaps in what it can deliver (e.g. modern strategic bombers). The EU naval sector has the requisite industrial capabilities to design, develop, produce and maintain modern complex warships over their life-cycle. However, the EU has too much capacity operating at a relatively small scale. The result is costly and wasteful duplication of industrial capability. The EU land sector has the capability for delivering and sustaining key military capabilities. However, these industrial capabilities are concentrated in just a few countries (France, Germany and the UK).

The aerospace sector, dominated by France and the UK, is competitive as reflected in its export performance for a range of products. The industry has some world-class firms (e.g. BAE; Rolls-Royce; SAFRAN; EADS; MBDA; Finmeccanica; Thales), and is also involved in co-operation with non-European partners (e.g. US and the F-35 combat aircraft/JSF). The naval sector is competitive in some product sub-sectors. The naval sectors in Member States such as France and Germany are successful in exporting significant shares of their output. However, this reflects demand for modestly-priced, less advanced ships, often with offsets included. The demand for the most advanced and most expensive ships is limited by other countries ability to pay and competition from other suppliers. As a result, while some major EU shipyards are rivals in world export markets, others focus on supplying their national naval requirements, and so there are major doubts about their international competitiveness. Future threats to EU warship builders are likely to come from Asian and US firms. Despite some notable export successes, there are reservations about the land sector's competitiveness, due to the lack of competitive export products. At the same time, the prevalence of state-ownership in some nations hampers the sector’s ability to evolve and adapt.

Performance

It is difficult to assess the performance of the EU defence sector due to the lack of transparent and comparable defence-specific time-series data. Data on trade show that over 1995-2008 there were some transfers of major weapons from the BRICKs to the EU. Most of these were accounted for by arms transfers from Russia to the former communist countries for central and Eastern Europe in the late-1990s and early-2000s. In some cases, arms transfers from the BRICKs were a significant proportion of total arms imports. Among the major EU producers, only France and the UK received arms from BRICKs countries over 1995-2008 (Brazil and Russia respectively). The major supplier to the main EU defence markets was the US. With regard to exports, the importance of the BRICKs markets to the EU defence sector varied considerably. In terms of value, the most important market over 1995-2008 was South Korea, which received $3.7bn (constant 1990 prices) worth of arms transfers from the EU. This is followed by India and then Brazil. Russia imported just $5m worth of major weapons from the EU over 1995-2008. In Brazil major arms transfers from the EU accounted for 76% of all arms imports over 1995-2008. By contrast, in Russia, which is the smallest export market among the BRICKs, weapons transferred from the EU accounted for just 3½% of all arms imports over 1995-2008.

3 Overview of international framework conditions

3.1 Introduction

This section sets out the existing international regulatory and non-regulatory framework for the global trade in arms. It describes how the current international framework has evolved, the key drivers for change and how this has affected the global defence market. At the outset, it is important to highlight that the international framework is composed of multiple layers of conditions established at the international, regional and national level. In some cases, national conditions can have an equal if not greater impact than regional conditions on the international market, owing to the size and significance of individual defence markets/industries. For clarification, the focus of the discussion surrounds the framework conditions affecting conventional arms. Nuclear arms are omitted on the grounds that they come under a far more expansive list of regulations, and are not widely traded between the EU and BRICKs nations.

An analysis of these frameworks provides an important context within which each of the BRICKs defence markets/industries and their future prospects can be evaluated in the later stages of this study. Focussing on the international implications of these framework conditions, this chapter first presents the international and regional conditions, followed by those established by the US as the world's largest military power. Other framework and exogenous conditions are then introduced.

3.2 International regulatory conditions

Regulation of the defence industry at the international level has developed from a common desire amongst arms producing nations to prevent certain states or regions seen as problematic from obtaining conventional arms and munitions. Without regulation of the arms trade at the international level, the concern was that military equipment could contribute to the escalation of conflict, the abuse of human rights, the disproportionate stockpiling of weapons or would damage the economic development of nation states[25]. The other principle motive for arms controls stems from a desire to protect national defence technological advancements and the associated industrial base from potential

[25] Wezeman, S. T. (2003): The Future of the United Nations Register of Conventional Weapons, SIPRI Policy Paper No.4, August 2003, available from: http://www.sipri.org

aggressors, both in military and commercial terms[26]. Exports of defence related goods can therefore be restricted on a national basis for reasons other than ethical concerns[27].

Historically, international and regional regulations and agreements governing the defence industry emerged from Cold-war measures introduced to prevent one side from obtaining the technology and equipment of the other side[28]. Over time, an additional objective to reduce overall military expenditure and arms transfers post-Cold war has emerged from these agreements. Conflicts involving Iraq, Iran and a number of African states during the late 1980s and early 1990s in which significant stockpiles of arms were a contributing factor, plus the emergence of terrorism has highlighted the continued need for regulation at the international level[29].

From a BRICKs perspective, none of the regulatory conditions enforced at an international level identified in this study, is deemed to significantly affect the ability of Brazil, Russia, India, China or South Korea to import or otherwise acquire defence equipment and technology. A summary, of the international regulatory conditions currently in place are discussed in Annex 3 to this study as supplementary information. They include:

- The United Nations Arms Embargo;
- United Nations Register of Conventional Arms (UNROCA), and
- Wassenaar Arrangements (to which South Korea and Russia are signatories).

Previous embargoes imposed by the United Nations, Europe or individual countries have had a lasting impact on some BRICKs defence industries. Following hostile exchanges between India and Pakistan, including the testing of nuclear weapons, many countries adopted an export ban on arms and dual-use items to India. Consequently, the military capability of India and some civil industry was adversely affected as critical components and spare parts were no longer available. In response, reduced dependence on foreign defence equipment is now a key policy priority, highlighted in the Defence Procurement Procedure (DPP) reforms of 2006[30]. Learning from the Indian experience, China and Brazil have also adopted similar policies to ensure security of supplies, indigenous capability and reduced reliance on foreign suppliers.

3.3 European regulatory conditions

3.3.1 Introduction

Building upon international efforts, the EU Commission and European Defence Agency (EDA) have initiated a programme of measures to achieve reductions in arms, increases

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26 Examples include the US ITARs and 'Buy American' provisions, in Europe see discussion on Article 296 of the EC Treaty regarding procurement regulation.

27 Conversely exports and transfers of defence equipment and technology to another country can be an important diplomatic tool in certain circumstances.

28 The Wassenaar Arrangements emerging from COCOM is one such example.

29 Wezeman, S. T. (2003): The Future of the United Nations Register of Conventional Weapons, SIPRI Policy Paper No.4, August 2003, available from: http://www.sipri.org .

30 India Defence (2006): Indian Defence Procurement Procedure, Procurement Manuel 2006, dated 30/08/2006 available at: http://www.india-defence.com/reports/2432 .

in transparency, security and stability, including a package of initiatives to improve and unify the fragmented European defence market. Political agreements have also been brokered between Member States in the case of the European Code of Conduct on Arms Exports, complementing international and national agreements.

European regulatory conditions are discussed in this section as an important influence on the development of international regulatory conditions and on the interaction between BRICKs and European countries in the development, production and trade in defence equipment products. The ability of BRICKs countries to export to Europe and, similarly, for European defence contractors to export to BRICKs countries is largely determined by the regulations, policies and strategies implemented by the institutions of Europe, and more importantly by the Member States themselves.

The EU Code of Conduct, EU Arms Embargoes and Dual Use Export Controls are the three key regulatory conditions affecting the interaction of BRICKs and European defence industries and as such are discussed in the following text. For completeness, a discussion of the other regulatory conditions affecting the European Defence sector and which may contribute to its future competitiveness are summarised in Annex 2.

3.3.2 EU Code of Conduct on arms exports

On 11 June 1998, the Foreign Ministers of the then 15 EU Member States adopted an EU Code of Conduct on arms exports[31]. The Code is a binding agreement under which Member States[32] abide by certain criteria when granting arms export licences. The objective is to set 'high common standards which should be regarded as the minimum for the management of, and restraint in, conventional arms transfers' and 'to reinforce cooperation and promote convergence in the field of conventional arms exports' within the framework of the Common Foreign and Security Policy (CFSP)[33].

The code sets out eight criteria, which the Member States must take into account when granting arms export licences. These are:

1) Respect for international commitments;
2) Respect of human rights in the country of final destination;
3) The internal situation of the country of final destination;
4) Preservation of regional peace, security and stability;
5) The national security of the Member States and of territories whose external relations are the responsibility of a Member State, as well as that of friendly and allied countries;
6) The buyer country's behaviour with regard to the international community, in particular its attitude to terrorism, the nature of its alliances and respect for international law;
7) The existence of a risk that the equipment will be diverted within the buyer country or re-exported under undesirable conditions; and

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31 Council of the European Union, European Union Code of Conduct on Arms Exports, document 8675/2/98 Rev 2, Brussels, 5 June 1998, available at: http://consilium.europa.eu/cms3_fo/showPage.asp?id=408

32 The Code of Conduct is now applied by the EU-27 countries, together with a number of other European countries to varying degrees (SIPRI, 2006).

33 CFSP objective are set out in Article 11 of the EC Treaty

8) The compatibility of the arms exports with the technical and economic capacity of the recipient country.

These criteria are complemented by operative provisions, which oblige Member States to inform each other of any licences they have refused, along with an explanation. Secondly, they require the Member States to circulate an annual report on their defence exports and on the implementation of the Code.

However, different interpretations of an import country's human rights record, security level and general conduct may cause inconsistencies in how the Code is applied by different Member States. Where these inconsistencies do emerge, they can have a number of ramifications for industry competitiveness. For example, if a BRICKs country cannot import specific technology from one Member State, but it can from another[34], the "level playing field" envisaged by the European Commission and EDA as existing between Member States is broken, giving the least stringent supplier a competitive advantage. In other cases where a consistently stringent export approach is adopted across all Member States, the importing country may be encouraged to develop its own defence industrial capability in a particular field, due to its license refusal or concerns over security of supply in the future. Should the development of this capability be successful, a new competitor for European producers may emerge in the medium to long term. The future desires of BRICKs countries and the approach adopted by individual Member States to prevent the export of sensitive technology and conventional arms is therefore likely to have an important bearing on future competitiveness for both defence industries.

3.3.3 EU arms embargoes

As with the United Nations at the international level, the European Union can also impose sanctions (including arms embargoes or restrictive measures) in pursuit of the CFSP objectives, namely:

1) to safeguard the common values, fundamental interests, independence and integrity of the [European]Union in conformity with the principles of the United Nations Charter;
2) to strengthen the security of the Union in all ways;
3) to preserve peace and strengthen international security, in accordance with the principles of the United Nations Charter, as well as the principles of the Helsinki Final Act and the objectives of the Paris Charter, including those on external borders;
4) to promote international cooperation; and
5) to develop and consolidate democracy and the rule of law, and respect for human rights and fundamental freedoms.

[34] For example, in 1999 the Czech government agreed to export T-54 and T-55 main battle tanks to Yemen. Poland had previously halted a shipment to Yemen of T-55 tanks after determining that an earlier shipment had been diverted to Sudan (a UN and EU embargoed nation). Other examples include China, not covered by an EU regulation, but by an EU Declaration that allows even further differences in policy to emerge. For further examples and discussion see: Bromley, M. (2008): The Impact on Domestic Policy of the EU Code of Conduct on Arms Exports – The Czech Republic, the Netherlands and Spain, SIPRI Policy Paper No. 21, May 2008 and Anthony, I. (2005): Military relevant EU-China Trade and Technology Transfer – Issues and problems, SIPRI Conference Paper, May 2005, both available at: http://www.sipri.org

Regimes that use arms and military equipment for internal repression or aggression against a foreign country can therefore have an arms embargo applied against them by the EU, generally comprising of:

1) a prohibition on the sale, supply, transfer or export of arms and related material of all types, including weapons and ammunition, military vehicles and equipment, paramilitary equipment and spare parts; and
2) a prohibition on the provision of financing and financial assistance and technological assistance, brokering services and other services related to military activities and to the provision, manufacture, maintenance, and use of arms and related material of all types.

Of particular relevance to this study, and in contrast to the United Nations, the European Council agreed a Declaration in Madrid on 27 June 1989 that the EU should impose restrictions on relations with China by imposing an arms embargo. In the context of defence markets, this represents a barrier to European exporters not just of military equipment, but also dual use and civil use technology. Similarly, European companies may be reluctant to use Chinese suppliers for fear of disclosing sensitive design information or innovations to an embargoed regime. The China declaration creates further difficulties as it was establish prior to the CFSP, thus the declaration is legally weaker and allows greater variation in interpretation by Member States than an EU Common Position or regulation would encounter. The legal aspects of the declaration, its differing interpretation by Member States and its role as a driver of further EU export controls is discussed further in a recent SIPRI paper[35]. In summary, the 1989 EU arms embargo has a different legal status to an arms embargo established post-CFSP as the EU has since enlarged its membership and developed its legislative framework in the area of defence and security policy. Specifically, the EU Common Military List[36] did not exist when the embargo was implemented and many nations have joined the EU since 1989. Consequently, it is unclear what products are covered by the embargo and the degree to which it applies equally to all EU Member States. The implication of this situation is that, although it might naturally be expected that there be no exports of defence equipment to China given the declaration of an embargo, it is still possible that some trade between the EU and China takes place. As an example, in 2004 a Czech defence company reached an agreement for the sale of 10 Vera radars to China[37]. However, the sale was blocked by the Czech Government due widely reported US opposition[38] rather than any embargo. Such grey areas are picked up again in Chapters 4 (Global BRICKs summary) and 5 (China).

The European Union has since considered lifting the embargo, as some Member States have suggested that it hinders the development of a “strategic partnership” with China. Indeed, in 2003, China issued its “Policy Paper on the EU”, urging the embargo to be

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35 Anthony, I. (2005): Military relevant EU-China Trade and Technology Transfer – Issues and problems, SIPRI Conference Paper, May 2005, available at: http://www.sipri.org

36 See Annex 2 for further details

37 Bromley, M. (2008): The Impact on Domestic Policy of the EU Code of Conduct on Arms Exports – The Czech Republic, the Netherlands and Spain, SIPRI Policy Paper No. 21, May 2008, available at: http://www.sipri.org

38 Gertz, B. (2004): ‘Radar Sale to China Stopped’, Washington Times, 26 May 2004; and Forbes (2004): ‘Radar Detected’, 15 November 2004, p.64, both quoted in Bromley, M. (2008).

lifted in order to "remove barriers to greater bilateral cooperation in defence industries and technology"[39]. The policy paper also called for high-level military exchanges; strategic consultation; exchanges of specialised military delegations and exchanges in military training and education. China's motives and some of the EU's advantages in repealing the embargo are summarised in a CRS Report for US Congress[40], they include:

1) *Commercial* – it is likely that following the removal of the embargo and with rising defence expenditure, the Chinese government will purchase European equipment. Specifically, components and subsystems, particularly for command, control, communications and sensors, which are not available to the same standard from Russian suppliers, but can be made compatible with Russian and Chinese platforms.

2) *China's Leverage* – real or potential competition from European companies could provide China with stronger leverage to negotiate favourable deals for platforms and technology-transfers among Russian, Israeli, European or other bidders for China's rising defence spending, a fact already recognised by the Russian government[41].

3) *Technology Transfers* – China is expected to seek technology-transfers through co-development and co-production with the EU in order to develop its industrial base and research capabilities.

The case of China clear demonstrates the potential competitiveness implications of future changes to embargoes and the stringency of Codes of conduct in the export of defence equipment and technology from the EU. The actions of third countries, such as Australia (which repealed its embargo in 2002) and the US, as key customers of some EU contractors should also be considered when evaluating these impacts. For example, it has been suggested that a large proportion of defence equipment produced in Europe contains US components, covered by ITAR restrictions. It is therefore important to highlight that although a product may be exported to China in the future, this would require US government approval as without it, the equipment may not function. Based on current US policy, the export of EU defence equipment to China or other countries that the US administration perceives as a threat is highly unlikely.

Other countries where EU arms embargoes are in force include Armenia, Azerbaijan, Burma, Democratic People's Republic of Korea, Iran, Lebanon, Uzbekistan and many African states including Zimbabwe, Congo, Sudan, Liberia, Somalia and the Ivory Coast.

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39 Xinhua [New China News Agency], October 13, 2003, available at: http://news.xinhuanet.com/english/2003-10/13/content_1120500.htm

40 CRS (2006): European Union's Arms Embargo on China: Implications and Options for US policy, CRS Report for Congress, Updated January 26, 2006, available at: http://italy.usembassy.gov/pdf/other/RL32870.pdf

41 Russian then President Vladimir Putin acknowledged this concern, saying "we sell a lot of arms to China. The less competitors in the Chinese market, the better", he also suggested future Russian –European cooperation in high tech projects for China. Comments made in a press conference following the four-country meeting among Russia, France, Germany, and Spain, March 18, 2005. Complete text of press conference available at: http://www.russianembassy.org.za/statements/text/mar05/dputin-pressconf180305.html

3.3.4 Dual Use Export Controls (EC) No 394/2006 amending Regulation 1334/2000 of 22 June 2000

Dual-use items are goods and technology developed for civilian uses, but which can be used for military applications. Dual-use item are not therefore 'war materials' as defined in Article 296 of the EC Treaty or listed in the EU's Common Military List.

The objective of this regulation is to make dual-use goods (including software) subject to effective control when exported, in order to ensure compliance with Member States' and EU international commitments to disarmament and non-proliferation. This then allows the free movement of these goods within the European Community. The international export regimes[42] that this regulation covers, and which many BRICKs countries are also signatures of are:

1) the Nuclear Suppliers Group is a group of over 40 countries set up in 1974 which seeks to contribute to the non-proliferation of nuclear weapons;
2) the Australia Group is a group of 39 countries and the European Commission set up in 1985 which aims to minimise the risk of assisting chemical and biological weapon proliferation;
3) the Missile Technology Control Regime (MTCR) is a group of 34 countries set up in 1987 which seeks to ensure the non-proliferation of missiles capable of delivering weapons of mass destruction; and
4) the Wassenaar Arrangement was agreed in 1995 and is supported by 40 countries to promote transparent and responsible trade in conventional arms and dual-use technologies.

The principle of the Dual Use Export Controls Regulation is that the items listed within Annex 1 of the Regulation cannot leave the EC custom territory without an export authorisation from a competent authority of a Member State, from which one of four licences can be produced (General Community Export Authorisation for the US, Canada, Japan, Australia, New Zealand, Switzerland and Norway: a National General Export Authorisation published by a MS in official journals; Global Authorisations; and Individual Licences can also be applied to other countries). The administrative burden and time taken to issue each license can therefore affect the ability of a particular defence exporter to compete. With many BRICKs countries likely to come under individual licenses authorised on a case-by-case basis, opposed to a more general export license issued to the US, Switzerland, Norway, etc, this can be regarded as a substantial barrier to future trade.

It is also worth noting that the dual export regulations are not all encompassing sets of rules for EU Member States, but rather they define a set of principles and objectives to harmonise national regulations, similar to the EU Code of Conduct on arms exports. Therefore, the authorisations and licenses applied can vary by Member State. Member State government policy is therefore likely to be the determining fact in whether a technology is exported or shared with a BRICKs country. Comments received from

[42] For further details on these regimes, see www.nuclearsuppliersgroup.org, www.australigroup.net, www.mtcr.info and www.wassenaar.org respectively.

industry also suggest that the amount and level of technology transferred is also likely to depend on the indigenous capability of each BRICK. Countries that already produce equipment with a high level of technology are therefore likely to receive more advanced technology offsets and transfers than those producing equipment of a lower technology standard.

3.4 US regulatory framework conditions

3.4.1 Overview

The political, economic and military significance of the US means that it exerts a significant impact on the world defence market. The importance of the US defence sector in relation to the EU is shown in Table 3.1 below, based on the most recent available data from the European Defence Agency[43].

Table 3.1 European – US Defence Expenditure 2007

European – US Defence Expenditure 2007		
Expenditure (% breakdown)*	**US**	**Europe**
Personnel	20.8%	52.0%
Operations & Maintenance	38.4%	23.0%
Equipment procurement	21.5%	15.8%
Research & Development and Research & Technology	14.5%	5.9%
Other Expenditure	6.9%	4.5%
Total Expenditure	€454 bn	$204 bn
Source(s): Aerospace Industries Association of Brazil- AIAB (http://www.aiab.org.br/).		

Thus the US regulatory framework can have a significant impact on both the EU and the BRICKs defence sectors. The influence of the US can be best summarised in relation to procurement and export controls in a regulatory context.

Procurement controls, can provide US domestic producers with advantages over European and BRICKs competitors. For example, the research and development of new technology often entails high fixed costs. Where these fixed costs are paid by the military, or are lower per unit due to large scale domestic procurement (scale economies), then competitors are often at a cost disadvantage if the technology is eventually used commercially (i.e. in space launch)[44] or competes in export markets (as they are less able to aggressively compete on price). The size of the US market and the regulations governing public procurement can therefore have a substantial impact on the world defence market.

43 Available at: http://www.eda.europa.eu/defencefacts/

44 Space related costs and their competiveness implications are given in RPA (2007) Impact Assessment Relating to the Economic and Governance Evolution of Space in Europe, for the European Commission DG Enterprise, April 2007.

In the case of export controls, some European defence equipment may utilise US manufactured components and technology. Where this is the case, the ability of the European manufacturer to share or export this technology may be limited due to security concerns in the US. Similarly, the size of the US market can give the US government leverage over European defence contractors who conduct a large proportion of their business in the US, with associated impacts on their business strategies and activities in BRICKs countries[45].

Each of the US regulatory conditions identified as affecting BRICKs and/or European competitiveness is described in detail in Annex 3. This includes procurement, technology transfer and export restriction regulations.

3.5 Regional framework conditions

3.5.1 Overview

Regional organisations and cooperation agreements are also an important influence on the defence market, specifically with regards to the interaction of BRICKs countries with neighbouring countries and international powers such as the US and Europe. .

A summary of the most significant regional organisations and agreements that may act as drivers of the defence industry in BRICKs countries are presented below. A number of other regional framework conditions are also highlighted in Annex 3 which may not directly affect the defence sector, but may represent important forums for governments and industry to cooperate and coordinate activities in various fields include defence and security in the future.

3.5.2 Organisation for Security and Co-operation in Europe (OSCE)

The OSCE is a regional security organisation with over 56 participating Member States from Europe, Central Asia and North America. This includes all EU Member States, Switzerland, Norway, Canada, United States, Russian Federation and many former CIS States. Originally created as a multilateral forum for dialogue and negotiation between East and West during the Cold War, the Helsinki final Act established in 1975 and signed by all participating states contains a number of commitments to politico-military, economic, environmental and human rights issues. As part of this 'Helsinki process', the organisation seeks to enhance military security by promoting greater openness, transparency and co-operation in the destruction of surplus Cold war weapons, conventional arms transfers, conflict prevention, and border management[46].

Despite the dominance of 'Western' powers in the OSCE, the presence of the Russian Federation and other former CIS states makes this organisation potentially important for

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45 BAE Systems is given as an example, regarding exports to China in: CRS (2006): European Union's Arms Embargo on China: Implications and Options for US policy, CRS Report for Congress, Updated January 26, 2006, available at: http://italy.usembassy.gov/pdf/other/RL32870.pdf

46 See OSCE website for more details: http://www.osce.org/about/19298.html

this study as vehicle for further cooperation and openness between Europe and Russia. For example, future progress may yield greater access to European markets for Russian space launches and energy exports[47]. While European producers could become more active in the Russian defence related industry (EADS already cooperates with Irkut Corporation, of which it owns a 5% holding, and with various space launch and helicopter manufacturers in Russia)[48].

3.5.3 Commonwealth of Independent States (CIS)

Following the dissolution of the former Soviet Union in 1991, the Commonwealth of Independent States (CIS) was established as a successor entity to the USSR in order to promote multilateral solutions to security and economic challenges facing these newly formed states. Originally founded by Belarus, Russia and Ukraine in December 1991, other former Soviet States joined later that year (including Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan and Uzbekistan) followed by Georgia in December 1993[49].

In 1993, the CIS charter[50] was adopted in order to formalise the membership of participating states. However, Turkmenistan has never ratified the Charter due to its UN-recognised position of neutrality and neither has the Ukraine, despite its initial role in establishing the organisation. Following the recent conflict in South Ossetia, Georgia has chosen to withdraw from the CIS organisation; this becomes effective on 17 August 2009[51].

The CIS aims to coordinate aspects of trade, finance, lawmaking and security between the various states. One product of this is the creation of the Eurasian Economic Community (EurAsEC) based upon an initial customs union created between Belarus, Russia and Kazakhstan in March 1996. The objective is to create a common market between former Soviet states in order to promote trade, competition and eventually develop a single currency.

Despite the progress made in terms of economic cooperation, the politico-military and security advances of the CIS are less clear. Russia is also a leader, sponsor and driver of other regional organisations. For example, it is currently a leading signatory of the Shanghai Cooperation Agreement and the Organisation of Central Asian Cooperation with its southern and eastern neighbours, alongside its roles in the Eurasian Economic Community.

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47 Two areas of cooperative focus highlighted by the EU-Russia Industrialist Round Table, details available at: http://www.eu-russia-industrialists.org/index.php

48 MDB (2007): EADS in Russia, article published in the Moscow Defence Brief (MDB) Issue 3, 2007, available at: http://mdb.cast.ru/mdb/3-2007/ic/article2/?form=print

49 CSTO Official website at: http://www.dkb.gov.ru/ [in Russian]. For an overview of CIS and CSTO developments, see http://www.globalsecurity.org/military/world/int/csto.htm

50 Available at: http://www.therussiasite.org/legal/laws/CIScharter.html

51 Press conference of the Russian Foreign Minister Sergey Lavrov after the meeting of the CIS Council of Foreign Ministers, Bishkek, 9 October 2008, available at: http://www.mid.ru/brp_4.nsf/e78a48070f128a7b43256999005bcbb3/f8239318a64b3edac32574de00287b06?OpenDocument

The impact of these political and economic developments with BRICKs countries and the regional organisations they participate in could be significant for the European Defence industry. For example, greater cooperation with BRICKs countries such as Russia could provide new opportunities for European industry to gain access to competitive Russian suppliers and CIS/CSTO markets. Alternatively, stronger links between Russian and Chinese industry facilitated by regional organisations, could result in the emergence of much stronger competitors in the fields of defence equipment and associated civil industries to compete with European suppliers. A shift in allegiance or priorities for key regional powers like Russia, between European, East Asian or Central Asian organisations due to socio-political and economic developments could also be an important factor to consider when evaluating future competitiveness.

3.5.4 Collective Security Treaty Organisation (CSTO)

The Collective Security Treaty Organisation (or Tashkent Treaty) began as the CIS Collective Security Treaty signed in May 1992 by Armenia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan, followed by Azerbaijan, Georgia and Belarus at a later date, with the Treaty[52] coming into force on 20 April 1994.

The Treaty, initially valid for five years unless extended, requires participating states to abstain from the use or threat of force in any disputes they may have with each other. Similarly, signatories are not able to join other military alliances or other groups of states, while aggression against one signatory would be perceived as an aggression against all. On renewal of the Treaty for an additional five year period, only six members signed, with Azerbaijan and Georgia leaving (Uzbekistan left and later rejoined in 2006). In 2002 the organisation was formally renamed the Collective Security Treaty Organisation (CSTO) and now participates as an observer organisation at the United Nations General Assembly.

Recent cooperation initiatives have included the signing of an agreement between the CSTO and the Shanghai Cooperation Organisation (SCO) to broaden cooperation on issues such as security, crime and drug trafficking. The CSTO has also taken moves to develop a collective rapid reaction force in order to combat crime, drug trafficking and maintain regional peace. The permanent regional peacekeeping force envisaged gives the CSTO an increasing role in the region, similar to NATO in other parts of the world[53].

If the CSTO leads to increased intra-organisation procurement of defence equipment, there may be potential impacts on the European defence market/industry, if markets become closed to non-signatories. Conversely, greater cooperation inside the CSTO and externally with the UN, NATO and the EU could open up markets, facilitating trade and competition. One barrier to this process might be Iran's participation in SCO as an observer, with some reports suggesting that it might also wish to join or at least cooperate with the CSTO[54].

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52 http://untreaty.un.org/unts/144078_158780/5/9/13289.pdf

53 Novosti [Russian News & Information Agency] (2007): Reports available at: http://en.rian.ru/world/20070514/65444995-print.html and http://en.rian.ru/russia/20071116/88417116-print.html

54 The Iran question is raised in several articles including: IWPR(2007): Iran Unlikely to Join Former Soviet Security Group, article available from the Institute for War and Peace Reporting (IWRP) and GlobalResearch (2007): Iran invited to join

3.5.5 Shanghai Cooperative Organisation

Formerly referred to as the 'Shanghai Five', China, Russia, Kazakhstan, Kyrgyzstan and Tajikistan formed an informal precursor to the Shanghai Cooperation Organisation (SCO) in 1996 by signing the Shanghai Agreement on Confidence Building in the Military Field in the Border Area. An Agreement on Mutual Reduction of Military Forces in the Border Areas followed in 1997 and numerous bilateral agreements on frontier delineation, trade and cooperation also contributed to the creation of the SCO as an institution in 2001, including Uzbekistan. The objectives of the SCO are:

"strengthening mutual trust and good-neighbourly friendship among the Member States; encouraging effective cooperation among the Member States in political, economic and trade, scientific and technological, cultural, educational, energy, communications, environment, and other fields; devoting themselves jointly to preserving and safeguarding regional peace, security and stability; and establishing a democratic, fair and rational new international political and economic order"[55].

Iran, India, Pakistan and Mongolia have since joined as observers, signalling possible membership in the future, as this organisation emerges with the ASEAN Asian Regional Forum as the most important regional organisation in Asia involved maintaining peace and security[56].

Any assessment of the competitiveness of BRICKs countries (Russia, India and China) in the region should therefore consider the future potential of SCO to drive cooperation, particularly in relation to trade, military production and development that may well exclude European involvement. The future of SCO will depend heavily on the leadership of China and Russian, both with different motives and objectives for the organisation, as summarised in two recent studies[57]. Both studies suggest that China's motives are more economic as the emerging superpower in the region, applying 'soft power' to pursuit greater cooperation, specifically in aspects of trade. Security is also important for China although it is not involved in any major conflicts at present. However, conflicts close to and within its borders could be destabilising. Further involvement of Pakistan and India in SCO is therefore not expected to be a priority for China due to security concerns and the dilution of its economic power in SCO if India were to join (India has a democratically elected government and a growing economy). For Russia, the traditional political and economic leader in the region, the two studies suggest that its motives are driven by a need to redefine itself in the post-Cold war era, while maintaining its influence in the region, largely through military power and regional energy needs. Economically, the two studies suggest that Russia also wants to stay close to the

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Central Security Treaty Organization, May 18, 2007 available at: http://www.globalresearch.ca/index.php?context=va&aid=5696

55 SCO(2001): Declaration on the Establishment of Shanghai Cooperation Organisation, signed on 15 June 2001, text available at: http://www.sectsco.org/html/00088.html

56 Chung, C-P. (2008): The role of Asia-Pacific organisations in maintaining regional security, article published in the Korean Journal of Defense Analysis, Volume 20, Issue 2 June 2008, pg.169-185.

57 Oldberg, I. (2007): The Shanghai Cooperation Organisation: Powerhouse or Paper Tiger?, report for the Swedish Defence Research Agency, June 2007, and Bailes, A.J.K et al (2007): The Shanghai Cooperation Organisation, SIPRI Policy Paper No. 17, May 2007, available at: http://www.sipri.org

emerging economies in the East and wealthy countries in the West in order to attract investment and secure customers for its substantial natural resources (oil, gas, minerals, etc.). Conflicts in former Soviet States are also a concern for Russia, suggesting that security and regional stability are likely to be its principle policy objectives driving the development of SCO.

3.6 Other framework conditions

3.6.1 Overview

Many other framework conditions are important in determining the performance of the defence industry. These include the structure of the labour force, the knowledge and skills base of the defence industry, its geographical location and availability/access to key raw materials, energy and technology development. However, these factors mainly affect defence markets and industries on a national or at most regional basis. A discussion of how each of the following factors identified in the proposed work plan affects the ultimate competitiveness of a defence industry/market is therefore included in the individual chapter on each BRICKs country and the European sector.

3.7 Exogenous conditions

3.7.1 Overview

Exogenous conditions affecting the conduct of the international defence industry and market refers to those factors of an international nature which are largely independent of any framework or planning by government or other institution. Rather, such factors are often driven by the market or changes in social values, which are largely uncontrollable within a policy setting. The exogenous conditions identified for examination at the international level are:

1) Technological change;
2) Commencement of Cessation of Military Conflicts;
3) Political Developments; and
4) Socio-Economic Developments.

Socio-economic factors have a complex causal relationship with developments in the defence sector. For example, it is possible to say that changes in population or lack of resources may affect the defence sector through their influence on political developments. However, a detailed analysis of these factors, specifically at an international and region level is outside the scope of this study.

3.7.2 Technological changes[58]

Superiority in arms and defence systems industry is not only a question of advanced technologies but also in the capability to maintain previous one. Due to a very long product life cycle of several decades, the combine existence of various and heterogeneous product generation also manufactured in short production batch impact the industrial requirement and raised a major obsolescence issue. Then to face new defence or geostrategic issues does not necessary require the development of new a technology, a technical challenge also exist in the maintenance of old technologies

Drivers for technological changes remain the main drivers that define the needs for arms and defence systems:

1) Country strategy;
2) nature of threats;
3) operational requirements;
4) defence budgets;
5) etc;

At country and industry level, the question of the economy of scale is also a driver for new organisation pattern related to new technology and industrial non recurrent cost:

1) increased costs in research, development and production as the technology 'envelope' is pushed further[59];
2) international trade in military equipment in order for countries to acquire skills and technology which they may not otherwise be able to economically develop and produce, and
3) greater cooperation and coordination of defence related activities, as many nations can no longer afford 'to go it alone' or may wish to share expertise

The decision to launch a development is a balance between cost and priority in relation with a State strategic need that could be satisfied with a new technology, either older technology could be also enough. This is a considerably different situation than the one of other industrial sectors of mass production for example and consequently this is an entry barrier for a decision to build up a defence industry.

Complexity of technology is also an issue that enforced advantage for established industry: a new defence system such as an aircraft or naval vessel can require new architecture, new material, improvement or development of new subsystems (e.g. communications, computer, sensors, and propulsion and information systems) or components (e.g. nano and stealth materials); but also it require higher integration know-

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58 Technology and its drivers and impacts on the wider EU economy is discussed in depth in: RPA (2006): Study on the Impact of Options which may be included in the Communication on stimulating EU-wide Efforts to ensure Competitive Security and Defence Related Industries, final report the European Commission DG Enterprise, December 2006

59 This refers to the increasing marginal costs incurred to achieve each additional technological improvement on the previous advancement. See graphical depiction in: RPA (2006): Study on the Impact of Options which may be included in the Communication on stimulating EU-wide Efforts to ensure Competitive Security and Defence Related Industries, final report the European Commission DG Enterprise, December 2006

how with homogenous interface and deeper communication/collaboration between subsystems with real time multiple control and systems interaction combining arms, engine, navigation, etc. .

Then the possibility to take a lead in the race for defence new technology is of course an issue, but with not necessary important export market possibilities. In the context of military procurement, a more technologically advanced product than the competitor can have advantages. It is likely to attract more investment and higher sales than the competition due to technical superiority. But there are conditions, due to the high initial fixed costs involved in research and development of new defence equipment and with often very short production runs, then higher initial sales based on technical advantages should help to lower unit costs, helping maintaining competitive sales in export markets. Of course thus programme are very sensitive to cancellation from initial customers has we may found many example in particular in developed Western industry.

Regarding technological transfers between civil and defence domain, it exists various situation:

- Coming from civil domain: all new digital component (MPU), comfort
- Military (proprietary): discretion, countermeasure, submarine, etc.
- Dual: Aircraft engine, helicopter platform, etc.
- Defence with transfer possible to civil domain: GSM, GPS, Internet, Night vision, etc;

Joint procurement deals and co-production agreements often involve the transfer of some technical know-how or skills to the procuring or partner country from the initial developer. For a BRICKs country wishing to procure defence equipment and develop its own industry, a more technically advance product can be therefore more attractive than 'standard' equipment, providing export controls allow the technology and know-how to be transferred to the BRICKs country from for example, the EU. A demand from importing countries therefore exists for exporters to maintain a high level of technological content in its equipment.

A consequence for BRICKs countries is also to develop a capacity to adapt solutions and technologies coming from diverse origins:

- The Indian TEJAS with a US engine for 1st batch
- Russian Mi 24 Mi 35 with Western avionics

One of the major concern for BRICKs countries is that in a lot of cases they don't have the all the key technologies to build up from scratch a new program and they have to deal with foreign equipments or technologies; it is the case for India with the Tejas light combat aircraft which is equipped with a F404 general electric engine almost for the first batch, due to the delay and technical concerns encountered by the indigenous Kaveri engine[60]. Another example is the procurement of seekers in Russia specifically developed for missiles developed by the Korean industry.

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[60] The recent cancelation of Kevari programme now forced Indian to find a remplacement solution, and not just for the 1st batch.

3.7.3 Commencement or cessation of conflicts

The commencement or cessation of military conflicts, including peace keeping and security roles of the United Nations and NATO, clearly have a direct impact on the demand for military equipment. Thus, existing conflicts[61] and future diplomatic 'hot-spots' can provide an indication of future defence market needs worldwide. As demonstrated previously in this chapter, conflicts can also contribute to political drivers affecting the defence industry, such as the degree of cooperation amongst nations.

3.7.4 Political developments

Overview

Arms trade is specific in that it relates to fundamental security interests of nation states and as such it is heavily regulated or facilitated by government policies. The nature of international arms transfers is thus determined by geopolitical and security conditions, with political milestones, such as the end of the Cold War or the 9/11 attacks. Political interests can be manifested by participation in global or regional arms trade control regimes or on a state-to-state basis with government policy determining trading partners. As global and regional arrangements are dealt with in more detail elsewhere in this Chapter, this section provides a brief introduction into the relevant bilateral dynamics by means of focussing on two BRICKs countries, namely China and Russia, and subsequently highlighting some of the overarching issues.

China

China's arms exports are a good example of government policy fundamentally impacting on the choice of a country's trading partners, with several explanations being forwarded as to the political motivations behind government decisions, including strategic considerations, ensuring access to raw materials, and preference of principles of non-interference over promotion of human rights.

Byman & Cliff (1999) note that Pakistan, Iran, Iraq, North Korea, Myanmar, and Thailand had been the main recipients of China's arms exports since the 1980s and conclude that China's export partners thus included destinations that may have been viewed by other countries as "pariah states". While both commercial and political considerations are seen as important in determining export decisions, Byman & Cliff (1999) assert that in China's case strategic considerations outweighed commercial factors[62]. Bert (2004)[63] argues that assistance extended by China to Myanmar is motivated by considerations relating to China's strategic positioning in the region vis-à-vis India.

A body of scholarship has recently emerged that points to China's arms exports being motivated by desire to improve access to raw materials, especially in the context of sub-

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61 Various listings of current conflicts are available, including: http://www.globalsecurity.org/military/world/war/index.html

62 Byman & Cliff (199) illustrate this on the basis of several examples, even though some of the information on which this assertion is based dates back to the geopolitics of the Golf War, such as China's nuclear assistance extended to Pakistan in the 1980s

63 Bert W (2004): *Burma, China and the U.S.A.*, In: Pacific Affairs 2004/2, pp. 263-282 (only abstract seen)

Saharan Africa. Taylor (2005)[64] notes that arms sales may be a way for China to cement special relationships with oil-rich countries, such as Sudan. Various human rights advocacy groups have highlighted that export destinations for Chinese arms transfers include Sudan, Myanmar, and Nepal and these exports have been linked to exchanges for raw materials[65]. A number of academics have studied Chinese trade involvement in Africa (not necessarily limited to arms trade) and pointed to factors such as lack of political conditionality (Alden, 2005)[66] or desire to ensure access to natural resources (Klare, 2006)[67].

Russia

Russia's arms exports provide another example of the importance of foreign policy in determining acceptability of certain export destinations.

Russia's arms trade seems to be based on very different export approaches to those taken by some other countries, such as the United States, and this difference can be largely explained by diverging government policies. Recent realised exports or declared intentions by Russia to export to several countries such as Iran, Syria and Venezuela are reported to have sparked increased tensions with the United States.[68] By means of example, Russia has been a significant arms supplier to Iran (between 1995-2005, 70% of Iran's arms imports was sourced from Russia[69]) which led the United States to engage in diplomatic attempts to restrain these exports and several sensitive exports prompted the United States to apply sanctions against individual Russian companies.

In addition, some of Russia's export may have been motivated by the desire to write-off Russia's financial obligations to foreign countries. A case in point would be Russia's military exports to South Korea (Ahn, 2009).[70]

3.8 Conclusions

The political and strategic agenda is central to determining international arms flows. While intertwined with commercial motives, strategic and political considerations may often be the major determent of which countries become recipients of arms transfers. By means of example, analysis of Chinese arms exports reveals that recipient countries may

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64 Taylor I (2005): *Beijing's Arms and Oil Interests in Africa*, In: China Brief 2005/21, pp. 4-6, Accessible at the Centre on China's Transnational Relations Internet site, http://www.cctr.ust.hk/articles/20051013_ChinaBrief.pdf, Accessed on 12th May 2009

65 Reports by Amnesty International and Human Rights Watch. Downloadable from Amnesty International Internet site (http://www.amnesty.org.hk/html/node/5023) and Human Rights Watch Internet site (http://www.hrw.org/reports/2003/sudan1103/26.htm)

66 Alden C (2005): *China in Africa*, In: Survival, 2005/3 , pp. 147 – 164 (only abstract seen)

67 Klare M (2006): *America, China and & the Scramble for Africa's Oil*, Review of African Political Economy 2006/106, pp. 297-309 (only abstract seen)

68 Beehner L (2006): *Russia-Iran Arms Trade*, Available at the **Council on Foreign Relations** Internet Site, http://www.cfr.org/publication/11869/russiairan_arms_trade.html; The Times (2008): *Russia ratchets up US tensions with arms sales to Iran and Venezuela*, http://www.timesonline.co.uk/tol/news/world/europe/article4781027.ece, Reuters (2007): *US concerned by Russian arms sales*, http://www.reuters.com/article/topNews/idUSL2145396920070321, all Accessed on 12th May 2009

69 Kassoanova A (2006): *Russian Weapons Sales to Iran*, Available at the **Centre for Strategic and International Studies Internet Site** http://www.csis.org/media/csis/pubs/pm_0427.pdf , Accessed on 12th May 2009

70 Ahn SH (2009): *Understanding Russian-South Korean Arms Trade*, Armed Forces & Society 35/3, pp. 421-436, (only abstract seen)

opt for Chinese products because they are cheap, easy to use and maintain but also because they are made available to them (Byman & Cliff, 1999).

Government strategies and policies are in a constant state of flux and as such the impact of politics on arms trade is difficult to analyse and predict in the short-term. However, consistent objectives and strategies do generally emerge over time, enabling realistic scenarios to be developed over a 10-25 year timescale. In addition, government policy may be determined by a large number of issues, including the following:

1) issues relating to state sovereignty and non-interference in domestic political set-up of nation states as opposed to the ‘responsibility to protect’ and promotion of human rights;
2) strategic alliances and animosities;
3) access to natural resources, and
4) current military conflicts and the war on terror.

4 Overview of BRICKs global position

4.1 Introduction

4.1.1 Key questions

With previous chapters in this report already providing an overview of the EU defence sector and of the regulatory framework, this chapter provides a brief overview of the BRICKs before subsequent chapters look at each country in more detail. It seeks to answer three main questions:

- How large is each BRICKs country in relation to its defence market / expenditure?
- How relevant are the BRICKs for the global trade of defence equipment?
- How important are the BRICKs for the competitiveness of the EU defence sector?

4.1.2 Data sources

To answer these questions, data from the Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database (http://www.sipri.org/databases/milex) and Arms Transfer Database (http://www.sipri.org/databases/armstransfers) are used. The benefits of using data from a single source are clear – consistency of measurement across the BRICKs is achieved, thus removing one of the main issues when dealing with data on the defence sector.

However, the SIPRI database is not without problems and critics. During the course of an industry stakeholder workshop that was part of the study, several data issues were raised which are worthy of mention and which also appear later in this chapter:

(i) EU exports to China – there is an EU export embargo to China and yet the SIPRI data show exports from France, Germany, Italy and the UK over the 1995-2008 period being studied.

(ii) Doubt was cast on data showing South Korea and India to be large shipbuilding exporters.

(iii) Industry representatives also expressed surprise that the SIPRI data did not show any record of Brazilian imports from Russia.

In relation to these three points and a general enquiry on accuracy, the following response can be given:

- SIPRI arms transfers refer to the actual deliveries of 'major conventional weapons'. It uses a trend indicator value, indicating the volume, but not the actual financial values, of transfers. So they are not a complete measure of arms transfers (as the only cover major transfers) and will not be the same as national measures. They do, however, provide both data on both register of physical items transferred and second valuation of these

- The value of transfers is based on an 'ordinal' scale of prices related to those weapons with real prices (average unit acquisition price based on open sources). Prices of other weapons systems are estimated relative to the 'core' weapons for which real prices are available; 'used' weapons are also allocated a price in this way.
- SIPRI data are more objective in terms of the technology transferred, since this is what they reflect, e.g. weapons that are transferred as gifts or under favourable terms obtain the same SIPRI value as if they had been transferred under commercial terms.
- SIPRI data also include details about the number and type of weapons transferred and produced under license.
- They are independent data, based on a number of sources, including the data reported by governments within the framework of the EU Code of Conduct and are valuable in providing consistent and comparable trend data.
- So for comparisons of trends in arms transfers SIPRI data are the best. They do not provide the same data as that which would be gleaned from national sources, based on expenditures on arms. These would be measuring different things and when used for comparisons would raise a range of issues.

Regarding the specific points:
(i) Arms trade with China
All sources of data show deliveries of military related equipment during the embargo period from the EU and also since 1995 and 1998 when the code of conduct was finalised. Not just SIPRI. It is generally recognized that EU countries export military equipment to China[71], and this has already been mentioned in Chapter 3 in relation to regulatory frameworks.

SIPRI and the EU Code of Conduct definition of major weapons include subsystems, such as engines and sensors (basically all land-, aircraft- and ship-based active (radar) and passive (e.g. electro-optical) surveillance systems with a range of at least 25 kilometres); most fire-control radars; and anti-submarine warfare and anti-ship sonar systems for ships and helicopters). Secondly, that the SIPRI arms transfer registers include licensed production.

Since the EU arms embargo was imposed in June 1989, the SIPRI register includes transfers of the following items:

- France: sonar for frigates produced in China and diesel engines for ships produced in China;
- Germany: diesel engines for ships, tanks and self-propelled guns produced in China;
- Italy: missiles for combat aircraft produced in China;
- UK: turbofans for combat aircraft produced in China.

[71] For example, for details of individual EU Member State arms data reporting practices see: Sibylle Bauer and Mark Bromley. The European Union Code of Conduct on Arms Exports: Improving the Annual Report. SIPRI Policy Paper No. 8. November, 2004. SIPRI , f o u n d a t [http://www.sipri.org/contents/armstrad/PP8]. See also http://www.fas.org/sgp/crs/row/RL32785.pdf.

In addition, the SIPRI registers include a technology transfer component of licensed production in China as follows:

- France: SAM systems, helicopters and fire control radars licensed before 1989 but with production in China after 1989;
- France: diesel engines, light helicopters and naval guns licensed after 1989;
- Germany: diesel engines licensed before 1989 but with continued production in China after 1989 and diesel engines for Chinese submarines licensed in 2000;
- Italy: fire control radars licensed before 1989 but with Chinese production after 1989;
- UK: turbofans licensed before 1989 but with Chinese production after 1989.

The arms transfer logs relating to points (i) – (iii) are included as part of Annex 1 (Discussion of Data Sources) so that the items and destinations / origins in question can be seen openly and discussed accordingly. Given these findings, the answer to item (iii) could be that because the contract has not yet been signed the data has not yet appeared on the SIPRI database.

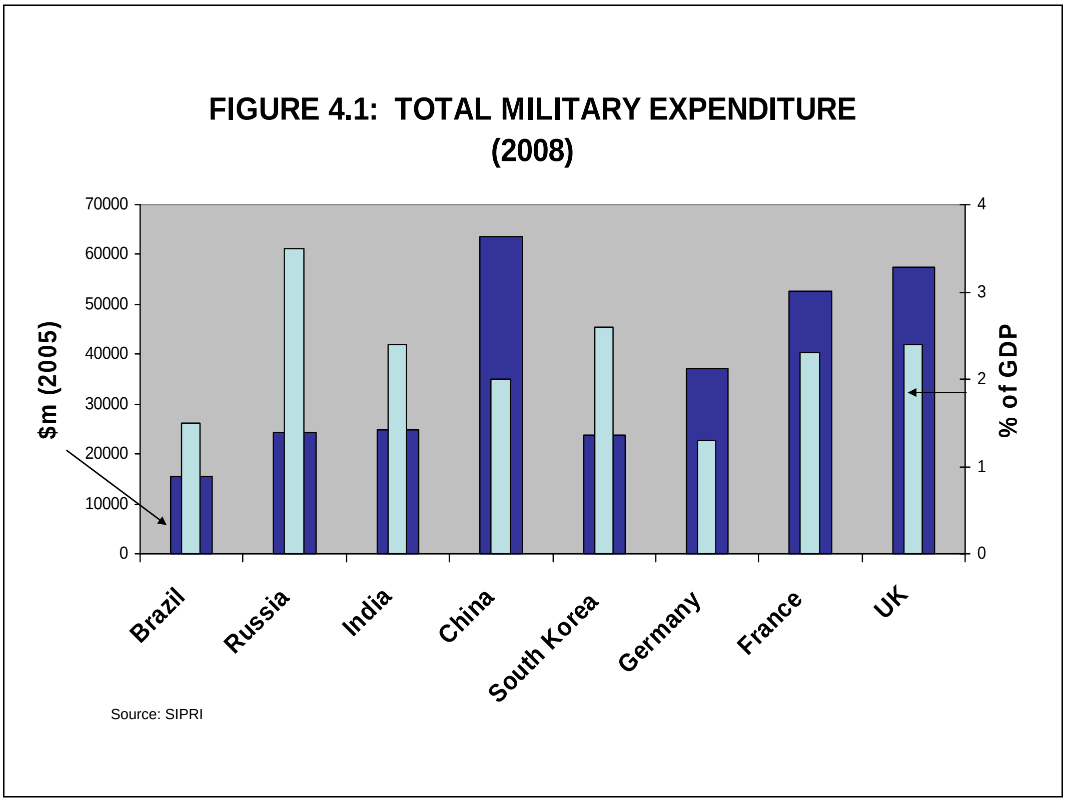
4.2 Scale of the BRICKs defence market

4.2.1 Market size

Military expenditure

Figure 4.1 shows the size and importance of military spending across the BRICKs, alongside some major EU Member States for comparison purposes.

Figure 4.1 Total Military Expenditure (2008)



China is clearly the highest spending BRICKs country, with more than double the volume of expenditure than Russia, India and South Korea, which are all at a similar level, with Brazil someway below this. When viewed in proportion to GDP, China returns towards the BRICKs average, while Russia stands out as having the largest expenditure in relative terms.

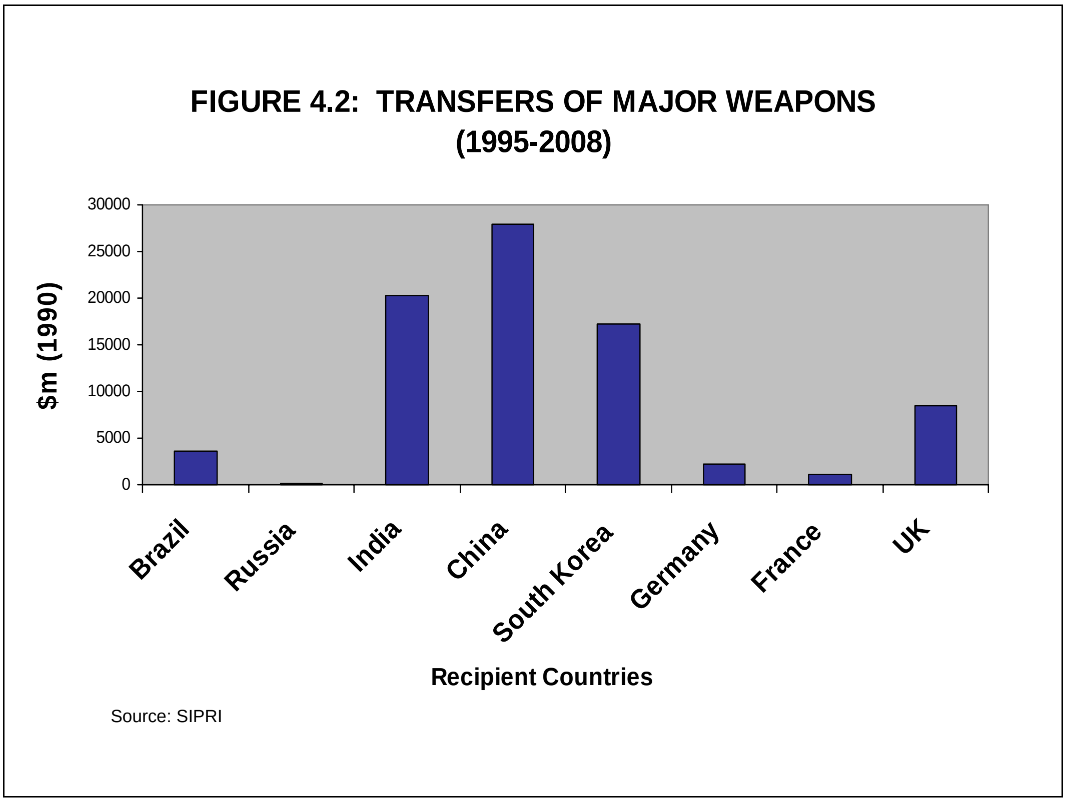
These scales can be contrasted with other countries around the world, as shown above and as also previously referenced in Chapter 2. France and the UK, two of the largest military spending Member States, have equivalent expenditures of $53bn and $57bn (both around 2.3-2.4% of GDP), with Germany some way behind on $37bn (1.3% of GDP). In contrast, the US is by far the largest country in terms of absolute volume military expenditure at around $549bn, or roughly 4% of GDP.

Of course, from the perspective of European competitiveness and interest, total military expenditure is a rather general indicator and for the large part is mostly made up of salaries and pensions of military personnel. What would be of more interest is expenditure on R&D and procurement. Unfortunately, even where they can be located, such data are not available on a comparable basis and so military expenditure is all that can be relied upon.

Trade

The total inflow of major weapons can also indicate the importance of the domestic market, and this is shown in Figure 4.2 which looks at major weapons transfers into each listed country over the 1995-2008 period.

Figure 4.2 Transfers of Major Weapons (1995-2008)



While the majority of the results are in line with the scale of total military expenditure, Russia stands out as being much less open to inflows of major weapons, given the size of its economy and general military spending. Compared to the major European Member States, India, China and South Korea are also much larger recipients of arms transfers.

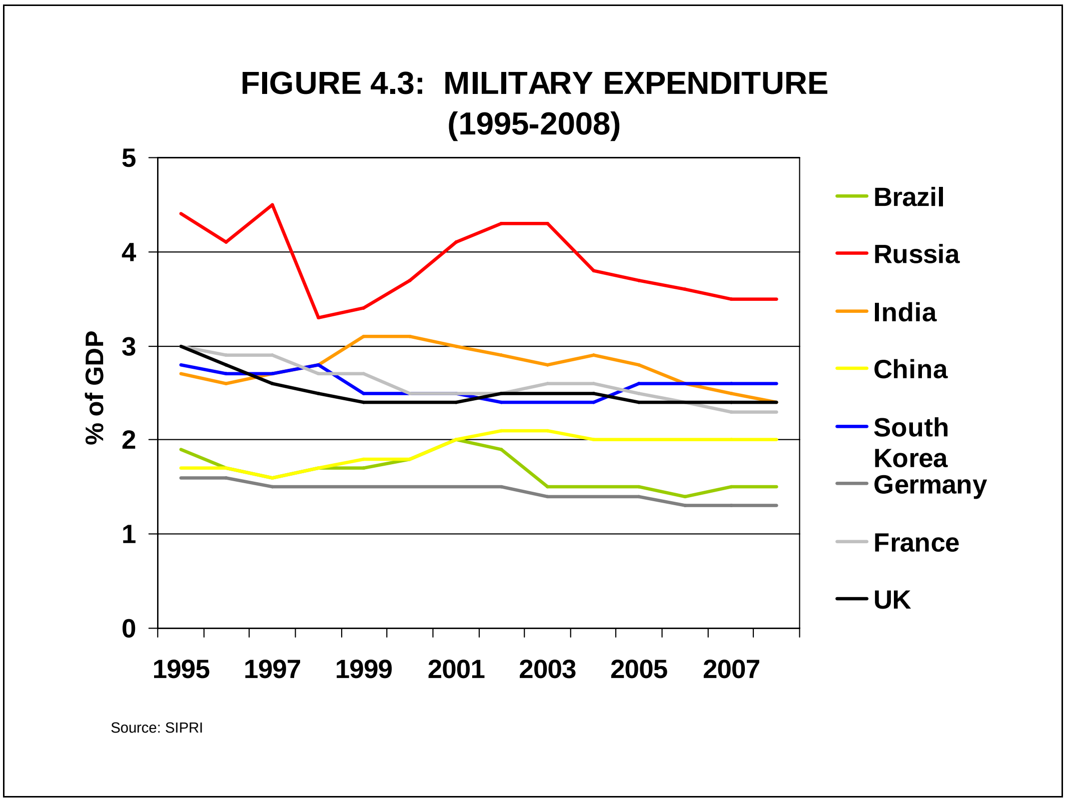
4.2.2 Market performance over time

Figure 4.3 shows how proportional military expenditure has evolved since 1995.

With the exception of China, a slight downward trend can be observed, although as previously mentioned the shares do tend to be fairly stable due to the large amount of expenditure allocated to relatively fixed items such as salaries and pensions. Russia displays more volatility, mainly reflecting the financial crisis in the late 1990s and subsequent recovery from this. It should be remembered that the BRICKs countries are typically quite fast-growing, so that even a constant or slightly declining proportional figure means that absolute volumes are rising over time.

The gradual decline seen in the BRICKs is not mirrored in the US, which has seen military expenditure rise from 3.5% in 1995 to 4% in 2008, albeit with a U-shape pattern rather than a linear trend. In Europe, however, there is more of a marked decline in importance of military spending, with France (3% to 2.3%), Germany (1.6% to 1.3%) and the UK (3% to 2.4%) all following this pattern over the period of study.

Figure 4.3 Military Expenditure (1995-2008)



4.3 Market relevance

4.3.1 BRICKs market

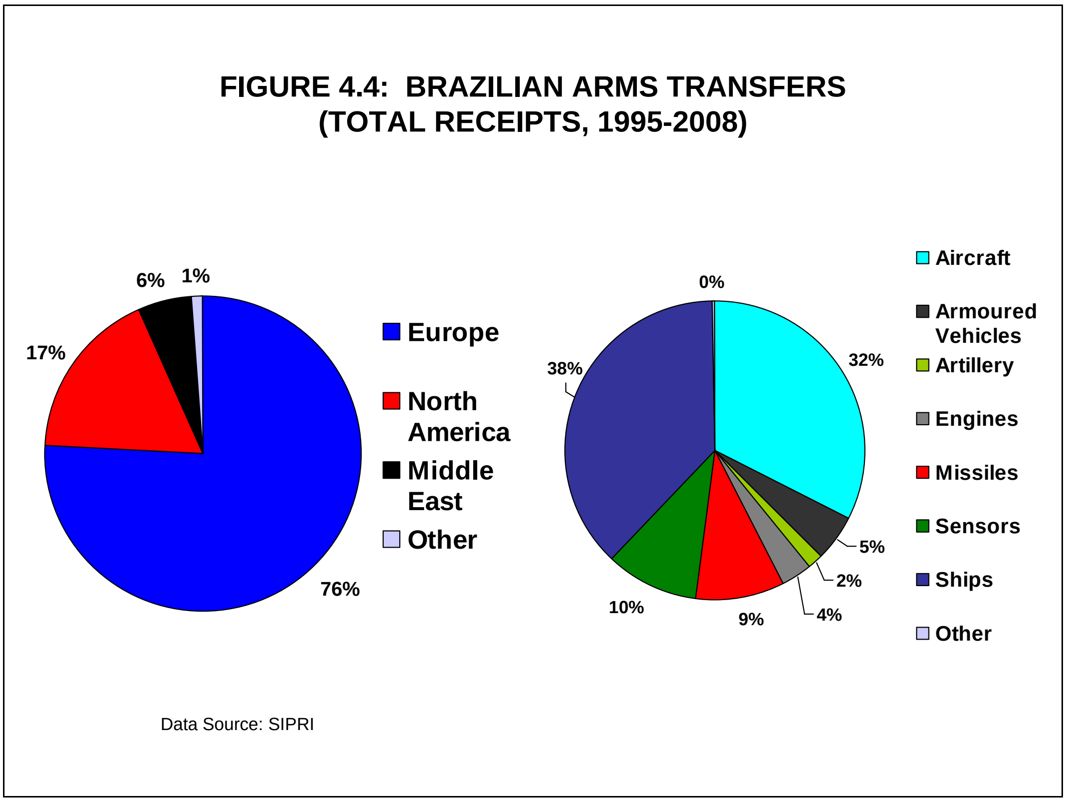
The next section again uses SIPRI data (for consistency[72]) to look at how important the BRICKs markets are for Europe, both in terms of origin of and destination of major arms transfers. This is important because the BRICKs can be seen as both potential markets for European companies, but also potential competitors, either in their own home market or in third markets where they both supply to.

Receipt of Arms Transfers

- *Brazil*

The data for Brazil show how Europe (ostensibly France, Germany and the UK) dominates with around three-quarters of the Brazilian market, followed some way back by North America (the US) and then the Middle East. This is a pattern which has not changed much over time, although the total volume of transfers has decreased over time following the effects of the budget crisis at the end of the 1990s.

Figure 4.4 Brazilian Arms Transfers (Total Receipts, 1995-2008)

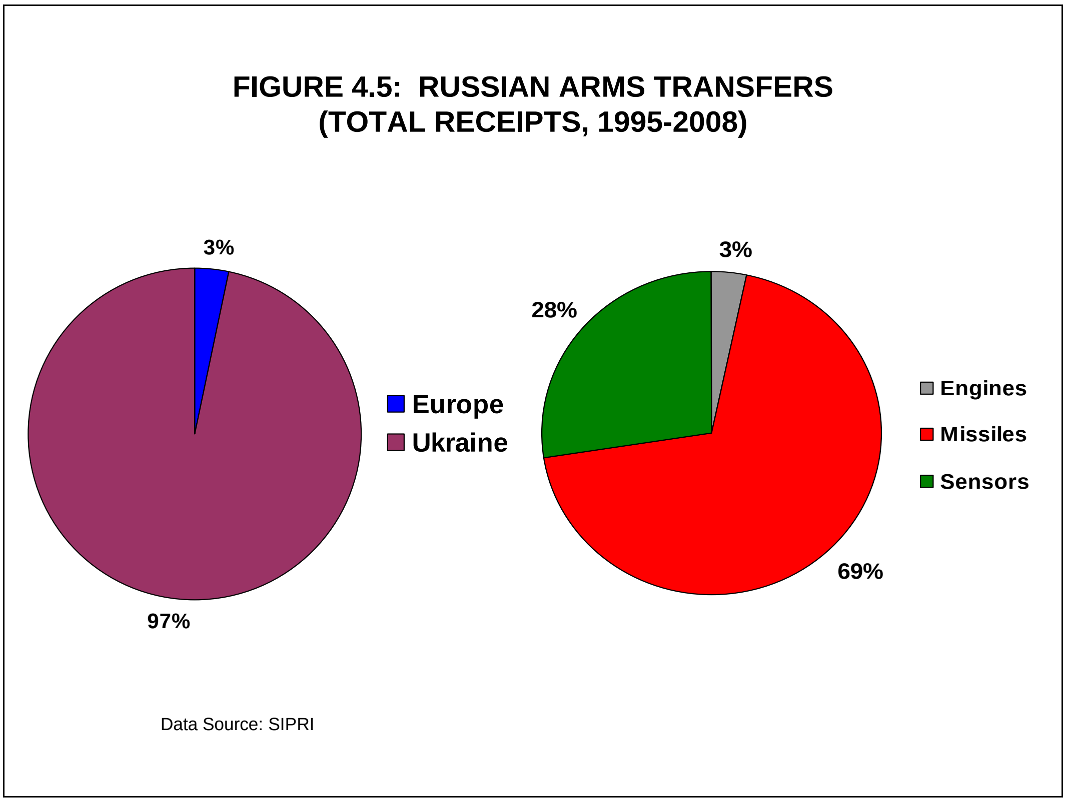


[72] All data analysed are in $1990m, totalled over 1995-2008 so that the effects of individual years, when a large shipment could potentially skew findings, are averaged out. Finally, it should be noted that the SIPRI data source allows trade by both area of domain to be analysed, but unfortunately not the two together unless detailed arms trade logs are presented, as above for some issues that have been raised at an industry stakeholder workshop.

When split by type of armament aircraft and ships account for 70% of volume, followed by a range of support equipment.

- Russia

Figure 4.5 Russian Arms Transfers (Total Receipts, 1995-2008)

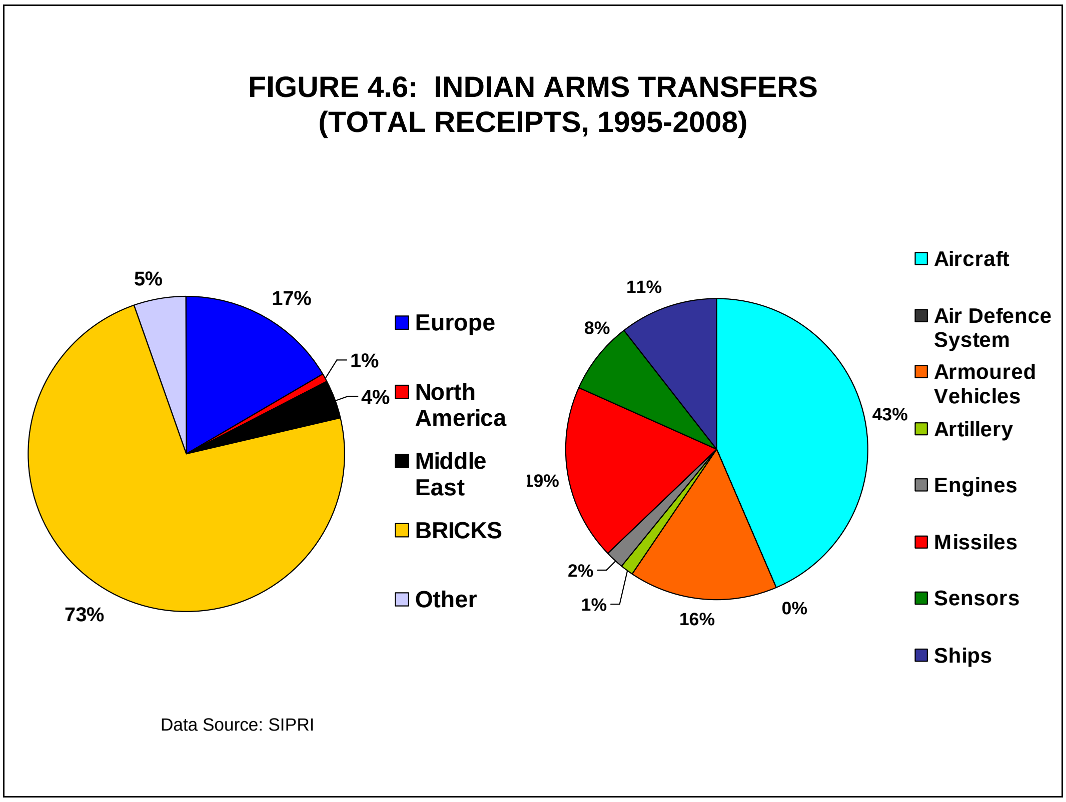


Previously it was seen how small supplies of arms were to Russia are in comparison to other BRICKs. Figure 4.5 shows that what inflow does exist is dominated by the Ukraine, with Europe making up a small residual and only in one specific year. The data by domain show that these inflows are made up mostly from missiles and sensors.

- India

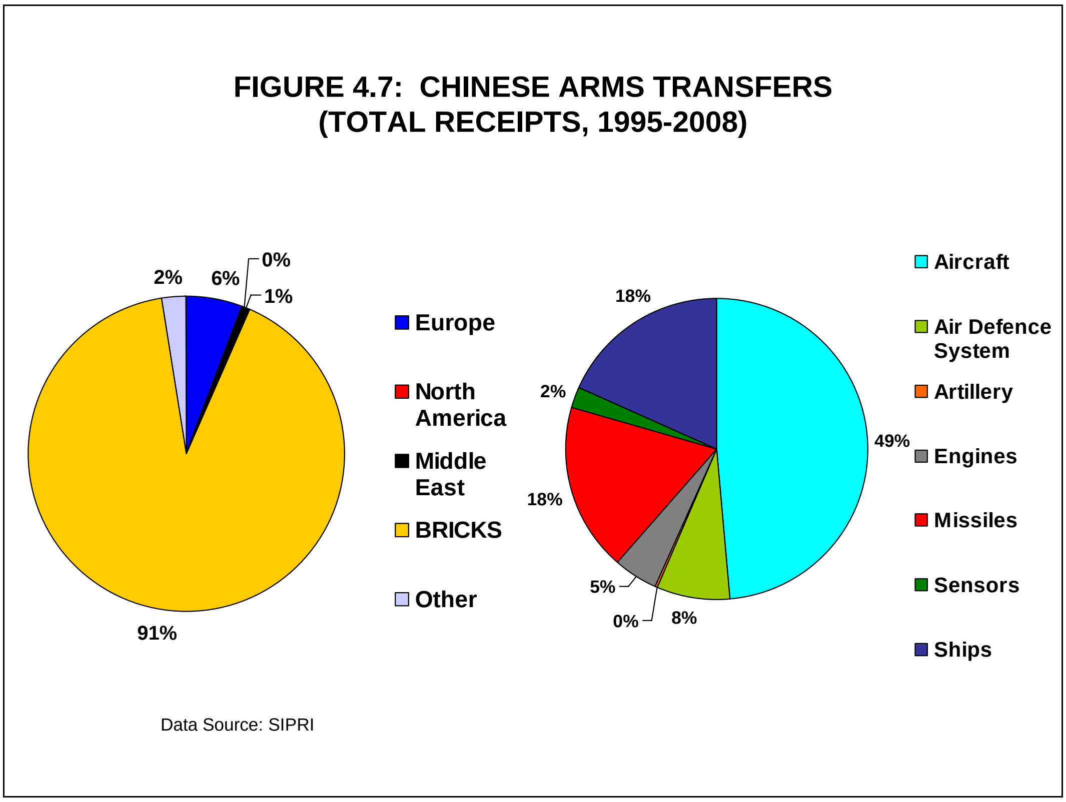
In contrast to Russia and Brazil, India's arms market is dominated by other BRICKs countries (namely Russia). Europe (mostly the UK, but also France, Germany and Italy) has a sizeable residual share, but Russia clearly dominates, and has also increased its share over time. The types of transfer are spread over a number of areas, but aircraft form the majority share and have also increased in importance over time.

Figure 4.6 Indian Arms Transfers (Total Receipts, 1995-2008)



- China

Figure 4.7 Chinese Arms Transfers (Total Receipts, 1995-2008)



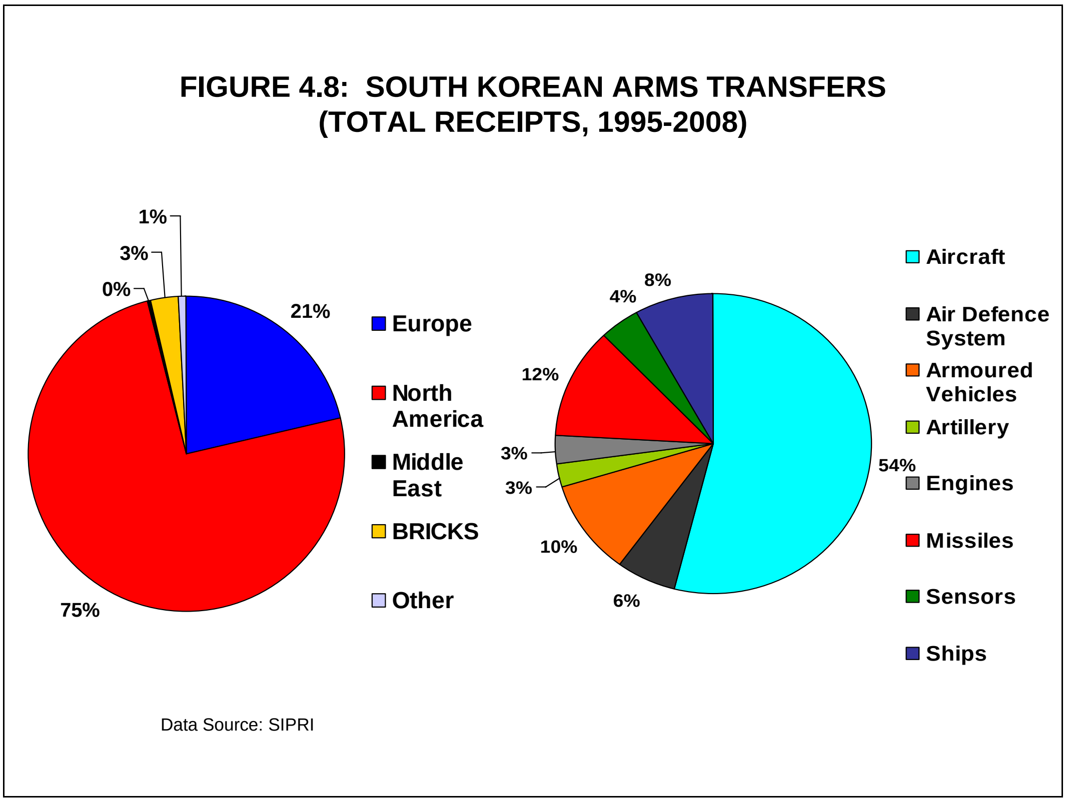
The Chinese profile is similar to that of India, in that it is dominated by the BRICKs, and in particular Russia. European penetration into the market (mostly France, and also Germany and the UK to a more limited extent) is very small and has shown no sign of increasing over time. Aircraft make up almost half of these purchases, followed by ships and missiles accounting for over another third.

- South Korea

Figure 4.8 shows how South Korea is the only BRICKs country to be dominated by North American arms transfers (mainly the US). This is a dominance that has changed little over time, although there is a slight upward trend in favour of the European share (mostly Germany and France) in the last couple of years of the sample. Supplies from other BRICKs is solely to do with Russia, but this trade is very small by comparison and shows no particular trend.

Across domain, aircraft once again make up the lion's share, with missiles, ships and armoured vehicles the other main categories of note. There is also little evidence of any trending in any particular type of weapon.

Figure 4.8 South Korean Arms Transfers (Total Receipts, 1995-2008)



Foreign Direct Investment

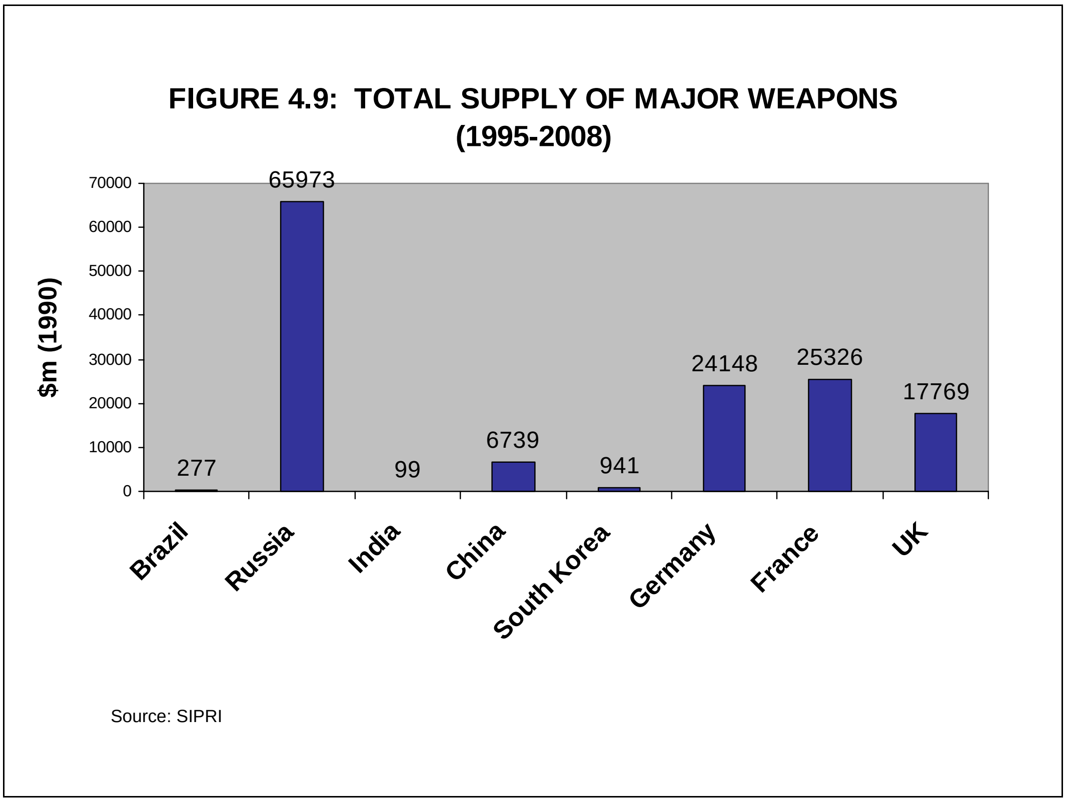
A useful complement to the trade data is information on FDI flows into the BRICKs, as investment (including M&A activity) represents another avenue through which the market can be accessed. The main source of such information is the UNCTAD World Investment Report, for which the latest version is the 2008 report.

Unfortunately, the detail of FDI data available in this publication do not allow bilateral flows of investment (e.g. German FDI in Brazil) to be identified, and even if they did the degree of disaggregation in the sectoral data is somewhat lacking in order to identify the defence sector. For this reason, further information on FDI is included in Annex 1, as the available data do no shed sufficient light on the BRICKs position to warrant inclusion in the main body of the report.

4.3.2 Other markets

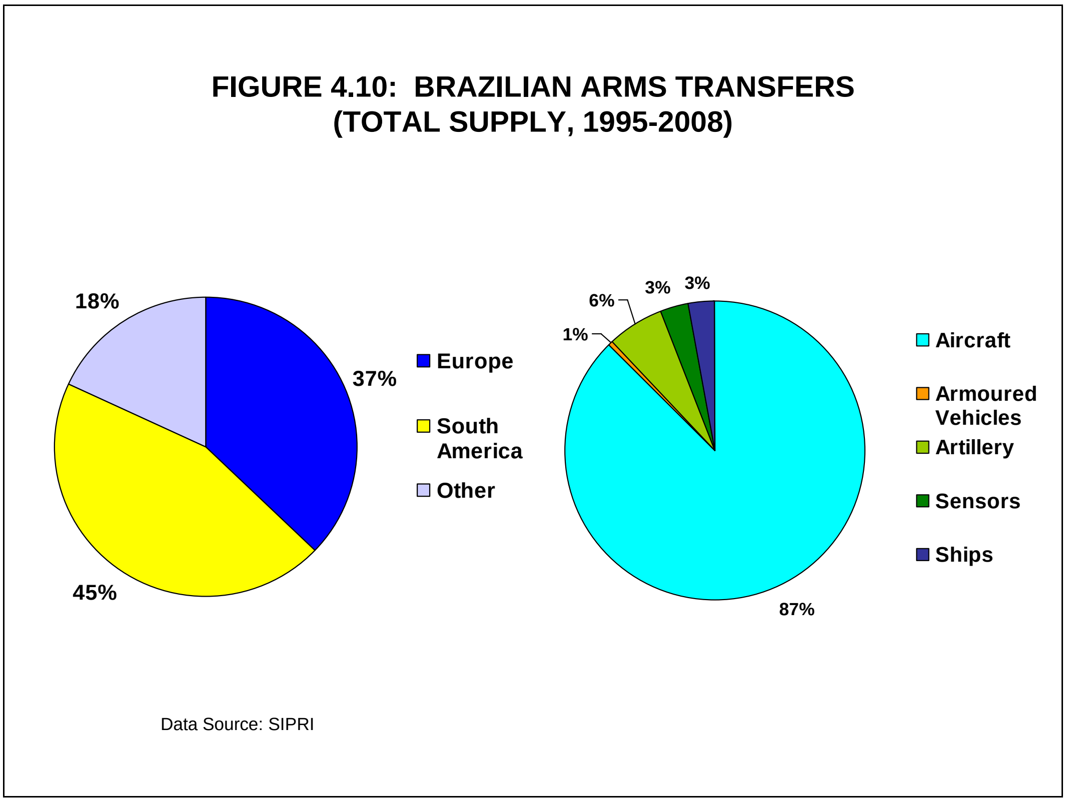
Figure 4.12 shows the total supplies of major weapons by BRICKs country, and clearly shows the dominance of Russia, which dwarfs all other countries (including major EU Member States) and is the only BRICKs country with a positive net transfer balance in armaments.

Figure 4.9 Total Supply of Major Weapons (1995-2008)



- Brazil

Figure 4.10 Brazilian Arms Transfers (Total Supply, 1995-2008)



Brazil's weapons supply is mainly focussed on other South American countries, but a sizeable minority is accounted for by trade with Europe (France and Greece), although this is fairly volatile given the low numbers. Specialisation by domain is clear, with aircraft dominating.

- Russia

Russian arms supplies cover a wide range of geographical areas, but are dominated by the BRICKs (mostly China and India, as shown earlier in the import data). Outside this, the destinations tend to be developing areas in Africa and Asia, with limited impact in Europe (a range of Member States are represented here, with no single one dominant). Similarly, the spread by domain indicates a range of expertise, although aircraft is the main component.

One thing that the analysis of total supplies over a period of time does not show is any change in patterns of trade. In most cases this is not relevant either because either there is no pattern or because the trade is rather lumpy and looking at such movements over time would be pointless. However, one trend that was mentioned at the industry stakeholder workshop is the relative importance of trade with China and India for Russia, namely the growing importance of India as a destination for Russian military supplies. This information has been extracted from the SIPRI data, and is shown in Figure 4.12, although given the fluctuation in trade over time it is difficult to discern a distinct pattern emerging.

Figure 4.11 Russian Arms Transfers (Total Supply, 1995-2008)

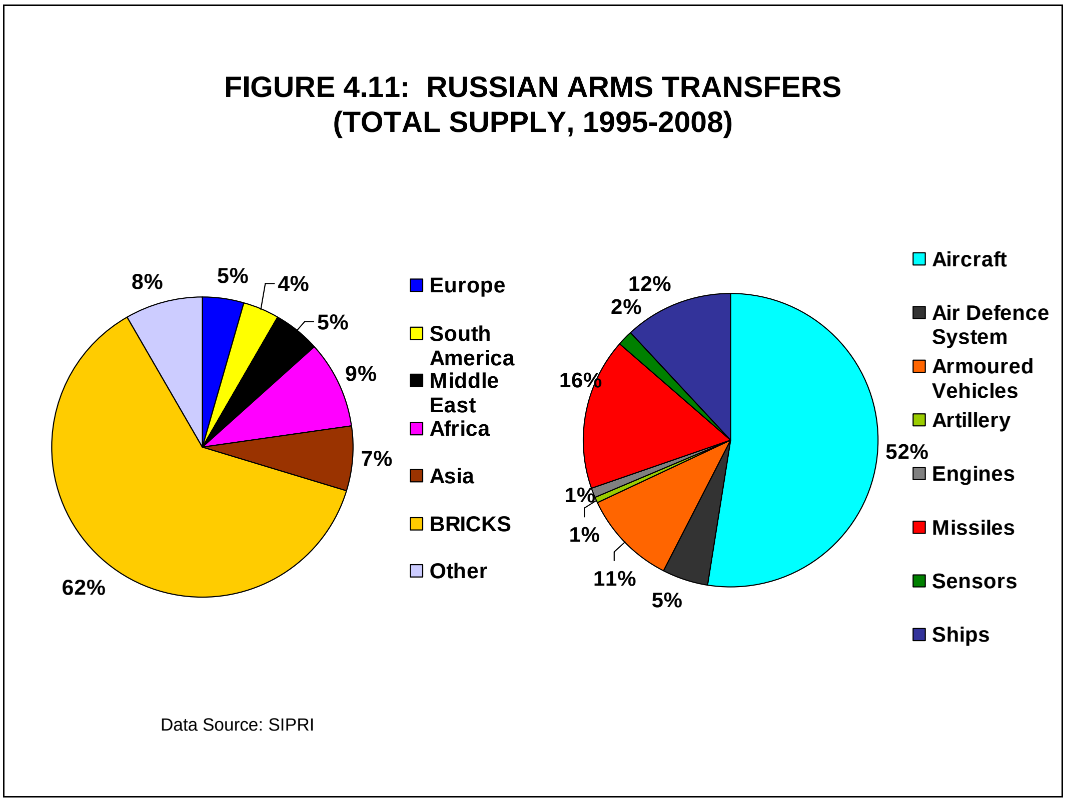
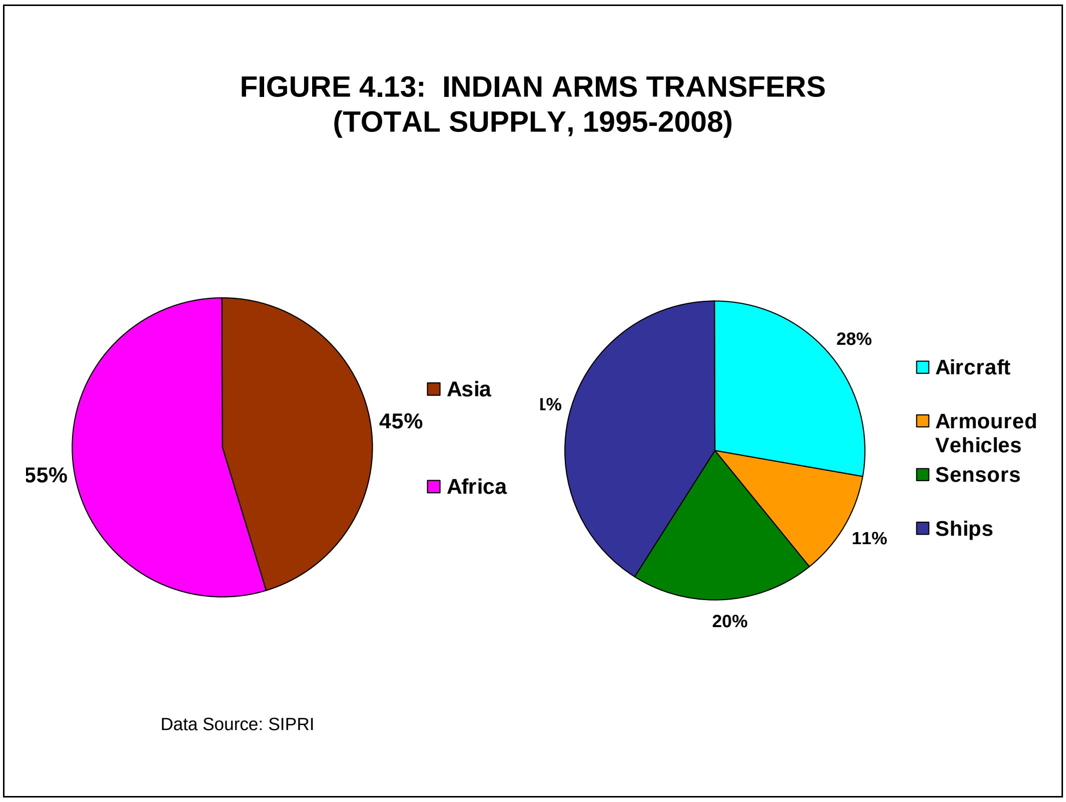


Figure 4.12 Russian Military Supplies to China and India

- India

India's supply of weapons is rather limited to other developing countries in Asia and Africa. Domain is also restricted, as expertise cannot be spread too widely, with ships and aircraft the main areas of specialisation.

Figure 4.13 Indian Arms Transfers (Total Supply, 1995-2008)



- China

China exports across a wide range of domains, mostly to neighbouring countries within Asia, although Africa and the Middle East also make up sizeable shares as well.

- South Korea

As with most other BRICKs, South Korea's transfer market is fairly limited to either neighbouring countries or other developing areas. There is some other BRICKs market penetration, however, although this is accounted for by exports to India in the early part of the data sample, with nothing since then.

Figure 4.14 Chinese Arms Transfers (Total Supply, 1995-2008)

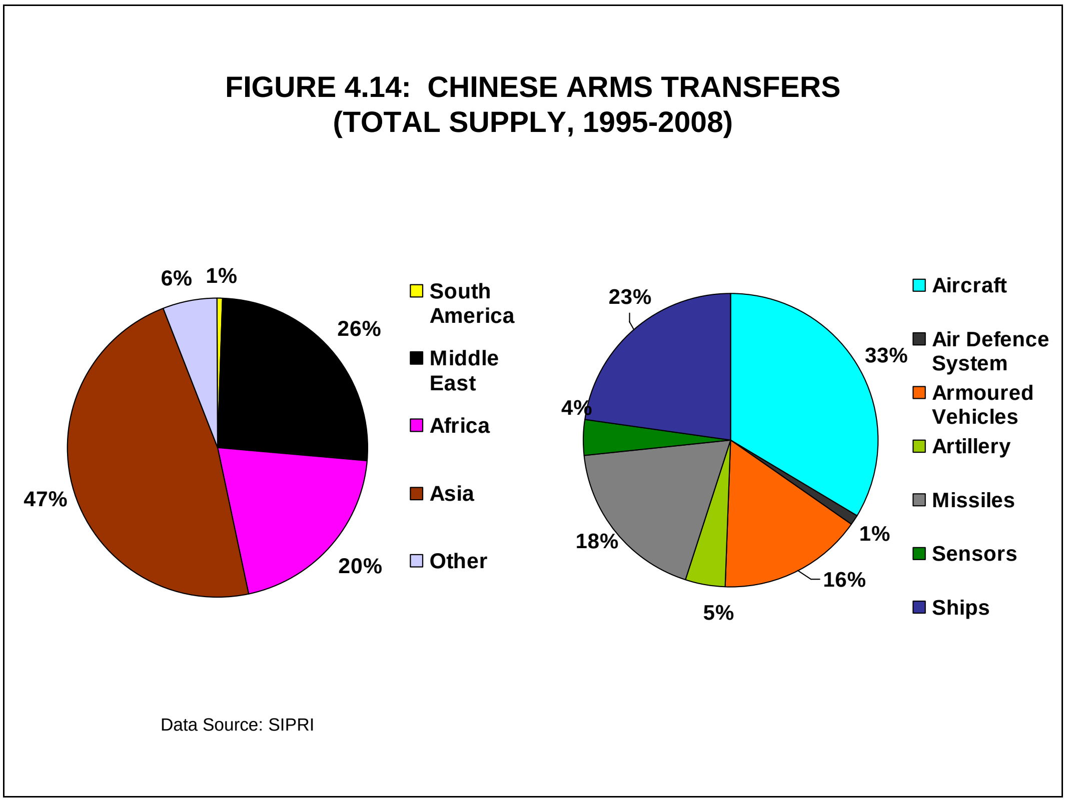
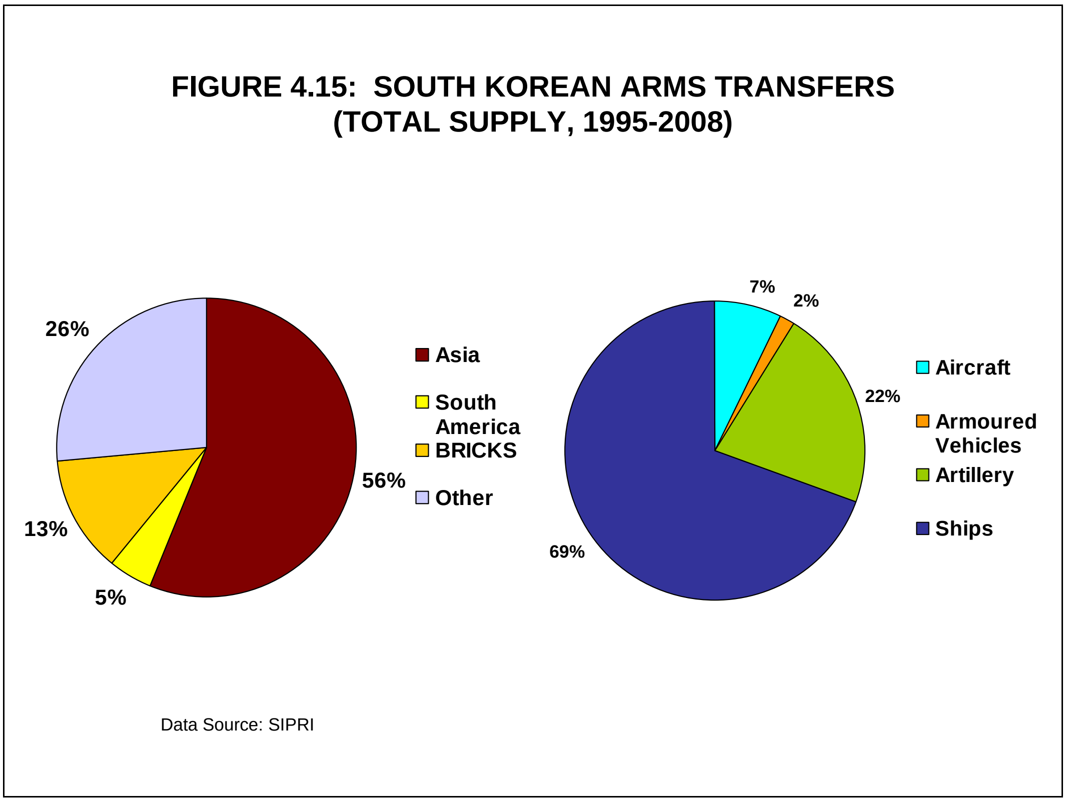


Figure 4.15 South Korean Arms Transfers (Total Supply, 1995-2008)



4.4 Conclusions

4.4.1 How large is each BRICKs country in relation to its defence market / expenditures?

Data on military expenditure show that China is the largest-spending BRICKs country by some margin, with over double the expenditure of India, Russia and South Korea, with Brazil some way behind. This volume of spending is comparable with some of the larger European economies, but is dwarfed by the US which spent almost 10 times as much as China in 2008. As a proportion of GDP, spending is again broadly similar (perhaps slightly higher) compared to major European countries, and again behind the US (although not so far). Over time, this expenditure has tended to decline over time as a % of GDP, with the exception of China which has increased slightly.

Looking at total receipt of arms transfers over the period 1995-2008 gives a different picture on the size of the BRICKs markets. Broadly speaking BRICKs total receipts are comparable to the volumes of military expenditure. The exception to the rule is Russia, where the market is extremely small in comparison both to its own size and to the other BRICKs.

4.4.2 How important are the BRICKs for global trade?

In terms of being a market for the supply of arms, European companies do best (in terms of % share) in Brazil (around three quarters), followed by South Korea and India (around a fifth market share), and then China and Russia (minimal exposure). Of course it should be borne in mind that the Brazilian market for military equipment is small in comparison to that of China, India and South Korea, so that in terms of absolute size over the 1995-2008 period, South Korea has been the largest market, followed closely by India and then Brazil. Geopolitical considerations should also be borne in mind when considering arms transfers, as Chapter 3 has shown that a myriad of allegiances and regulations exist which distort transfer movements well away from what might exist in an open market based purely on country size, specialisation and relative competitiveness.

Intra-BRICKs arms transfer is most important for India and China, where the majority of supplies come from Russia. Indeed, the data show that Russian is the only BRICKs country that has traded with the others over the period of analysis.

South Korea is the only BRICKs country dominated by North American supplies (mostly from the US), which is as much a reflection of political allegiances and regulatory control as anything else.

Detailed FDI data would be a good complement to the trade data, as it would enable us to investigate an alternative route to market access, i.e. invest in the country rather than trade more remotely with it. Unfortunately, although Eurostat data do permit a detailed bilateral analysis it is still not possible to identify the defence sector or related activities. Aggregate data show that:

- the BRICKs are predominantly net recipients of FDI,
- the US is a dominant FDI provider in most BRICKs with the exception of Russia,

- among the EU Member States, there are clear patterns / links with some of the BRICKs.

It could be assumed that this summary picture is unlikely to alter much for the defence sector, but this premise cannot be tested on currently available data.

4.4.3 How important are the BRICKs for the competitiveness of the EU defence sector?

In contrast to the size of the import volumes, exports are very small by comparison indicating a huge net transfer deficit in most BRICKs. The only exception is Russia, where supplies dominate the other BRICKs. As noted from the receipts data, Russia supplies quite heavily to the other BRICKs (mostly India and China) and also across a wide range of armament domains, making it an important competitor to EU suppliers.

Most other BRICKs supplies are mainly to a limited number of neighbouring areas or other developing countries, and in a limited range of domains (mostly Asia and Africa).

Penetration in European markets is very limited, with only Brazil and Russia showing any supply activity the 1995-2008 period. Although the share of supplies over this period was important to Brazil, the small value of its total military supplies compared with Russia means that Russian supplies to Europe were around 30 times the scale of those from Brazil, again underlying the importance of Russia as a competitor relative to other BRICKs.

5 The defence market and sector in China

Impressive economic growth in China in the recent years has been accompanied by a two-digit annual increase in its military expenditure. Increased domestic defence expenditure, indigenous defence industrial development, dual-use technologies, and foreign technology acquisition have been the main sources for the national defence and armed forces modernization featuring lower cost and higher efficiency.

Due to its huge reliance on foreign technology, primarily from Russia, China's ability to sustain military power at a distance remains limited. Nevertheless, its armed forces continue to develop and field disruptive military technologies, including those for anti-access/area-denial, as well as for nuclear, space, and cyber warfare. Such developments are changing regional military balances and this might have implications beyond the Asia-Pacific region.

Overview of the situation and assessment of competitive position

- An industry committed to filling up its gap
- A technical level beyond competitors
- Foreign technology dependence
- Very ambitious

SWOT

Strengths	Weaknesses
• Capacity to assimilate technologies • Industrial base • Cost	• Focused on internal market • Very poor in naval domain • Major dependence (Russia, Israel)
Threats	**Opportunities**
• Veto on export (product under licences, …)	• Great potential • Extension of Chinese influence

5.1 Structure

5.1.1 Distribution of production and employment within China

Total production/ by sub-sector

Indicators for total production are not available for China, either as a total or for any of the sub-sectors (land, sea and air-based activities). However, China's 2006 Defence

White Paper includes a brief note on the production side of the defence sector: the output value, added value, and gross revenue of defence-related science, technology, and industry increased by 24.3%, 20.7%, and 21.6%, respectively, in 2005. A similar analysis was not included in the 2008 Defence White Paper.

Total Budget/ by sub-sector

Data covering total government budget are available from various sources. In particular, the *China's National Defence in 2008*[73] provides good time series data for China's defence budget covering years between 1978 and 2007. The Chinese defence expenditure increased by 20.4% in 2006 and 19.3% in 2007. The most recent total (for 2008) is sourced from Military Balance at $61.1bn.

There is limited information on defence expenditure by sectors. However, the main use of the defence expenditure in 2007 is tabled in *China's National Defence in 2000* (see Table 4.1).

Table 5.1 China Defence Expenditure in fiscal year 2007 (US $m)

				Total	
	Active Forces	Reserve Forces	Militia	Amount	Percentages (%)
Personnel	15,638	137	0	15.776	33.76
Training& maintenance	14,757	199	954	15,911	34.05
Equipment	14,748	149	145	15,042	32.19
Total	45,144	485	1099	46,729	100

Notes:

1. Personnel expenses cover salaries, allowances, food, clothing and bedding, insurance, welfare benefits and pensions for officers, non-ranking cadres, enlisted men, and contracted civilians.

2.Training and maintenance expenses cover troop training, institutional education, and running and development of daily work and activities.

3.Equipment expenses cover R&D, procurement, maintenance, and transportation and storage of weaponry and equipment.

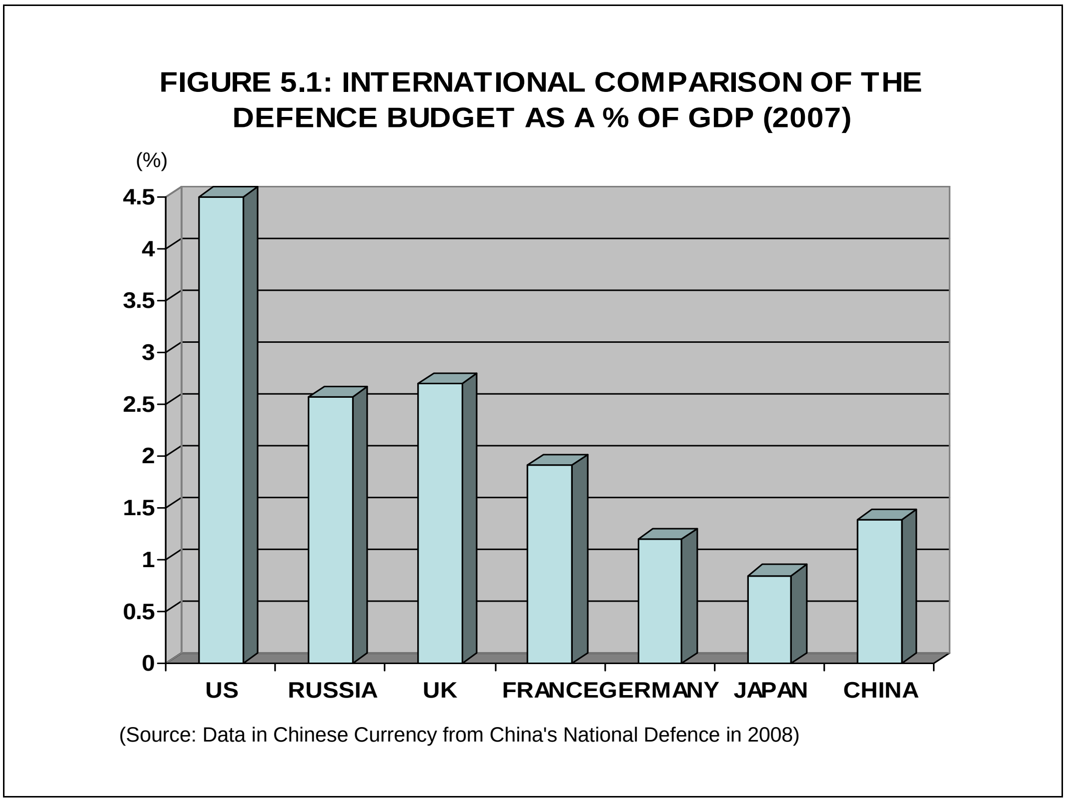
4. source: China's National Defence in 2008

China's defence expenditure mainly comprises expenses for personnel, training and maintenance, and equipment. Expenses for personnel and training and maintenance account for two thirds of the defence expenditure.

In spite of increasing defence spending in recent years, China's defence expenditure remains low compared with the world's main power (see Figure 4.1). In terms of share of defence spending in GDP, it's was 1.38% for China, 4.5% for the US and 2.7% for the UK.

[73] It is issued by China's State Council, See: http://www.gov.cn/english/official/2009-1/20/content_1210227.htm

Figure 5.1 China Defence Expenditure in fiscal year 2007 (US $m)



It is worth noting that the defence expenditure data published by China have to be treated and interpreted with cautions. For example, in *Military Power of the People's Republic of China 2009* (published by the US Department of Defence), it is stated that:

> "Estimating actual PLA military expenditures is a difficult process due to the lack of accounting transparency and China's still incomplete transition from a command economy. Moreover, China's published military budget does not include major categories of expenditure. China's legislature does not have an oversight process for the PLA budget. Although academic experts and outside analysts may disagree about the exact amount of military expenditure in China, almost all arrive at the same conclusion: Beijing significantly under-reports its military expenditures."

Total employment/armed force and by sector

The figures in the *SIPRI* database show that total employment in arms production was 2.1 million in 2003. However, no data for the years proceeding 2003 are available. Moreover, no data on employment by sector are available.

According to *The Military Balance 2009* (IISS), the size of the China's active armed force, namely People's Liberation Army (PLA) in 2008 was 2,195,000. The army numbers 1,600,000 (including 800,000 conscripts); the navy numbers 255,000, and the air force has between 300,000 and 330,000. The majority of the PLA is engaged in the ground force operation (see Table 4.2).

Table 5.2 The size of armed forces and its share in the total labour force

Sub-sectors	Size of armed forces (000s)	Share in total PLA (%)
Army	1,600	73.3%
Navy	255	11.7%
Air	300-330	15%
Total	2,185	--
Source: The Military Balance 2009 (IISS)		

5.1.2 Size distribution of companies/ extent and role of SMEs in sector

Main companies

Prior to the reforms of 1998, top five Defence and Technology Corporations and one ministry represented China's defence industrial base. In 1998, each of the five corporations split into two competing corporations in the shipbuilding, aviation, nuclear, ordnance and missile/aerospace arenas. Therefore there are two state-owned large corporations in each of the three main defence sectors we are looking at.

- Navy

China State Shipbuilding Corporation (CSSC)[74] has 60 sole proprietorship enterprises and shareholding institutions, including a batch of most powerful and some renowned shipbuilding and ship-repairing yards, research and design institutes, marine-related equipment manufacturers and trading firms in China. In 2006, the shipbuilding completion, newly obtained orders and held orders of CSSC took a global share of 7.9%, 16.9% and 11.5% respectively. They ranked the second in the world, only behind Hyundai Group of Korea (16.1%, 19.7% and 17.4% respectively). The sales profit margin of CSSC in 2006 (10.93%) was the highest among shipbuilding groups around the world. It was 6% higher than that of South Korean Hyundai Group.[75]

China Shipbuilding Industry Corporation (CSIC)[76] has 46 industrial subsidiaries and 28 R&D institutes. The group has a total asset base of USD 27.54 billion and a workforce of 140,000. In addition to having the largest shipbuilding and ship-repair facilities in China, CSIC is also the leading player in the research and design of naval and merchant ships. CSIC is also a major marine engine and equipment manufacturer in China covering a full range of marine products. The group's 28 R&D institutes employ more than 30,000 engineers. CSIC has eight state-level laboratory centres, seven state-level enterprise technological centres and 150 large-scale laboratories.

- Army

China North Industries Group Corporation (CNGC)[77] is the largest weaponry-manufacturing group in China. It researches and develops high technological weapons of

[74] See: http://www.cssc.net.cn/enlish/index.php
[75] See:http://www.reportbuyer.com/industry_manufacturing/company_reports_industry_manufacturing_/company_study_china_state_shipbuilding_corporation.html
[76] See: http://www.csic.com.cn/en/default.htm
[77] See: http://www.cngc.com.cn/english/about_us.asp

various areas such as precision striking, amphibious assaulting, long-range suppression, air defence anti-missile, information night vision, high effective destruction, etc. for the army, navy, and air force as well as the arms of other services. CNGC employs around 300,000 people and its sale revenue was around US$18bn[78].

China South Industries Group Corporation (CSGC)/China Defence Equipment Corporation[79] is a mega corporation specialises on military-civilian goods. It employs around 120,000 people and the total sales revenue is around US$18.8 bn. It has around 50 research and developing centres. As well as producing non-nuclear weapons and defence equipments, the corporation also engages in the production of automobiles, motorbikes, and optoelectronic products. In particular, it is the biggest motorcycle corporation in the world and it has 11 car factories in China.

- Air Force

Aviation Industry of China (AVIC), which had 560,000 employees, was split into **China Aviation Industry Corporation I (AVIC I)**[80] **and II (AVIC I)** following the reforms in 1998. However, the two corporations were merged again in November 2008 to form **Aviation Industry Corporation of China**. The newly formed AVIC has 200 industrial subsidiaries and a total asset of US$8bn. The planned growth rate in over 2009-2018 is 20% pa[81]. Before the merge, AVIC I alone provided 90% aviation weaponry systems to People's Liberation Army (PLA), and had produced over 15,000 aircraft in 20 projects, 50,000 aero-engine in 20 projects, and more than 10,000 missiles.

There is limited information on the size distribution of companies and the extent and role of SMEs in the sector. However, analysis by the *Global Security* (http://www.globalsecurity.org/military/world/china/industry.htm) provides valuable insights into the structural features within the Chinese defence industry: the main producers in the aviation industry tend to be large- and medium sized state-owned enterprises and the role of SMEs is small; producers in the shipbuilding industries tend to be large-size producers, especially due to the shipyard expansion in recent years; the size distribution of companies in the armament industry is unclear due to the large number of enterprises that are operating in the industry and belong to the CNIGC and CSIGC.

5.1.3 Location and nature of key industry clusters

Companies that are industrial subsidiaries of these mega-state-owned corporations scatter around the countries. Nevertheless, there are certain degrees of some geographical industry clustering within the shipbuilding industry. Enterprises that belong to the CSSC are located in East China, South China and Jiangxi Province, whereas those belong to the CSIC are located in Northern China.

[78] See: http://www.cngc.com.cn/Intro1.aspx

[79] In the its English Website under the company name of China South (http://www.chinasouth.com.cn/English/index/about.asp?hang=3), the company's involvement in the production of military goods is not mentioned; however, the second version of the company website under the company name of China Defence Equipment Corporation (http://www.csgc.com.cn/index/about.asp?hang=3, in Chinese) explicitly describes the company's main role as a defence equipment supplier.

[80] See: http://www.avic1.com.cn/English/EnglishIndex.asp

[81] See: http://news.xinhuanet.com/newscenter/2008-11/08/content_10327179.htm

5.1.4 Trade

Total exports

The figures in the SIPRI database show that over the years from 1995 to 2008 arms exports from China have been on a very small scale, amounting to a total value of $6.7bn (in constant 1990 dollars), less than one-fourth of the total value of arms imports to China.

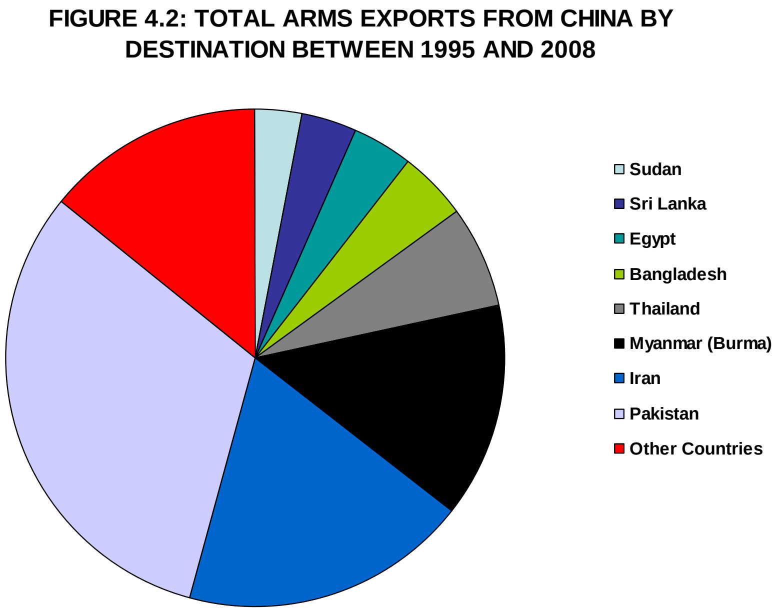
As shown in Figure 4.2, Iran and Pakistan account for around half of total arm exports from China over 1995 and 2008. Other main destination countries include some main South Asian countries (Burma, Thailand, Sri Lanka and Bangladesh) and African countries (Egypt and Sudan).

The main exported products are the JF-17 fighters (with dedicated missiles) and K8 training aircrafts for Pakistan which also acquired T98 and T80 Main Battle Tank and T63 light tanks from China.
T63 light tanks are largely exported outside Pakistan (e.g. Thailand, Sudan) as well as missiles.

In naval domain export includes

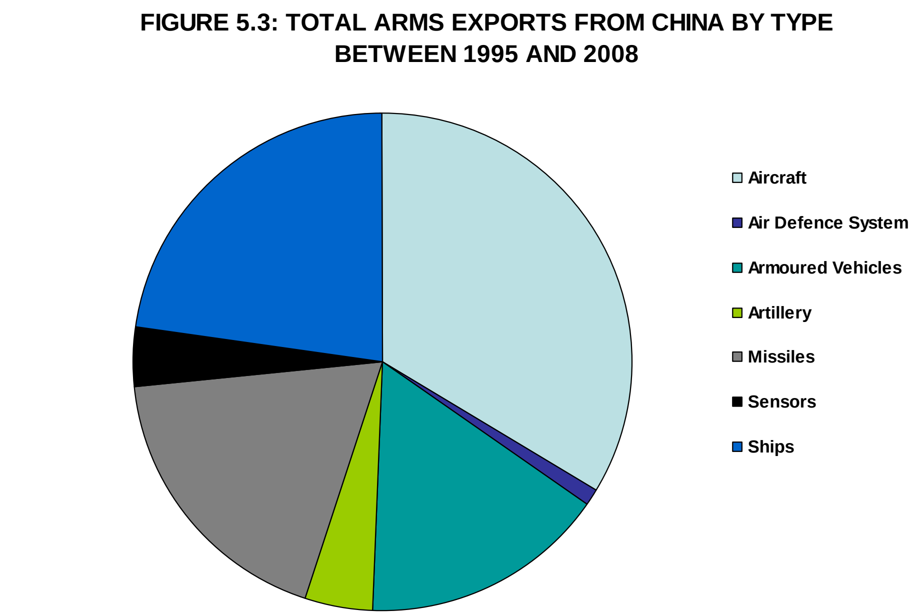
- small vessels (patrol, fast attack) to various customers (Cambodia, Iran, Myanmar, Sierra Leone and Thailand);
- plus some larger ship including frigates to Thailand and Pakistan, one landing ship Yuhai/Type-074 to Sri Lanka and 23 submarine to North Korea (of which 16 assembled in North Korea).

Figure 5.2 Total arms exports from China by destination (1995-2008)



(Source: data from SIPRI, see: http://www.sipri.org/contents/armstrad/at_db.html, analysed by CE)

Figure 5.3 Total arms exports from China by type (1995-2008)



(Source: data from SIPRI, see: http://www.sipri.org/contents/armstrad/at_db.html, analysed by CE)

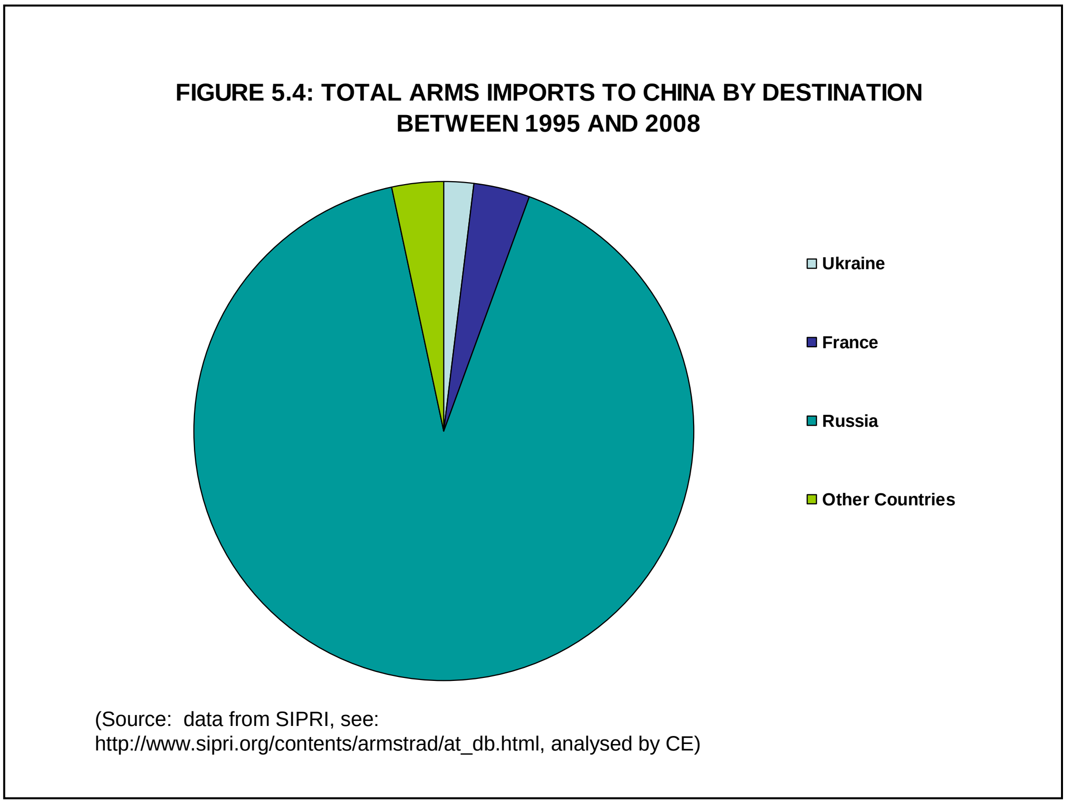
The figures in the SIPRI database show that the main types of arm exports from China for the years between 1995 and 2008 have been Aircraft, Missiles, Armoured Vehicles and Ships.

Total imports

As shown in Figure 5.4, over the years from 1995 to 2008 Russia has consistently been by far the principal exporter of arms to China, accounting in total for more than 90% of such imports by value. France has come a distant second with 3.8%.

The data showing imports from France (and other European countries) into China, could be seen to contravene the arms embargo currently in place across the EU. However, the statement that “there are no EU defence exports to China” is incorrect. All sources agree that there have been some defence exports to China. The reason is the nature of the EU arms embargo on China, which consists of only one sentence in a European Council Declaration, including its weak legal status; its lack of details and specifics, in particular its lack of reference to defined equipment to be banned, since neither the CFSP nor the EU Common Military List did even exist at the time of the declaration (as explained in Chapter 3 of this study); and the expansion of EU Member States since 1989.

Figure 5.4 Total arms imports from China by destination (1995-2008)

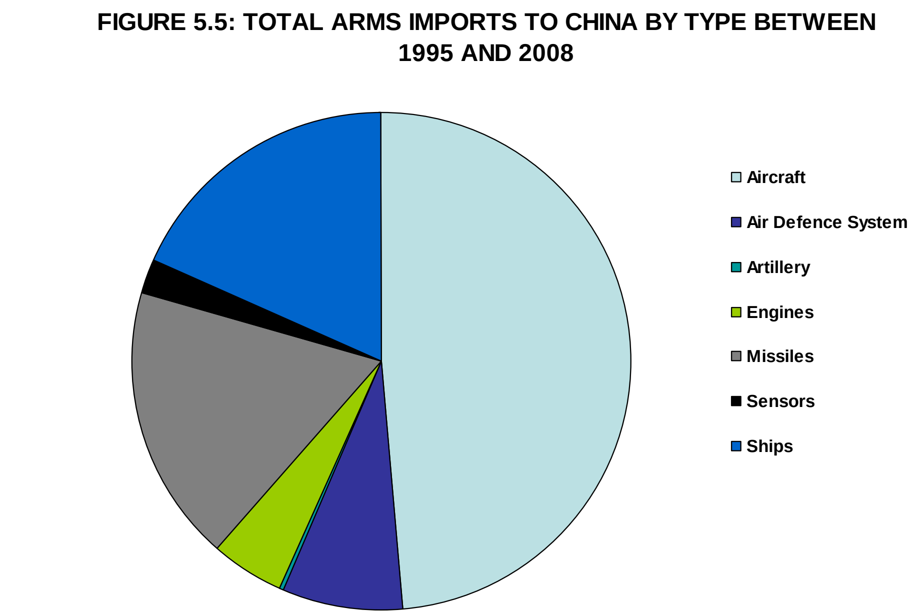


If most of the military equipments imported by China are coming from Russia and Ukraine, there is also a long-term cooperation between France and China in the helicopter segment.

The beginning was a license for Super Frelon in the sixties (a heavy naval helicopter) followed in the late seventies by a licence for the civilian helicopter Dauphin; China also derived later military version from this platform for its own needs.
Now the cooperation is focused on the EC 120 light civil helicopter (in production) and the co-development of a medium transport helicopter, the EC 175.

The figures in the SIPRI database show that the main types of arm imports to China for the years between 1995 and 2008 have been Aircraft, Missiles and Ships, accounting for around 50%, 18% and 18% of the total imports over these years respectively.

Figure 5.5 Total arms imports to China by type (1995-2008)



(Source: data from SIPRI, see: http://www.sipri.org/contents/armstrad/at_db.html, analysed by CE)

5.1.5 Market Access

Principal EU and non-EU producers by sub-sector/country

China has relied heavily on foreign technologies to build up fill the gaps in critical technical capacities. As analysed in the *Military Power of the People's Republic of China 2009*, the areas of foreign technologies that China is in great need of are:

> "guidance and control systems, turbine engine technology, and enabling technologies such as precision machine tools, advanced diagnostic and forensic equipment, applications and processes essential to rapid prototyping, and computer-assisted design/manufacturing (CAD/CAM)", and "China often pursues these foreign technologies for the purpose of reverse engineering."

In the recent years, Russia has been China's primary weapons and material provider, selling China advanced fighter aircraft, missile systems, submarines and destroyers.

Despite the embargo on lethal military sales to China imposed by the EU, a small number of EU countries have in rare occasions provided military products or components to China.

Germany between 1998 and 2008 delivered an order of Diesel engines (AV) to China. These were used for Type-98 (ZTZ-98) and Type-99 (ZTZ-99) tanks produced in China.

UK between 1988 and 2006 delivered 140 Turbofans to China and these were used for JH-7 combat aircraft produced in China. Between 1999 and 2001, China received 6-8 AEW aircraft radars from the UK.

Foreign direct investment

According to the Chinese Statistical Yearbook 2008, the contracted value of Foreign Direct Investment (FDI) received by China has increased steadily from $41.2bn in 1999 to $193.7bn in 2006. While data for contracted value is not available for 2007, for utilised value it is available at $74.7bn (an 18.6% increase from 2006).

There is limited data for FDI in China's defence sector. Although the data shown in Table 5.3 show that a substantial amount of FDI received by China is within the manufacturing sector, it is not clear how much FDI the defence sector has received, given the strategic nature of the industry. There are no major FDI projects in China's defence industry at present. Opportunities for foreign firms to be involved in the domestic industry may lie in collaboration rather than direct investment and ownership.

Table 5.3 FDI to China by sector (2007)

Sector	Utilised FDI (US $bn)	Share in total (%)
Agriculture, Forestry, Animal Husbandry and Fishery	0.92407	1.24
Mining	0.48944	0.65
Manufacturing	40.86482	54.66
Production and Supply of Electricity, Gas and Water	1.07255	1.43
Construction	0.43424	0.58
Transport, Storage and Post	2.00676	2.68
Information Transmission, Computer Services and Software	1.48524	1.99
Wholesale and Retail Trades	2.67652	3.58
Hotels and Catering Services	1.04165	1.39
Financial Intermediation	0.25729	0.34
Real Estate	17.08873	22.86
Leasing and Business Services	4.01881	5.38
Scientific Research, Technical Service and	0.91668	1.23
Geologic Prospecting	0	0.00
Management of Water Conservancy, Environment and	0.27283	0.36
Public Facilities	0	0.00

Sector	Utilised FDI (US $bn)	Share in total (%)
Services to Households and Other Services	0.7227	0.97
Education	0.03246	0.04
Health, Social Security and Social Welfare	0.01157	0.02
Culture, Sports and Entertainment	0.45109	0.60
Public Management and Social Organizations	0.00044	0.00
National Organizations	0	0.00
Total	74.76789	--
Source: The Chinese Statistical Yearbook 2008		

5.2 Drivers

5.2.1 Regulatory & framework conditions

Scope: notable political, industrial and geostrategic situations that have a notable effect on defence industry and its future potential development or the capability of the country to develop a competitive offer.

The geostrategic overview:
China is characterized by a complex geostrategic situation with borders with Russia, India and Pakistan and a key position within the maritime axis between the Red Sea, the China Sea and the Straits of Malacca and Formose (maritime transit to Japan and Korea).
Its large population and its vast territory raise the domestic problem of the cohesion of large masses of this nation (Tibet ...).

Border conflicts persist with Russia and India as well as with Taiwan regarding the independence of the island. Its relations with the countries bordering the South China Sea are also strained because of various land claims concerning many islands (Japan for the Senkaku Islands, Vietnam, Philippines, Malaysia, Brunei, Indonesia for the three archipelagos of Pratas of Paracel and of Spratley). Chinese claims aim to ensure control of access to the China Sea and the Indian Ocean without a permanent naval presence.

China also seeks to provide a counterweight to the strong US military presence in the area.

Today, China aims at transforming its «quantitative army» into a « qualitative army » that induces a shift to an « info-centric » armed forces format and a coordinated development of its economy and its defence industry.

Yet the Chinese industry is still relatively dependent on licensed and foreign technology (preferably Russian). Nevertheless, the Chinese industry has developed specific products and this trend is expected to increase to move towards greater autonomy.

Overview

In March 1998, the Chinese government initiated a series of structural reforms to the defence industry and market[82]. These changes have established a new regulatory framework in which military and civilian related products are researched, developed, produced and procured by the army. The governance structure of the Chinese defence sector has also undergone similar reforms in order to revise its responsibilities, objectives and consequent policies.

The two objectives of these organisational changes were to reform the management and operation of China's defence industries to improve efficiency and competition and, secondly, to create a more rational and formal military procurement system[83].

At the organisational level within government, the principle development emerging from the defence reforms was restructuring of the Commission of Science, Technology, and Industry for National Defence (COSTIND) under the control of the State Council [Chinese Parliament] and the creation of the General Armaments Department (GAD) of the People's Liberation Army (PLA) under the Central Military Commission.

Following these reforms, defence companies involved in the production of military goods are treated as civilian entities under the authority of the State Council and thus its subordinate body, COSTIND. Companies are then contracted by the GAD of the PLA to produce military items for the security and defence of the nation.

Procurement

The General Armaments Department of the PLA has responsibilities for military procurement and other functions of the General Staff and General Logistics Departments involved in weapons procurement, previously part of COSTIND. The GAD and PLA are therefore responsible for the lifecycle management of the military equipment, including weapons testing, evaluation and training. The drawing up of specifications for new equipment and eventual procurement are therefore centralised around one organisation to meet the demand of the military, avoiding potential conflict with other government departments regarding decision making.

To meet the needs of its weaponry and equipment development, China is also looking to further reform its management system of defence related science, technology and industry, specifically with regards to investment for arms companies. China's White Paper[84] entitled 'China's National Defence in 2008' states that:

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82 Coverage of the Chinese defence market reforms and the new role for COSTIND are well documented in: Medeiros, E. S.(2004): Analyzing China's Defence Industries and the Implications for Chinese Military Modernization, Testimony presented to the U.S.-China Economic and Security Review Commission on February 6, 2004, also see summary of COSTIND roles at: http://www.nti.org/db/china/costind.htm

83 See: T. M. Cheung (2007): The Remaking of the Chinese Defence Industry and the Rise of the Dual-Use Economy, by Dr. Tai Ming Cheung at the Institute on Global Conflict and Cooperation, University of California, San Diego, July 13 2007

84 PRC (2009): China's National Defense in 2008 – White Paper, published by the Information Office of the State Council of the People's Republic of China, Beijing January 20, 2009, available at: http://www.china.org.cn/e-white/20041227/IV.htm

> *"In 2007, the State Council approved **Some Opinions on Deepening the Reform of the Investment System of Science, Technology and Industry for National Defense**, which explicitly proposes a new investment system featuring effective government regulation and control, participation of social capital, … and possible military-civilian interaction…. [and is] steadily promoting the transformation of defense industry enterprises into joint-stock enterprises… encouraging restructuring and the integration… of enterprises, universities and research institutes".*

Such reforms suggest that while PLA procurement expenditure may be important to the future of the Chinese defence industry, capital received from private sector investors, including international investors, mainly from Russia, and dual-use production are likely to be significant in the future.

The White Paper also highlights progress made in the licensing of production to the non-public sector to encourage competition for research and production projects, while maintaining state control[85]. To aid non-public sector involvement in this more open procurement system, the PLA has launched a procurement website[86] to promote transparency[87].

5.2.2 Defence & industrial policy

Export Controls

Until 2002, conventional export controls were based on the Regulations on Export Control of Military Items[88] established in 1998. These regulations were the first to give legal effect to China's conventional arms export principles, including the creation of a control list of equipment and permitted only State council designated entities to conduct military exports. In 2002, these regulations were revised to include details of the organisations involved with export controls and expanded missile export control regulations.

Producers and exporters of military equipment must be licensed with the Chinese authorities, and seek approval before being issued with an export license. China has recently made infrastructural improvements to the licensing system to improve its efficiency, transparency and enforcement to include a new electronic licensing platform and commodity classification system[89].

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85 PRC (2008): Regulations on the Licensing Administration of Weaponry and Equipment Research and Production, March 2008

86 http://www.plap.cn/welcome.jsp

87 China Daily (2005): Military Opens Material Procurement Website, 10/22/2005

88 See Decree of the State Council and the Central Military Commission of the People's Republic of China No. 234 and Decree No.366 of the State Council and the Central Military Commission of the People's Republic of China

89 CITS (2005):Export Controls in the People's Republic of China 2005, by the Center for International Trade and Security, University of Georgia, February 2005

Regarding China's stated policy on where to export conventional arms, it strictly adheres to three export principles, consistent with its overall defence policy published in its 2008 White Paper[90]. These principles are[91]:

- the weapons exported must be meant for legitimate self-defence;
- the weapons must contribute to regional stability; and
- the weapons must not be intended for interference in another country's internal affairs.

The objective of Chinese arms exports is therefore to help the recipient state create a sufficient defence capability without impairing peace, safety or stability either in a particular region or globally[92]. The defence white paper also reiterates China' participation in the United Nations register of conventional arms transfers and that it upholds the principles contained in the Charter of the United Nations. However, several PRC entities continue to provide arms to customers in unstable regions such as Zimbabwe Iran and Sudan, suggesting China's expanding international interests. Such sales are thought to be 'disruptive to regional and global stability'[93].

International Cooperation

In March 1998, the Chinese government initiated a series of structural reforms to the defence industry and market. These changes have established a new regulatory framework in which military and civilian related products are researched, developed, produced and procured by the army. The governance structure of the Chinese defence sector has also undergone similar reforms in order to revise its responsibilities, objectives and consequent policies.

At the organisational level within government, the principle development emerging from the defence reforms was restructuring of the Commission of Science, Technology, and Industry for National Defence (COSTIND) under the control of the State Council [Chinese Parliament] and the creation of the General Armaments Department (GAD) of the People's Liberation Army (PLA) under the Central Military Commission.

Within the revised framework, COSTIND is responsible for industrial policy, industrial development, research and technology, and restructuring of the sector to supply the market with the military equipment it demands. COSTIND's five major duties include:

1. Research and drafts guidelines, policies, laws and regulations related to science, technology and industry for national defence and the development of military civilian production conversion; formulates guidelines for the management of science, technology and industry for national defence.

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[90] PRC (2009): China's National Defense in 2008 – White Paper, published January 20th 2009 by the Information Office of the State Council of the People's Republic of China , available at: http://www.china.org.cn/government/whitepaper/node_7060059.htm

[91] Martin, J. (2007): China's Conventional Arms and Missile Export Controls, material provided by the Center for Non-proliferation Studies (CNS) for NTI, available at: http://www.nti.org/db/china/conexcon.htm

[92] SIPRI (2009): China –Arms Export Control, article available at: http://www.sipri.org/contents/expcon/china_conventional.htm

[93] see: Military power of the People's Republic of China.

2. Organises the research and implementation of structural reforms in national defence science, technology and industry.
3. Researches and formulates plans for the development of science, technology an industry for national defence.
4. Organises and manages quality, safety, measurement, standards, statistics, and records in the area of national defence science, technology and industry, as well as related major research and development efforts and the promotion of those efforts.
5. Undertakes the organisation and management of all international cooperation and exchange, introduction of foreign technologies, and foreign trade that involves national defence science, technology and industry; overseas matters relating to bilateral and multilateral international cooperation.

In partial fulfilment of these objectives, COSTIND plays an important role in encouraging the establishment of co-production, technology transfer and offset activities with international suppliers, specifically Russian and European in origin in order to acquire technological know-how and expertise, a stated goal of Chinese policy and acknowledged by many commentators. Successes include the earth resources satellite project with Brazil and a cooperation agreement with the EU in 2003 to foster awareness, training and industrial partnerships between Europe and China in relation to the Galileo global positioning satellite system. Despite this desire for co-production and cooperation programmes, China does not have an established offset policy making it difficult to assess future developments.

5.2.3 Defence programmes

Recent defence programmes include:

- Short-Range Ballistic Missiles (SRBMs) (< 1,000 km)
- Medium-Range Ballistic Missiles (MRBMs) (1,000-3,000 km)
- Land-Attack Cruise Missiles (LACMs)
- Air-to-Surface Missiles (ASMs)
- Anti-Ship Cruise Missiles (ASCMs)
- Anti-Radiation Weapons
- Artillery-Delivered High Precision Munitions

China successfully performed its first space walk in September 2008 from the Shenzhou-VII, which was preceded by the October 2007 launch of its first lunar orbiter, the Chang'e-1. China's goals are to have a manned space station and to conduct an unmanned lunar landing and return mission by 2020.

China's National Medium- and Long-Term Program for Science and Technology Development (2006-2020), issued by the State Council in February 2006, seeks to transform China into an "innovation-oriented society by 2020." The plan defines China's science and technology focus in terms of "basic research," "leading-edge technologies," "key fields and priority subjects," and "major special items" – all of which have military applications.

China is planning eight satellites in the Huanjing program that are capable of visible, infrared, multi-spectral, and synthetic aperture radar imaging. In the next decade, as Beijing fields a more robust constellation of reconnaissance satellites, it probably will employ commercial satellite imagery to supplement existing coverage.

5.2.4 Production processes

There is limited information on the production processes in China's defence sector, especially given that the production of military goods is only part of firms' production activities.

5.2.5 Intra-industry relations

The intra-industry relations are most likely to be governed by the main objectives of the Government's structural reform. The main objectives of the reforms in 1998 were to improve efficiency and competition in the sector. Companies involved in the defence sector are contracted by the GAD of the PLA to produce military items for the security and defence of the nation. Therefore GAD's responsibility for military procurement is to ensure that the supply meets the demand of the military.

What is more, development of innovative dual-use technology and an industrial base that serves both military and civilian needs is among the highest priorities of China's leadership.

According to the Military *Power of the People's Republic of China 2009*:

> "Progress within individual defence sectors appears to be linked to the relative integration of each – through China's civilian economy – into the global production and R&D chain."

5.2.6 Organisation

Firms that involved in the defence sector are mostly large- and medium-sized ones producing both military and civilian goods. These firms tend to belong to state-owned corporations. However, there is limited information on the organisation structure of these firms.

5.3 Inputs

5.3.1 Skill profile of employment

There is limited information on the skill profile of employment. However, China has benefited from the transfer of skills from joint-ventures, increased partnerships with academic institutions for recruiting and providing technical training for existing staff and return of the overseas-educated scientists, engineers and managers (*China's National Defence in 2008*).

5.3.2 Capital/Intermediate goods and services

According to *Military Power of the People's Republic of China 2009* (published by the Department of Defence of the United States America), increased domestic investment and foreign technology acquisition have accelerated the modernisation in the Chinese defence sector. Up until now, China has relied on foreign advanced weapons/technology acquisition primarily from Russia to fill the near-term capacity gap. However, a potential lift of the current EU arms embargo on China would allow China to access a wide range of weapons and technologies that are not available from the traditional Russian suppliers.

There is limited information on the amount and types of domestic and foreign capital that have been devoted to the defence sector in China.

5.3.3 Knowledge & technology

Two important resources for the modernisation of PLA are dual-use technologies and foreign technology acquisition. China has constantly replied on the acquisition of foreign weapons and technologies (especially from Russia) to fill its capacity gaps. Moreover, China has benefited from the Foreign Direct Investment and Joint-Ventures in the civilian sector in terms of management know-how, technical expertise and moreover the transfer of such technologies to the military production.

5.4 Performance

5.4.1 Recent trends

Output

According to the analysis in *Military Power of the People's Republic of China 2009*, published by the US Department of Defence, China's military production capacities have improved following the reforms in 1998. Augmented by the integration between defence and non-defence sectors and the direct acquisition of foreign weapons and technology, these reforms have enabled China to develop and produce advanced weapon systems such as missiles, fighter aircraft, and warships.

However, there has been uneven progress across China's defence industry. Production trends and resource allocation appear to favour missile and space system. The report also provides qualitative analysis of the production capacities by sectors.

- Navy

China has surpassed Japan in 2008 to become the 2nd largest shipbuilder in the world. China's shipbuilding capacity and capability have been improved by shipyard expansion and modernization. China has already demonstrated an ability to surge submarine and amphibious production but it continues to rely on foreign suppliers for some propulsion units and, to a lesser degree, fire control systems, cruise missiles, ship-to-air missiles, torpedo systems, sensors, and other advanced electronics.

- Army

China’s ground force modernization includes production of new tanks, armoured personnel carriers, and artillery pieces.

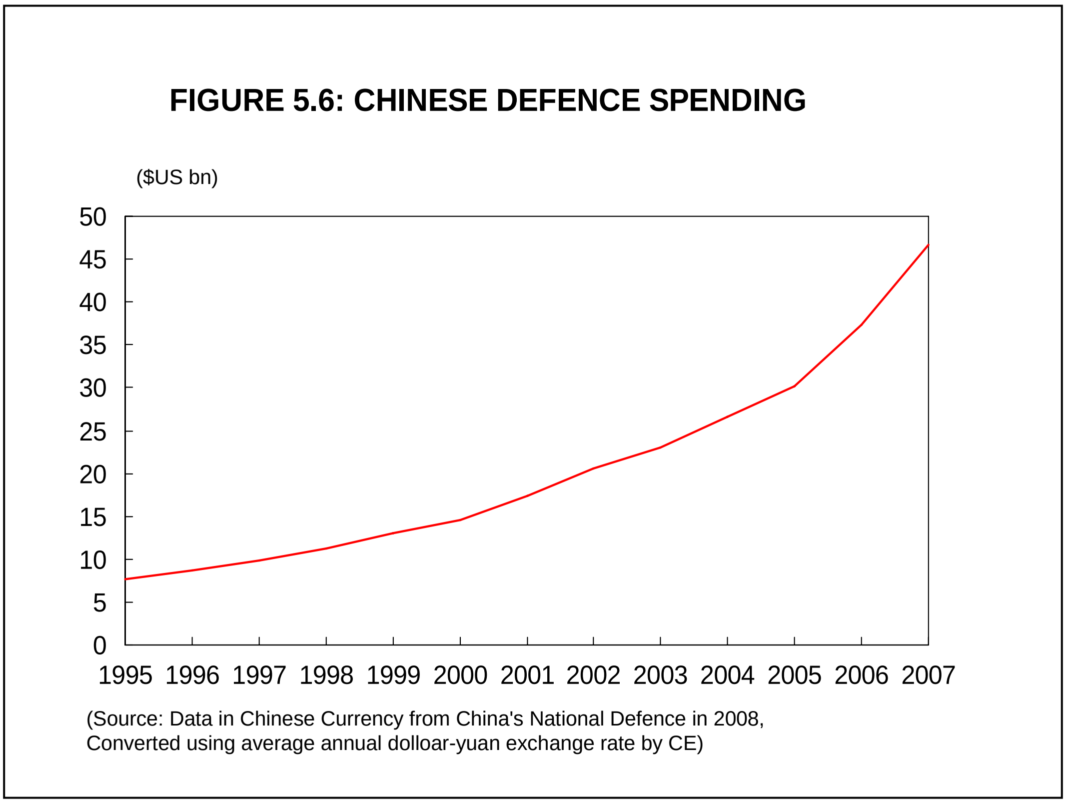
- Air force

China’s commercial and military aviation industries have developed and produced indigenous aircraft which include improved versions of older aircraft and modern fourth generation fighters.

Investment/Defence spending

Defence spending is one of the most important resources for the modernisation of the PLA. Guided by the principle that defence expenditure should grow in line with the demands of national defence and economic development, the Chinese government decides on the size of defence expenditure. China continued to increase it defence expenditure steadily on the basis of its rapid economic growth. During this period, the average annual increase of defence was 16.4%.

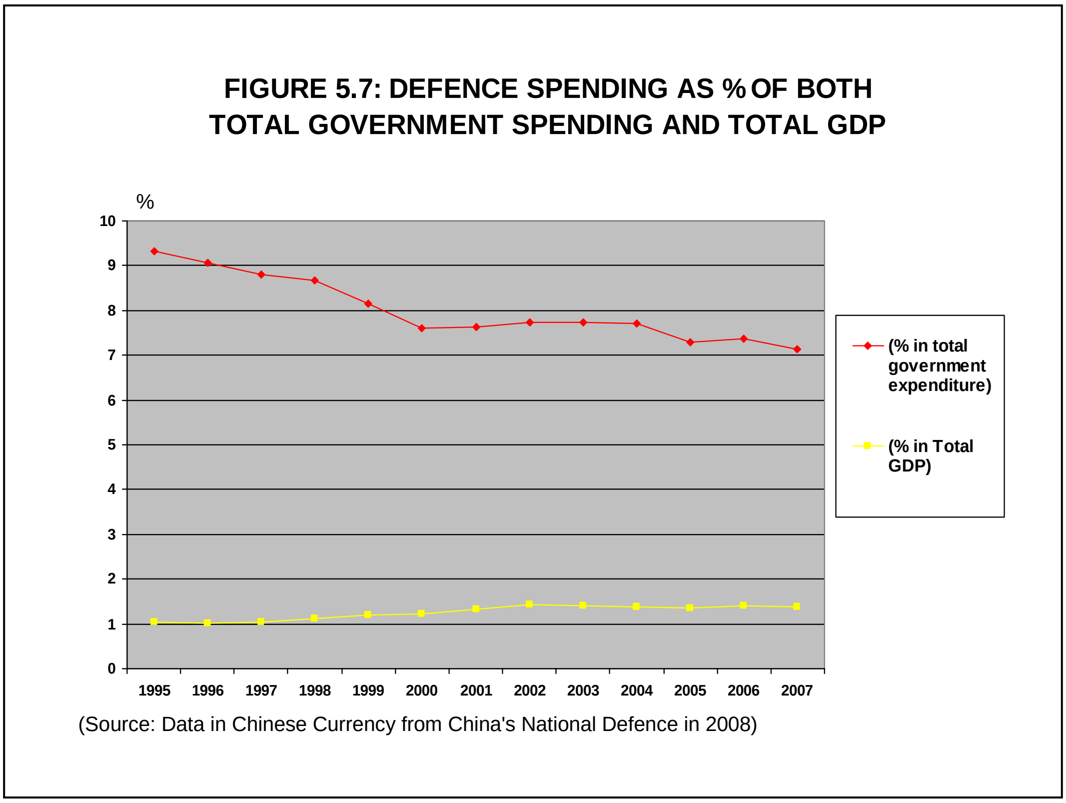
Figure 5.6 Chinese defence spending



The declining trend of the share of China’s defence expenditure in its total government expenditure indicates that the government expenditure increased faster that the defence spending during the same period.

While the growth in the defence expenditure was faster than the economic growth, a steady increasing trend in the share of defence expenditure in GDP was observed over 1995-2007. In particular, the share rose from around 1% in 1995 to around 1.33% in 2007. Data from Military Balance show that the share was 1.44% in 2008.

Figure 5.7 Defence spending as a % of both total government spending and total GDP



Employment/ Size of armed forces

The figures in the *SIPRI* database show that total employment in arms production decreased steadily from 3.5 million to 2.1 million over 1995-2003. However, no data for years proceeding 2003 are available.

According to *WMEAT*[94], the size of China's armed force, namely the People's Liberation Army (PLA), decreased steadily from 2.93 million in 1995 to 2.07 million in 2005. The share of the PLA in the total labour force also decreased from 0.43% to 0.27% over the same period (see Table 5.4).

[94] World Military Expenditures and Arms Transfers 2005, see: http://www.state.gov/t/vci/rls/rpt/wmeat/2005/index.htm

Figure 5.8 Employment in arms production

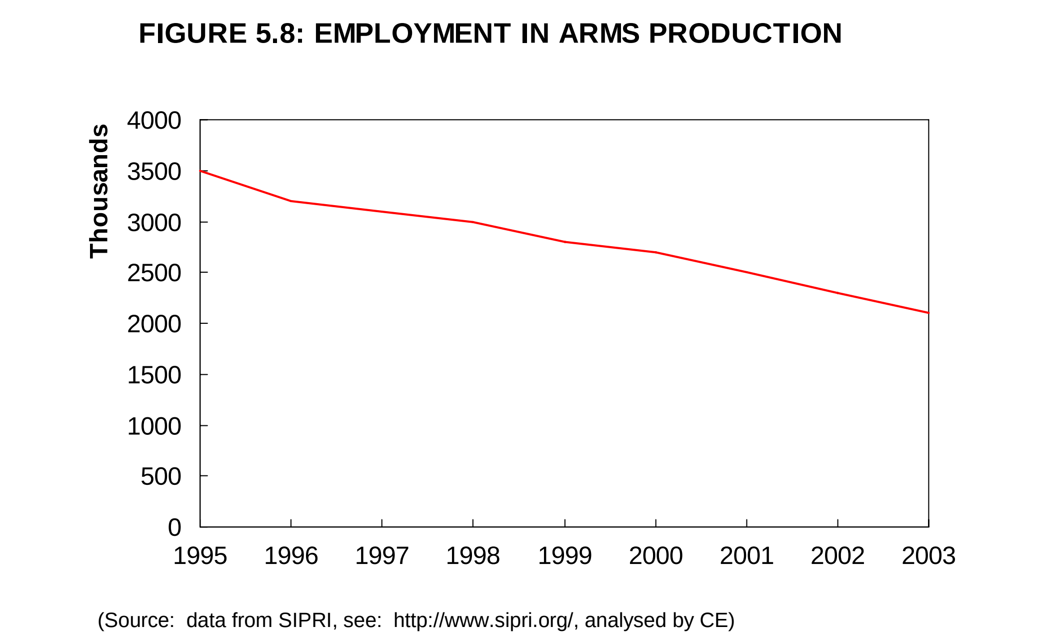


Table 5.4 Armed forces and their share in the total labour force

Year	Size of armed forces (000s)	Share in Total Labour Force (%)
1995	2930	0.43
1996	2650	0.38
1997	2600	0.37
1998	2600	0.36
1999	2400	0.33
2000	2300	0.31
2001	2250	0.30
2002	2200	0.29
2003	2150	0.28
2004	2100	0.27
2005	2070	0.27

Source: World Military Expenditures and Arms Transfers (WMEAT) 2005, see http://www.state.gov/t/vci/rls/rpt/wmeat/2005/index.htm

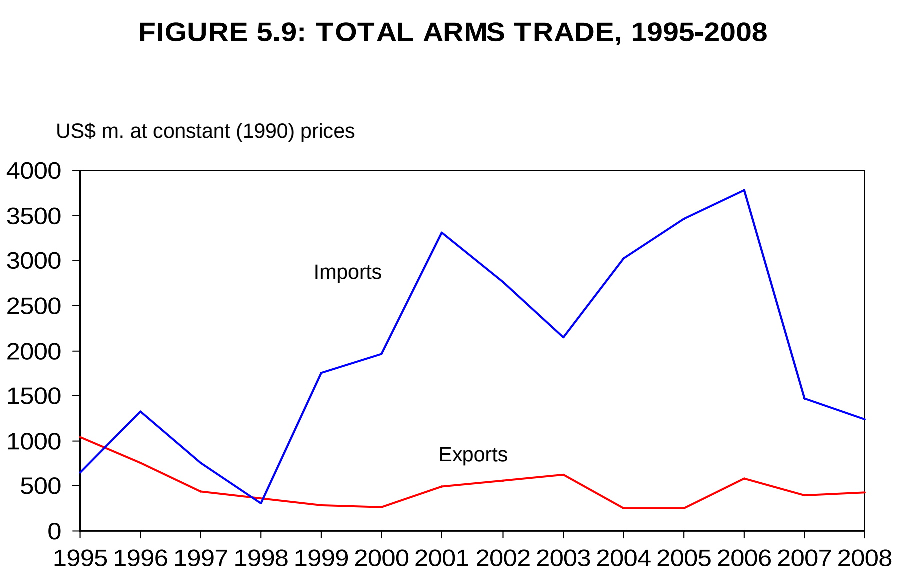
Productivity/ Profitability

There is limited information on the productivity of the sector due to the lack of production and complete employment information.

Trade

As shown in Figure 5.9, arm exports from China are at a much smaller scale compared with its arm imports.

Figure 5.9 Total arms trade, 1995-2008



(Source: data from SIPRI,
see: http://www.sipri.org/contents/armstrad/at_db.html, analysed by CE)

China conducts arm sales and training both to enhance foreign relationships and to generate revenue to support its domestic defence industry. Chinese companies sell primarily to developing countries where China's low-cost weapons sales serve both commercial and strategic purposes. However, as China's arms have become less competitive compared to more sophisticated Western and Russian arms suppliers, arm export has declined in importance to China as a tool of influence.

China's voracious need for developing its defence industry has been reflected by its large expense on arm imports, in particular from Russia. China's production of new weapons and equipments have frequently based on the improvement of the old models imported from Russia.

Industrial structure

The integration between defence and non-defence sectors has contributed to the acquisition of dual-use technologies from Foreign Direct Investment and joint-ventures.

Progress within individual defence sectors appears to be linked to the relative integration of each – through China's civilian economy – into the global production and R&D chain. For example, the shipbuilding and defence electronics sectors, benefiting from China's leading role in producing commercial shipping and information technologies, have witnessed the greatest progress over the last decade. Information technology companies, including Huawei, Datang, and Zhongxing, maintain close ties to the PLA and collaborate on R&D. Commercial off-the-shelf technologies, such as computer network switches and routers, increasingly provide the PLA with state-of-the-art telecommunications equipment.

There are also enterprises in the sector that produce high-performance computers, advanced applications software, and specialized top-end semiconductors/microprocessors but these enterprises have little connection to China's civil-industrial sectors.

The transformation of the defence industry is high in the China's development agenda. As stated in the *China's National Defence in 2008*:

> "China is steadily promoting the transformation of defence industry enterprises into joint stock enterprises, actively exploring approaches to diversifying the structure of property rights, giving priority on helping qualified competitive enterprises to be reorganized and listed on the stock market, and encouraging specialization oriented restructuring and the integration of the efforts of enterprises, universities and research institutes."

5.5 Performance and recent trends by domain

5.5.1 Aircraft

China originally expanded its aviation industry with the help of the USSR and initially built its business upon the licensed production of Russian aircraft, including fighter planes. This activity focused on airframes, engines, combat system and weapons.

At the next stage, China naturally turned toward the development of derivatives and the upgrade of these planes. Licensed productions are still continuing through aircraft such as the Sukhoi 33.

It has also developed two aircraft in partnership with Pakistan: the K8 training aircraft, and the JF-17 Thunder jet fighter, based on a Russian design (Mig 33), propelled by a Russian-made engine and fitted with Russian or Western equipment.

At the end of the 1980s, China began the development of a new jet fighter, the J-10. This was based on an own design but many sources indicate that China enjoyed the support of Israel so that the J-10 derives from the Lavi programme. The engine and a part of the combat system come from Russia. Other parts are Israeli-made.

The J-10 appears to be a jet fighter with a substantial level of technology and performance. This is a concern to Russia since it increases Chinese military capabilities (including those in relation to Taiwan) and offers a credible alternative (technically and economically) in export markets.

China has the capability to become, especially with the help of Russian, Western or Israeli equipment manufacturers, a new competitor in the field of combat aircraft. The first country likely to feel the impact of such Chinese competition would be Russia, followed at a later stage by Western Europe and finally by the US.

In other segments (training, transport and specialized aircraft), China is not likely to become a major competitor for Western manufacturers.

5.5.2 Helicopters

Since the 1960s, China has developed relations with Aérospatiale which led the country to produce several helicopters licensed from the French manufacturer. Later, China developed derivatives for its own use and it did the same with the most of the Turbomeca engine ranges. In spite of the acquisition and production of Russian materials during the same period, the helicopter partnership with France remained strong. This partnership led during the 1990s to the light helicopter EC120, jointly designed and developed by Eurocopter and Chinese and Singaporean manufacturers. More recently, Eurocopter and the Chinese have cooperated in the development of a civil medium-size transport helicopter (6/7 tons): the EC175. Through this programme and the development of derivatives of the Eurocopter range for its own needs, the Chinese defence industry has acquired a certain level of competence in the area of helicopters.

Through this programme and the development of derivatives of the Eurocopter range for its own needs, the Chinese defence industry has acquired a certain level of competence in the area of helicopters. Even if, in the short-term, China is not in a position to develop, produce and independently certify such aircraft, the country has nonetheless taken an important step towards autonomy. China can be expected to emerge in the next twenty years as a competitor in some segments with helicopters of its own design. In the meantime it is possible that it will enter some export markets with machines manufactured without any licence agreement.

5.5.3 Land armaments

China has started to produce land armaments at the quality level of Western production. It has already had some success in exporting light armoured vehicles; the next step is to produce a modern battle tank.

In terms of light-armoured vehicles (tanks and light infantry vehicles), China has exported tanks and Type 63 light tanks to Burma, Cambodia, North Korea, Pakistan, Sudan, Sri Lanka and Vietnam. China has also exported various other light armaments: personal weapons, ammunition etc.

China's most modern battle tank is the Type 98. Before developing this, China had produced more than 1,500 copies of the second-generation tank, type ZTV 96, for its national needs. The Type 98 tank (local name WZ-132) was designed and manufactured by NORINCO (China North Industries Corporation). The Type 98 represents a qualitative shift in Chinese weapons development by incorporating upgrades that appeared on the Russian T80 and T90 models. It has modern equipment: 125 mm gun, automatic loading system, aiming system allowing firing while travelling (day and night).

In export markets, China has collaborated with Ukraine to design and manufacture the tank Al Khalid MBT, a tank that has the same parentage as the Type 98 or T80. Some 320 units were exported to Pakistan.

NORINCO (China North Industries Corporation) accounts for a large part of the Chinese defence industry and employs more than 900,000 people. The company's principal products are:
- Chinese battle tanks
- ZSL92: a six-wheeled armoured infantry vehicle fitted with German-designed mechanical equipments
- Howitzer PZL 155 (entered service in 2007)
- Howitzer PLL05: a six-wheeled vehicle fitted with a 120 mm gun (howitzer) developed from a Russian design
- Multiple Rocket Launcher

The Howitzer PLL05 has been offered for export sale, but no orders have yet (September 2009) been placed.

The Dongfeng Motor Corporation manufactures wheeled vehicles, including replicas of the American Humvee.

5.5.4 Surface ships

In terms of the number of its vessels (more than 500) and its strength (255,000 persons), the Chinese navy is the largest in Asia and the third-largest in the world. It is now entering a phase where the focus is on quality rather than quantity. A corollary of this is that the number of personnel should gradually decrease. This shift to quality has three objectives:
- to continue to dissuade Taiwan from officially declaring its independence
- to regain some parity with the Japanese navy while Japan remains dependent for its trade on access of the Strait of Formosa
- to continue to enforce a vast Exclusive Economic Zone (EEZ) composed of a large number of small islands, where sovereignty is disputed

In the longer term, the goals are:
- to have a greater power of projection in order to become the Asian reference in terms of naval power
- to reduce the gap with the US navy

In 2008 the Chinese navy possessed the following major warships:
- 26 destroyers
- 49 frigates
- 27 large landing craft

China has no aircraft carriers. There continues to be much speculation about what China intends for the Varyag, a Soviet aircraft carrier whose hull was complete by 1992, when all work on the vessel stopped. China bought the vessel from Ukraine in 1998 and eventually towed it to the Dalian shipyards, where work on it was still continuing in 2009. It is not clear how far China can proceed without Russian cooperation. China, knowing it cannot keep its naval power rank without aircraft carriers, is seeking a solution at this problem, perhaps less ambitious than the 67 000 tons of the Varyag.

China has shipyards (such as the Dalian one) capable to manufacture frigates. Nevertheless, it is still dependent concerning most heavily armed vessels as tends to prove the order in 2002 of two Sovremennye type missile destroyers built by the shipyards of Saint Petersburg.

The Chinese navy remains very dependent on foreign suppliers. Among Chinese equipment (anti-aircraft missiles HQ-9, anti-ship missiles C 803) there are still many items of Russian equipment (missile systems S-300 and missiles type 5V55, SA-N-7 or SS-N-22) and, to a lesser extent, European equipment (100 mm guns, Crotale missiles, sonar, firing systems).

The Chinese naval shipbuilding industry is, therefore, not yet able to design the most powerful warships and their weapons system. However, the aim of moving towards a higher-quality navy requires and will probably lead to improvements in technology. In the long term China will become a real competitor, but for the immediate future is main objective is to support the upgrading of its navy.

5.5.5 Submarines

The Chinese industry was denied access to Russian technology for many years. As a result China did not launch its first ballistic missile until 1982. The current capability of China to produce missile-carrying submarines can be assessed on the basis of the following programmes:

- the SLBM type 092 submarine, in service since 1987, apparently based on the Russian Delta III class submarines (its missiles that have a range of 1,700 km)
- the SSN type 093, the first of which was launched in 2003 from the Huludao yards: development discontinued because the submarines were too noisy
- the SLBM type 094 submarine (probably derived from type 093), the first of which was launched in 2004 from the Huludao yards: the first Chinese SLBM to have genuinely intercontinental strategic missiles (8,000 km range), but there are some doubts about the performance level of this submarine (sound discretion, etc) and its operational capacity

China has also developed some conventional submarines, which could be exported:

- Type 039G submarines, built in the Wuhan shipyard and in service since 1999, but there are differences of opinion about their level of performance (acoustic discretion)
- Type 041 submarines, more recent than Type 039G, based on the Russian Kilo class submarines and with the same anaerobic propulsion technology

China is also believed to have ordered eight 636M Kilo Class submarines from Russia.

These numerous programmes reveal the willingness of China to develop its own submarine industry. There are, however, some signs of a technology gap: construction delays, the fact that there are some prototypes but only a few of them are planned to go into production, and reports about undesirable features of performance. The recent order for 636M Kilo Class submarines from Russia may also show a certain failure of the Chinese industry to meet the needs of its navy as well as the continuing reliance on technology transfers.

China has not reached the level of maturity of the Russian submarine industry, but it comes second only to Russia among the BRICKs countries in its success in developing a national submarine industry. In the near future, the presence of China on the conventional submarine market suggests that it could be a strong competitor.

5.5.6 Missiles

In the missile field, China has equipped itself, as in most other military areas, with Russian hardware.

Because two of its neighbours, Russia and India, are nuclear powers, China has developed technological and industrial capabilities in the field of strategic ballistic missiles.

In the tactical missile area, in addition to maintaining and upgrading the equipment of its armed forces, China has developed expertise and an industrial base to support its military requirements. Tactical missiles have always been a high priority for China.

Initially, most of the tactical missiles were largely based on products or technologies of Russian origin. But while the technology progressed relatively slowly during the 1980s, investments made by China have helped to speed things up and since the beginning of the current decade significant progress has been made.

Currently China has developed and now produces missiles including air-air, anti-ship cruise missiles and anti-tank missiles. The main manufacturer of these is CPMIEC (China Precision Machinery Import / Export Corporation) which is the main Chinese missile producer, just as the other niche producer, NORINCO, is the main maker of armoured vehicles and guns.

Overall, however, Chinese tactical missiles show a technology gap equivalent to a whole generation compared to the US, Russian or European products.

At the same time, China is continuing to equip its modern hardware, whether bought from Russia or produced under licence, with Russian missiles (themselves either acquired or produced under licence).

Nevertheless, because China is developing and producing its own missiles, especially for its air force and navy, it should soon be in a position to export them without any difficulty.

Given this background, it seems unavoidable that China will continue its efforts to develop key technologies and industrial resources required for a missile industry of the highest level. This means that China is very likely to become a serious competitor in the field of missiles. Over a twenty-year horizon China's competitive strength in missiles would be complementary to its position as an exporter of air and naval equipment, if its aims in these areas are also achieved.

5.5.7 Electronic systems & optronics

In 1979 the share of civil products reached only 20% of electronics production in China, but in 2000 almost all electronics production was for the civil sector and a great part of it was made in military factories that also produced goods for the defence industry. Among the 50 largest Chinese companies in electronics, 30 originated in the military sector.

Electronics is one of the means by which China aims to raise the quality of its army. The introduction of network-centric warfare capability in the Chinese Army is relatively recent and went hand-in-hand with the development of telecommunications systems in the country.

In response to US pressure and following the end of cooperation with Russia and Israel, China had to develop its own AWACS system (local name KJ2000), which is fitted onto a Russian airplane: an Il76. The radar and electronics in the AWACS system, even if they derive originally from a cooperative project, are completely controlled locally by the Nanjing Research Institute of Electronic Technology. The antenna uses the advanced AESA (Active Electronically Scanned Array) technology.

The China Electronic Technology Corporation (CETC) is the largest player in the sector in China, present both in civil and professional electronics and in military electronics: C3I, radars, electronic warfare, telecommunications, optronics etc.

However, it must be emphasised that in an emblematic area such as the leading-edge radar of fighter planes (X-band), China depends on foreign alternatives (Russian NIIP and Phazotron, along with the Italian FIAR) that are tested on the equipment of its J-10 combat aircraft. Recent statements (2007) suggest that China is developing a Passive Electronically Scanned Array (PESA) radar (tube technology). Unlike Western countries and Russia, China is not yet in the development phase and implementation level of an active radar (Active Electronically Scanned Array using Monolithic Microwave Integrated Circuits modules).
Since the 1990's, China has been aware of the importance of electronics for a modern army. The quality of Chinese electronic equipment prevents at short-term China from competing directly with Western manufacturers. China must acquire its independence in this sector over a longer term in order to become a competitor in military electronics.

5.6 Conclusions

5.6.1 Competitive strength of local industry and likely developments

The main objective of the structural reforms in 1998 was to make the defence sector more efficient and competitive. Augmented by increased investment in domestic military production and foreign acquisitions, the reforms have accelerated modernization in each military service and increased the production capacity. For example, China has developed and produced new generations of survivable nuclear armed ballistic missiles, advanced attack and ballistic missile submarines and associated weaponry, advanced Russian aircraft and precision weaponry for the air and naval air forces.

China's competitive strength have been and will continue to be enhanced by: transfers of technology and skills from foreign joint ventures; increased government funding for research, development, and procurement; the manned space flight program, including its vessels and tracking stations; acquisition of foreign military and dual-use technology; increased partnerships with academic institutions, which improve student recruitment and technical training for existing staff; and overseas training and experience gained by an increasing number of scientists, engineers, and managers returning to China.

China is seeking for the modernisation of the PLA through its concurrent pursuit of 'mechanization' (equipment acquisitions) and 'informatisation' (networking of equipment). Supported by increased government funding for research, development, and procurement, PLA's goal of accomplishing mechanization and make major progress in informatisation by 2020 is likely to be realised.

5.6.2 Strengths and weaknesses

The competitive strength in China's defence sector has been discussed above. An additional advantage will be China's ability to maintain its low-cost production. The weaknesses in the defence sector are its over-reliance on foreign-acquired weapon and technologies to fill the capacity gaps. For industries (e.g. high-performance computers and aviation and ordnance sectors) whose outputs are highly defence-related but lacking of link with the civic-industrial sectors, there has been little scope for technological diffusion through FDI and joint-ventures. Little progress has been made in such industries. Moreover though the Department of Defence projected aerial refuelling as an operational capacity by 2005, China still does not have the number of tankers, properly equipped combat aircraft, or sufficient training to employ this capacity for power projection.

The progress in the Chinese defence sector has been uneven in recent years with a proportionately larger amount of resources devoted to missile and space system development. These fields of developments might be useful for displaying purposes but a mature national defence system and industry does not merely reply on missiles.

The implication of the imbalanced development in China defence industry is that China is also likely to continue importing weapons and technologies from Russia. The potential lift of EU's arms embargo on China may result in an increase in trade between the two sides and this will be potentially mutually beneficial. On one hand, increased EU content in Chinese equipment could contribute to Chinese industry advancement. On the other hand, access to the Chinese market could be an important source of revenue, future investment which would in turn enable the EU producers to benefit from economies of scale.

However, China's relations with Russia as a supplier of many commodities might undermine EU's competitiveness in terms of export sales and technology. Offset and cooperative agreements that involve natural resources in exchange for arms or similar, may therefore put European manufacturers at a distinct disadvantage in competitive bidding. Nevertheless, the desire of China to acquire specific technology in some segments of the market not produced by Russia (e.g. in some electronics segments) may still create opportunities for Europe as a technology leader.

So far, exports of low-cost weapons from China to developing countries have had little effect of the demand from these countries for more sophisticated arms supplies from the EU.

6 The defence market and sector in Russia

Since the collapse of the Soviet Union in 1991 the defence industry in Russia has undergone frequent change. The general trend has been one of decline, in terms of production and employment, and size and structure of the arms industry. There has been some recovery in output since 2000 (when Vladimir Putin was elected president) and funding for procurement and R&D has increased. However, the fragility and weakness of the Russian economy since the mid-1990s means that government has been reluctant to increase the share of GDP devoted to defence. As a result the Russian defence industry continues to suffer from serious structural problems and has become more dependent on exports.

Overview of the situation and assessment of competitive position

- Not a new player - already a major arms & defence system provider
- An old competitor, currently gaining strength after a period of decline
- Now Russia is entering markets outside former zone of influence

In fact Russia is not an emerging country in terms of arms & defence systems, it is a global competitor entering new markets (to compensate the loss of former Warsaw Pact customers); in South America it is offering Sukhoi 27 and MIG-29 families in several countries including Brazil. It is fully independent in terms of technology as well as capability to integrate Western solutions if needed. The only real limit for the moment is in unmanned aerial vehicles (UAV) where Russia is in negotiation with Israel to import technology.

SWOT

Strengths	Weaknesses
• Wide range of product • Technological level • Stock available for immediate purchase • Strong industrial base • Cost	• NATO enlargement • Some gap to fill in electronics
Threats	**Opportunities**
• US or European competitors	• Globalisation (market target outside former Soviet zone of influence) • Capable of integrating Western technologies in Russian products

Implications for EDTIB

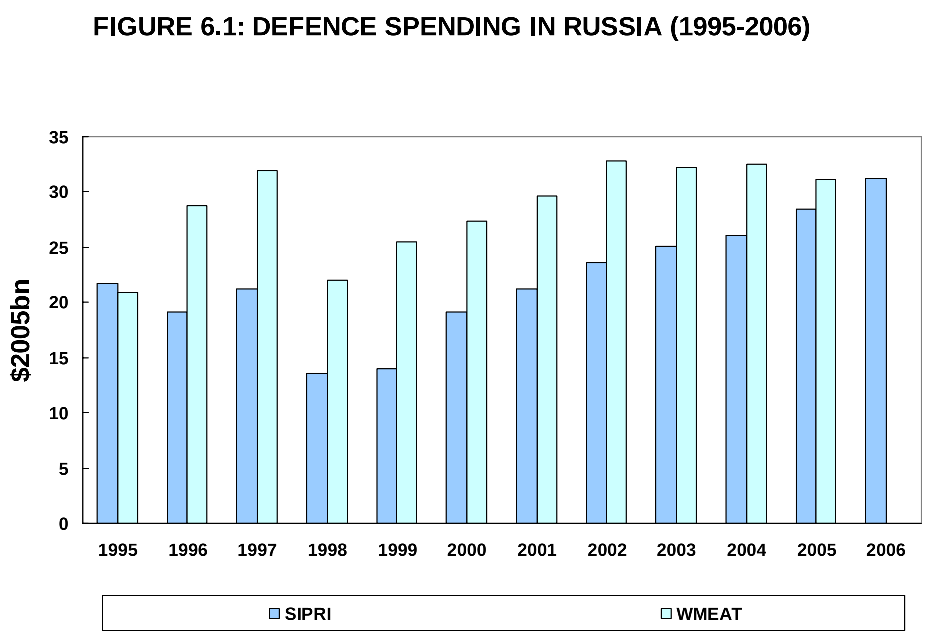
- Russia will be a major competitor to the EU in the BRICKs and other third markets.
- Its penetration in the EU has been limited. It would make more sense for Russia to exhaust opportunities in more accessible markets outside the EU before getting itself bogged down in trying to access EU markets.
- Russia's defence industry is in desperate need of investment and export revenues alone are not enough. Political challenges aside, this presents an opportunity for EU firms to get more involved in the Russian defence industry and capitalise on Russia's share of the global export market and the need to modernise Russia's own forces.
- A shortage of funds to sustain and support the development of all sub-sectors means that at some point there may be an economic case for withdrawing support for a sub-sector and letting it decline. This would reduce competition for the EDTIB and present an opportunity to enter the Russian market to meet Russia's defence needs.

6.1 Structure

Defence spending

The recent historical trend in defence spending is presented in the chart below.

Figure 6.1: Defence spending in Russia (1995-2006)



Source: SIPRI, WMEAT.

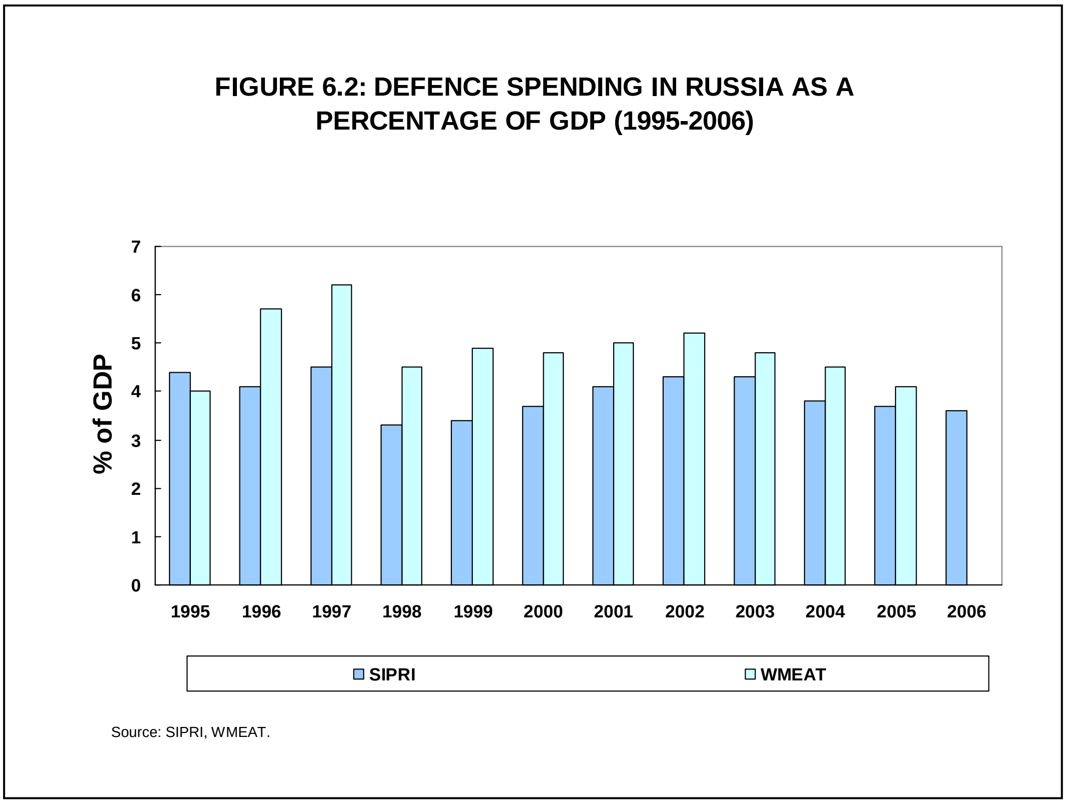
The figures show estimates from two sources: SIPRI and the World Military Expenditure and Arms Transfers (WMEAT). The figure shows that Russian defence spending amounted to around $12bn in 1995 (in 2005 US dollars). SIPRI estimates that the value of defence spending (in constant terms) stayed at $20-21bn in 1996 and 1997 before falling to around $14bn in 1998 and 1999, the low points of recent defence spending. Thereafter, defence spending in Russia has increased on a sustained and steady basis, reaching $35bn (in 2005 US dollars) in 2007. This represents a 43% increase in real defence spending since 1995 and a 140% increase since the nadir of 1998. The estimates from WMEAT differ somewhat in value form the SIPRI estimates but they illustrate a similar trend. WMEAT estimates that defence spending reached $32bn (in 2005 US dollars) in 1997 before collapsing to $22bn in 1998. Thereafter, however the WMEAT estimates indicate that defence spending increased in a sustained and steady manner, to $31bn (in 2005 US dollars) in 2005. This represents a 49% increase in real defence spending since 1995 and a 41% increase since 1998.

In recent years 30-40% of spending has gone on R&D with the rest on procurement, although the trend has seen the share spent on R&D fall and the share spent on procurement rise. It should be noted here that, while Russian equipment is not necessarily built with the latest technology, and many technology gaps exist, the strategy followed by Russia is more to have a robust / simple (but very efficient) product rather than a complicated platform capable to receive all the latest technical developments and IT extensions. In which case Russia are capable of adapting their products with Western solutions as and when required. This in turn enables them to supply products comparable to those of Western countries in term of efficiency. This means that, while the share of R&D may be falling, the technological gap may not be increasing by as much.

Table 6.1: Share of planned expenditure on the State Defence Order

Spending category	2003	2004	2005	2006
Procurement (% share)	58.6	62.3	66.4	69.3
R&D (% share)	41.4	37.7	33.6	30.7
Total (% share)	100	100	100	100
Source: SIPRI, *Military Spending and Armaments, 2005* (Appendix 9C).				

Figure 6.2: Defence spending in Russia as a percentage of GDP (1995-2006)

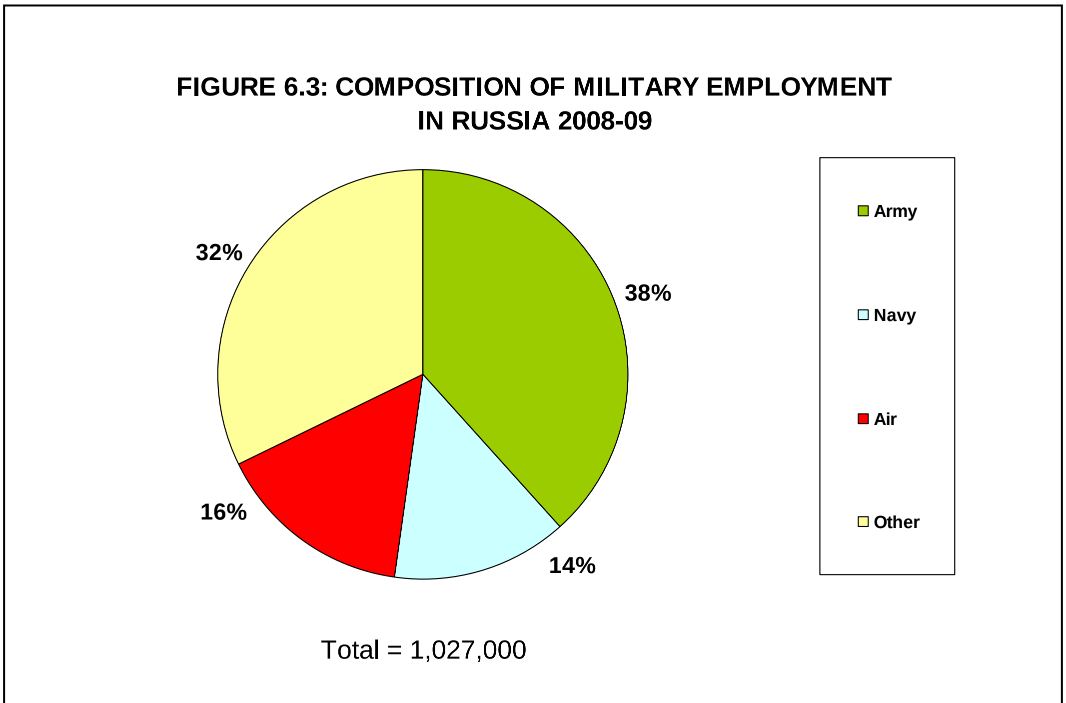


In terms of share of GDP, again there is some variation in the values estimated but the trend is similar in each case. SIPRI estimates that defence spending amounted to 4-4½% of GDP over 1995-97, while WMEAT estimates an increase from 4% in 1995 to 6¼% in 1996. However, both indicate a marked fall in defence spending as a share of GDP in 1998: SIPRI estimates it fell back to 3¼% while WMEAT gives a figure of 4½%. Both sources indicate a gradual and continuous increase in defence spending as a share of GDP increased thereafter. SIPRI's measure suggests it peaked at 4¼% of GDP in 2002 and 2003 before falling back to around 3½% in 2006. The WMEAT figures indicate it peaked at 5¼% in 2002 and fell back thereafter to 4.1% in 2005.

It is not clear how defence spending or production is distributed between the main military branches (air, land, navy). However, estimates from the Military Balance[95] and WMEAT indicate that total military employment in Russia is in the region of 1m. The Military Balance estimates 1,027,000 military personnel were employed in Russia in 2008-09, compared to 1,037,000 in 2005 and 1,004,100 in 2000. Around 330,000 were employed in 'strategic deterrent forces' (80,000) and 'command and support' (250,000) in 2005 and 2009. A figure of around 300,000 is estimated for 2000. This means 600,000-700,000 were employed in the army, airforce and navy. In 2008-09, the Military Balance gives figures for 495,000 army personnel, 142,000 navy personnel and 160,000 airforce personnel. The corresponding shares are presented in the chart below.

[95] Various years, published by the International Institute for Strategic Studies (IISS).

Figure 6.3: Composition of military employment in Russia 2008-09



Note(s): Other is composed of 'command and support' and 'strategic deterrent forces'.

Source: IISS, *Military Balance, 2009*.

Organisation

Since the fall of the Soviet Union in 1991 there have been several reforms of the government's administrative structures overseeing the arms industry, and these are summarised in the table below. The general trend throughout these reorganisations has been a reduction in the number of government personnel involved with the defence sector and the increasing difficulty of implementing a single, consistent state policy.

Under the current structure, Rosprom oversees all Russian industry, not just the defence industry. Its division for defence is structured along similar lines to the 199-2004 period, with departments based on the former five agencies. Rosprom is overseen by Minpromenegro, which is responsible for the development of policy for the arms industry; Rosprom implements the policies. Roskosmos is the federal space agency and is responsible for firms engaged in production and R&D related to the space and missile industry. Rosatom, the federal atomic energy agency, oversees the development and production of nuclear warheads and devices.

The result is that while around 10,000 government personnel were involved with the defence sector in the Soviet era, nowadays it is little more than 500. Consequently, there is a general perception these days that the state is not equipped to deal with the arms industry.

Table 6.2: Administrative Structures of the Russian Arms Industry, 1991-2004

Year	Administrative Structure
1991	Nine Soviet arms industry ministries (incl. Ministry of Atomic Power and Industry (nuclear weapons))
1991-92	Ministry of Industry; Minatom (Ministry of Atomic Energy)
1992-93	Roskomoboronprom (Russian Committee of the Defence Industry); Minatom
1993-96	Goskomoboronprom (State Committee of the Defence Industry); Minatom
1996-97	Minoboronprom (Ministry of the Defence Industry); Minatom
1997-98	Minekonomiki (Ministry of Economy); Minatom
1999-2004	Two-tiered system: Minekonomiki (later Minpromnauki (Ministry of Industry and Science)) plus agencies for Aerospace, Conventional Arms, Munitions, Shipbuilding, Control Systems); Minatom
2004-	Two-tiered system: Minpromenegro (Ministry of Industry and Energy) plus two federal agencies: Rosprom (Federal Agency for Industry), Roskosmos (Federal Space Agency); Rosatom (Federal Agency for Atomic Energy)
Source: SIPRI, *Military Spending and Armaments, 2005* (Appendix 9C).	

6.2 Drivers

6.2.1 Regulatory & framework conditions

Scope: notable political, industrial and geostrategic situations that have a notable effect on defence industry and its future potential development or the capability of the country to develop a competitive offer.

The geostrategic overview:

The geostrategic environment of Russia can be characterized as follows:

- Vast territories to protect;
- Difficult maritime access;
- Borders with many States among which some are considered as presenting risks of instability;
- The rising economical power and military strength of the Chinese neighbour.

The military strategy of Russia is also based on its desire to become a world power again and to balance its role in comparison to the United States and NATO ones, of which expansion is seen by Russia as a threat to its sphere of influence.

The defence of its economical interests is now clearly shown, as tends to prove their military strategy. This defence goes through the protection of maritime routes, oil and gas terminals of which the Russian economy is dependent.

In this context, the new Russian maritime policy plans the defence of the guaranteed access to international transport corridors:

- With a West-East axis linking Western Europe to Southeast Asia (Black Sea, Mediterranean Sea, Red Sea, Indian Ocean, South China Sea, East China Sea, Sea of Japan) ;
- And a North-South axis, linking northern Europe to the Middle East, Central Asia and the Indian subcontinent.

In the longer term, the outlook on the global warming, which could radically alter the world maritime shipping map, may give new perspectives to the maritime route in the Far North.

On its homeland territory, Russia has to cope, like other countries, with organized crime, extremism and other arms trafficking. It also displays its determination to defend the Russian populations in the former Soviet republics.

In its willingness to restore its international position, Russia has tightened in recent years its position on the following topics:

- Suspension of its participation in the Treaty on Conventional Forces in Europe (CFE-1A);
- Unofficial threats of unilateral withdrawal from the Treaty on intermediate-range nuclear forces (INF).

As a result, the Russian government gives priority to the following investments:

- Strategic Nuclear Forces;
- Equipment of units with a high degree of availability;
- Equipment of forces fighting against terrorism.

Russia is the only BRICKs country capable of exporting in total autonomy all types of military equipment.

Procurement

In common with other BRICKs countries, the Russian defence industry and its governance by the state has undergone a series of reforms since the collapse of the former Soviet Union. The most recent reforms summarised by Isakova[96], as in China, have separated the buyer from the producer of defence equipment in order to improve efficiency and quality by introducing competition in the market. These reforms have also brought civil control over the military, thus increasing government ownership and intervention in what was previously within the military sphere of influence. This model of restructuring and central control is essentially borrowed from Russia's successful experience in the energy sector[97].

Via these reforms, all defence procurement has been unified into a single office and individual manufacturers have been consolidated into large government run and vertically integrated umbrella enterprises, mainly in the aviation, radio-electronic and shipbuilding

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96 Isakova, I. (2007): The Russian Defense Reform, in the China and Eurasia Forum Quarterly, Volume 5, No.1 (2007) pp.75-82, available at: www.silkroadstudies.org/new/docs/CEF/Quarterly/February_2007/Isakova.pdf

97 Blank, S. (2007): *Rosoboroneksport:* Arms Sales and the Structure of the Russian Defence Industry, Strategic Studies Institute, U.S Army War College, January 2007, pp.10-17

industries[98]. Established in March 2006, the Military-Industrial Commission (MIC) is tasked with overseeing the development of the arms industry and coordinating defence-industry policies. It is therefore able to identify and execute interesting research projects working closely with the Ministry of Defence (MoD). The Federal Agency on Procurement of Weapons Systems, Military and Specialised Equipment and Logistics came into force in 2008, and is responsible procurement. Its roles include preparing, monitoring and signing contracts, in addition to accounting activities[99].

Russia also procures defence equipment from non-domestic suppliers; this is one of the responsibilities of Rosoboronexport discussed further below in relation to its main responsibilities in regulating Russian arms exports.

Export controls

Since the break up of the former Soviet Union, defence exports have represented an important source of revenue for the dual use and defence industry, as defence equipment previously supplied to various countries has generated a substantial market for spare parts and maintenance in some cases, while in others new equipment sales have been more significant. Prior to 2000, this activity was controlled by two separate state arms exporters. As part of the subsequent reforms[100], these were merged into a single entity, Rosoboronexport (ROE). As the intermediary of the state, ROE is responsible for exporting and importing defence, military and dual-purpose products, as well as technologies and services. The main goals of Rosoboronexport are: "*to promote and strengthen long-term mutually beneficial partnerships with foreign customers, and sustain Russia's leading positions in the global arms market...in pursuance of the governmental policy in the sphere of military-technical cooperation of the Russian Federation with foreign states*"[101]. Its basic trade activities include[102]:

- exportation / importation of the state's array of available military and dual-purpose products and services;
- organization of licensed armament and military equipment production abroad;
- maintenance and repairs of weapons, armaments, and military equipment supplied to customers;
- modernization of armaments and military equipment made in Russia;
- training of foreign specialists to operate and maintain supplied material in Russia and customer countries;
- technical assistance in building military infrastructure installations, such as defence enterprises, airfields, depots, firing grounds, training centres, etc.; and
- promotion of innovative high-technology civil-purpose products developed by Russian defence industry enterprises.

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98 Nicolli, A. (2007): Russia's defence industry: Phoenix from the ashes?, IISS Strategic Comments, vol.13, International Institute for Strategic Studies, October 2007

99 Isakova, I. (2007): The Russian Defense Reform, in the China and Eurasia Forum Quarterly, Volume 5, No.1 (2007) pp.75-82, available at: www.silkroadstudies.org/new/docs/CEF/Quarterly/February_2007/Isakova.pdf

100 Enterprise was established by Russian President's Decree No. 1834 dated 4th November 2000, available at: http://www.roe.ru/company/docs/03_11_19_uk.html [in Russian]

101 From Rosoboronexport's Official Website at: http://www.roe.ru/

102 http://www.globalsecurity.org/military/world/russia/rosoboronexport.htm

Since 2007, Rosoboronexport influence has encroached on the civilian industry by integrating the trading activities of firms in the automobile and metallurgical sectors. With such control over exports, the revenue received is centralised for R&D and procurement within Russia. Rosoboronexport has also established its own holding company, OPK (United Industrial Corporation) or Oboronprom as a joint stock company in order to actively encourage further integration in the defence sector and promote cooperation between Russian and with foreign companies.

Regarding export control regulations, Russia adheres to its international commitments (UN, OSCE and Wassennar Arrangements) through national legislation established in 1998[103] and 2000[104]. This legislation places the responsibility for what can and cannot be exported to foreign countries on the President when drawing up control lists of military products for authorised exports and establishes licensing procedures for exporters and transfers of technology to foreign clients[105]. In the vast majority of cases this means Rosoboronexport is the monopoly exporter.

Offset policy

Offset policy in Russia is unclear as no mention of any specific policy can be found in the literature. It is therefore assumed that Rosoboronexport negotiates individual contracts with importing nations of Russian equipment. However, a recent article in the defence media[106] does highlight that *"The Kremlin can…outpace its competitors by offering higher levels of technology transfer or licensed production than Western companies – hampered by either economic prudence or legal restraint"*. This suggests that although negotiated on a case by case basis, Rosoboronexport is likely to offer more substantial offsets than other competitors in Europe and the US tied to national regulations, making them more competitive in certain respects.

As a net exporter of defence equipment and with a large domestic industrial base, it is not thought that much technology or equipment is imported by Russia. The absence of an offset policy is therefore not surprising.

International co-operation

It is acknowledged that China and India constitute approximately 80% of the total Russian arms transfer market[107], of a total of $5-6 billion by 2006[108], demonstrating the importance of international trade and cooperation with these two countries for the Russian industrial complex. However, as indigenous defence industries develop in China and India, and Russian producers are exposed to greater competition, particularly from the potential of European producers in relation to China[109], the Russian defence industry

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103 Federal law of the Russian federation on Military-Technical Cooperation of the Russian Federation with Foreign States, adopted by the State Duma on 3 July 1998and by the Federation council on 9 July 1998

104 Russian Federation Presidential decree No. 1953, "to form the Russian Federation Committee for Military-Technical Cooperation with Foreign States", 1 December 2000

105 Summary available at: http://first2.sipri.org/db/dbf/export_reg_display

106 Stratfor (2009): Russia: the Future of the Kremlin's Defence Exports available at: http://www.stratfor.com/memberships/114705/analysis/russia_future_kremlins_defense_exports

107 Mitchell, C.S. (2007): Phoenix from the Ashes?: Russia's defence industrial complex and its arms exports, Australian Defence Force Academy, University of New South Wales, available at: http://handle.unsw.edu.au/1959.4/38745

108 http://www.globalsecurity.org/military/world/russia/rosoboronexport.htm

109 See earlier discussion on the lifting of the EU arms embargo on China

is likely to come under increased pressure. In response, Rosoboronexport has launched an aggressive marketing campaign into the Middle East, South East Asia and Latin American markets[110], with recent successes including sales to Algeria, Indonesia and Venezuela[111].

Regarding cooperation with Europe, not a traditionally large market for Russian arms, Rosoboronexport has instigated a strategy to encourage international investment in many of the vertically integrated joint stock companies. EADS's 5% holding in the Irkut Corporation and the corresponding 5% holding of the Russian state in EADS is one such example of this strategy in action[112]. Cooperation with European companies is likely continue in this manner as Russia tries to attain Western technology, develop management systems and find new markets in which to sell its output, particularly in automobile, aerospace, ICT, radio and telecoms sectors with dual use linkages with defence, highlighted by recent EU-Russia policy dialogue[113].

6.3 Performance

Output

Output in the Russian arms industry has followed a similar trend. Figures from SIPRI show that after production collapsed in the 1990s following the break-up of the Soviet Union it has risen steadily.

Following the historical trend in defence spending, output for the Russian arms industry reached its lowest point in 1997. In 1997 military-dedicated output fell to just 17% of 1991 levels, and despite recovering since then (the level of output in 2005 was over three times higher than that in 1997) it remains over 55% below 1991 output levels. Civilian-related output fared only slightly better, as Russia moved to a market and consumer-based economy. After falling to a low in 1998, civilian-related output levels have improved steadily and in 2005 were only 35% below their 1991 levels. As a result, in 1997 total output of the Russian arms industry fell to just 20% of its 1991 level. It has since recovered as defence spending has, although the level of output in 2005 was still 45% below 1991 levels.

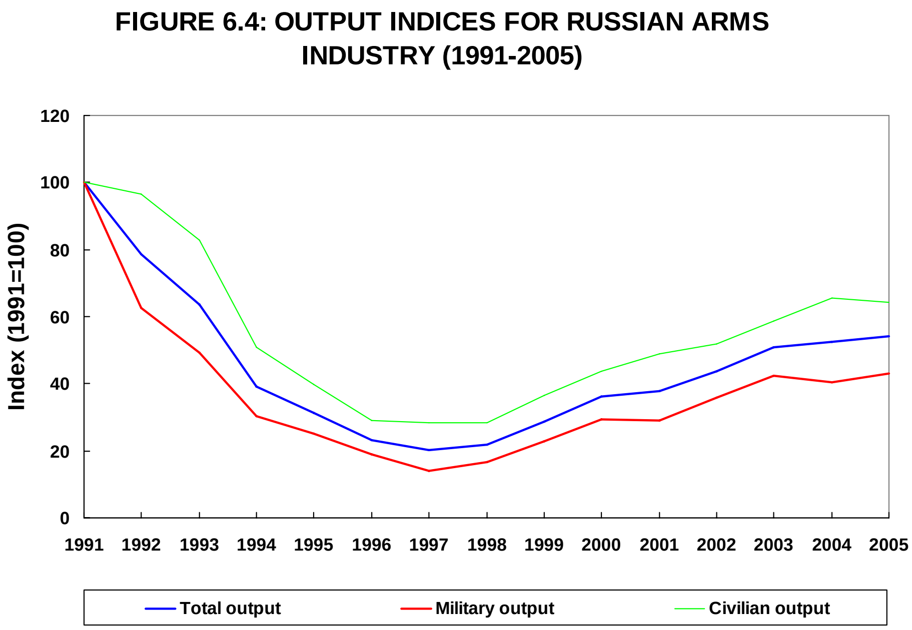
[110] Mitchell, C.S. (2007): Phoenix from the Ashes?: Russia's defence industrial complex and its arms exports, Australian Defence Force Academy, University of New South Wales, available at: http://handle.unsw.edu.au/1959.4/38745

[111] MDB (2008): Russian Arms Trade in the First Half of 2008, published by the Moscow Defense Brief at the Centre for Analysis of Strategies and Technology (CAST), available at: http://mdb.cast.ru/mdb/2-2008/item6/article2/?form=print

[112] MDB (2007): EADS in Russia, article published in the Moscow Defence Brief (MDB) Issue 3, 2007, available at: http://mdb.cast.ru/mdb/3-2007/ic/article2/?form=print

[113] See: http://ec.europa.eu/enterprise/international_relations/cooperating_governments/russia/index_en.htm

Figure 6.4: Output indices for Russian arms industry (1991-2005)

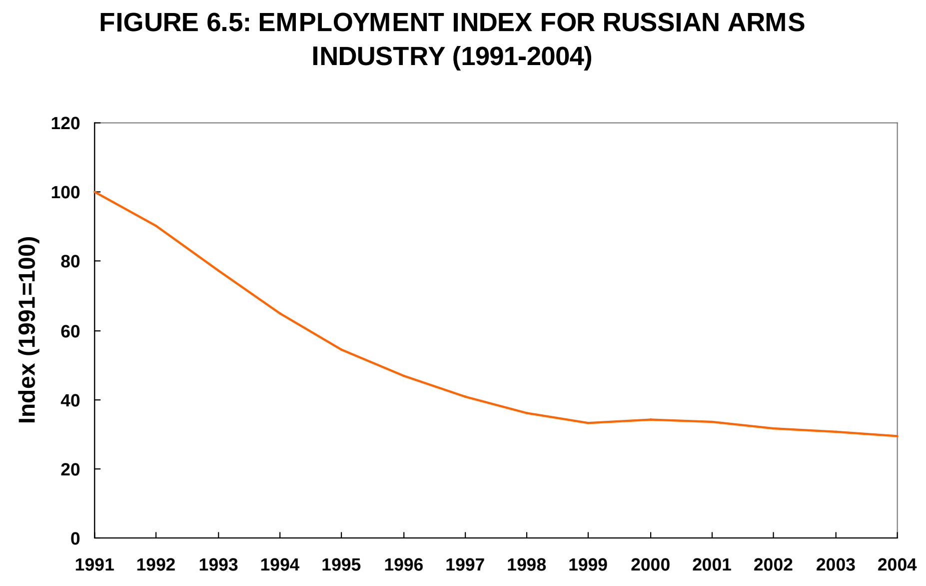


Source: SIPRI, *Military Spending and Armaments, 2005* (Appendix 9C).

Employment

The trend in employment in the Russian defence industry paints a picture of decline. Employment declined sharply in the 1990s following the break-up of the Soviet Union, the decline has continued since 2000 but at a much slower pace. This is in spite of the rise in defence spending and output. The Russian defence industry was estimated to employ 1.8m in 2004, compared to 2.6m in the mid-1990s and around 8m in 1990. This 1.8m in 2004 corresponded to 9½% of total industrial employment and 2.7% of total employment in the economy. In the early 1990s the defence industry in Russia accounted for 19% of total industrial employment and just under 7% of total employment in the economy.

Figure 6.5: Employment index for Russian arms industry (1991-2004)



Source: SIPRI, *Military Spending and Armaments, 2005* (Appendix 9C).

Of the 1.8m working in the defence industry in 2004, 25% (around 450,000) were employed in R&D functions with 75% (around 1.35m) were employed in industry. In absolute terms, this represents a sharp reduction in the 1-1.5m that were employed in R&D in the early 1990s. But as a share of the workforce, employment in R&D has increased, from 17-18% in the early 1990s.

Average wages in the defence industry remain relatively low. Even in the Soviet era, average monthly wages in the defence sector were typically 85-95% of the average monthly industrial wage; this collapsed to 59% in the mid-1990s as the industry contracted. It has since recovered but even in 2004 average monthly wages in the defence industry were only 78% of the average industrial wage.

Trade

Exports

In recent years, the value of world trade in arms has been $20-25bn (in constant (1990 US dollars) terms) and in 2008 was worth $22.6bn. Data from SIPRI show that, with regard to transfers of major weapons, Russia was the second-largest exporter of arms in 2008, just behind the US. EU countries were the next largest exporters but are some way behind the US and Russia (by value). Germany, France and the UK were the third-, fourth- and fifth-largest exporters respectively with German exports less than half that of Russia. The only other BRICKs country among the top ten arms exporters was China, but Russia and the US exported 14-15 times more (by value) than China in 2008.

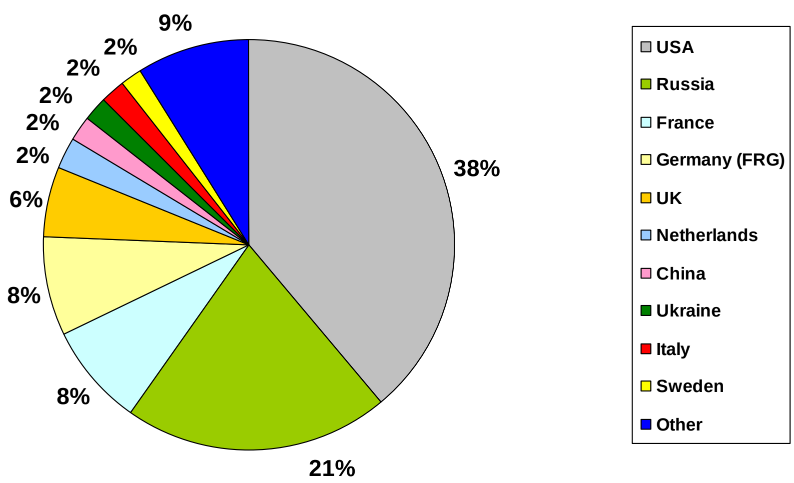
Table 6.3: Top Ten Arms Exporters, 2008

	Exporting country	Exports (value ($1990m))
1	USA	6,159
2	Russia	5,953
3	Germany (FRG)	2,837
4	France	1,585
5	UK	1,075
6	Netherlands	554
7	Italy	484
8	China	428
9	Sweden	380
10	Ukraine	233
Source: SIPRI.		

Even over time this picture holds true. The chart below shows the shares of the top ten arms exporters over 1995-2008.

Figure 6.6: Top ten arms exporters (1995-2008)

FIGURE 6.6: TOP TEN ARMS EXPORTERS (1995-2008)



Total = (1990)$314bn

Note(s): Based on constant 1990 US dollar values.
Source: SIPRI.

In total, around $314bn (in 1990 US dollar terms) worth of arms were exported around the world. Of that, the dominant shares came from the US and Russia. The US accounted for 38% of all arms exports over 1995-2008 and Russia accounted for 22%; so together they were responsible for just under 60% of all arms exports over that time period. The US and Russia were the largest exports by some distance, with the next largest exporters, Germany, France and the UK, accounting for just 6-8% of total arms exports each. China, the only other BRICKs country in the top ten accounted for just 2%. A key conclusion therefore is that Russia is a major player in the international trade in arms.

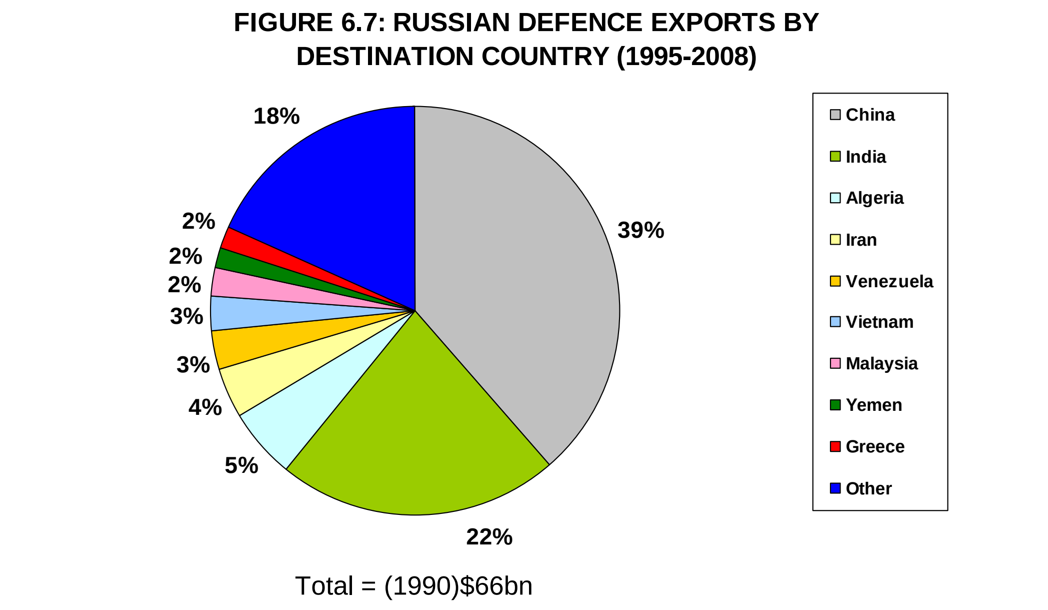
A closer look at Russia's arms exports in 2008 shows that it was reliant on just three or four countries for most of its arms exports. The largest recipient of Russian arms exports was Algeria with a 27% ($1990m 1,585) share. This was closely followed by India, which received a quarter of all arms exports from Russia. China was the third largest recipient, with a 19% share, and this means that together, Algeria, India and China received just over 70% of all exports from Russia. With Venezuela (the recipient with the next largest share) this increases to 83%. Of the other top-ten countries receiving Russian exports, several were in the Asia-Pacific region (eg Malaysia, Indonesia, Vietnam), with the others in the middle-east (Syria, Iran) or eastern Europe (Croatia). However, apart from Malaysia, each accounted for less than 5% of Russian exports in 2008.

Table 6.4: Top Ten Recipients of Russian Defence Exports in 2008

	Country	Value ($1990m)	% share
1	Algeria	1,585	27
2	India	1,488	25
3	China	1,109	19
4	Venezuela	733	12
5	Malaysia	427	7
6	Vietnam	237	4
7	Iraq	95	2
8	Syria	81	1
9	Croatia	54	1
10	Indonesia	41	1
Source: SIPRI.			

Over a longer time period, this breakdown of recipients of Russian exports changes only a little. The figure below shows the breakdown of recipient countries over 1995-2008.

Figure 6.7 Russian defence exports by destination country (1995-2008)



Note(s): Based on constant 1990 US dollar values.
Source: SIPRI.

This shows that of the $66bn worth of arms exported by Russia over 1995-2008 (in 1990 US dollar terms), 39% went to China and 22% went to India (mostly aircraft and missiles). Together they were the dominant recipients of Russian arms, accounting for just over 60% over 1995-2008. After China and India, the recipients with the next largest shares of Russian arms exports were Algeria, Iran, Venezuela and Vietnam, although Algeria, which accounted for the largest share among these four, received just 5% of Russian defence exports. Brazil and South Korea do not feature on the list of top ten recipients of Russian exports, either for 2008 or for the period 1995-2008. Indeed, Brazil appears to be a market completely overlooked by the Russian arms industry (SIPRI data indicates no exports to Brazil), while over 1995-2008 South Korea accounted for less than 1% of Russian arms exports (with SIPRI data indicating no exports to South Korea in 2007 and 2008). It is also worth noting that exports to the EU or G7 countries are very small or non-existent.

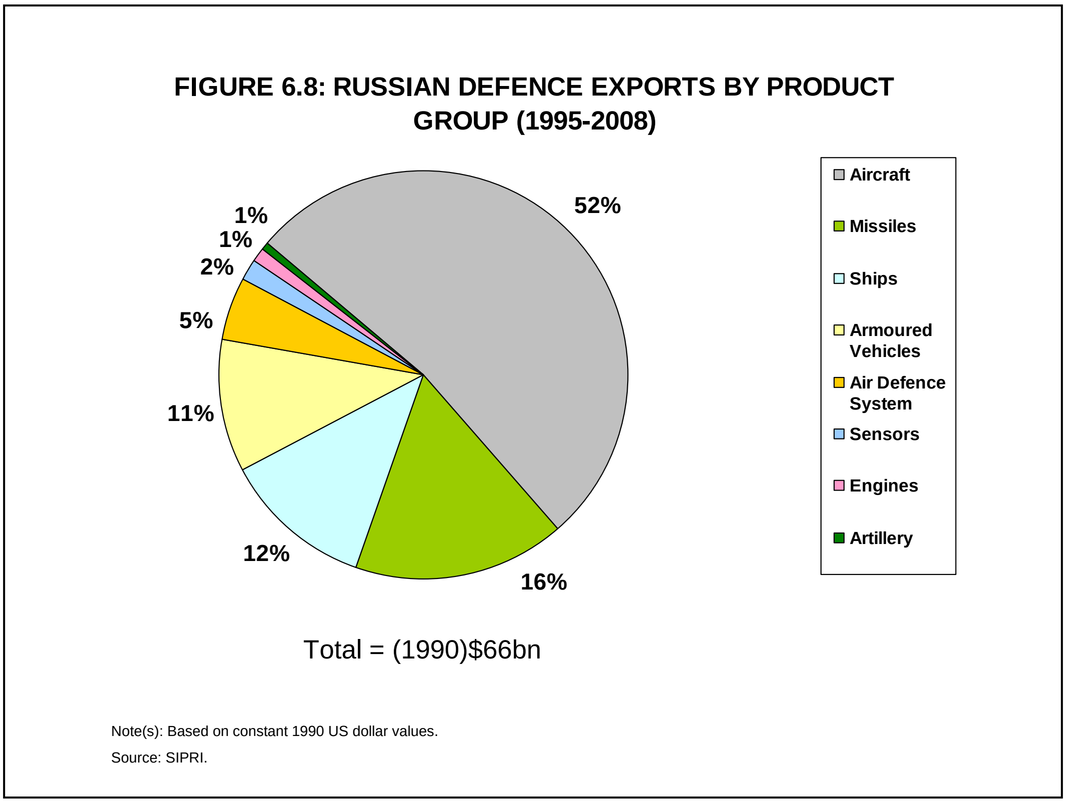
An analysis of Russian defence exports by type shows that aircraft was the dominant product group in 2008. The table below shows that of the $5,953m of arms exported (in 1990 US dollars), 55% ($3,294m) was aircraft. The next largest export category was missiles, which accounted for 21%, which means that together aircraft and missiles accounted for over 75% of Russian arms exports in 2008. It is not clear how the missiles category is broken down by launch-base or arena (air, land, sea). However, the third largest category, air defence systems accounts for 8%. This means that air-related defence products dominated exports in 2008, accounting for 63% in total. Ships accounted for just 4%, while land-based defence products (armoured vehicles and artillery) accounted for just 9%. Other cross-cutting exports (sensors, engines) accounted for just 4% of exports.

Table 6.5: Ranking of Russian defence exports by type in 2008

	Category	Value ($1990m)	% share
1	Aircraft	3,294	55
2	Missiles	1,232	21
3	Air Defence System	501	8
4	Armoured Vehicles	464	8
5	Ships	236	4
6	Sensors	96	2
7	Engines	93	2
8	Artillery	36	1
Source: SIPRI.			

The dominance of aircraft in export flows from Russia in 2008 is consistent with the longer term trend. The chart below shows that over 1995-2008, aircraft accounted for 52% of all Russian exports.

Figure 6.8: Russian defence exports by product group (1995-2008)



This tends to be volatile, however, with a share as high as 67-68% over 2002-04 and as low as 32-33% in 2005 and 2006. After aircraft, missiles accounted for the next largest share of exports, accounting for 16% of Russian arms exports over 1995-2008. The share of missiles in Russian exports has been rising from as low as 8½% in 2001 to 20-21% in 2007 and 2008. The third most important export over 1995-2008 was ships, which accounted for 12% of arms exports on average over the period. Once again, however, this was volatile, with a share as high as 35% of exports in 2005 and as low as 2% in 2002; there is no clear trend in the importance of ships in Russian arms exports. Armoured vehicles accounted for 11% of exports over 1995-2008. Its share of Russian arms exports has been a bit more stable, although after dipping slightly in the mid-2000s it has picked up again to 14% in 2007 and 8% in 2008. Together, the four categories discussed above accounted for over 90% of Russian arms exports over 1995-2008. This suggests that over the longer term Russian exports have been more broadly distributed across the land, air and sea-based categories, although air-related products still dominate.

A major change since the fall of the Berlin Wall and the demise of the Warsaw pact is that Russia try to compensate the loss of his “natural” markets in the former Eastern counties by the gain of new markets without political regime consideration. Russian industry doesn’t hesitate to propose to include foreign equipments or systems on a Russian platform (EU, Israeli in most of cases) in order to increase the chance to win a customer. Examples are the retrofit of MIG-29 fighters or MI helicopters.

Imports (and access to market)

There is a lot less to say on imports. In the broader, global context Russia accounts for little if any import demand. Data from SIPRI indicate that in 2008 the largest recipient of major weapons transfers was South Korea, which accounted for 8½% ($1,898m (1990 US dollars)) of the global total. This was closely followed by India on 8% ($1,847m) and China on 5½% ($1,241m) of the global total. So three BRICKs countries topped the list of arms importers in 2008. Brazil and Russia were not among the top importers. Even though South Korea, India and China topped the list, their shares were still small compared to the dominance of the US and Russia among exporters. Greece was the only EU country among the top importers in 2008 and there was one G7 country (Japan).

Table 6.6: Top arms importers, 2008

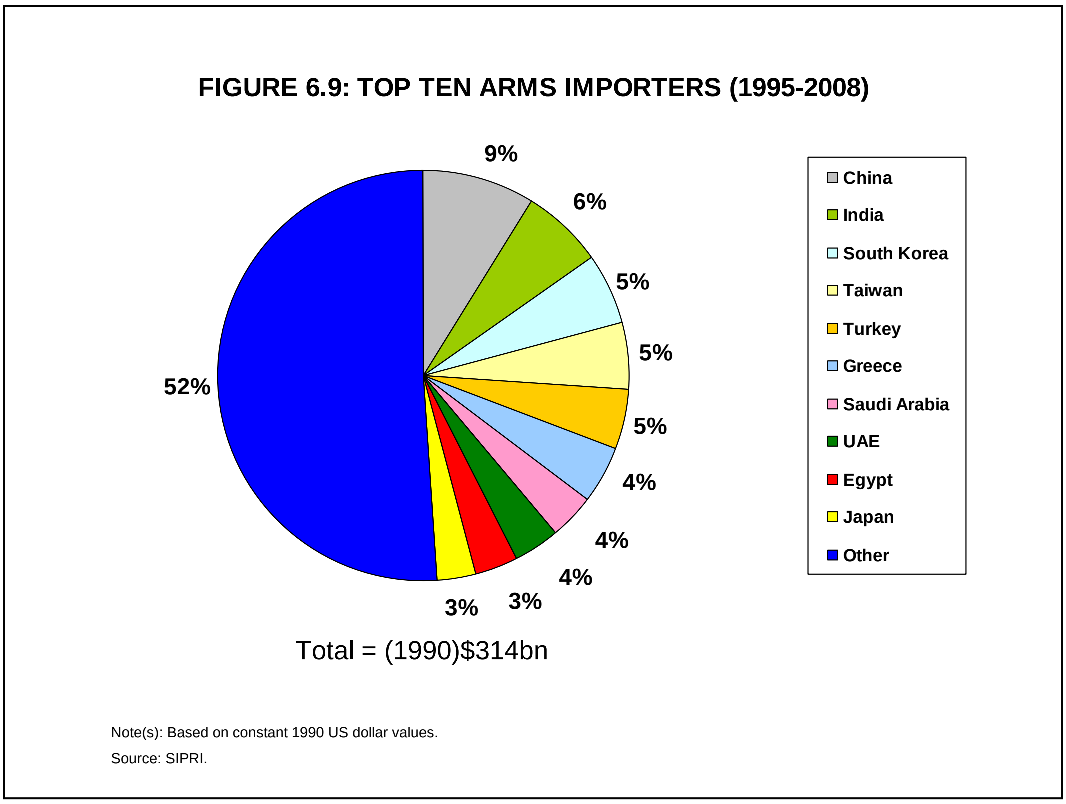
	Importing country	Imports (value ($1990m))
1	South Korea	1,898
2	India	1,847
3	China	1,241
4	Turkey	723
5	UAE	671
6	Japan	578
7	Greece	518
8	Egypt	119
9	Saudi Arabia	56

Source: SIPRI.

The picture of global defence imports in 2008 is broadly consistent with the longer term. The chart below shows that over 1995-2008 the three largest importers of arms were China, India and South Korea, with 9%, 6% and 5% of global defence imports respectively. Both Taiwan and Turkey also accounted for 5%. Russia and Brazil are no where to be seen. Again the concentration of imports is much lower compared to exports, with the three largest importers accounting for just 20% of imports and the top ten accounting for less than 50%.

With regard to imports by Russia, data from SIPRI highlight just three flows over 1995-2008. The first is the import of $5m (1990 US dollars) of engines from Germany in 2006; the second is the import of $40m (1990 US dollars) of sensors from the Ukraine in 1995; the third is the import of $100m of missiles from the Ukraine in 2007. It is not clear to what extent this reflects the reality of trade flows into Russia and to what extent it reflects the lack of available or transparent data. In either case, it would indicate that Russia remains a relatively closed and isolated market for arms exporters.

Figure 6.9: Top ten arms importers, (1995-2008)



6.4 Performance and recent trends by domain

6.4.1 Aircraft

Russia cannot be considered as an emerging country in the field of armaments in general. In the field of combat aircraft, Russia remains at the technological level of the best players. In terms of sales, it is one of the leading exporters. More generally, the Russian industry is the only non-Western defence industry with a presence in both civil and military aviation.

With the Mig 29/35 and Su 27/30/33 Russia offers state-of-the-art combat aircraft and continues to improve these products so as to offer upgrades or more advanced versions. In order to maintain its technological level Russian industry is currently working on the next-generation fighter.

At present Russia is offering aircraft that are less advanced than US models in terms of their ability to escape detection and less advanced than Israel in the area of unmanned aircraft, but which demonstrate a very high level of performance in terms of manoeuvrability.

Russia remains the largest and most important competitor of Western countries in the combat aircraft market. The MIG and Sukhoi have widened their export markets since the end of the Cold War.

The Russian industry has all the necessary skills for the development and production of combat aircraft both airframe, engine, combat system equipment and weapons (including if necessary Western equipment to meet customer wishes).

In all military areas, the Russian industry has a rich and uninterrupted experience. The only period when its ability to develop new products was reduced came in the 1990s following the end of the Cold War and the loss of the Warsaw Pact market. Nevertheless, the need to renew products for export and to penetrate new markets has since revitalized the defence industry.

The Russian industry is able to produce the entire range of aeronautic products: advanced training aircraft, transport aircraft and specialized aircraft for maritime surveillance, air warning, electronic warfare and aerial refuelling.

6.4.2 Helicopters

Russia remains the largest and most credible competitor to the Western countries in the helicopter segment.

Like the aircraft industry the helicopter industry also suffered during the 1990s from the end of the Cold War and the loss of the Warsaw Pact markets. But this industry too has since become a more serious contender in global markets with the Mil and, to a lesser extent, the Karnov.

With the Mi 8/17 and Mi 24/35 Russia offers and succeeds in exporting state-of-the-art transport and combat helicopters. They are considered to be very good products and their export success is furthered in some markets by their being fitted with western avionics or subsystems.

The Russian defence industry has all the necessary skills to develop and produce helicopters: the airframe, the engine, the combat system and weapons. In relation to the weapons, it does not hesitate to enter into partnerships with western firms in order to meet the needs of its customers. Russian helicopters like the Mi24/3 or Mi18/17 are offered with Western components including, for example, US engines.

The Russian industry has started to develop new versions of existing machines or even to launch new products. However, the helicopter producers thrive by serving both the civil and the military markets. The Russian helicopter industry is hampered by its low presence on the civilian market because it presents an array of products that have not been designed to satisfy civilian needs. Russian helicopters can cover all military needs from combat missions to heavy transport tasks and specialized missions.

Thanks to its successful return to export markets on the back of a broad range of skills especially in military machines, the Russian industry is in a good position to remain a credible player with a technically and financially competitive offer.

6.4.3 Land armaments

Russia has a very competitive land armaments industry and is able to produce the full range of products.

At present, the T-90 is the only tank being produced in Russia. The chassis is derived from the T-72 but with the latest improvements: capability of firing fin-stabilized projectiles, explosive reactive armour, infrared jammer, laser warning detector, stabilization of the turret, automatic loader, day and night sighting system etc.

While most items in this list are Russian, we note that some T-90 models (including some used by the Russian army) are equipped with the Catherine thermal camera produced by Thales (France).

An advanced T-90S is available for export at a much more competitive price than its US (M1 Abrams) and European competitors (only one-third of the price of the Leclerc and half the price of the Leopard 2). The T90S, already sold to India and Algeria, could be of interest to many armies. The export consortium Rosoboronexport is selling it in the Middle East (Yemen, Libya, Saudi Arabia etc)

Besides the tanks, the other great export success of the Russian defence industry is the range of fighting infantry vehicles BPM-1 (also manufactured by the Czech Republic and Slovakia), BMP-2 and the model that is now being exported, the BMP-3. The reputation of the BMP-3 is due to important armaments for a vehicle of this type: 100 mm gun or antitank missiles and an automatic 30 mm gun.

The list of countries to which this equipment has been exported is impressive:

- BMP-1: Afghanistan, Algeria, the CIS, Cuba, Czechoslovakia, Egypt, Ethiopia, Finland, Hungary, India, Greece, Iran, Iraq, North Korea, Libya, Mongolia, Poland, Russia, Syria, Yugoslavia and Morocco
- BMP-2: Abkhazia, Afghanistan, Algeria, Angola, Armenia, Azerbaijan, Belarus, Bulgaria, Congo, Finland, India, Iran, Iraq, Jordan, Kazakhstan, Kuwait, Slovakia, Syria, Ukraine, Uzbekistan, Yemen and Togo
- BMP-3: Cyprus (43), Kuwait (110), South Korea (70), Sri Lanka (36), Syria, UAE (390), Greece (450) and Algeria (100).

The BMP-3, which dates from the early 1990s, is the first of the series not to be exported to any countries of the former USSR

Not only does the Russian industry offer a complete range of material that is particularly effective and at competitive prices, but it also offers this hardware fitted with western equipment (including electronics and optronics).

The financial condition of the land armaments industry remains mixed:

- Uralvagonzavod (UVZ), the consortium that since 2008 heads a part of Russian land armaments industry is currently enjoying success with the T90. UVZ also provides goods for its non-military activities (tractors, equipment for industry, etc);
- Currently, Omsk KBTM (State-owned engineering bureau), seems to maintain its independence;
- Omsktransmash, which was involved in the production of the T80 tank, is in trouble and had to be rescued by the Russian government.

The modernization of this industry is managed by Rosoboronexport, which is also responsible for the successful implementation of export orders.

Finally, we must not forget that the collapse of USSR left a part of its industrial skills base outside of Russia, as for instance the Ukrainian engineering bureau KMDB (the designer of the tank T80UD). The Antonov bureau is another example of a former Soviet industrial and military important body now based in another country. Antonov in particular is offering the An-70 which is a competitor to the A400M.

6.4.4 Surface ships

The issue of access to the sea is for Russia a major concern. The collapse of the communist regimes of the satellite states of the former USSR reduced access to the sea for the Russian navy (in particular in the Mediterranean).

The need to control waterways, and oil and gas terminals which are crucial to the Russian economy, is a major reason for maintaining a large fleet of battleships and the related industry.

Russia is, as in other areas, the only BRICKs country capable of exporting whole weapons systems (i.e. submarines, frigates, patrol boats completely fitted out with its own technology. The Russian military shipbuilding industry is an exporting leader far ahead of the western countries (the United States usually exports few goods in this area), including the EU.

The Russian warship construction industry covers all aspects of surface vessels, equipment and electronic systems, including airborne systems. The industry is represented by more than 160 companies, including shipyards, design bureaux and research centres.

For export Russia offers an array of vessels ranging from frigates and corvettes to the most modern missile-carrying speedboats. These are one of the great export successes of Russian industry. In these areas, Russian engineering bureaux are still highly competitive.

Russian equipment (radar, missile systems, etc) often provides strong selling points for export because of the operational advantages it offers.

6.4.5 Submarines

Russia has an industry capable of designing and manufacturing large nuclear attack submarines like the Akula II or SLBMs like the Oscar and the Project 955.

The condition of the Russian strategic fleet in recent years might have raised some doubts about the condition of its submarine industry; but to combat these doubts we must highlight the following points:

- These problems are related more to a lack of financial resources available to the strategic Russian fleet during this period than to a loss of skills;
- Even during this lean period, Russia continued to export submarines;
- The strategic fleet is now being upgraded; and this will benefit the Russian industry.

The main Russian-made product for export is the Kilo Class submarine, in different versions. These different versions were designed by the Rubin design bureau but built by different yards: Yard n°492 in Severodvinsk in the Kola Peninsula, Krasnoye Sormovo shipyard in Novgorod, the Admiralty Shipyard in St. Petersburg and the Amurskaya site. A version called 1650 Amour is equipped with an anaerobic propulsion system developed by Rubin. For the sake of the export market the proposal is that many Kilo Class submarines should be refitted to take this type of propulsion.

Kilo Class submarines have been sold to Algeria, China, India, Indonesia, Iran, Libya (contract in 2008), Poland (delivered during the communist period and still in use along with four other submarines from Norway), Romania (in dock for 13 years and in a very poor condition) and Venezuela (contract in 2008).

The Russian industry makes the full range of equipment and weapons necessary for a submarine. Russia depends on no other country for any part of the vessels it offers for export. Indeed, in addition to their own qualities, one of the selling points of the Kilo class submarines lies in their equipment and weapons including cruise missiles (S Club) and anaerobic propulsion.

6.4.6 Missiles

Russia remains the largest and most credible competitor of the Western countries in the missiles segment.

As in other branches of the defence industry the export prospects for missiles have recently become more favourable after the slow period caused by the loss of the Warsaw Pact markets and the end of the Cold War.

The Russian industry has all the necessary skills for the development and the production of missiles in all areas and applications. Its range is not limited to tactical missiles for land or naval air platforms but the Russian industry is also one of the few industries in the world having the know-how and the production resources for ballistic missile systems equipped with strategic nuclear weapons. Vympel, Zvezda-Strela and Novator are the main players in this industrial network.

The portfolio of the Russian industry covers all market segments, all types of applications and all carriers alike. This wide range of equipment, combined with the reputation gained by the Soviet missiles in conflicts such as Vietnam or in the Middle East, is an asset for Russian exporters since it allows the country to offer complete systems to its customers, weapons included.

The Russian industry has started during the past few years to develop new hardware or upgraded versions of existing missiles. This is particularly the case of the air-air and anti-surface missiles and in the field of systems for intercepting rustic ballistic missiles (Scud-type).

The specifically-tailored catalogue, covering all client needs and based on domestic products manufactured at the highest level of technology, combined with Russia's major industrial assets in this field, will create a real advantage on export markets.

The prospects for the sale of these weapons, a necessary complement to other Russian hardware, will benefit also from their position in export markets and will contribute to the recovery efforts launched by the whole Russian arms industry.

Russia should therefore remain a credible player and a leader in the missiles market with a complete offer, attractive technically and financially, as the ideal complement to Russian exported combat systems.

6.4.7 Electronic systems & optronics

The Russian industry is still lagging behind the international competition in electronics and optronics. This technological lag is primarily due to the method and quality of production. Learning in these areas is mainly achieved by volume and hence by civil activities.

However Russia has made great progress since the early 1990s, and the opening of borders enables the country to learn and to improve its access to technology. Besides, the electronics armaments industry is highly invigorated because electronic equipment makes an essential contribution to the quality of materials and their export. If the production quality leaves a bit to be desired for some components, the R&D military level is excellent in almost all areas.

When the quality of domestic production is not sufficient, the Russian industry calls in Western technology, if necessary, both for national needs and exported equipment. The modernization of the large quantity of existing Russian equipment elsewhere in the world is for many Western manufacturers an attractive market. In particular this was done in many former Warsaw pact countries, usually with the help of the original Russian supplier. It was the case, for example, with former East German Mig-29 that was upgraded to Nato standard. But Russia is also capable of undertaking such adaptation, if the Western components can be supplied. This type of upgrade to Nato standard also applies to the Russian battle tank in use in various other New Member States.

Three specific activities in the field of arms will illustrate the state of the Russian industry.

Combat aircraft radars

There are currently two developments of Active Electronically Scanned Array (AESA) radars in Russia.

- Tikhomirov NIIP develops the first one. This company produces fighter aircraft equipment, gyroscopes, radar systems and anti-aircraft missiles. It is developing the Sh121 radar for the Russian 5th generation fighter aircraft. The government is financing the design of this radar. The Sh121 antennas will be spread in different parts of the aircraft and will have various operation modes (including electronic warfare). It is a very advanced technological programme.
- The second, the Zhuk-AE radar, is being developed by the Phazotron-NIIR Institute and is both self-financed and subsidised by NSK MiG. The Zhuk-AE radar will equip the MiG-35 for export.

Both companies can rely on the existing components industry: companies NPP, GRPZ, NIIP and Micran are involved in the development and production of Tx / Rx modules for active radars.

This industry has already the capacity to produce some combat aircraft radars (the Zhuk demonstrator flies on MiG-35 and the Sh121 is on a test bench). It is a key factor for Sukhoi and MiG, both for domestic needs and for export.

Navigation Guidance

It appears that the Russian industry is lagging behind. For export the Western inertial measurement units are sometimes requested by customers, a situation that has led the Russian industry into cooperation with Western companies:

- the acquisition of Sagem's SIGMA inertial navigation unit
- cooperation between JSC RPKB and Sagem on inertial navigation issues

Optronics

Some projects are suffering delays mainly because of shortcomings in the control of production and a lack of experience in microelectronics technology.

- In the light-intensification field, one company, Katod, is trying to develop the latest generation of technology (EBCMOS and Gallium Arsenide). But these projects are running about ten years behind schedule and also suffer from a level of production capacity that is insufficient for national needs.
- Russia's technological lag in the field of infra-red and thermal cameras is shown by the acquisition of Thales thermal imagers and the creation of a joint venture between Thales and Rosoboronexport for the production of thermal imaging cameras in Russia and the creation of a joint venture in thermal cameras between Safran and UOMZ.

- Russia has also made the following purchases from Thales: DAMOCLES laser designators (preferred to the Russian-made UOMZ ones) and the Topsight helmet-mounted sight.

The foregoing examples highlight two categories of development activities.
- Russia focuses on its own developments to access a specific technology. This applies particularly to radar components for combat aircraft, which is a strategic area for the military and aircraft manufacturers;
- Where Russia suffers from a technological gap and must create partnerships with foreign manufacturers and accept, at least temporarily, to be dependent.

Despite these gaps, the Russian electronics industry is the one that has the best technology among the BRICKs countries. In addition, this industry covers all areas: radar, avionics, optronics, sonars, control command systems, etc. Western OEMs are attracted by the Russian market and also by its export market, which is accessible via Russian platforms.

It is likely that in the medium term, the gaps cited will be bridged or closed.

6.5 Conclusions

The defence sector in Russia suffered after the collapse of the former Soviet Union in the early 1990s, with output and employment falling in the 1990s. Employment in the sector has fallen dramatically from early-1990 levels, with the number of R&D personnel falling by around 66% since the early-1990s. The importance of the sector as a major employer, therefore, has declined considerably and this is reinforced by the relatively low wage levels available. Conditions have been improving in recent years, with output levels recovering on the back of a steady rise in defence spending (in absolute terms). Nevertheless, the Russian defence sector looks to be becoming more stretched as output levels rise and export levels remain high while employment in the sector falls and defence spending plateaus or falls, both in absolute terms and as a share of GDP.

The industry has been through several reforms since the collapse of the Soviet Union and one of the key results has been a sharp fall in number of government personnel involved in the defence sector. This gives the impression that the state is no longer equipped to deal with the sector and makes it harder to implement single, consistent policies. A key driver of Russia's defence procurement, and thus, industry, is the protection of its own economic (defence of oil & gas terminals, maritime routes etc) and political (become world power again in face of US and NATO) interests. As a result, priority is placed on: Strategic Nuclear Forces; Equipment of units with a high degree of availability; and Equipment of forces fighting against terrorism. Another key issue for Russia is re-equipping its forces with modern hardware. Some hardware in the Russian forces is 20-30 years old. A significant obstacle to this is the lack of funds.

Offset policy in Russia is unclear. It is assumed Rosoboronexport negotiates individual contracts with importing countries, and recent reports suggest that where need be Rosoboronexport can offer more substantial offsets than other competitors in Europe or the US.

Many recent joint ventures and acquisitions have been in the field of electronics and optronics, one of Russia's weaker sub-sectors, which have allowed Russia to acquire know how and access to Western technology: eg in the field of navigational guidance, the purchase of Sagem's SIGMA internal navigation unit, and co-operation with Sagem on inertial navigation; joint ventures between Thales and Rosoboronexport, and Safran and UOMZ in the field of thermal imaging cameras. Beyond that, Russia shows an increasing willingness to mount western technology on its platforms in order to secure export sales.

6.5.1 Competitive strength of local industry and likely developments

The strength of the Russian defence industry is its breadth of coverage and existing major presence in the global arms market (second largest exporter after the US). It is able to produce equipment in all domains and as such is able to export the full range of military hardware. This is supported by a relatively autonomous and well organised body overseeing export sales, Rosoboronexport, which appears nimble and relatively successful in securing export orders for Russian defence sector. It appears able to price Russian arms exports very competitively and offer attractive incentives. This reinforces the price advantage Russian products typically enjoy. Allied to this is the recognition by Rosoboronexport of the importance of after sales service and this is being reflected in new contracts.

In the medium term the industry will continue to focus on export sales as means to generate income to fund the upgrading and development of the defence industry. It is also likely to be supported by growing domestic demand due to increases in domestic military spending. However, this growing domestic demand is unlikely to be enough to support the industry and export sales will remain a key source of revenue. It seems that closer collaboration with and investment from advanced producers could help meet this need. Frameworks have been put in place to support public-private partnerships to encourage more private investment in the industry. However, most Russian firms lack the funds required while it remains to be seen if foreign firms will get more engaged when politicians are so involved in the Russian sector, and if their own governments will allow them to. It is not inconceivable that, with a lack of funds supporting a full spectrum of defence sub-sectors, one or more sub-sectors are allowed to stagnate and fall further behind or at worst go into terminal decline.

6.5.2 Strengths and weaknesses

Strengths

- its breadth of coverage. This allows Russia to produce hardware in all defence domains and remain independent. As such it is able to offer this full portfolio to export customers without having to collaborate.
- it faces little competition in the domestic market, allowing the sector and Rosoboronexport to focus on the export market;
- it has a higher penetration of BICK markets compared to the EU and other BRICKs countries;
- it does not suffer from an arms trade embargo from EU, like that for China (but see weakness below);

- it has strong political support/backing in recognition of the importance of export revenues and the need to upgrade defence-industrial complex to support Russia's role/re-emergence as global military force;
- it is one of the few industries in the world capable of producing ballistic missile systems equipped with strategic nuclear weapons;
- success in securing export orders in recent years mean that Russia will soon be able to fund the development of new weapons again;
- operating at full or near capacity, which should raise productivity, and with enough export orders to sustain production until 2013-14. This should make it more attractive to invest in the Russian defence sector.

Weaknesses

- weak domestic demand: Russian military is a hungry but poor customer, starved of adequate funds. The military is in desperate need of new or upgraded equipment, so there is huge potential demand, but the military budget is far too small to buy enough new or upgraded equipment to meet its needs. Even recent announced increases in military spending mean it would still take at least 20-40 years to equip the Russian military with modern equipment;
- coupled to export-focused nature of the Russian defence sector, it means the Russian defence sector is very exposed to a downturn in export demand – a shortage of funds means domestic demand is unlikely to pick up any slack;
- it is losing ground to China, which spends much more on defence and is beginning to overtake Russia with better quality and more advanced technologies in some defence sub-sectors;
- a heavily reliance on China and India for exports. As these countries develop their own defence sectors, the demand for Russian made defence equipment will fall. This poses a challenge for the sector in terms of finding other markets just as large and potentially lucrative. The politics of international relations mean it is unlikely to secure huge orders from Western countries, and so it must rely on potentially smaller or less wealthy countries;
- penetration of EU is still very limited; and US refuses to allow Russian imports and US firms to collaborate with Russian firms;
- electronics and optronics sub-sector: not as advanced as other sub-sectors and globally not at the cutting edge;
- weakened industrial base being further eroded by rising imports in context of globalisation and rising natural resource-based wealth, making it harder to support needs of defence sector;
- decline in civil demand for some dual use technologies, eg aircraft, ships, which is impacting on production volumes, profits and product development overall, and forcing some firms into bankruptcy; the supports a decline in production capacity and development of military hardware;
- operating at full or close to full capacity, so unable to take on many more export orders.

Implications for EDTIB

The weakness of domestic demand/spending, the importance attached to export revenues to fund the development of the Russian defence industrial complex, Russia's ability to export all types of military hardware and its apparent willingness to trade with almost anyone now, mean that Russia will be a major competitor to the EU in the BRICKs and other third markets. Russia already has a significant presence in China and India, and is beginning to make inroads into Brazil and other South American countries. It seems likely that as China and India develop their own defence sectors and reduce their dependence on Russia, Russia will shift its focus to other third markets and competition will intensify.

Its penetration in the EU has been limited. While the impact of the recession on EU military budgets may make lower priced Russian equipment more attractive, it remains to be seen if the EU, its Member States and allies would countenance a significant increase in Russian exports to the EU; both for strategic reasons and the impact on Member States' own defence industries. It would make more sense for Russia to exhaust opportunities in more accessible markets outside the EU before getting itself bogged down in trying to access EU markets.

Russia's defence industry is out of date and behind the times, operating with out of date equipment, low levels of management, low capital stocks and an ageing workforce. It desperately needs funds to support its development, but export revenues alone are not enough. While there may be substantial political challenges to working in Russia or collaborating with Russian firms, this would appear to present a great opportunity for EU firms to get more involved in the Russian defence industry, through more joint ventures and FDI, and capitalise on Russia's share of the export market and the strength of demand to modernise Russia's own army.

Although Russian export sales continued to grow in recent years, not all sub-sectors have benefited to the same degree. With domestic spending on military hardware limited, it remains to be seen if the Russian defence sector can continue to cover all defence domains. It seems plausible that at some point there may be an economic case for withdrawing support for a sub-sector and letting it decline. However, whether the political decision to do that would be taken is another matter; Russia appears keen to retain is independence in all domains. Were the Russian government to allow that to happen, this would reduce competition for EU producers and offer them the chance to fill the gap left by Russian producers in that sub-sector. At the same time this also has implications for which export products are supported and marketed the most: if cash is what the sector needs most, it makes sense for the sector to target the most profitable arms sales or, at the very least, those that offer substantial revenues up front. To that extent, the discounting and attractive incentives being offered by Rosoboronexport in 2009 appear counterproductive and are surely unsustainable for the whole defence sector.

7 The defence market and sector in India

In term of emergence India will have to confirm, it current problem is the difficulties to maintain know-how, in particular those received through transfers. For example, the TEJAS programme launched in the 80ies is still in development phase, in term of aircraft generation it corresponds to a 1st generation of French Mirage 2000. Despite the important industrial base, India's poor capacity in maintaining knowledge entails that the country will not be capable of competing with Western defence industry within the next 10 years. For the moment its exports are very small in value terms and may remain so.

Overview of the situation and assessment of competitive position

- Numerous and diversified targets
- An important industrial base but with durability issues
- Uncertain programme development

SWOT

Strengths	Weaknesses
• Independency willingness enforced by a recent embargo episode • A wide industrial base • The National Agency (DRDO)	• Difficulties to complete programmes • Poor capacity to maintain know-how
Threats	**Opportunities**
• Poor reliability	• Cooperation with major suppliers: in Israel, Russia and Europe

7.1 Structure

Until relatively recently, India's defence sector had been a closed sector under the exclusive control of the government, meaning that the study of India's defence industry attracted little attention both nationally and internationally. Therefore, there is a limited supply of detailed information on the sector.

India's defence industry has experienced significant changes, however. It has developed from the lowest end of the production spectrum in the period prior to, and immediately after, independence, catering mainly for the maintenance, repair and overhaul of imported weapons to a stage where it can boast of designing and developing a range of state-of-the-art weapons systems.

7.1.1 Distribution of production and employment

While India's defence companies are mainly publicly owned and were originally set up as dedicated defence manufacturers, a number of producers now sell to the civilian market as well. For example, a BICC paper[114] indicates that more than half of the output from Bharat Electronics Ltd., a major defence supplier, is now for the civilian market and in the case of Bharat Earth Movers Ltd., less than 7% of its output is now for the defence sector.

Total production

India's domestic defence-industrial production is based around the 39 Defence Ordnance Factories (OFs) and eight Defence Public Sector Undertakings (PSUs), which were created as corporations[115]. These units are under complete government control. In 2001, the Indian government opened the defence sector completely to participation from the private sector, although Foreign Direct Investment (FDI) was, and still is, limited; an overseas company may not hold more than a 26% stake in an Indian defence company, subject to government-issued licences. The response from the public sector was muted, owing to the requirement for heavy investment; uncertainties over future defence requirements and sustained demand; and long product cycles from development, through to trialling, and finally to introduction of new equipment. Private-sector involvement has increased since then thanks in part to more active encouragement from various government bodies. This involvement has been mainly through establishing ties either with the OFs, PSUs or defence conglomerates from abroad.

The value of India's public-sector defence production was just over $6bn for the 2006-07 financial year (see Table 7.1).

Table 7.1 India's defence industry

Company / number of units	Number of employees (approx.)	Value of production 2006-2007[a]	Major production	Defence / civil sales 2006-2007[b]
Ordnance factories / 39	111,841	1828.4	Manufacture of defence hardware for the armed forces.	
Hindustan Aeronautics Ltd. / 28	30,000	2031.3	Manufacture and overhaul of aircrafts, engines and rotables for the defence services, Coast Guard and exports.	
Bharat Electronics Ltd. / 9	12,357	885.8	Manufacture of electronics equipment/	83:17

[114] BICC (2004), *Changing Times? India's Defence Industry in the 21st Century* http://www.bicc.de/index.php/publications/papers/paper-36

[115] Ordnance Factories are run directly by the Indian government and are engaged primarily in manufacturing. Public Sector Undertakings are corporations in which the government has a majority stake ie public enterprises. They engage in both production and research activities.

Company / number of units	Number of employees (approx.)	Value of production 2006-2007[a]	Major production	Defence / civil sales 2006-2007[b]
			components for the use of defence services and other infrastructure providers in the telecommunications sector.	
Bharat Earth Movers Ltd. / 4	11,478	571.9	Manufacture, sales and after-sales-service of construction and mining equipment, defence products and rail and metro products.	
Mazagaon Dockyard Ltd. / 4	8,000	413.3	Manufacture of destroyers, frigates, missile boats, corvettes, submarines and patrol vessels for the defence sector and merchant vessels and dredgers for the civil sector.	
Garden Reach Shipbuilders & Engineers Ltd. / 2	5,126	141.6	Manufacture of high value technology complex engineering items.	
Goa Shipyard Ltd. / 1	1,725	59.0	Manufacture of medium sized sophisticated vessels for Indian Navy and Coast Guard.	
Bharat Dynamics Ltd. / 1	2,742	85.2	Manufacture of guided missiles.	
Mishra Dhatu Nigam Ltd. / 1	1,281	49.4	Manufacture of various alloys, specialised metal plates and others.	43:57
Total	184,550	6066.0		

Note(s): a) Figures are in US$m; b) Figures are ratios.
Source(s): Annual Report 2007-2008, Ministry of Defence, Government of India and PSU company websites.

Total production by sub-sector

- Army

The main equipment manufacturers for the Indian Army are the OFs. In 2006-07 they accounted for 30% of total public defence production. The OFs manufacture weapons (small arms, tank guns, field howitzers, artillery guns, mortars, air defence guns, rocket launchers); ammunition; armoured and transport vehicles (T-72 'Ajeya' tanks, more advanced T-90 'Bhishma' tanks and various infantry combat vehicles); troop comfort items; opto-electronics (optical instruments and opto-electronic devices as well as fire control instruments for armoured vehicles) and various other items (aluminium alloys, cables). Some of the PSUs also manufacture equipment for the Army.

- Navy

Of the eight PSUs, three focus on manufacturing equipment for the Indian Navy and Coast Guard. In 2006-07 they accounted for 10% of total public-sector defence production. Mazagaon Dockyard Ltd. and Goa Shipyard Ltd. focus on vessel manufacture while Garden Reach Shipbuilders & Engineers Ltd. specialises in technology and complex engineering items.

- Air Force

Hindustan Aeronautics Ltd. (HAL) is the main manufacturer of aircraft and other equipment for the India Air Force. The PSU's production accounted for 34% of total public-defence production in 2006-07. HAL manufactures 11 types of aircraft from in-house R&D and 14 types by licence. The current indigenous aircraft are: advanced light helicopter, intermediate jet trainer and the light combat aircraft. The following are produced under licence: SU-30MKI fighter aircraft, Jaguar, Hawk, Dornier (DO-228), Cheetah/Chetak helicopters.

Total employment and by sub-sector

In 2006-07 the public defence sector employed around 184,000 people, of which 61% work in the OFs. Other large employers include Hindustan Aeronautics Ltd., Bharat Electronics Ltd. and Bharat Earth Movers Ltd.

- Army

The OFs employ around 61% of the total public defence sector workforce.

- Navy

The main PSUs that manufacture equipment for the Indian Navy and Coast Guard employ around 8% of the total public defence sector workforce.

- Air Force

Hindustan Aeronautics Ltd., the main manufacturer of equipment for the air force, employs around 16% of the total public defence sector workforce.

Location and nature of key industry clusters

India's 39 OFs are spread across 24 distinct locations across the country.

Size distribution of companies/extent and role of SMEs in sector

India's defence industry is dominated by the state-controlled OFs and PSUs.

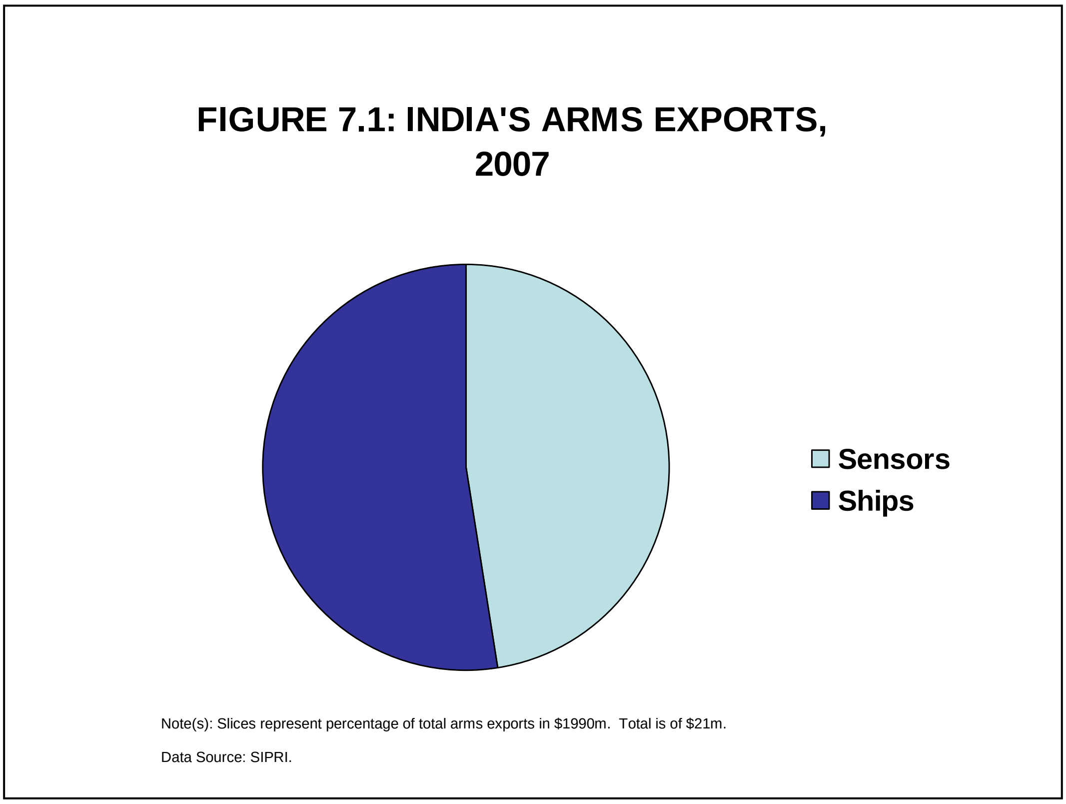
7.1.2 Trade

Exports

Indian export activity has, historically, been quite limited and, judging by the values and the various destinations over the years, the country appears to have engaged in small, one-off contracts in the past. In 1990 prices, the value of exports totalled $88m over 1971-75 and $49m over 1978-79 but the annual value of exports then fell to practically zero until 2000. The value of arms exports in 2007 was $21m in 1990 prices, while in 2008 the value of total arms exports was less than $0.5m. The main destination countries for India's arms exports are: Mauritius, Myanmar (Burma), Namibia, Nepal, Seychelles and Sri Lanka.

In 2007 India's arms exports were divided evenly between ships and sensors (see Figure 7.1). In this year these goods were all exported to Sri Lanka.

Figure 7.1 India's arms exports (2007)



Imports

Roughly 70%[116] of India's defence equipment requirements are met by imports, the rest from domestic sources. The bulk of India's defence imports has always consisted of aircraft and until the early 1960s the UK was the main source. The value of UK imports during this period ranged from as little as $100m (in 1990 prices) to as much as $1bn. The UK's contribution to Indian defence imports has waned somewhat since then and, by value, was outstripped by the USSR over 1960-90 and, subsequently, Russia. Imports from the USSR grew substantially, peaking at almost $3.6bn (1990 prices) in the late 1980s. Imports of other defence goods, notably ships, armoured vehicles and missiles, fluctuated over 1950-90. At present, Russia is still the main source of military equipment, but countries like France, Germany and the UK have also supplied several

[116] BICC (2004), *Changing Times? India's Defence Industry in the 21st Century* http://www.bicc.de/index.php/publications/papers/paper-36

systems. New emerging suppliers include Israel and South Africa, with the latter considered as a long-term reliable source of weaponry by the Indian government.

Figure 7.2 India's arms imports by country of origin (2007)

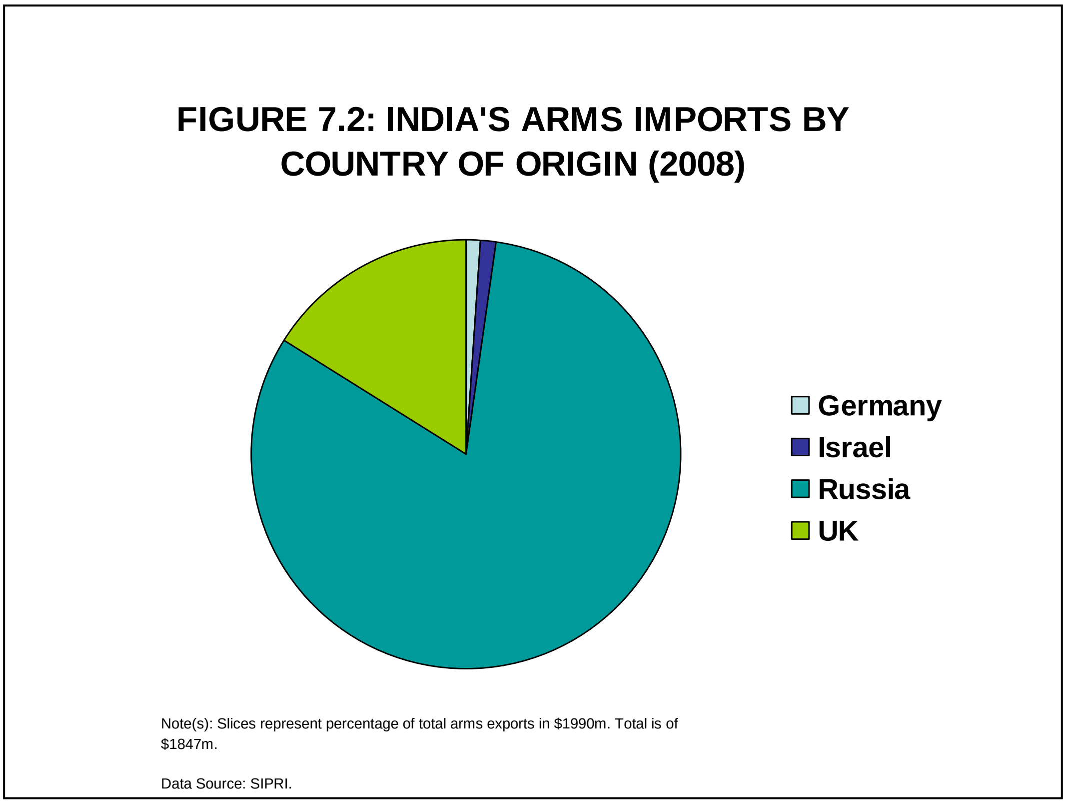
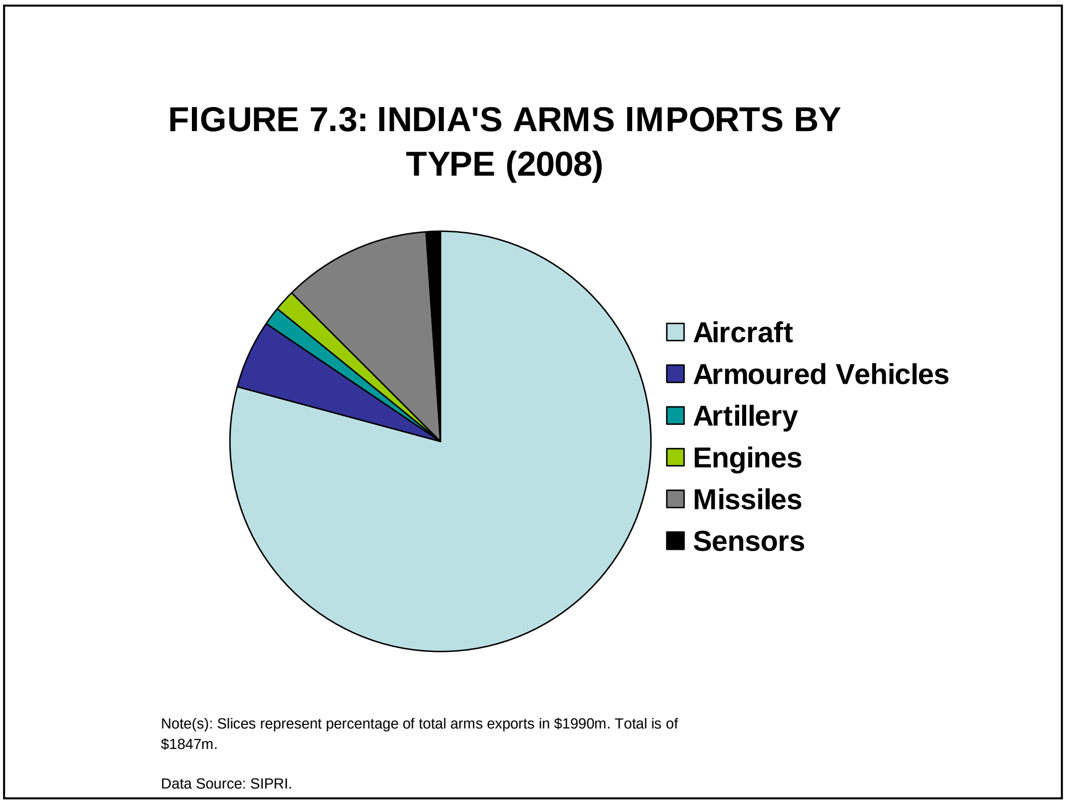


Figure 7.3 India's arms imports by type (2008)



The value of India's arms imports in 2008 was $1.8bn in 1990 prices, of which 80% ($1.5bn) came from Russia (see Figure 7.2). Arms imports from the UK accounted for 16% and the remainder came from France, Germany and Israel.

Aircrafts accounted for more than 79% of India's arms imports in 2008 (see Figure 7.3). Missiles and armoured vehicles accounted for 11% and 5%, respectively.

7.1.3 Companies

Three public-sector companies make up the bulk of India's defence-sector sales (see Table 7.2). In 2006, Hindustan Aeronautics, Bharat Electronics and the OFs made up 75% of India's public defence sector sales. These sales are of a combination of products produced under licence (both Western and Russian) and domestically-developed products eg helicopters developed and manufactured by Hindustan Aeronautics. All three companies can be found in SIPRI's *Top 100 arms-producing companies*, *2006*.

Table 7.2 India's main arms producing companies

Company	Sector	SIPRI world rank[c]	Value of sales 2006-2007[a]	Percentage of total sales[b]
Hindustan Aeronautics Limited	Aircraft, missiles	38	1550	33
Indian Ordnance Factories	Artillery, small arms, ammunitions	45	1300	28
Bharat Electronics Limited	Electronics	65	660	14

Note(s): a) In current $m; b) Total sales by OFs and PSUs; c) The SIPRI top 100 excludes Chinese companies.
Source(s): SIPRI Top 100 arms-producing companies, 2006.

There is limited information on foreign companies operating in India's defence sector.

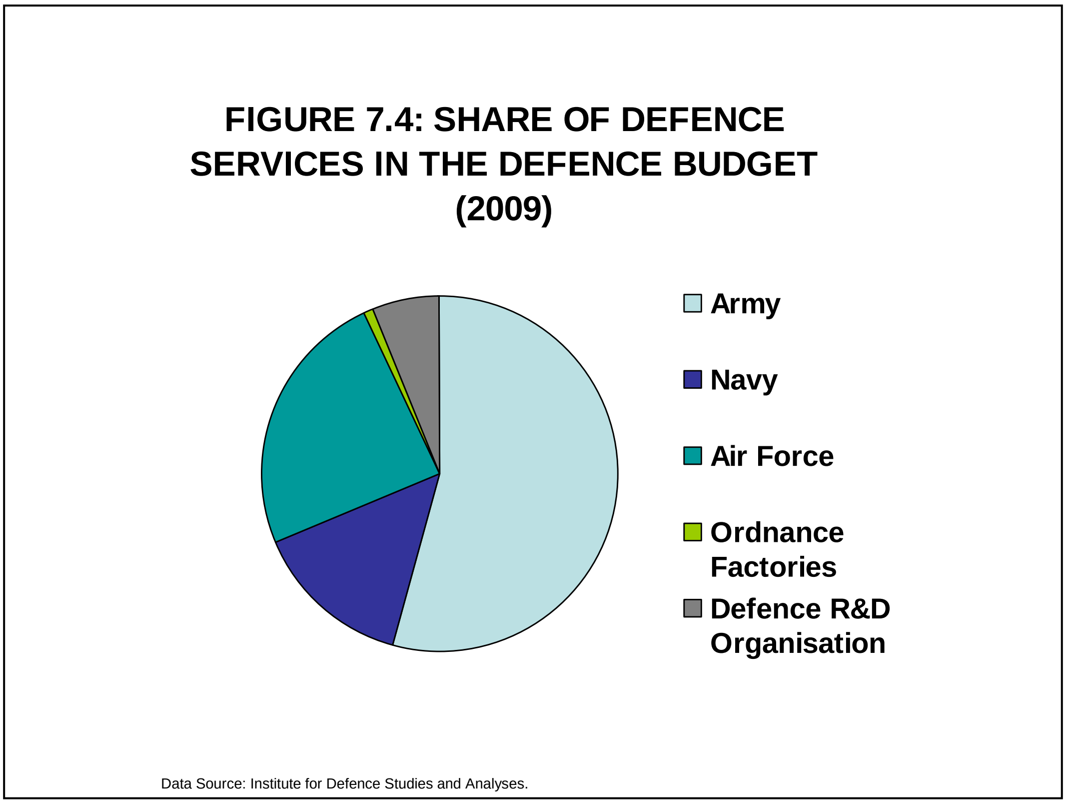
7.1.4 Defence budget

India's defence budget for the period 2009-10 will rise by more than one-third, to $30.8bn[117], according to the interim budget published in February 2009. Revenue expenditure, which is used in maintaining the military services and other departments, accounts for 61% of the total defence budget, while capital expenditure, which is mostly used for modernisation, accounts for the rest.

The Army will receive the largest share of the 2009 budget (see Figure 7.4).

[117] 1,417bn Rupees.

Figure 7.4 Share of defence services in the defence budget (2009)



The 34% increase in India's defence budget is one of the highest in the country's history of defence spending, prompted in part by the need to increase security following the attacks in Mumbai in 2008. It may also have been intended to boost public expenditure in the run-up to the general election that would take place over April and May 2009 as well as to keep pace with the expenditures of neighbours Pakistan and China. The last time the defence budget was increased by more than 30% was in 1987 (an increase of 43%).

7.1.5 Size of armed forces

According to the most recent IISS *Military Balance*, India had 1.28m active personnel in 2008 with the majority serving in the army (86%) and the air force and navy accounting for 9% and 4%, respectively. The Coast Guard accounts for the remaining 1% that is classed as active personnel.

There are just as many paramilitary personnel and just as many employed in the reserve forces as there are active personnel.

7.1.6 Access to the market

In 2001 the Indian government opened the defence industry to the private sector, allowing for 100% equity ownership with a 26% cap on foreign investment. Participation is subject to licensing, guidelines for which were subsequently issued by the Department of Industrial Policy and Promotion. Industrial licensing is now quite rare in India and, in the case of defence, appears to have been retained largely for strategic reasons: security, but also to ensure a stable flow of investment (transfer of equity is subject to both state approval and a three-year 'lock-in' period) and so as not to prevent the continued indigenisation of the defence industry.

7.1.7 Foreign direct investment

Figures for FDI in defence could not be found although given the limited private-sector involvement in India at present, coupled with the cap on overseas firms’ holdings in India firms (26%), the value of FDI can be assumed to be small.

7.2 Drivers

7.2.1 Regulatory & framework conditions

Scope: notable political, industrial and geostrategic situations that have a notable effect on defence industry and its future potential development or the capability of the country to develop a competitive offer.

The geostrategic overview:
India, since its independence, and the foundation of the Non-Aligned Movement, the country still maintains this stance nowadays and benefit from links with Russia, Western countries and other Non-Aligned States.

India has a wide spread coastline in a strategic region between the Straits of Malacca and the Horn of Africa.

It has also long land borders especially with Pakistan and China, countries with which tensions and conflicts have been frequent. With both countries India still today has territorial disputes. The situations in Nepal, Bangladesh and Sri Lanka are also causes for concern for India.

The environment in India is thus strongly influenced by ethnic and regional instability but also by the risks associated with religious fundamentalism, organized crime and arms and drugs trafficking.

India also has to protect its economic interests that are dependent of maritime routes through which passes trough almost all of its trade.

In the field of armaments, India has sought to diversify its sources of supply (Russia, France, United Kingdom, etc). More recently it has sought to develop a defence industry to meet its own needs through licenses and own developments.

In 1998, following a nuclear test, India had to face an embargo. Although the embargo was lifted, the local development strategy remains as it has been adopted then. The key player to this strategy is the Defence Research & Development Organization (DRDO), which now employs about 30 000 people.

Procurement

Procurement of conventional arms for the Indian military is placed under the control of the Department for Defence Production (DDP), within the Indian Ministry of Defence (MoD). The Ordnance Factory Board (OFB) and Defence Public Sector Undertakings (DPSUs) in the DDP are entrusted to regulate research, design, development and production capabilities sought by the army. Thus, DPSUs are directly involved in the procurement of defence related goods.

Currently, the bulk of Indian military equipment is sourced from overseas, which the Indian government is trying to reverse by introducing a 'make' procedure to boost indigenous research, development and production facilities, as outlined in its Defence Procurement Procedure (DPP-2006) reforms of 2006[118]. These reforms, detailed in the DPP, have set a target for 70% of defence equipment to be procured from domestic industry by 2020. This is to be achieved through the implementation of minimum indigenous content requirements on future contracts (30% minimum) and places stringent offset requirements on foreign input where this is required (currently 30% of contract value, see section below).

More recent reforms, outlined in the India Defence Procurement Policy 2008[119], have gone one stage further with the objective of making *"acquisitions speedier, ensuring greater transparency in the procurement process, and encouraging competition by broadening the vendor base, with the emphasis on the quality and reliability of equipment"*. In summary, these latest reforms have introduced the following measures:

- companies no longer require a license from the government to manufacture defence-related goods;
- vendors will be given advanced information before a Request for Proposal (RFP) is issued on the MoD website, to allow preparation time for bids;
- all communication with the vendor and government procurer to be confirmed in writing within week, with any contract signed by the DPSU in all cases where the procurement value exceeds Rs. 20 crores;
- vendors are required to give details of reliability models and the basis for reliability prediction in order to improve reliability and quality assurance in project delivery; and
- procurement decisions up to a value of Rs.100 crores can be approved by individual service headquarters, with only larger procurement above this amount cases required to go before the Defence Acquisition Council.

Should these reforms of Indian defence sector achieve their objectives, a much stronger domestic defence industry should emerge as a competitor to European companies internationally and are likely to push European companies out of the Indian market over time, given the tough offset and indigenous content requirements introduced.

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118 India Defence (2006): Indian Defence Procurement Procedure, Procurement Manual -2006, dated 30/8/2006 available at: http://www.india-defence.com/reports/2432

119 India Defence (2008): Indian Defence Procurement Policy 2008 - Details, dated 1/8/2008 available at: http://www.india-defence.com/reports/3937

Export controls

Other than the international obligations of India regarding defence export controls described previously in this study, little information appears to be available in the literature, partly due to the fact that India has traditionally not been a significant exporter of arms, but rather a net importer, a situation it is trying to reverse through the reforms discussed above.

Offset policy

Offset policy for defence procurement was introduced in June 2005 as part of Indian Defence Procurement Procedure (DPP)[120]. It stipulates that all contracts over Rs. 300 must have a minimum offset of 30% and that offset obligations should be discharged concurrently with the main contract.

Indian offset requirements[121] permit *"the direct purchase of, or executing export orders for, defence products and component manufactures by, or services provided by the Indian defence industry"*. Consequently, when Israeli companies recently won a major contract to provide airborne radar and surveillance aircraft to India, an Israel company placed a contract with Indian manufacturer for components, widely perceived to be an offset[122].

The same article highlights that while offsets have worked to India's advantage in this case, 30% investment in Indian companies is considered harsh by many contractors. The cancellation of a Bell Helicopter contract is given as an example, whereby the offset policy has driven away competitors.

International cooperation

The 'self-sufficiency' model adopted by the Indian government reforms in procurement and industry first requires a transfer of some technology and the development of industrial defence capability. Consequently, co-production and cooperative industry activity with more established defence industries has been encouraged. Military-technical cooperation with Russia[123] and historic links to the British defence industry should be highlighted in this regard[124].

Despite this desire for cooperation, overseas interest is limited by current Indian state rules that prevent more than 26% Foreign Direct Investment (FDI) in the Indian defence industry. However, 49% is considered on a case-by-case basis[125], illustrated by BAE Systems joint venture with Mahindra Defence Systems (MDS)[126].

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120 India Defence (2006): Indian Defence Procurement Procedure, Procurement Manual -2006, available at: http://www.india-defence.com/reports/2432

121 India Defence (2006): Indian Defence Procurement Procedure, Procurement Manual -2006, available at: http://www.india-defence.com/reports/2432

122 Defence Procurement News (2008): Indian Offset Policy Leads to Israeli Contract, article dated 1/12/2008 available at: http://www.defenseprocurementnews.com/2008/12/01/indian-offset-policy-leads-to-israeli-contract/

123 MDB (2007): Russo-Indian Military-Technical Cooperation: New Challenges and New Opportunities, article published in the Moscow Defence Brief (MDB) at the Centre for Analysis of Strategies and Technology (CAST) Issue 4, 2007, available at: http://mdb.cast.ru/mdb/4-2007/item2/article1/?form=print

124 See: Mohanty, D.R. (2004): Changing Times? India's Defence Industry in the 21st Century, Paper 36 for the Bonn International Center for Conversion (BICC), available at: http://www.bicc.de

125 Tha Indian (2008): 49 per cent FDI in defence sector on need basis: Antony, article dated September 20, 2008, downloaded from: http://www.thaindian.com

126 http://news.bbc.co.uk/go/pr/fr/-/2/hi/business/7644513.stm

The FDI issue is also discussed in EU-India Business Dialogue to promote cooperation at the EU level on trade and sector specific issues to include mechanical engineering, information technology and the space defence related industries[127]. Progress on both sides could therefore be an important driving factor in the future development of both European and Indian defence industries.

7.2.2 Defence & industrial policy

As with its other industrial activities, India's defence-industrial strategy has self-reliance as a primary objective; the country never being allowed to develop such competences pre-Independence. Currently, a clear imbalance exists between the requirements of the armed forces and the country's domestic production capacity, with around 70% of demand currently being met by imports. The existing government strategy was designed with the primary aim of supplying 70% of the armed forces requirements from domestic sources by 2020.

The government is also looking at various options of encouraging private and foreign portfolio investment in the defence sector. Overall, the current strategy aims to transform the defence-industrial sector into a key sector to drive economic development.

7.2.3 Defence programmes

India's latest defence procurement programmes are:

- F/A-18 Super Hornet combat jets
- P8I maritime surveillance aircraft
- Apache combat helicopters
- Mig-29K (Fulcrum-D) fighters; under the 2004 contract for the acquisition of the Admiral Gorshkov aircraft carrier, India is to receive 12 single-seater MiG-29K and four two-seater MiG-29KUBs by 2010, with the option of ordering an additional 30 fighters by 2015
- Ka-31 helicopters
- Il-38D aircraft
- Spyder missiles
- Akash surface-to-air missiles
- Hawk Mk-132 advanced jet trainers
- Multi Role Combat Aircraft; the Indian Air Force is to receive 126 from 2012 onwards
- Fifth Generation Fighter Aircraft, co-developed with Russia; these are likely to be introduced in 2016

[127] See summary of the EU-India cooperation at: http://ec.europa.eu/enterprise/enterprise_policy/business_dialogues/india/eu_india_overview.htm

7.2.4 Production processes

There is little information on production processes within Indian defence manufacturers. Indian firms involved in the defence sector typically feature large-scale in-house assembly lines.

7.2.5 Intra-industry relations

The Indian government's defence policy is designed to encourage cooperation between the private and public defence sectors. The policy is also intended to support the diversification of the public-defence sector into civilian production, a practice first instituted in the 1950s to maintain operational capacity and skills in times of lower demand.

7.2.6 Organisation

The Indian defence sector is dominated by large state-owned enterprises (the OFs and PSUs). These enterprises are administered by the Department of Defence Production which falls under the auspices of India's Ministry of Defence. The OFs and PSUs operate their own R&D units but the majority of development is undertaken by the Defence Research and Development Organisation, the largest R&D in the country.

7.3 Inputs

Immediately after independence, India faced a lack of funds as well as limited access to modern defence technologies. These problems were compounded by wider issues such as the conflict with Pakistan, India's legacy of a relatively-undeveloped industrial base and the expected difficulties in building a new nation. Policies designed to induce rapid industrialisation through heavy centralisation led to the formation of large publicly-funded companies, including the PSUs. Government allocations of funds during this period seem somewhat heavy-handed today and the defence production did not perform well. However, as India's economy and technological capacity grew, so did the performance of the defence sector. The success of HAL and BEL in technologically-advanced sectors is of particular note and illustrates India's growing skills and technological base.

The Defence, Research and Development Organisation (DRDO) was set up in 1958 to address India's growing defence-related R&D demands. The DRDO remains the most important contributor to the country's defence R&D with some 50 laboratories spread across the country as well as a number of other scientific bodies such as the Council of Scientific and Industrial Research.

7.4 Performance

7.4.1 Output

The value of sales by the publicly-owned defence producers (the PSUs and the OFs), after some fluctuation in the late 1990s, is increasing strongly; growth between 2001-02 and

2006-07 averaged almost 8% pa. Broken down by sub-group (see Table 6.3) the level of production from the Ordnance Factories has been relatively stable while production from the PSUs has increased strongly with double-digit growth since 2002-03. In 2006-07, the last complete year of data, sales from the PSUs accounted for more than 70% of total sales. In 1997-98 the share was around one-third.

Table 7.3 Sales by publicly-owned defence producers

	Sales (Rs. bn)									
Sub-Sector	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Public Sector Undertakings	30.7	55.4	89.8	76.7	79.2	87.9	98.9	112.5	130.3	158.5
Ordnance Factories	60.6	40.1	54.5	55.2	60.3	65.1	65.2	61.9	68.9	62.0
Total	91.3	95.5	144.3	131.9	139.5	153.0	164.1	174.4	199.2	220.5

Source(s): Ministry of Defence, Government of India.

7.4.2 Employment

Employment in arms production began to decrease in the late 1990s and, correspondingly, its share of total employment in India fell, too. The employees' unions of the OFs and PSUs are outspoken and strongly oppose privatisation.

Table 7.4 Employment in Indian arms production

	Employment						
	1997	1998	1999	2000	2001	2002	2003
Employment in arms production	190	190	185	183	180	175	170
Defence employment as a % of total employment	0.67	0.67	0.66	0.65	0.65	0.64	0.63

Note(s): Total employment data is calculated as the sum of employment in the public and organised private sectors.
Source(s): SIPRI; Ministry of Labour & Employment, Government of India.

7.4.3 Trade

India's exports of arms by value have been low and sporadic (see Table 6.5). Indian defence goods were exported to Singapore and South Africa in the 1970s but export trade did not pick up again until 2000. According to SIPRI, since 2000 the main destinations for India's exported goods have been Nepal, the Seychelles and Sri Lanka. The type of goods exported also differs between these two periods; in the 1970s armoured vehicles were India's principal exports while post-2000 the emphasis has shifted to aircraft, ships and sensors.

Historically, India has been heavily reliant on imports of defence equipment. Imports have increased strongly since the middle of the 20th Century, peaking in the mid-to-late

1980s although India was ranked by SIPRI as the second-largest recipient of imported arms (after China) for the period 2004-08, accounting for 7% of global arms imports. Until the 1960s the majority of imports originated in the UK. The UK became comparatively less important as a trade partner with the ascendance of Soviet Russia. Since the collapse of the Soviet Union in 1991, Russia has remained India's main source of defence goods followed, admittedly by some margin, by France, Israel and the UK. Post-2000, by import share, armoured vehicles have become less important and aircraft more so (at least since the 1960s). The share of imports accounted for by missiles and sensors is also somewhat higher post-2000.

Table 7.5 Indian exports and imports of arms

	Trade in Arms ($1990m)											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total exports	0	0	0	16	2	0	4	26	13	14	21	0
Total imports	1658	733	1048	822	1021	1680	2862	2305	1175	1414	1445	1847

Source(s): SIPRI.

7.4.4 Profitability

Profits made by the PSUs in aggregate have generally been rising in the 2000s although, when disaggregated, some manufacturers have seen their profits fall. Total profits made by the PSUs' in the 2006-07 financial year were 20% greater than in the year before. All but two PSUs recorded substantial growth in profits; the two PSUs to see a fall in profits were BEML Ltd., a producer of electronics equipment, and Bharat Dynamics Ltd., a manufacturer of missiles. PSUs' sales and profits are largely determined by government military expenditure and the change in their fortunes is thus closely-tied to the requirements of the armed forces. At the time of writing some companies have made their performance in 2007-08 public; BDL's profits have grown once more while those of Garden Reach Shipbuilders & Engineers Ltd. have fallen.

From relatively humble beginnings, India's OFs, collectively are ranked as the 45th largest arms-producing organisation in the world, according to SIPRI while two of the PSUs, Hindustan Aeronautics Ltd. (aerospace) and Bharat Electronics Ltd. (electronics) are 38th and 65th, respectively, a marked change from the low-level production that took place 60 years earlier.

7.4.5 Industrial structure

Prior to independence in 1947, India's defence industry was mainly limited to the repair and maintenance of weapons systems with some limited capacity to repair warships. There were 16 OFs before 1947, the first dating back to 1801, mainly providing munitions to support British-made weapons and equipment. Another 23 OFs have been established, as well as the eight PSUs and India's economic growth has made more funds available for R&D and domestic production.

There was relatively little interest in India's defence sector after it was opened up to the private sector and (some) foreign investment. However, more recently there are indications that interest from the private sector is growing. Mahindra Defence Systems (MDS), a division of Mahindra & Mahindra, has a manufacturing plant located outside of Delhi, the first privately-owned plant in the country dedicated to the manufacture of military vehicles.

7.4.6 Investment

The 26% ceiling on Foreign Direct Investment in any single Indian defence company remains but there is clearly interest in such activities from overseas firms. BAE Systems, for example, has applied to the country's Foreign Investment Promotion Board for permission to undertake a joint venture with MDS; MDS would hold a 51% stake and BAE the remaining 49%.

7.4.7 Defence spending

India's defence expenditure has increased almost continuously since the early 1990s and accounts for 2.5-3% of GDP (see Table 6.6). The budget is expected to exceed $30bn by 2012.

The IISS Military Balance divides this expenditure into two distinct categories: personnel, operations and maintenance; and procurement and construction. The split between the two will of course depend on the armed forces' requirements for new equipment.

The army, by virtue of its size, has the largest allocation of funds made available for personnel, operations and maintenance. The air force and the navy have smaller budgets but their shares are smaller than the funds allocated for defence pensions. These four areas accounted for the largest shares of funds made available for the purposes of personnel, operations and maintenance; they accounted for around 93% of the 2008 budget within this category and 57% of the overall budget in this year.

Table 7.6 Indian military expenditure

	Military Expenditure ($2005m)											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Expenditure	14.1	14.8	17.2	17.7	18.3	18.3	18.7	19.2	22.3	23.6	24.2	25.3
Expenditure as a % of GDP	2.7	2.8	3.1	3.1	3.0	2.9	2.8	2.6	2.8	2.7	2.4	2.3
Source(s): IISS, SIPRI.												

7.4.8 Size of armed forces

Between the mid-1980s and mid-1990s India had an armed force in excess of 1.2m troops. A substantial reduction in numbers, of more than 100,000, took place in 1995 but after this the number began to increase once more. By service arm from 2000 onwards, the number of personnel in the army has remained relatively constant with increases in air force and navy personnel driving the increases in the aggregate figure (see Table 7.7).

Table 7.7 Size of India armed forces

	Armed forces personnel ('000s)											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Personnel	1145	1175	1173	1200	1200	1205	1205					1281
Source(s): IISS, SIPRI.												

7.5 Performance and recent trends by domain

7.5.1 Aircraft

India began to build up its aviation industry at the end of World War II and the industry son embarked on the design of combat aircraft thanks to the support of German engineers like Professor Tank (designer of the FW 190 and its derivatives). It produced several planes including the HF24 Marut fighter, but most of them had British-made engines and equipment.

There followed a period during which the Indian industry mainly produced licensed European aircraft (Gnat, Jaguar, Hawk) or Russian jets (MIG 21, 23, 27). India still pursues this strategy, producing Sukhoi 30 aircraft under license and also overhauling the licensed aircraft in the Indian forces.

In the 1980s India also embarked on the development of a fighter, the Tejas LCA (light combat aircraft), and its engine, the Kaveri. Despite assistance from Western firms, both of these developments have encountered numerous difficulties and repeated delays with the result that the jet is not at the same technical level as European, American or Russian aircraft currently on the market. Delays in the Kaveri programme led India to buy the US GE F-404 engine for the first batch of Tejas jets. The cancellation of the programme has now made it necessary to find a replacement engine for the second batch. Candidates are the F-414 (a higher power version of the F-404) and the EJ-200 that is used on the Eurofighter.

The programme to develop a light training plane has also run into difficulties and delays.

To sum up, India undoubtedly wishes to go beyond upgrades and to develop a combat aircraft, but its technological and industrial capacity have not reached the level of the best players. It is most unlikely that India will be able to export such aircraft in the short or medium term.

Moreover, the few programmes for adapting equipment to alert and in-flight refuelling missions appear to only cover India's own needs and do not reflect any export aspirations at all.

7.5.2 Helicopters

The Indian aviation industry has been engaged for many years in the licensed production of Aérospatiale helicopters and Russian Mil transport helicopters.

The industry also maintains and upgrades the helicopters of the Indian air force.

In the 1980s, India began to design a multi-mission, medium-lift helicopter (class 5 tons): the Dhruv. This was designed for transport and naval missions as well as such activities as police, safety & rescue.

With the support of MBB and then Eurocopter (after the merger of the helicopter division of Aérospatiale and MBB), India developed and certified the helicopter. The French company Turbomeca was awarded the contract to develop the engine.

The Dhruv programme encountered many technical difficulties which led to substantial delays. Nevertheless, in the early 2000s, deliveries started and since then, India has tried to export the Dhruv (it has been sold to South American customers) with the help of the Israeli defence industry, which provides avionics and some systems.

Into the medium term its lack of a range of machines is likely to prevent India from becoming a major competitor for the European helicopter industry. Nevertheless, the Indian helicopter industry may still win some tenders and generate some confusion on the market by offering particular products at low prices.

7.5.3 Land armaments

According to SIPRI, India is, after China, the second-largest importer of Russian defence hardware. This is especially true of land armaments.

Since 1970 India has been trying to develop a battle tank (the Arjun, with an MTU engine). The programme is the responsibility of the Defence Research and Development Organization (DRDO). There have been many difficulties in the programme. Production was approved in 1996 but the first units had still not been delivered in 2004 and therefore India then decided to buy Russian T90S tanks.

The first of these tanks were manufactured in Russia and assembled in India, but India plans to produce 1,000 T90S tanks under licence by 2020 in the framework of its equipment acquisition plan. The Ordnance Factory Board (OFB) and/or HVF (Heavy Vehicles Factory) are involved in this production.

In May 2009, however, India has, after much difficulty, managed to operate its first Arjun tanks. This may make the plans for Indian production of the T90S somewhat uncertain.

India also has Russian-made BMP-2 light-armoured troop-carrying vehicles. However, the DRDO is developing an IFV (Infantry Fighting Vehicle) called Abhay as a replacement for these Russian vehicles.

It should be noted that Thales (France) equips the Indian armoured vehicles (T90S, T72 and BMP-2) with a night-vision sighting system.

Moreover, the Indian army possesses the following artillery pieces: Bofors 155 mm gun (from Sweden), LFG 105 mm gun (Indian-designed), Howitzer 122 mm and 74/24 mm gun (originally designed in Russia), Grad BM-21 122 mm gun (Russian-designed multiple rocket launcher).

At the industrial level, technical skills are mainly to be found within the following organisations.

- The CVRDE (Combat Vehicles Research & Development Establishment), a laboratory of the DRDO, has developed the Arjun tank and also developed or adapted several types of vehicles or weapons (armoured vehicles, bridge layers, reconnaissance vehicles, mortars).
- The Ordnance Factory Board (OFB) is the arsenal of the Indian Department of Defence involved in the production of most of the land armaments and ammunition.
- The Heavy Vehicles Factory (HVF) was founded in 1965 to produce tanks. This company is involved in the manufacture of the Arjun tank local, in the assembly of Indian T90S and other armoured equipment.
- The TATA group is involved in this sector through the manufacture of a multiple rocket launcher (the Pinaka) and in the production of composite materials for protection.
- Larsen and Toubro Ltd is involved in this sector thanks to its systems for combat vehicles (turrets), weapons, ammunition and launching systems as well as its combat systems (radars, missile systems, anti-aircraft guns)

The industrial facilities in India are still largely state-owned and essentially oriented towards national needs. These facilities also remain dependent on the contribution of foreign technology. The development of an export capacity is not expected into the medium term unless India manages to carve out niches (for example with the LFG 105 mm gun, which has a great flexibility of use).

7.5.4 Surface ships

The coastline of India and its position in an important transit area are among the main reasons for developing a naval force. Other reasons are the rivalry with Pakistan and, since the 1990s, the growth of Chinese naval strength in the Indian Ocean (from the Red Sea to the Strait of Malacca).

In addition, the threat of terrorism and the development of piracy have led India to maintain a fleet for military surveillance.

Although India has a tradition of shipbuilding (represented, for example, by Mazagon Dock Ltd and Garden Reach Shipbuilders & Engineers Ltd), it is still dependent on foreign technology inputs (UK, Russian, Italian or French).

The aging of the fleet is expected to lead to a lack of capacity around 2012. Therefore, the Indian Navy is planning a major renewal of its fleet. India plans to take this opportunity to reduce its dependence on foreign suppliers by building ships of the new generation on its territory. These ships include an aircraft carrier currently under development and scheduled to be commissioned in 2014 (note, however, that Fincantieri is responsible for the integration of the propulsion and the Russian engineering bureau Nevskoie is designing the aviation-related parts). Another motive for reducing dependence on foreign suppliers may also arise from known difficulties in the execution of past contracts with Russian shipyards (for example, the renovation of the former Russian aircraft carrier Gorshkov).

To sum up, Indian shipyards do not yet have the capacity to meet India's needs, let alone to focus on export markets.

7.5.5 Submarines

India has on paper a large submarine fleet but the condition of the fleet makes it necessary for India to buy new vessels.

India has diversified its sources of supply in the past by buying, in chronological order, first Russian (Foxtrot class) and German (type 209) submarines, then Russian Kilo class submarines equipped with Club S cruise missiles and then to sign a contract with DCNS (Directions des Constructions Navales Services) in 2005 to buy six French Scorpène submarines equipped with Exocet missiles.

The Mazagon Dock shipyard in Mumbai is the site most involved into the construction of Indian submarines (Type 209, Scorpène and the nuclear attack submarine project). The state-owned Hindustan Shipyards is involved in the maintenance and overhaul of existing submersibles.

In relation to submarine weapons, we would draw attention to the fact that the Indo-Russian BrahMos JV plans to conduct the first test launches of its immersion hypersonic missile in 2009. This will, if successful, give the Indian defence industry access to one of the most modern submarine weapons.

India also has a nuclear-powered submarine project called Advanced Technology Vessel. For this project India has developed its own nuclear boiler technology. The submarine (derived from the Russian Akula II class) is designed to launch ballistic missiles. The official timetable is to begin testing this submarine in 2009.

The path taken by India and its industry in terms of submarines aims at responding to what it considers to be its own operational needs. Just like Brazil and for the same reason, India cannot be regarded as a potential competitor in exports in the medium term.

7.5.6 Missiles

The Indian defence industry has less of a presence in the tactical missile area than in the field of aircraft, even though the country also has some skills that have enabled it to develop and produce its own strategic missile launchers.

Apart from maintaining and upgrading the missiles possessed by its armed forces, the involvement of the Indian defence industry in the field of tactical missiles consists mainly of the production under licence of missiles, mostly of Russian origin, to serve the needs of the Indian armed forces.

In recent years, however, the Indian defence industry appears to have committed itself to the pursuit of greater independence in the development and the production of missiles, just as it has in the fields of aeronautics and armaments. One sign of this move towards greater independence is an effort to secure local production of some items over and above the Indian production already written into the programmes in which India collaborates with Russia to produce anti-ship, zone-defence and other types of missile. Another sign is the licensed production of MBDA Milan anti-tank missiles by the state-owned firm Bharat Dynamics Ltd. Finally, the government agency DRDO (Defence Research and Development Organization) has embarked on a missile called the Nag as an entirely Indian initiative.

Despite these moves towards independence, India is in no position to become a serious competitor to the European defence industry in the field of missiles in the medium term. The small size of the Indian missiles industry, the lack of a product range and the need to make major investments to acquire the skills needed in the key technologies and at an appropriate industrial level are all serious obstacles to any such ambition.

Nevertheless, India could supply basic products at a low cost in a few very specific niches and to a limited number of customers. This possibility should not be overlooked.

7.5.7 Electronic systems & optronics

It is by no means an easy task to make a definitive judgment about the capacity of the Indian electronics industry in the field of armaments. It is crucial to distinguish clearly between the long-term programmes of the DRDO (Defence Research and Development Organization) and the foreign origin of the equipment that has recently come into service. The DRDO has set up programmes aimed at achieving national autonomy in almost all areas (except possibly optronics).

- There are electronic warfare programmes with the involvement of state-owned companies like Bharat Electronics (BEL) and the Electronics Corporation of India, as well as private firms like Tata Power SED and CMC.
- In the field of radar, the DRDO is working in cooperation with the Israeli company Elta and the French company Thales. But other programmes are strictly national, including an AESA radar project for fighter aircraft.
- The DRDO is working in partnership with BEL for the three branches of the armed forces 3 armies on C3I (Communications, Command, Control and Intelligence).
- The DRDO is also working with BEL on sonars.
- Moreover, the DRDO is working on core technologies (microprocessors, components, architecture, software tools).

In terms of equipment recently acquired, on the other hand, the Indian army continues to make extensive use of Russian and Western technology.

India, like Russia, suffers from a technology lag in optronics.

- For infrared applications, Indian tanks are fitted with Thales thermal cameras. BEL has a partnership with the Israeli company Elop in this area.
- For night vision, Indian production is of very poor quality, in spite of a Western licence.

Overall, then, India remains a market for Western manufacturers of defence electronics. Even the major Indian electronics companies rely heavily on Western technology. Thus BEL (the largest Indian firm in the sector with 12,000 employees) has partnerships with companies from Israel (Elbit, Elop and Elta), France (Thales), Germany (Rhode & Schwarz), Sweden (Ericsson MW) and Italy (Alenia).

However, the embargo that followed the Indian nuclear tests in 1998 inspired the government to launch its own programmes in order not to be dependent on Western technology. Even though the embargo has now been lifted, the tremendous effort then put in and its continuation might lead eventually to India becoming a credible competitor even in the electronic equipment market.

7.6 Conclusions

7.6.1 Competitive strength of local industry and likely developments

As indicated by SIPRI data, India has developed strengths in aerospace (through HAL) and some electronic products (BEL). The OFs also continue to perform well, as evidenced by their place in the SIPRI world rankings. The growing participation by the private sector, after some reluctance, should also benefit the sector.

The streamlining of the procurement process and advance warning of bids to domestic suppliers should also help to strengthen India's domestic production, in line with the country's efforts to substantially reduce its dependence on imported defence goods.
The aim of the new 'offset' policy is to capture some of the economic benefit of foreign production by requiring these firms to source domestic supplies but, as will be discussed below, there is a risk that this may deter overseas companies.

At present India is more focused on serving its domestics market, meaning that competition with EDTIB is unlikely in the near future. The country is an open market to all suppliers from Western countries and Russia and has a willingness to develop further, so there is a possibility of developing some cooperation.

7.6.2 Strengths and weaknesses

A possible limitation on defence production may be regulatory in nature; the 26% cap on FDI for example, has impeded BAE Systems' proposed tie-up with Mahindra Defence Systems that would give India a strong position in the global supply chain. There is also the risk that the new 'offset' policy, requiring foreign suppliers to purchase goods from Indian firms, may deter some international companies from investing in the Indian defence sector. The risk of this is perhaps decreasing with time, though, as India already has a presence in the global defence market (see above) and it is advancing rapidly in terms of technology; the two areas where foreign involvement might be desirable.

The paper published by BICC[128] suggests that some rationalisation of the workforce may occur at some point in the future. Moreover, privatisation of some production units is a possibility. In both cases, the employees' unions of the OFs and PSUs will be a significant obstacle.

[128] BICC (2004), *Changing Times? India's Defence Industry in the 21st Century*
http://www.bicc.de/index.php/publications/papers/paper-36

8 The defence market and sector in South Korea

Originally motivated by the North Korean threat to develop a defence systems industry South Korea has now become very ambitious and is targeting export markets.
In civil and military shipbuilding South Korea is already a world leader. Although this industry is oriented towards surface vessels, the country is rapidly building up its expertise in submarines. Its aim is to become independent of its present reliance on foreign (mainly German) technology.

In aircraft technology South Korea is dependent on US technology and is also barred from exporting this technology without special permission from the US. Consequently the only area in which South Korea poses a competitive threat to European industry is in some types of aircraft (training aircraft and light combat planes) and in helicopters and missiles.

In armoured vehicles and land-based weapons systems South Korea has developed some products that are on an equal or superior footing with advanced US and western armaments. As in the case of ships, so too in the case of armoured vehicles the principal Korean manufacturers serve both the defence and the civilian industries, producing passenger cars as well as military vehicles.

For reasons of political commitment and national security the US is the principal supplier of arms to South Korea. The policy of the South Korean government is, in other respects, to have a self-sufficient defence industry across all types of weapons. One consequence is that there is strong resistance to FDI in the defence industry.

The policy of self-reliance is reinforced by the fact that from 2012 South Korea takes over from the US the lead role in its own defence, both in planning and preparedness and in operational command in the event of conflict.

Hence the openings for the European industry are limited to weapons technologies that South Korea currently lacks. These opportunities may take the form of selling the weapons or of cooperation with South Korean industry in producing the weapons in South Korea. Even so, the country normally requires that technologies used in such cooperation be transferred to Korean ownership.

Overview of the situation and assessment of competitive position

- A developed industrial base
- Very competitive niches
- Trade ambition

SWOT

Strengths	Weaknesses
• US support • Aggressive sales attitude • An industrial base at Western level (quality, technologies, etc.)	• Important dependency on foreign technology • Limited range of product
Threats	**Opportunities**
• US veto	• Complementary with U.S. solutions • Competitive offer

8.1 Structure

8.1.1 Distribution of production and employment

Because the main Korean companies in the defence industry are also producers of merchant shipping, cruise liners, passenger vehicles, automobile parts, aircraft parts and commercial aircraft, we have not found it possible to distinguish figures for defence-related activities from other figures. The only estimates we have been able to obtain from *Korea Defense Industry*[129] and the Korean 2006 *White Paper* cover the period 2001-05 for output and 2003-06 for employment (see Table 8.1). They thus do not seem useful for the present report.

The IISS (International Institute for Strategic Studies) estimates that Korean companies manufacture about 80% of all Korea's defence equipment and armaments, including equipment made under licence. The Korean Ministry of National Defence claims that the country's defence industry is capable of making all the types of equipment and armament needed by the armed forces.

Only in aerospace is there a large proportion of equipment manufactured outside Korea, principally in the US. In addition, Korean aircraft manufacturers currently remain dependent on US designs and technological expertise.

Navy

Korea possesses the world's three largest shipbuilders (Hyundai Heavy Industries, Samsung Heavy Industries and Daewoo Shipbuilding and Marine Engineering). All three build a wide range of ships, and two of them (Hyundai and Daewoo) also build vessels for the navy: submarines, destroyers, frigates, corvettes and support vessels.

Hyundai Heavy Industries (HHI) and Daewoo Shipbuilding and Marine Engineering (DSME) have their main shipyards on the south-east tip of the Korean Peninsula: HHI at Ulsan Bay and DSME at Okpo Bay on Geoje Island.

[129] Innovation Norway (2008), *Korea Defense Industry*

Both are very large companies. HHI claims to control about 15% of the global market for shipping. DSME, the third-largest shipbuilding company in the world, employs 1,500 in design and R&D and more than 10,000 skilled workers (it is unclear how much of this is attributable to the defence industry). According to the listing of equipment in *The Military Balance 2009* all the tactical submarines, destroyers, frigates and corvettes of the Korean navy are of Korean manufacture and, so far as we can tell, almost all were built by HHI or DSME.

In addition, a principal supplier of patrol boats, landing and support ships to the navy is Hanjin Heavy Industries & Construction. One of Hanjin's two divisions makes road infrastructure and a wide range of commercial and institutional buildings as well as military facilities. The other makes container vessels, bulk carriers, RO-RO vessels and naval patrol vessels.

Army

Two of the principal Korean makers of tanks, jeeps, armoured vehicles and parts for them are also leading car manufacturers in the global market.

Kia makes trucks, jeeps and other light military vehicles as well as its range of passenger cars. It makes the KM420, which is the standard light vehicle of the Korean Army. It has a division, Kia Machine Tools, which makes towed field guns. Hyundai-Kia Machine is located in Changwon, a hub of high-technology companies in the south of the country, including Samsung Techwin.

Hyundai Mobis makes structural and engine parts for all Hyundai and Kia passenger vehicles. It also makes the Korean army's standard battle tank, the K1 and later versions, and special military vehicles for heavy transport and bridge construction.

Doosan DFT, formed in September 2008, makes armoured fighting vehicles. Its current contract, inherited from its predecessor company, is for 500 such vehicles (K 21), which it is starting to deploy in 2009.

Air force

The principal aerospace manufacturer is Korea Aerospace Industries (KAI). Located in Sacheon on the south coast of Korea, it has the exclusive rights in Korea to all the government's military logistics and aerospace projects. It has 2,000 employees, including about 900 engineering personnel. However, despite KAI's favoured position, most aircraft currently operated by the South Korean military are of US manufacture.

KAI produces basic and advanced trainer aircraft, fighters, unmanned aircraft, helicopters and marine patrol aircraft. It also produces commercial helicopters, airframe parts and satellites. Its current flagship product is the T-50, one of the world's only high-performance supersonic training aircraft. This was designed with extensive input from the US's Lockheed Martin. KAI's helicopter production has been in collaboration with the US company Bell, and through technology transfer from Eurocopter.

The Korean Air Aerospace Division (KAA) makes helicopters and aeroplanes, including several US designs under licence such as the 500 MD/D and UH-60, and also makes satellites for the South Korean space programme. It also supplies components to Boeing and Airbus.

Specialised sectors

Samsung Techwin specialises in the modification, repair and overhaul of engines and accessories. It also makes armaments, particularly howitzers, and electronic control systems for military vehicles. It is collaborating at present with the US division of BAE Systems to produce an undisclosed number of amphibious assault vehicles for delivery in 2010.

8.1.2 Size distribution of companies/ extent and role of SMEs in sector

The defence industry is dominated by a small number of very large companies, all of which are also involved in related types of manufacturing. We have described this in Section 8.1.1 above for the three branches of the armed forces. We have not found it possible to quantify how much of these companies' employment, profits and output is attributable to defence manufacturing, and how much to other activities. In addition to the major companies, there is a number of SMEs working as sub-contractors. However, it has not been possible to find any data or much evidence on the distribution, extent and role of SMEs.

8.1.3 Trade

Total arms exports from South Korea by EU (recipient) country

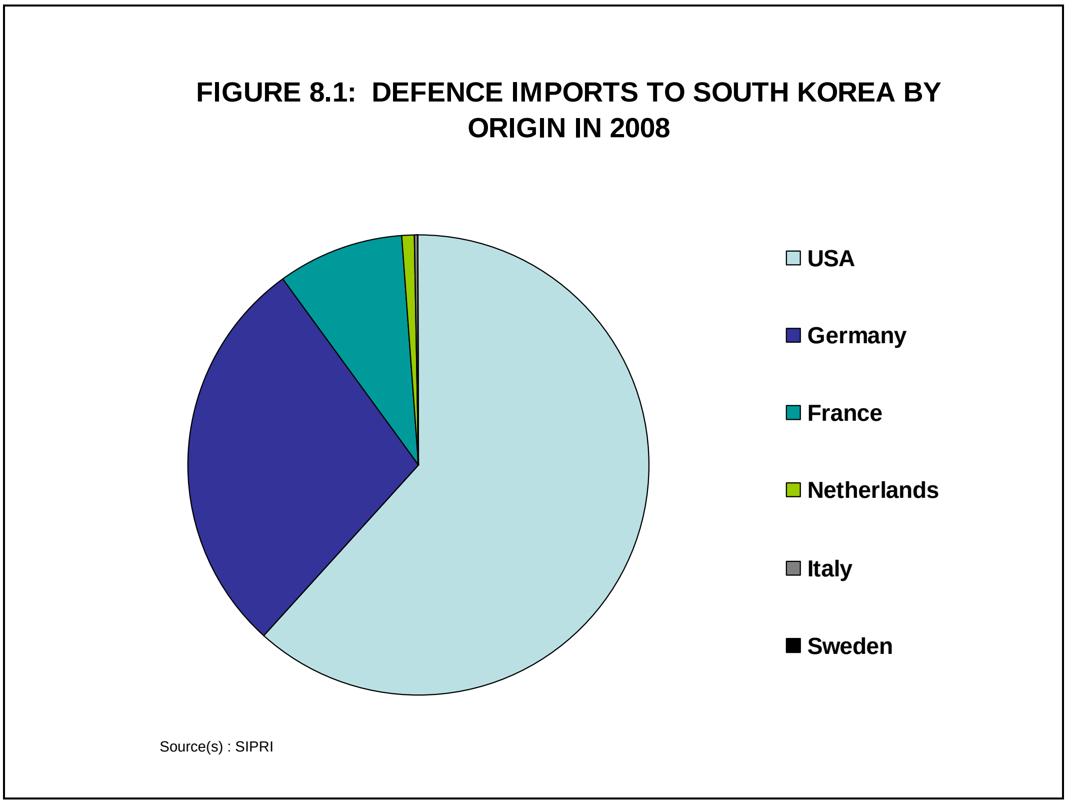
The figures in the SIPRI database show that over the years from 1980 to 2008 arms exports from South Korea have been on a very small scale, amounting to a total value of $1.75bn (in constant 1990 dollars), less than one-sixteenth of the total value of arms imports to South Korea. No EU country has been the destination of exports. Since 2000 Indonesia has been the principal destination for South Korean arms exports followed by Turkey and Bangladesh. India used to buy South Korean arms, but has not done so since 1998.

Total arms imports into South Korea from EU (exporting) country

The figures in the SIPRI database show that over the years from 1980 to 2008 the US has consistently been by far the principal exporter of arms to South Korea, accounting in total for 79.5% of such imports by value (see Figure 8.1). Germany has come a distant second with 8.4%, followed by France with 4.6%.

The recent imports are mainly constituted by F-15E fighters from Boeing, a batch of second-hand SAM (Patriot PAC -3) missiles and systems from Germany and a contract with Eurocopter covering the development of a heavy/medium military transport helicopter.

Figure 8.1 Defence imports to South Korea by origin in 2008

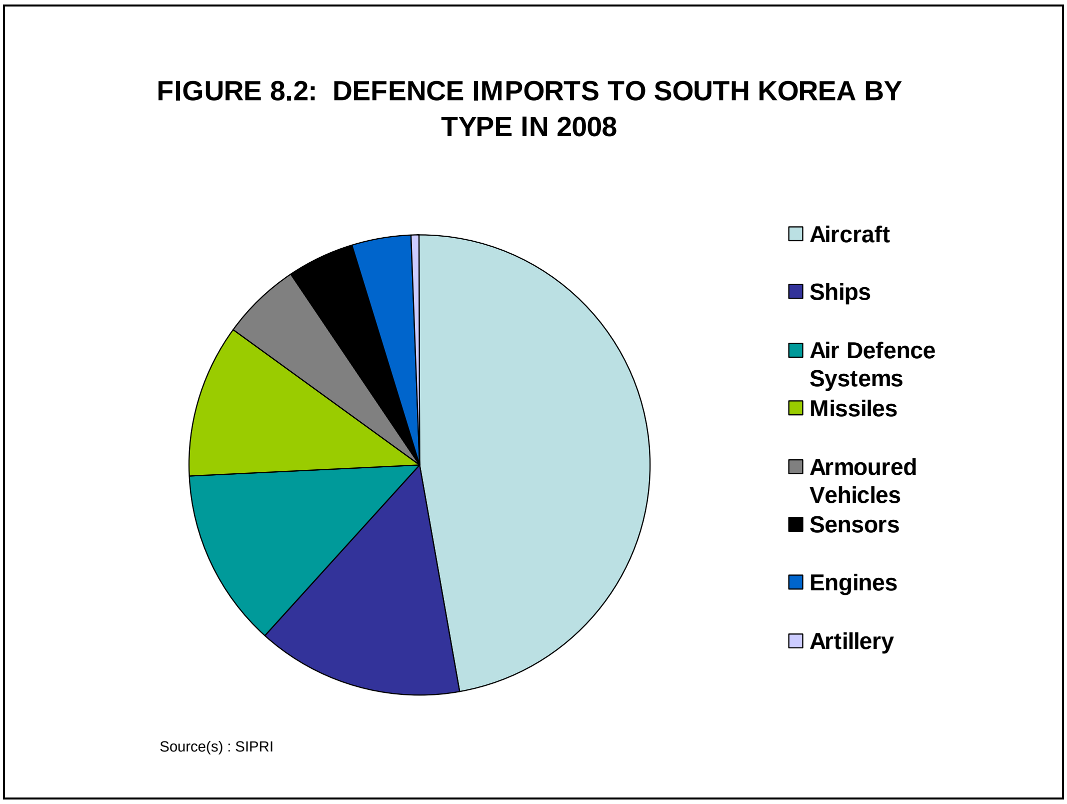


Total imports by sub-sector

The SIPRI database shows that imports of aircraft account for 50% by value of total imports over the period 1980-2008. Armoured vehicles come second with 13.8% and missiles third with 10.4%.

These have also been the relative positions in most years, but it is worth noting that air defence was ahead of armoured vehicles in 2007 and 2008 and missiles overtook armoured vehicles in 2008 (see Figure 8.2). This is probably related to continuing tensions with North Korea and to modernisation under the Defence Reform 2020 programme.

Figure 8.2 Defence imports to South Korea by type in 2008



Market access

By correlating the SIPRI database of transfers of major conventional weapons between 1980 and 2008 with information provided by *Global Security*, we discover that, apart from aircraft and helicopters supplied by the US, most weapons sales to South Korea have been equipment including armaments and ammunition for naval vessels, ships or armoured vehicles.

The US has always been by far the main producer of weapons for South Korea, supplying most of the aircraft and helicopters for its air force and army as well as missile systems, radar and anti-missile defences.

Among EU countries, since the early-1990s:
France has supplied Crotale and Mistral SAM missiles and Exocet surface-to-surface missiles and, more recently, licensed the assembly of Crotale missiles in South Korea for delivery in 2009. The French defence giant Thales has operated a joint venture with Korea's Samsung since 1999. Samsung-Thales specialises in developing automated fire control systems for South Korea, and it has supplied systems for air defence systems, surface warships and submarines.

Germany has supplied diesel engines for frigates, tanks and self-propelled guns, as well as sonar for frigates and torpedoes for submarines. Diesel engines, in fact, appear to have been a staple of German arms-related exports to South Korea since the early 1980s. As mentioned above, Germany is selling South Korea 400 SAM missiles and six SAM systems, originally supplied to Germany by the US.

Germany has also licensed the production of twelve light helicopters and nine submarines to German designs in South Korea since 1987 and a further six submarines to be delivered between 2012 and 2020. All these submarines were designed by Howaldtswerke in Kiel (which, in January 2005, became part of ThyssenKrupp Marine Systems).

The six submarines being built to German design between 2012 and 2020 are all 3,000-ton vessels. However, South Korea's expressed intention is to develop a Korean-designed 3,000-ton submarine by 2020. It already has the capacity to produce 1,800-ton submarines to its own design.

Italy has supplied naval guns.

The **Netherlands** has supplied the South Korean navy with radar and with CIWS (anti-missile defence systems), and has also licensed the production of radar systems in South Korea.

Spain has supplied transport aircraft.

The **UK** has supplied Lynx helicopters and trainer aircraft.

8.1.4 Foreign direct investment

Foreign direct investment to South Korea has dipped in recent years, as China and India have emerged as major destinations in competition with South Korea. Investors in South Korea also face significant cultural and regulatory obstacles. However, the government is taking steps to win a share of the investment that is being diverted to emerging economies. It is, however, not clear that government enthusiasm for FDI extends to the defence industry, given the strategic nature of the industry and the government's policy of active involvement and building up domestic expertise by encouraging cooperation across domestic manufacturers and universities. For example, the majority owner of DSME (Daewoo Shipbuilding and Marine Engineering) is still the Korea Development Bank (the state-run creditor). KDB was in the process of selling its 50.4% stake in Daewoo during 2008, but it abandoned the deal in January 2009 when the would-be purchaser, the Korean company Hanwha Group, was unable to secure funds to finance the $5bn purchase. The interesting point is that the only plausible purchaser was South Korean.

There are no major FDI projects in South Korea's defence industry at present. Opportunities for foreign firms to be involved in the domestic industry may lie in collaboration rather than direct investment and ownership.

8.1.5 Profile of Armed Forces

Size of defence budgets

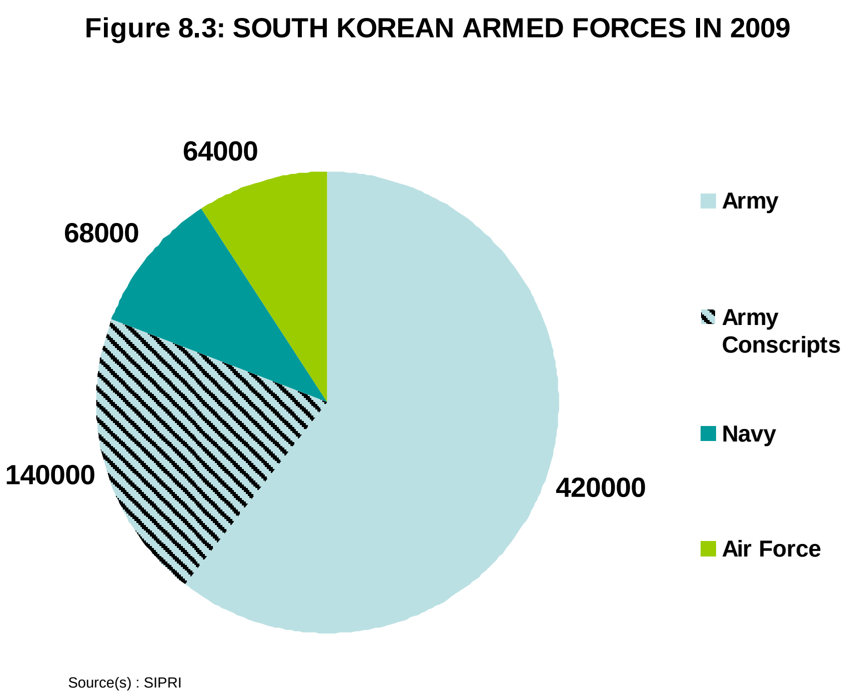
South Korea's defence budget was 2.8% of GDP in 2008, which was slightly above the level of recent years. In absolute terms, its 26.7tn Won budget in 2008 was in the top 20 in the world. However, it is among the smallest of the BRICKs countries, higher only than Brazil.

Size of armed forces

The armed forces were reduced in number from 750,000 to 700,000 in 1996 and stayed at around that level until 2002. Since that year the numbers have been gradually reduced to stand at 687,000 in 2008. As part of *Defense Reform 2020*, it is expected that this number will be reduced further in the next decade.

According to *The Military Balance 2009* (IISS), the army numbers 560,000 (including 140,000 conscripts); the navy numbers 68,000, and the air force has 64,000 (see Figure 8.3). These sub-totals add up to 692,000, but the IISS does not comment on that.

Figure 8.3 South Korean armed forces in 2009



8.2 Drivers

8.2.1 Regulatory & framework conditions

Scope: notable political, industrial and geostrategic situations that have a notable effect on defence industry and its future potential development or the capability of the country to develop a competitive offer.

The geostrategic overview:

The main threat to this country comes from North Korea.

The general trend in South-East Asia is towards rearmament, a trend that is encouraged by US policy that South Korea and Japan should take more responsibility for their own defence.

Although both countries are allies of the United States, South Korea is watching closely the move in Japan towards playing a more independent role in a region that extends to the Indian Ocean.

Because this is over the long term (i.e. setting aside the present global downturn), a region of strong economic growth, all the major powers (China, Japan, US and Russia) are in strategic and economic competition for influence and markets in this region. Such competition can create tensions.

At a more specific geographical level, the issue of the Straits in Northern Asia is a source of tension. The same goes for the ownership of certain islands in an area close to Korea (Kuril between Russia and Japan and Senkaku between Japan and China).

The partial withdrawal of American troops in Japan may worry South Korea. Within South Korea itself the number of US bases in the country is being reduced from 43 to 16 according to the terms of the agreement of 2004. At the same time some tasks now carried out by US forces are being transferred to South Korean forces; and in April 2012 South Korea takes over from the US operational command of its forces in wartime.

8.2.2 Defence & industrial policy

South Korea’s defence policy is dominated by the need to prepare itself for a military confrontation with North Korea, or to deal with the aftermath of the collapse of the North Korean regime. Defence policy until 2020 is governed by *Defense Reform 2020*, a policy adopted by the previous government in 2005 and in effect since 2007, but modified by the government that came to power in 2008. Relations with North Korea have become tenser since the formation of this government.

The background to *Defense Reform 2020* is that the US is gradually adopting a ‘doctrinally support’ role in the defence of South Korea instead of being in command. On 17 April 2012 South Korea takes over operational command of its forces in wartime. The reorganisation of the command structure of US forces in Korea and of Korean forces is now being prepared; it formally takes effect on that day.

In order to build up a military force that can take the lead responsibility for the defence of South Korea and to compensate for the reduction in US involvement (both a reduction in troop numbers, which has already occurred, and a withdrawal south of the Han river), *Defense Reform 2020* aims to transform the Korean military into a smaller, more élite force equipped with armaments suited to modern warfare. To develop the armaments there will be a considerable emphasis on the uses of science and technology and domestic R&D. There will also be purchases of foreign weapons systems, provided always that they are competitive on price and are accompanied by transfer of the technology to South Korea.

Since 2006 the Defense Acquisition Program Administration (DAPA) has been in charge of defence procurement. DAPA is an independent body charged with raising the transparency and effectiveness of the arms trade. It aims to promote the domestic industry and domestic R&D, and is openly biased in favour of funded domestic R&D. It encourages cooperation across defence manufacturers and university-based research.
According to *Global Security*, the three key factors in decisions about procurement are price, transfer of technology and offset agreements. Offset agreements are applied to foreign purchases of a value greater than $10m (or lower, at DAPA's discretion). The offset level is set universally at 30%.

Companies must give assurances that technology used in the purchases will be transferred to South Korea.

The élite military of the future is to be smaller than at present. The total numbers of the combined armed forces are to be reduced from 687,000 at present to 500,000 by 2020, and the numbers of the reserves are to be cut by half, to about 1.5m. The armed forces will therefore be more dependent on professional, voluntary soldiers, rather than mass conscription.

The principal modification introduced by the government that took office in 2008 is that the upgrading of the weapons and equipment must precede the reduction in troop numbers and streamlining of the military structure. This means that military expenditure programmes have to be brought forward in time. South Korea's economy did not go into recession in the first half of 2009 and it seems (in September 2009) that the country may well avert recession entirely. Nevertheless, the global financial crisis is curbing the government's resources, and so the planned growth in military expenditure has been cut, and will doubtless be cut further when the MND has had time to produce a revised *Defence 2020* plan. A draft revised plan was published in November 2008.

In practice it is being assumed that the target date for completing the reforms will be put back from 2020 to 2025.

8.2.3 Defence programmes

Under *Defense 2020*, the main procurement programmes for the period 2008-12, according to *The Military Balance 2009* (and confirmed by the analysis given by *Global Security*), include:

- tactical command, control, communications, computers and intelligence capabilities and satellite communications
- K1A1 tanks and next-generation tanks and infantry vehicles
- KDX-111 destroyers and 1,800-tonne submarines
- F-15K fighters, T-50s (the current training model and a future adaptation to a light fighter role), next-generation fighters and the Korean Helicopter Program
- 155 mm self-propelled artillery; airborne warning and control systems
- guided weapons (Joint Direct Attack Munitions, Joint Air to Surface Standoff Missiles)

The tanks and infantry vehicles will presumably be made by Korean companies. Samsung Mobis makes the KI family; Doosan DST has a contract for 500 K-21 IFVs. The naval vessels will also presumably be made by Korean companies. DSME has a contract for KDX destroyers and HHI is building 1,800 tonne submarines.

The F-15 fighters have been ordered from Boeing; the T-50 is built by KAI (Korean Aerospace Industries) and the Korean Helicopter Program speaks for itself. Korean production of the next-generation fighters may be one outcome of KAI's KFX project, which aims to build Korea's first advanced fighter aircraft, with capabilities greater than the Eurofighter Typhoon.
The artillery, warning and control systems, guided weapons and missiles all rely on a greater degree of foreign involvement. But it must be remembered that Korea is developing its own multi-function SAM missile and that Hyundai-Kai Machine makes artillery. The US company Raytheon is currently supplying SAMs and Sidewinder missiles. French and UK companies have supplied missiles and warning systems in the past. In March 2009 LITEF (a German subsidiary of Northrop Grumman) announced that it has a contract to supply the navigation system for the K21s being made by Doosan DST.

8.2.4 Production processes

There is little information on production processes within Korean defence manufacturers, particularly as defence usually forms only a part of a firm's activity. Generally, Korean firms involved in the defence sector feature large-scale in-house assembly lines. There is little outsourcing.

8.2.5 Intra-industry relations

Although there is little evidence on intra-industry relations, it is known that it is the South Korean government's policy, through DAPA, to encourage and foster cooperation across the defence sector in order to advance the industry as a whole. As the major firms in the country's defence sector are major firms involved in many markets, intra-industry relations are likely to be governed by a range of interests most of which will be outside the defence sector.

8.2.6 Organisation

As discussed earlier, the industry in Korea is dominated by large firms with the majority of their activities outside the defence sector, supported by more specialised SMEs. Information on organisation within these large firms is limited, and it is not even clear how much of their activity is in the defence sector.

8.3 Inputs

Although the evidence is limited, it seems safe to say that the South Korean defence industry has an ample supply of indigenous skills, capital and intermediate goods. Where there are imports, they are more often of finished products, such as US fighter aircraft, rather than inputs. However, one area in which South Korea is known to be lacking is defence knowledge and technology. Firms are often reliant on design input from firms in countries with more advanced defence industries. For example, many of South Korea's larger (1,800 and 3,000 tons) submarines are of German design, and the new T-50 training aircraft was designed in cooperation with Lockheed Martin of the US. Because it is a top priority in the country's defence industry policy to reduce this deficit in technological knowledge, the gap is likely to narrow in coming years.

8.4 Performance

8.4.1 Recent trends in output and employment

Because the main Korean companies in the defence industry are also producers of merchant shipping, cruise liners, passenger vehicles, automobile parts aircraft parts and commercial aircraft, we have not found it possible to distinguish figures for defence-related activities from other figures. The estimates we have been able to obtain from the Korean 2006 *White Paper* and *Innovation Norway*[130] cover the period 2001-05 for output and 2003-06 for employment, and are shown in Table 8.1. The data suggest that the Korean defence industry has been growing in the 2000s, but that employment has been falling (and therefore productivity has improved). However, these estimates are incomplete, and come with no information on their methodology, and so firm conclusions cannot be drawn from them.

Table 8.1 Recent Trends in the South Korean Defence industry

Sales and Employment in the Korean Defence Industry

	2001	2002	2003	2004	2005	2006
Sales $bn 2005	4.00	4.70	4.52	4.63	5.20	-
Employment (000s)	-	-	23.2	23.1	22.4	20.9
Employment as a % of workforce	-	-	0.10	0.10	0.098	0.090

Source(s): 2006 Government of the Republic of Korea Defense White Paper, Innovation Norway

8.4.2 Trade

SIPRI figures show that South Korea's defence exports and imports have fluctuated widely since 1980, and have not shown a clear trend (sees Table 8.2 and Figure 8.4).

[130] A paper by Innovation Norway, a government body that promotes Norwegian exporters: http://www.innovasjonnorge.no/Internasjonalisering_fs/Utekontorer/Korea/Defense%20Sector%20Korea%202008_INK.pdf.

Table 8.2 Total Arms Exports and Imports from and to South Korea

South Korean Total Arms Exports and Imports ($m 2005)														
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Exports	26.8	78.7	74.4	87.9	0.0	0.9	185.0	0.0	109.4	29.7	48.0	92.6	132.4	135.2
Imports	2284	2246	1312	1681	1841	146	651	378	598	986	661	1544	1759	1812

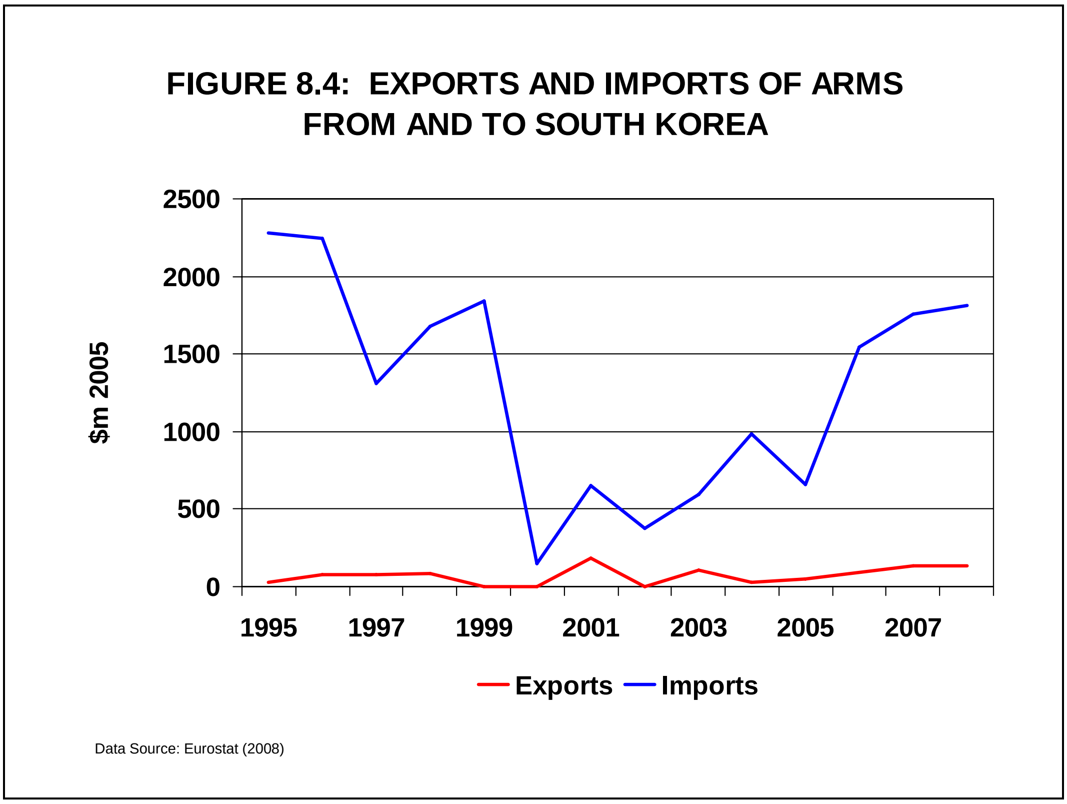
Source(s): SIPRI

Imports are far greater than exports, and most of these imports are in the aerospace sub-sector. There is little clear sign that the expansion of South Korea's domestic production base has had much impact on trade, although exports in the 2000s appear to have been a little higher than in the 1990s and 1980s.

One powerful constraint on arms exports from South Korea has been the ban on transferring US technology to other countries. This particularly affects aircraft made under licence in South Korea or using US technology in Korean designs. These constraints on arms exports are reflected vividly in the figures in the SIPRI database. More than 82% by value of South Korea's total arms exports over the years from 1980 to 2008 is accounted for by shipping, while exports of aircraft account for just under 4%.

A key factor in exports, then, is going to be the extent to which Korea can use its own technology or technology transferred by foreign producers.

Figure 8.4 Total Arms Exports and Imports from and to South Korea



We have noticed that two South Korean arms companies, DSME and KAI, have publicised in recent years their intention of penetrating export markets. So far their successes seem to have been within the established markets for South Korean armaments. DSME has cited its success in winning orders from the Indonesian navy in 2005 and in supplying battleships to Bangladesh. KAI started selling basic trainer jets to Turkey in 2007. KAI's latest trainer aircraft is the high-performance, supersonic T-50, and it hopes that this will represent a major breakthrough in its export capability.

Surface ships and submarines up to 1,800 tons are now of Korean design, and Korean shipbuilders intend to have their own designs for 3,000-ton submarines by 2020. At present they use German designs under licence.

Tanks and military vehicles generally are built to Korean design.

For missiles and air defence systems, however, the Koreans are heavily dependent on US equipment or on using US technology.

One area in which Korea could penetrate exports markets for arms is in defence electronics. Some of the principal products of Samsung Techwin involve guidance systems for artillery.

On the import side, it is likely that imports will increase along with general defence expenditure as part of *Defense Reform 2020*. However, the development of Korea's own defence industry may hamper opportunities for foreign firms to sell in Korea; for example South Korea may become less reliant on American aircraft as KAI expands its product range. Future opportunities for EU firms may therefore lie in supplying components to products that are assembled, and perhaps designed, in South Korea.

It is also worth noting that the US company Raytheon is supplying surface-to-air missiles from 2008 onwards and received an order for Sidewinder air-to-air missiles in 2008, but that Korea is developing its own multi-function surface-to-air missiles to come into full production after 2009. Germany is selling to South Korea 400 Patriot SAMs from 2008 onwards and six Patriot SAM systems. These, of course, are US armaments originally supplied to Germany but no longer needed there.

8.4.3 Industrial structure

Encouraged by the country's industrial development policies, South Korea's defence industry has come to be dominated by extremely large firms, with a number of SMEs vying to supply to the major manufacturers. Generally, these large firms, including Hyundai, Daewoo and Samsung are also involved in civilian industries. Indeed, in many cases the defence aspect of their business may be relatively minor, although there are not enough data for us to make any such statement with confidence.

The industrial structure appears to be fairly stable. Insofar as there has been a trend, it was towards increased consolidation among the major manufacturers following the Asian financial crisis of 1998. For example, tank (and passenger car) manufacturer Kia was bought by Hyundai Motors in 1998. Aircraft manufacturer KAI was created in 1999 out of the aerospace divisions of three conglomerates that had fallen into serious financial difficulties: Samsung Aerospace, Daewoo Heavy Industries and Hyundai Space & Aircraft. There were exceptions however: Doosan DFT is descended from Doosan Infracore, which was spun off from Daewoo Heavy Industries in 1999.

8.4.4 Defence spending and size of armed forces

Military budget

Expressed as a percentage of GDP the defence budget declined from 3.2% of GDP in 1998 to 2.5% in 2002 (see Table 8.3). The defence budget then rose to 2.6% of GDP in 2003 and 2004. It has since been rising steadily to reach 2.8% in 2008.

Over the longer term, the *Defense Reform 2020* programme calls for large-scale acquisition of weapons, modernisation of equipment and reductions in manpower. The programme envisages that the defence budget is to increase by 9.9% per year between 2006 and 2010, by 7.7% each year between 2011 and 2015 and by 1% each year between 2016 and 2020.

These increases now seem over-ambitious, particularly in light of the global recession, and they are likely to be cut back. In 2009 the government has asked Parliament for an increase of 8.6% in the defence budget.

Table 8.3 Military budget of South Korea

Military Budget of South Korea

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
$bn 2005	15.6	17.0	18.3	18.1	16.9	17.3	17.7	18.4	18.9	19.8	21.2	22.5	23.0	24.6
% of GDP	-	-	3	3.2	2.9	2.7	2.6	2.5	2.6	2.6	2.7	2.8	2.8	2.8

Source(s); CIA World Fact Book, RoK Ministry of Strategy and Finance

Size of armed forces

The size of the armed forces was reduced from 750,000 to 700,000 in 1996 and stayed at around that level until 2002. Since that year the armed forces have been gradually reduced to stand at 687,000 in 2008 (see Table 8.4). Under the *Defense Reform 2020* programme numbers are to be reduced to 500,000 by 2020 and the reserve forces are to be halved to 1.5 million.

Table 8.4 Size of the South Korean armed forces

Size of the South Korean Armed Forces (000s)

1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
750	700	700	695	680	700	700	700	690	685	685	674	687	687

Source(s); CIA World Factbook, 2006 Government of the Republic of Korea Defense White Paper

However, since it came to power in 2008 the current government has modified the priorities of the programme so that the reduction in the size of the armed forces will not be made until the weapons systems have been upgraded.

8.5 Performance and recent trends by domain

8.5.1 Aircraft

Two powerful sources of development in the South Korean aerospace industry have been:
(1) the maintenance of US aircraft based on Korean territory and of its own aircraft (at present this applies particularly to the national fleet of F15 and F16 aircraft)
(2) subcontracting activities for the US industry

In the 1990s South Korea developed a basic training turboprop aircraft (the KT-1) but since 2000 it has developed the K-50 which is a light combat aircraft (also used for advanced training tasks). This jet is equipped with systems and engines supplied by the US; and Lockheed-Martin helped in the design of the aircraft, as part of its cooperation with the Korean industry in the K-50 programme.

Such an aircraft, especially with the support of Lockheed-Martin, has a considerable potential in export markets, particularly in the context of:

- the renewal of existing contracts
- the purchase of advanced training aircraft or light combat aircraft (the US itself may be one of these markets when the time comes to replace the T38)

South Korea is eager to offer the K-50 for export, and the country is becoming more commercially proactive.

8.5.2 Helicopters

South Korea has produced licensed helicopters or has been involved in the production of US-designed helicopters including the military Bell UH-1 or the civilian Sikorsky S-76.

It also provides maintenance and subcontracting activities.

The aim of the Korean Helicopter Program (KPH), in effect since 2005, is to develop a fleet of utility helicopters for use by the army. The programme involves collaboration with a foreign helicopter manufacturer (Eurocopter). This is the first step toward the development of an autonomous South Korean helicopter industry. It is clearly an aim of the South Korean government that this industry should become a competitor in foreign markets.

Through the KPH South Korea may become a serious competitor in South- East Asia by the end of the decade 2010-20, especially in markets where technology will not be the main selling point.

8.5.3 Land armaments

In 1980, South Korea selected Chrysler (now General Dynamics) to develop a tank to meet its own needs. The prototype was made in the US, but some 800 tanks were built locally at Hyundai facilities. Deliveries to the Korean Army began in 1985. The K1 is based on the US M1; it incorporates the main equipment except the engine (MTU of the Leopard 2) and the viewfinder (ex SFIM). The oleo-pneumatic suspension was designed in Korea. In 1995 an improved version was developed: the K1A (shield, 120 mm gun, Raytheon camera). The entry into service of the K1A1, due in 2002, was delayed because of the tense relations between the two Koreas.

An armoured infantry-fighting vehicle, the KIFFV, was developed by Daewoo. Designed in the US, it is fitted with a MAN engine and a UK-made transmission. Some 1,700 of these vehicles have been sold to South Korea and it been exported to Malaysia.

The successor to Daewoo in the manufacture of armoured vehicles is Doosan (created in 2008 and descended ultimately from a company spun off from Daewoo in 1999). Its current model now being delivered to the army is the K21.

Asia Motors Inc has produced 200 KM 900 wheeled armoured vehicles (licensed from Fiat and Oto Melara products).

KIA (today a Hyundai subsidiary) manufactures various vehicles and artillery equipment (derived from US models).

On the whole Korea has the technological capability to develop land armaments. Its industry is able to provide quality products, but Korea does not yet have a high profile in this market.
It is, however, worth noting the comment of *Defense Industry Daily* (23 March 2009) on Doosan's K 21 that:

Doosan intends to seek exports around the globe, which means it will compete with BAE's powerhouse M2/M3 Bradley and CV90 offerings, Russia's BMP-3, Singapore's Bionix, and to some extent with Germany's Puma at the high end of the tracked IFV market. It will also compete indirectly with wheeled APC/IFV options like General Dynamics MOWAG's Piranha/LAV family, General Dynamics Steyr's Pandur II, Patria of Finland's popular AMV, France's VBCI, and the German-Dutch Boxer MRAV.

8.5.4 Surface ships

South Korea has a powerful civilian shipbuilding industry with worldwide leading players like Hyundai, Daewoo, Hanjin and Samsung, players that are also present on the military shipbuilding market.

However, the South Korean military shipbuilding sector is still dependent on foreign suppliers for some weapons systems and engine parts. For instance, the current destroyers KDX (Korean Destroyer Experimental), the KDX III, are manufactured by Hyundai and equipped with the AEGIS combat system (developed by Lockheed Martin) and with Rolls-Royce turbines. The use of the AEGIS combat system fosters greater interoperability between the US Navy and the Korean Navy, but makes South Korea dependent on the US for the entire weapons system.

The type FFK frigate (made by Daewoo), which is also active in the Korean navy, has been sold to Bangladesh and is specially equipped for this country with a Thales combat system. This shows how European suppliers (but not European shipbuilders) are able to export to South Korea.

The design and construction of the next-generation frigate (FFX) has been contracted to Hyundai. It is expected that this generation of vessels, will have a higher proportion of South Korean equipment, such as light torpedoes, 3D radars, sonars and combat systems.

Korean Pohang corvettes (for coastal patrols) are also equipped with foreign devices: including Oto Melara and Breda guns, Exocet and Harpoon missiles, MTU engines.

South Korea's Fast Patrol Boat is a 400-ton fast armed missile ship equipped with LM 500 GE turbine and MTU Combined Diesel And Gas (CODAG) engines. The search radar and the combat system are Korean-made. The Hanjin shipyard assembles these vessels. The success of the anti-ship and anti-aircraft test firing carried out at the end of 2008 shows the level achieved independently by South Korean Defence, Science and Technology.

This success could be put to service in developing larger warships with less dependence on foreign technology and products. The same success could also give greater credibility to South Korean defence exports.
Korea is already a serious competitor in fast patrol boats and corvettes (in competition with the DCNS Gowind and with the Blohm & Voss Type 130). Jean-Marie Poinboeuf of DCNS acknowledged this recently when he said, "the Chinese will be on the market tomorrow, but the Koreans are already there".

8.5.5 Submarines

As with surface vessels, so too with submarines South Korean military shipbuilding is still dependent on foreign suppliers and technology.

The Korean Navy is currently equipped with the following submarines:

- nine type 209 – 1400 submarines– from the German shipyards Howaldtswerke (now part of ThyssenKrupp Marine Systems), with the technology being transferred to Daewoo Shipbuilding and to Marine Engineering Co
- three type 214 submarines (anaerobic) from the German shipyards Howaldtswerke, with the technology being transferred to the Hyundai plants at Ulsan Bay; these were launched in 2006.

Also six new 214 type submarines were ordered in early 2009.

South Korea handed over two of its type 209 submarines to Indonesia in 2008. Nevertheless, we cannot consider South Korea (because of its dependence on German licences), as being in a position to export its own submarines in the medium term.

8.5.6 Missiles

The emergence of the relevant skills and of a missile industry in South Korea is largely due to the geopolitical and geostrategic context of the area.

The entire missiles programme is supervised or developed by the South Korean Agency for Defense and Development. The main manufacturers of the sector are LG Inotek and Samsung.

In view of the North Korean threat, South Korea was first equipped with American weapons systems. It then started to develop derivative versions, including the first anti-air missile Huinmo, developed at LG Inotek by reverse engineering from the Nike Hercules. South Korea also produced a local version of the French system Crotale Shahine called Pegasus.

South Korea has subsequently developed its own anti-ship and anti-air missiles, ASS / SSM 700K by LG Inotek, as well as the cruise missiles Huinmo II Boramae and Chonyang.

The development of these cruise missiles was accelerated particularly after the agreement with the US in 2001 allowed South Korea to develop weapons with a greater range than 300 km.

More recently LG Inotek has developed a portable anti-air missile, which came into service in 2005, the KP-SAM, with a Russian-made seeker.

South Korea, facing the threat from the ballistic missiles of its northern neighbour, has initiated, in addition to the Patriot missiles (that equip its units), the development of an anti-air missile with an anti-missile capability.

On this programme, called M-SAM, the missile and the launcher are made by Samsung Electronics and guidance by Lucky Goldstar and Sangyong. The guidance of this missile, scheduled to enter into service in 2010, has a Russian technology input. In addition, South Korea wants to develop a Cheolmae II missile derived from the Russian S-400.

The evolution of the South Korean missile industry over the past two decades shows the willingness of this country to establish an industrial branch at the highest level of technology.

This industry has a real potential and a portfolio that is expanding. Moreover, it shows a great capacity for learning. It still needs the support of major players in the field as is shown by its calling on Russian suppliers in the field of seeker or guidance.

Over the years to come, South Korea has the capacity to become a serious competitor at a technical level for some European products. Nevertheless, it should be noted that it would have at its disposal only a few home-designed platforms, and this paucity will hamper its potential export ambitions.

Moreover, even if its products are suitable for equipping US armed forces, it is unlikely that the US industry will give South Korea a free hand in its product offer to other customers.

Finally, the context in which the South Korean missile industry was established would appear to orient the country more towards achieving autonomy in defence matters related to North Korea and towards an unhampered meeting of its own defence needs rather than towards export markets. Indeed the country has shown no eagerness yet to enter such markets with its missiles.

8.5.7 Electronic systems & optronics

The Korean electronics industry is powerful. In the military sector, it is represented mainly by four companies:

1) EO Systems, which produces optical and optronics devices (IR vision, night vision and periscopes)
2) Huneed Technologies, which is active in many areas: communications networks, data links, computers, graphical user interface, command & control systems, naval combat systems, imaging (laser designators for fighter aircraft)
3) LIG Nex1, which produces missiles, torpedoes, anti-submarine radar, electronic warfare, avionics, UAV, tactical communications, control system, sensors for missiles
4) Samsung, which in a joint venture with Thales (France) is now engaged in producing computerised fire-control systems, tank gun sights, computers for artillery pieces, electro optical tracking system, forward looking infrared system, night vision, tactical communications, search and tracking system, command and control system for destroyer-based artillery

Even though the South Korean defence electronics industry is not fully independent in respect of basic military components, it has access to Western technology and has an extensive know-how in the civil sector.

It is capable of integrating foreign technologies and inserting them into controlled complex systems, thus allowing the Korean armaments industry to meet its national and its export needs.

8.6 Conclusions

8.6.1 Competitive strength of local industry and likely developments

The declared intention of the Korean government is to develop and promote its indigenous defence capacity, and it is prepared to show open bias towards Korean firms in order to achieve this. Because of the global status of its shipbuilding industry, it is likely to achieve this goal for all types of naval vessel and submarine. At present it is using German designs under licence for 3,000-ton submarines, but it should be able to develop its own capacity for this type of vessel by its target date of 2020.

South Korea is also in a very good position to achieve full or nearly full indigenous defence capacity for all types of military vehicle from tanks to personnel carriers. This is largely because its major producer of military vehicles, (Hyundai-Kia) is already a major global producer of civilian vehicles. Hyundai-Kia is also one of the Asian makers of passenger vehicles most likely to survive the global recession in good shape.

For the production of aircraft and helicopters, Korea is probably going to rely on US technology for many years, particularly in the design stages. However, the domestic industry is progressing rapidly, as witnessed by the development of the (largely US designed) T-50; and the KFX future fighter programme may represent a further leap forward in domestic capability. It should also be borne in mind that much of the specialised equipment and armaments rely on advanced electronics (sensors, detection systems, radar, guidance systems etc), an area in which South Korea already has some globally leading companies.

8.6.2 Strengths and weaknesses

The main strengths of the South Korean defence industry are:

- the fact that its leading companies in the military areas of surface naval vessels, tanks and armoured vehicles and electronics are also world-leaders in the civilian counterparts of such products
- the high technological level of its defence and civilian industries and their proven ability to learn rapidly so as to catch up with and surpass western levels of technology
- government support for the goal of increased indigenous defence capacity across the whole range of defence equipment
- the motivation given to the defence industry by the threat from North Korea and the timetable for taking over from the US responsibility for the country's defence
- access to US technology
- the experience and high reputation for civil products in potential export markets of leading Korean companies also engaged in the defence industry

The main weaknesses of the South Korean defence industry are:

- US restrictions on the export of its technology by recipient countries
- a dependence on foreign technology and products for some weapons systems and types of engine; but this is a diminishing dependence
- the fact that its defence equipment is focussed on the circumstances of the Korean peninsula and may thus not always be suitable for other theatres

EU companies seeking to export to South Korea face a market in which indigenous companies are not merely supported by the government but are also acknowledged world leaders in the building of surface vessels and land vehicles and in electronics. Indigenous companies are also rapidly developing their capacity to produce larger submarines and some types of specialist aircraft.

EU companies have to contend also with strong resistance to FDI in the defence industries and to privatisation more widely. They are also entering a market in which the US has long been the overwhelmingly dominant supplier.

The openings for EU companies in the South Korean market would seem, therefore, to be in the area of specialised equipment for ships, aircraft or armoured vehicles that are assembled in South Korea, rather than in such large items themselves. This is where they have been successful in the past. Opportunities for designing large items that are then manufactured in Korea, as in the case of German submarines, are likely to diminish, as Korean expertise develops.

To date, US firms have had far more success in South Korean than EU firms, owing in part to the close military alliance between the two countries. However, it is a key element of the Korean defence-industrial strategy that companies seeking contracts must undertake to transfer the technology to South Korea. US companies are in no position to give such guarantees, since this is always a matter for the government. It may be that EU companies are in a better position in this respect. In addition, South Korea may become less dependent on US arms as it takes over more responsibility for its own defence.

Alongside the requirement of technology transfer there is also the rule that for foreign purchases of a value greater than \$10m (or lower, at the discretion of the Defense Acquisition Programme administration) there is an offset level of 30%. This might discourage some companies. However, given the high levels of technology and expertise among South Korean companies, this requirement seems more likely to encourage potentially rewarding joint ventures and other forms of cooperation. It could thus lead to openings for EU firms in the South Korean market.

The requirement to transfer technology, when set alongside the electronics expertise of South Korean companies, suggests that one way forward is through joint ventures. For example, the joint venture of Thales (France) and Samsung is currently developing weapon and radar systems for the new fleet of frigates. The work is being carried out between 2006 and 2011. It is also bidding to develop similar systems for submarines.

Turning to the potential for South Korean exports of defence equipment, the challenge to the EU defence industry is likely to come in certain very specific areas rather than across the board. As South Korea focuses more than it has in the past on exports of defence equipment it is turning first to markets in Asia as the destination for large-scale items such as ships or submarines (Bangladesh and Malaysia are recent cases in point). The country may not seek further markets for such items, partly because the resources of the defence industry may be fully occupied in meeting South Korea's own needs for more sophisticated surface and undersea vessels, aircraft and military vehicles to compensate for the planned reduction in South Korean personnel and the partial withdrawal of US troops. The South Korean defence industry is, however, casting its net more widely for exports of specialist training aircraft (notably the supersonic T-50) and armoured land vehicles (notably Doosan's K21). South Korean companies already supply aircraft components to Boeing and Airbus. Because of the long-standing links with the US, the use of US technology and the compatibility of systems, South Korea is also in a strong position to export some specialised equipment and components to the US itself. In defence electronics, the joint ventures that could help EU companies into the South Korean market could also become very competitive exporters to EU markets.

9 The defence market and sector in Brazil

Arms and defence systems exportation is not a priority in Brazilian strategy, it is really developed only in the field of aircraft and is maintaining a competitive offer on very narrow niche market.

Europe is already the principal exporter to Brazil, way ahead of the US and Middle East, and so opportunities are already clearly being exploited, while the risk in terms of third or home-market competition is minimal in most domains.

The continued development of an offset policy, and technology transfer requirements are something that Brazil, given it's weakness to compete in export markets, is keen to enforce to help domestic industry develop further. Nonetheless, this is unlikely to deter European companies as they seek to further develop their markets in South America.

Overview of the situation and assessment of competitive position

- Limited objectives in term of arms trade.
- An industrial base focused on aeronautic domain.
- An existing potential on a limited set of products.

SWOT

Strengths	Weaknesses
• Regional influence: the largest Latin American country (economy, …) • Embraer already a recognised leader	• Industrial base specialised in aircraft • Very narrow range of product • Dependence on foreign suppliers for electronics
Threats	**Opportunities**
• Exposure of Embraer to civil market downturn	• Competitive range of light/training combat aircraft • Surveillance aircraft (anti- drugs, immigration and other illegal traffic)

9.1 Structure

9.1.1 Distribution of production and employment within the country

Total production / budget and by sub-sector

Indicators for total production are not available for Brazil, either as a total or for any of the sub-sectors (land, sea and air-based activities). However, data covering total government budget[131] and across each sub-sector are available from several sources, the most recent total for which (for 2008) is sourced from Military Balance at $23.3bn, which is equivalent to 7% of government spending and 1.5% of GDP. Budget data for 2009 are also available from the Ministry of Defence's most recent budget report[132], but as data for GDP and exchange rates are not yet complete for this year a conversion is not possible.

International comparisons place Brazil at 13th in a country ranking of total dollar military expenditure and 12th in terms of purchasing power parity adjustment, which makes Brazil the largest country in South America in terms of absolute defence budget and expenditure. However, according to the CIA World Factbook[133], as a percentage of GDP Brazil's military budget ranks 62nd across all countries, well below South American compatriots such as Cuba (32nd) and Columbia (37th). It should be noted here that comparisons such as these are fraught with difficulties and use information from a variety of sources (ie they are not necessarily consistent with the figures from Military Balance mentioned above).

One interpretation of Brazil's low ranking in terms of GDP percentage could be of a stable country in an increasingly integrated continent (particularly concerning relations with Argentina). Also, heavy limitations on procurement and operations remain following the 1998 international financial crisis that imposed severe fiscal limitations on government spending in general.

However, various sources examined to obtain the budgetary and expenditure data state that any numbers should be interpreted with care. For example, Global Security (http://www.globalsecurity.org/military/world/brazil/budget.htm) state that

> "Data on Brazil's military expenditures need to be approached with caution. Their accuracy is complicated by high rates of inflation since the late 1950s, by secrecy surrounding the funding of various military-related projects, by personnel costs that are sometimes hidden in other budgets, and by the common practice of mixing the accounts of the national treasury, the Central Bank, and the Bank of Brazil. However, even if the figures generally attributed to Brazilian defence expenditures understate their true value, there is consensus that Brazil is among the countries with the lowest levels of

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[131] From the sources investigated, the government budget for the armed forces is usually more-or-less equivalent to the actual expenditure, and so only the budget is reported here.

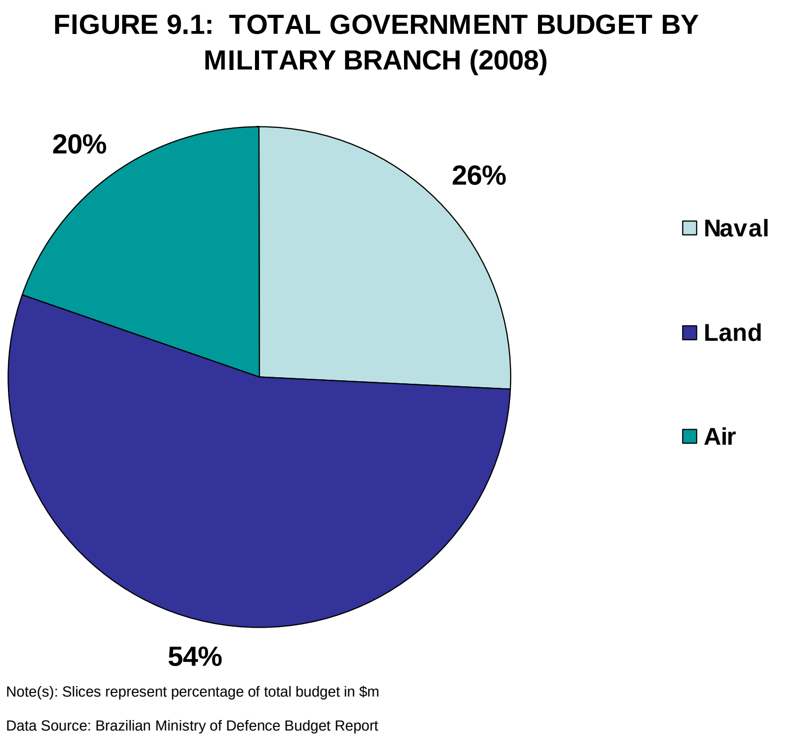
[132] See https://www.defesa.gov.br/bdlegis/index.php.

[133] See https://www.cia.gov/library/publications/the-world-factbook/rankorder/2034rank.html.

military expenditures, and that those levels have declined in the last three decades."

Figure 9.1 shows how the government's military budget is split across the different types of armed forces. Unfortunately, the Military Balance source which provides a total figure for 2008 does not provide an additional split by separated armed forces. For this information, we have used a more recent source, namely the Brazilian Ministry of Defence's budget report. This data are available in local currency, which is acceptable for working out shares of expenditure as no conversions are required.

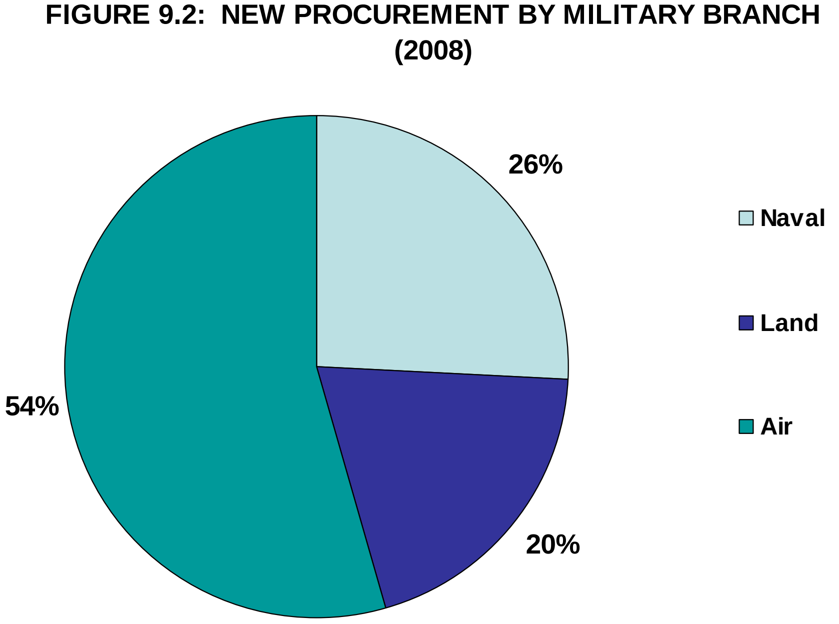
Figure 9.1 Total Government Budget by Military Branch (2008)



The data for 2008 show that land-based activities have over half the share of the military budget, followed by the Navy with roughly a quarter and air-based with the remaining fifth. Further investigation of the budgetary data reveal that almost half is made up from military salaries and pensions, and is roughly in line with the relative shares of employment in each of the branches discussed in more detail below.

In contrast, procurement across the different branches is quite restrained. Only 8% of the 2008 budget (US$1.7bn) was made available for new procurement and only US$122m was allocated to research and development. Figure 9.2 shows the split of budget allocated purely to new procurement for 2008.

Figure 9.2 New Procurement by Military Branch (2008)



Note(s): Slices represent percentage of total budget in $m

Data Source: Brazilian Ministry of Defence Budget Report

The sharp difference between the new procurement budget and the total budget is, of course, dictated by national defence policy regarding which military equipment are in most need of upgrading, and any longer-term defence strategy.

Total employment /armed forces and by sub-sector

Total employment[134] in the armed forces was 326,000 in 2008, equivalent to 0.4% of the labour force. This is split across the various military branches as shown in Figure 9.3, and explains the budget requirements in terms of pensions and salaries as mentioned previously.

Total budget per employee in the armed forces is shown in Figure 9.4. While land and air-based activities have virtually the same budget, the budget for naval employees is around 35% higher, and mostly likely represents equipment and R&D expenditure not occurring in the other branches.

There were no further data available on the labour market, in terms of employees, hours-worked or skills profile.

[134] Data for the armed forces ignores paramilitaries and reserves (ie direct employees only).

Figure 9.3 Total Employment by Military Branch (2008)

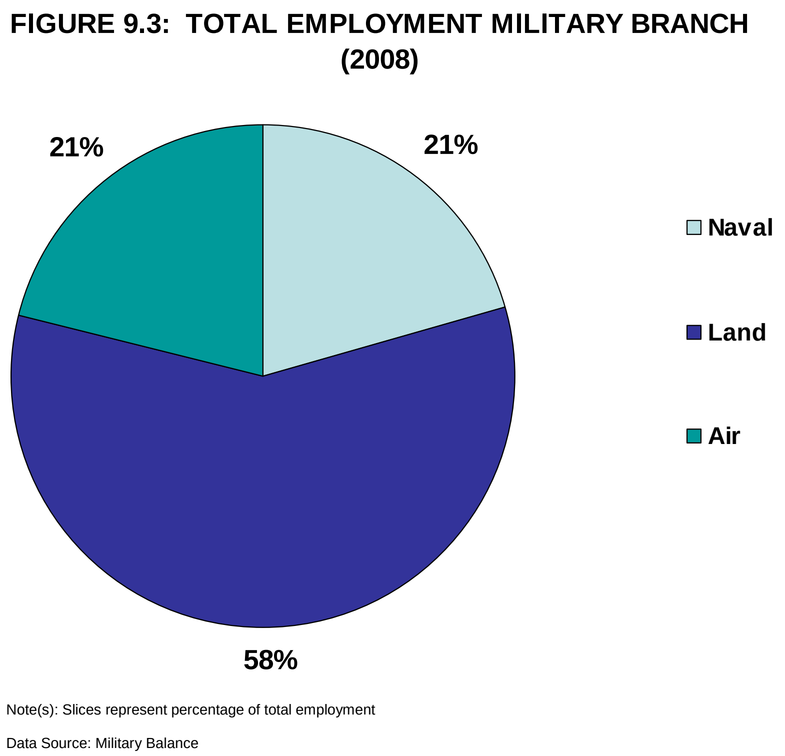
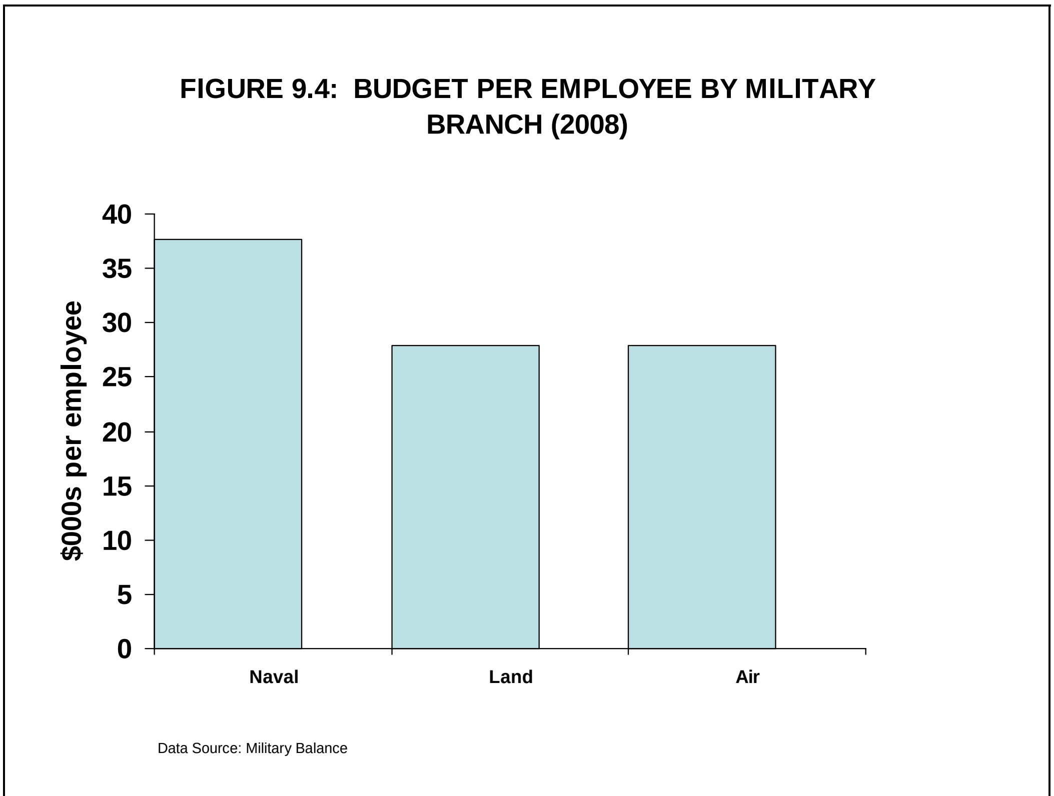


Figure 9.4 Budget per Employee by Military Branch (2008)



9.1.2 Size distribution of companies/ extent and role of SMEs in sector

Main companies

SIPRI maintain a database list of the 100-largest arms-producing companies, none of which are registered in Brazil. The largest domestic company in Brazil in this area is Embraer[135], which focuses on commercial and executive aircraft, and military defence systems. According to the company's website, Embraer was Brazil's largest exporter from 1999 to 2001 and the second largest in 2002, 2003 and 2004, and currently employs more than 17,000 people (not including subsidiaries), 87.7% of whom are based in Brazil.

Embraer was previously a nationalised company, and only became a private entity in 1994 following the near-collapse of Brazil's arms industry after 1988, as a result of the termination of the Iran-Iraq War (1980-88), a reduction in world demand for armaments, and the decline in state support for the industry. In early 1990, the two major manufacturers, Engesa and Avibrás, filed for bankruptcy. Avibrás[136] is still a going concern, and produces rockets and missiles and related systems, armoured vehicles, and air defence systems. A third, state-run organisation, IMBEL[137], has links with the Ministry of Defence and is one of the biggest manufacturers of defence systems and materials in South America. It was established in 1975 to unify the army's seven ordnance and ammunition factories, and merged with Engesa's ordnance-related activities in the mid-1990s.

Location and nature of key industry clusters

Embraer has its headquarters in San José de Campos in the state of San Paulo and is at the heart of an aerospace cluster developing complex and advanced technology and employing a highly qualified workforce[138]. According to the CECOMPI website, the cluster comprises approximately 130 companies and is responsible for 5,000 direct jobs. Among these companies are Ambra Solutions, A.S. Avionics Services, BrasCopter, Giovanni Passarella, Friuli, Finetornos, Flight Solutions, Flight technologies Iacit, Gyrofly, Lanmar, INBRAAEROSPACE, Rastreal, Vectra Technology, Globo Usinagem and Winnstal, among others. Also, some foreign companies are installed, such as Latecoere (France), Aernnova (Spain), Sobraer (Sonaca Group- Belgium), Pilkington Aerospace (UK) and Gamesa (Spain).

According to the Aerospace Industries Association of Brazil, AIAB[139], the aerospace sector registered a turnover of $6.2bn in 2007, with Aeronautics accounted for 91.3%, followed by Defence (6.6%) and Space (0.4%). Also, more than 90% of production was exported (accounting for around 3% of the total Brazilian exports). In the same area, IMBEL possesses five manufacturing installations located in the triangle São Paulo - Rio De Janeiro - Minas Gerais. Its headquarters are situated in the São Paulo city of Piquete. The IMBEL has stockholdings in other military groups, such as the Brazilian Company of Cartridges (the only plant for infantry ammunition Brazil), and South America Ordnance

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[135] See http://www.embraer.com/english/content/home/.
[136] See http://www.avibras.com.br/I/index.asp.
[137] See http://www.imbel.gov.br/.
[138] See also http://www.cecompi.org.br/ingles/.
[139] See http://www.aiab.org.br/.

(a joint-venture created to produce ammunition of artillery with new technologies for the Brazilian market and for export).

Additionally, the company keeps partnerships on commercial techniques with the Swedish industries Nitro Nobel AB, Chematur Engineering AB and Bofors Explosives AB, and keeps agreements of technological cooperation with the companies Development and Electronic Research S/A, of Portugal, and Thomson-CSF, of France.

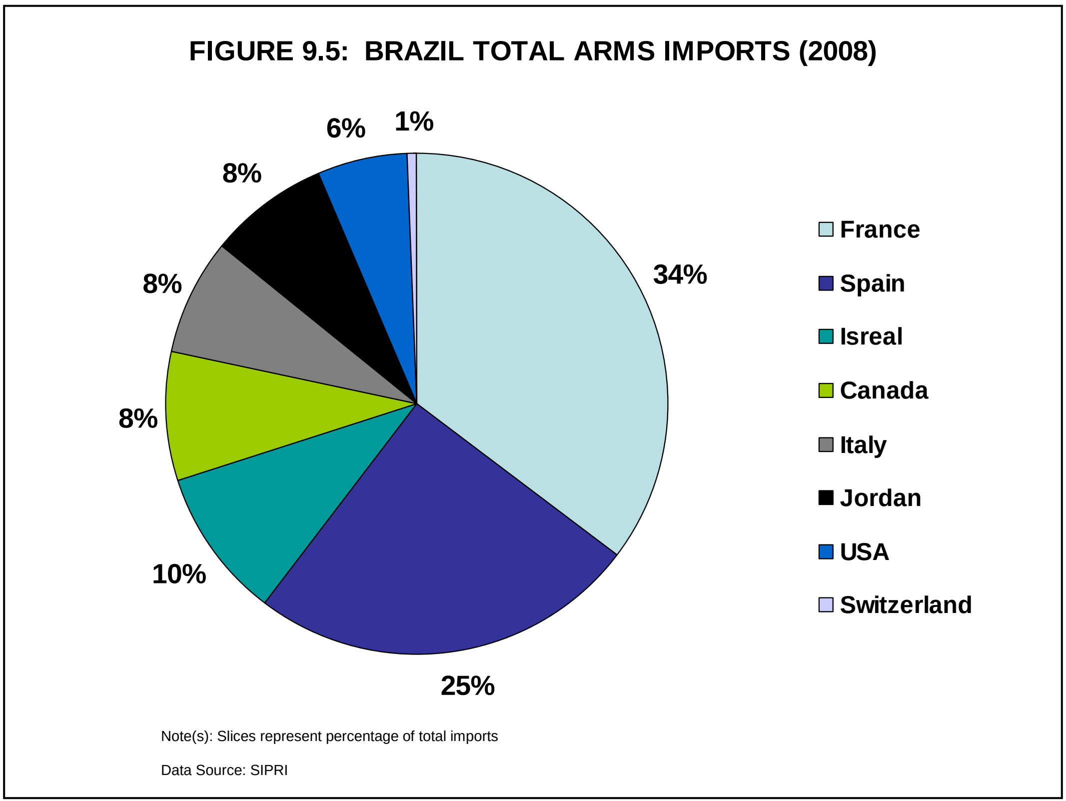
9.1.3 Trade

Data on Brazilian trade of military items comes from the Stockholm International Peace Research Institute (SIPRI).

Total imports by country

Total imports amounted to $156m (in 1990 prices) in 2008, and Figure 9.5 shows how France and Spain accounted for around 60% combined. With Italy adding an additional 8%, European Member States supplied around two-thirds of arms imports to Brazil in 2008.

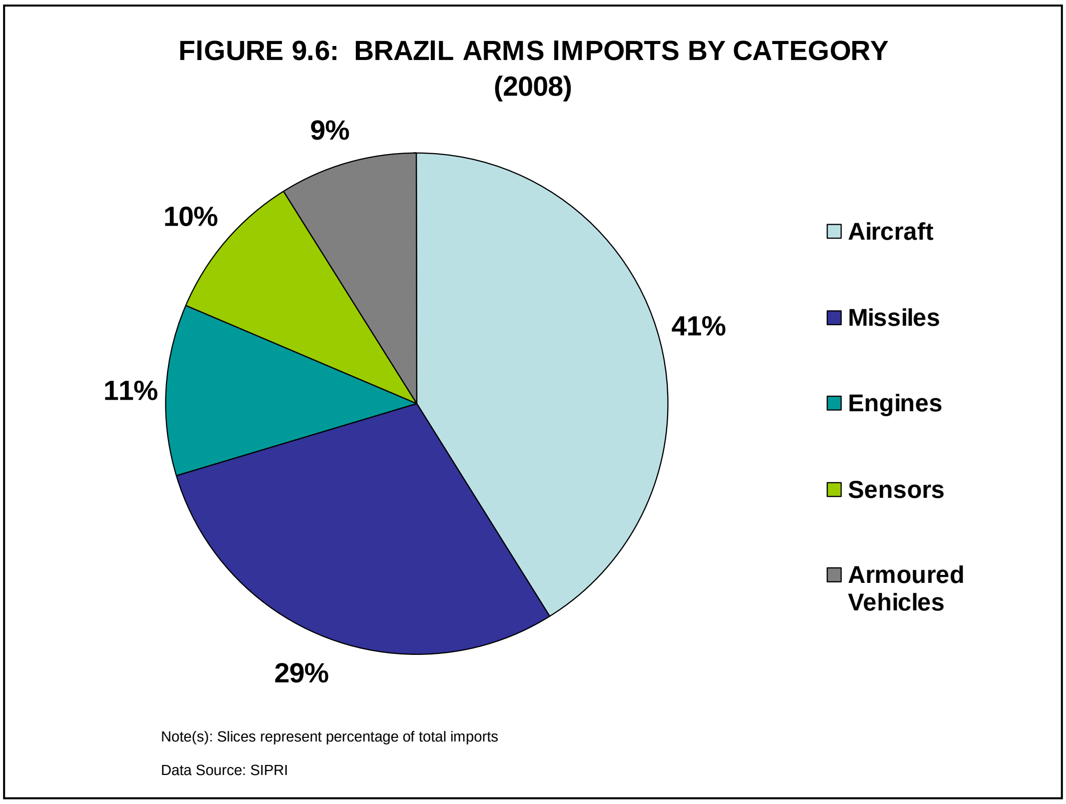
Figure 9.5 Brazil Total Arms Imports (2008)



Total imports by sub-sector

The SIPRI data do not provide an exact match with the three military branches, but provide enough categorisation of interest, as shown in Figure 9.6. As can be seen, imports of aircraft made up by far the largest share at around 40%. The results in Figures 9.4 and 9.5 are brought together by additional information on the SIPRI website which provides detail of the importation of 12 Mirage-2000 aircraft from France in 2008, which have been purchased as an interim solution to replace the 30-year-old Mirage III ERs with which the Brazilian Air Force was currently equipped.

Figure 9.6 Brazil Total Arms Exports (2008)



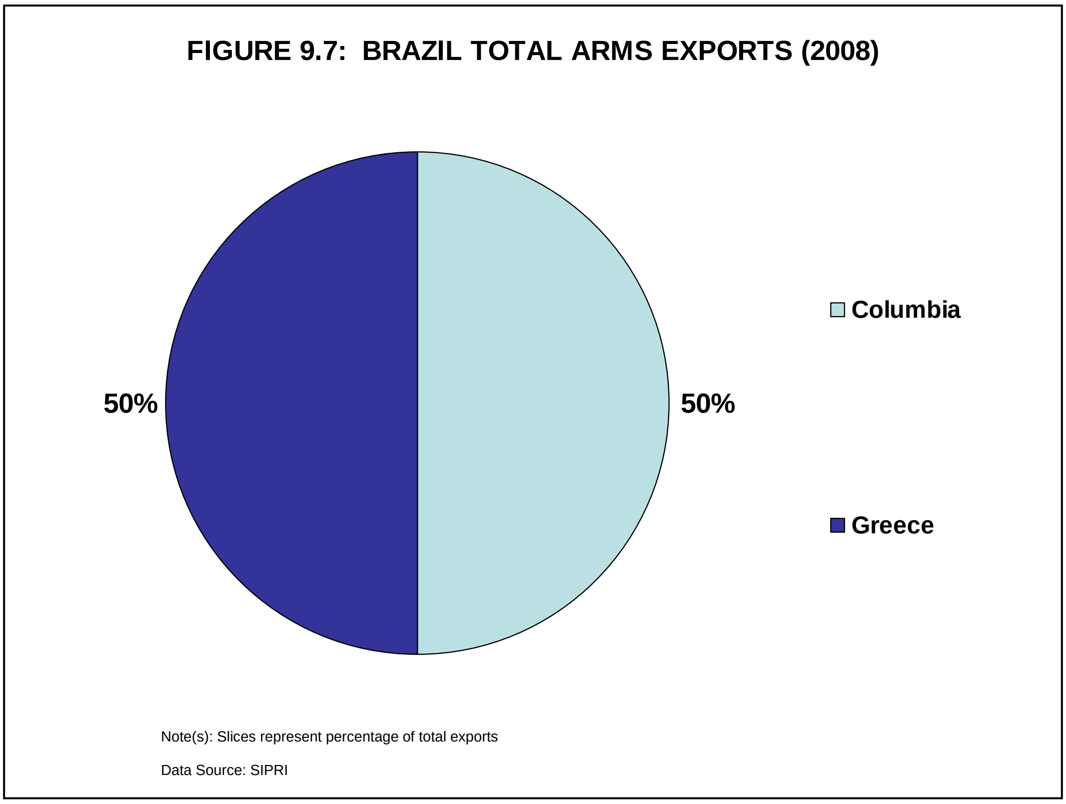
Total exports by country

Arms exports from Brazil amounted to $48m in 2008, with an even split between Columbia and Greece as shown in Figure 9.7.

Total exports by sub-sector

All the exports for 2008 were for aircraft, so no further division is necessary. Additional detail from the SIPRI website show that the order for Columbia related to the completion of a three-year order for 25 EMB-314 Super Tucano trainer/combat aircraft, while for Greece the exports represented the completion of a 9-year order for 4 EMB-145 AEW&C aircraft. These aircraft are fitted with an early warning systems from Ericsson.

Figure 9.7 Brazil Total Arms Exports (2008)



9.1.4 Market access

Principal foreign producers by sub-sector/country

SIPRI maintains a database on national export control systems, but Brazil is not on it. This can be taken as a reasonable indication that Brazil is a fairly open country with no particular accessibility issues for the exports of EU Member States / companies. Unfortunately there is little detail on the SIPRI website as to which producers are providing the exports to Brazil, or which have subsidiary companies in the country. Military Balance provides some anecdotal evidence of collaborations, such as the navy procuring three Scorpene-class submarines from French supplier DCN. Collaboration with France will be further enhanced by the announcement from Eurocopter that it will build an expanded facility in Brazil for the manufacture of its helicopters. The terms of the agreement require Brazil to buy up to 50 Super Cougar helicopters from Helibras, Eurocopter's subsidiary in Latin America. Meanwhile Eurocopter will spend up to $500m expanding its existing production facilities.

Foreign direct investment

As a newly-industrialised country (NIC), Brazil tends to be more of a recipient of FDI than a supplier. Data from the UN UNCTAD publication show that in 2007 Brazil received $34,585m inward investment, but only supplied $7,067m of outward investment. Although some sectoral detail is available on FDI flows, albeit rather dated (2002 being the most recent year in the UNCTAD database), it has not proved possible to obtain a more detailed breakdown that would help identify firms in the military arena. In any case, there would never be a category listed as 'military activities', instead the main sector affected would be aerospace or motor vehicles, and these are unfortunately subsumed within larger categories making it impossible to discover how much FDI is for military versus civilian purposes.

9.2 Drivers

9.2.1 Regulatory & framework conditions

Scope: notable political, industrial and geostrategic situations that have a notable effect on defence industry and its future potential development or the capability of the country to develop a competitive offer.

The geostrategic overview

The geo-strategic environment of Brazil includes South America and South Atlantic to the coasts of Africa and in particular the « Community of Portuguese-Speaking Countries ».

No Latin American country is nuclear-armed. Brazil signed the Nuclear Non-Proliferation Treaty.

Homeland security of Brazil also goes through its ability to control zones of instability and organized crime that affect several regions in Latin America.

Brazil has land borders with ten countries and a large coastline. In this context, border surveillance is a crucial issue. The defence strategy in Brazil is therefore both continental and maritime.

The lack of accessibility in certain regions of Brazil requires the use of air and river means, as well as secure communication channels including terrestrial ones when they exist.

The extension of the maritime field gives access to Brazil to oil, gas and fishing resources that must be defended as well as the maritime routes that cross it. Almost all the Brazilian foreign trade is passing by these routes.

The surveillance and the protection of such vast regions need the deployment of air and space capacities, which is particularly important.

Brazil aims to readjust its armed forces to its needs by developing a defence industry, which is able to reduce its technological dependence and which is able to protect itself from impossible access to sensitive technologies.

Brazil may participate in military operations under the UN mandate, including the fight against terrorism and humanitarian actions, missions that require the means of projection force.

Brazil is not a permanent member of its Security Council, although was recently among five new council members chosen to serve two-year terms on the 15-member body starting January 2010. Brazil clearly has intentions of achieving a permanent seat on the Security Council, and this may also be having an influence on its defence investment and co-operation programmes.

Procurement

Brazilian government procurement regulations are contained in Law 8666 of August 1993 establishing an open competition process for major government procurements. Law 8666 effectively makes price the determining factor in selecting suppliers, and opens most government procurement to international competition[140]. Procurement of telecommunications and ICT equipment which may have a dual use purpose, are exempt from this legislation, with preference given to domestically manufactured products. However in practice, where many large bids are involved (eg in military purchases) procurement is done through "sole sourcing" or "national security" arrangements which effectively excludes some foreign competition[141].

As for the system itself, electronic procurement is being introduced to improve efficiency and allow smaller companies to participate in the competitive process. It should also be highlighted that compared to the other BRICKs countries evaluated in this study, these competitive procedures are much more established in Brazil than elsewhere.

As for the future of defence procurement, Brazil's National Defence Policy[142], establishes the *"invigoration of the country's capability in the defence field is essential and should be obtained with permanent involvement from governmental, industrial and academic sectors, aimed to scientific and technological production and to innovation… including the domain of technologies of dual use"* as a key objective of future action.

In practice, Brazil's Defence Minister Nelson Jobim has stated that Brazil's current priority is "Brazil's technological empowerment in the defence area, especially in the cyber, space and nuclear areas, …[and] every relevant acquisition, from now on must include technology transfer and partnership with Brazilian companies"[143] . This suggests that a large proportion of industrial development (defence and civil) and procurement will come from overseas, until capability and capacity is sustainably established in Brazil.

Export controls

The export of military and dual use items in regulated in Brazil under Law 9112, entitled "Rules of the Export of Sensitive Goods and Services Directly Linked Thereto". It establishes definitions for the creation of control lists on military and dual-use goods, licensing procedures and designates the Ministry of Defence as the supervisory authority for all transactions involving military goods. Law 9112 and its provisions came into force October 10, 1995 meeting all its international obligations. However, Brazil is not

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140 Summary available from the SICE - Foreign Trade Information System at the OAS, at:

http://www.sice.oas.org/ctyindex/USA/ftbbra2004_e.pdf

141 ICON (2007): Executive Report on Strategies in Brazil – Abstract, from the ICON Group International, June 2007, abstract available at: http://www.researchandmarkets.com/reports/602995/executive_report_on_strategies_in_brazil

142 A free translation is available at: http://merln.ndu.edu/whitepapers/Brazil_English2005.pdf

143 Defence News (2009): Brazil Seeks Arms, Technology Transfer, article dated 14/4/2009, available at: http://www.defensenews.com/story.php?i=4035342

party to the Wassenaar Arrangement for which, the official explanation is that the country has no need to join this multilateral export control arrangement as Brazil is not currently a major exporter of military equipment.

Offset policy and international cooperation

No formal offset policy is thought to exist in Brazil, although it is believed that one is currently being developed. Co-production and technology transfer requirement are however a fundamental component of defence contracts signed with overseas suppliers as Brazil's Strategic Affairs Minister Roberto Mangabeira Unger stated that "*we will not simply be buyers or clients, but partners*" in building a state-of-the-art arms industry[144].

Brazil's Defense Minister Nelson Jobim, reiterated this policy this year, stating that "we see our defense not only as a way to face threats, but also as a means to leverage research which will bring new technologies to our military equipment and to the products of our civilian companies"[145].

Recent successes of this policy that demonstrate cooperation between Brazil and other BRICKs countries and the EU, include the China-Brazil Earth Resources Satellite (CEBR)[146], and deals to build four Scorpéne submarines with French company DCNS, and fighters jets from Russia[144].

9.3 Inputs

Skill profile of employment

As previously stated, there is no data to hand on the skills profile of employment in Brazil's military sector or suppliers, other than the earlier reference to the aerospace cluster near San José de Campos employing a highly qualified workforce.

Capital

There is no value attributed to the capital stock of Brazil's military sector, and to do so would probably raise more questions about the assumptions used than it would answer. However, there is information about the types of capital items available for each of the military branches available from a number of sources. For example, an inventory of aircraft (by branch) is provided by the Aviation Week publication[147]. In summary, the list of equipment is as follows:

Army	1,472 armoured vehicles. 6,676 military vehicles, 482 artillery pieces, 82 helicopters
Navy	95 ships, 111 aircraft
Air force	773 aircraft

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144 NYTimes (2008): President of Brazil Unveils Plan to Upgrade Military, article dated December 18, 2008, available at: http://www.nytimes.com/2008/12/19/world/americas/19brazil.html?_r=1&ref=americas

145 Defence News (2009): Brazil Seeks Arms, Technology Transfer, article dated 14/4/2009, available at: http://www.defensenews.com/story.php?i=4035342

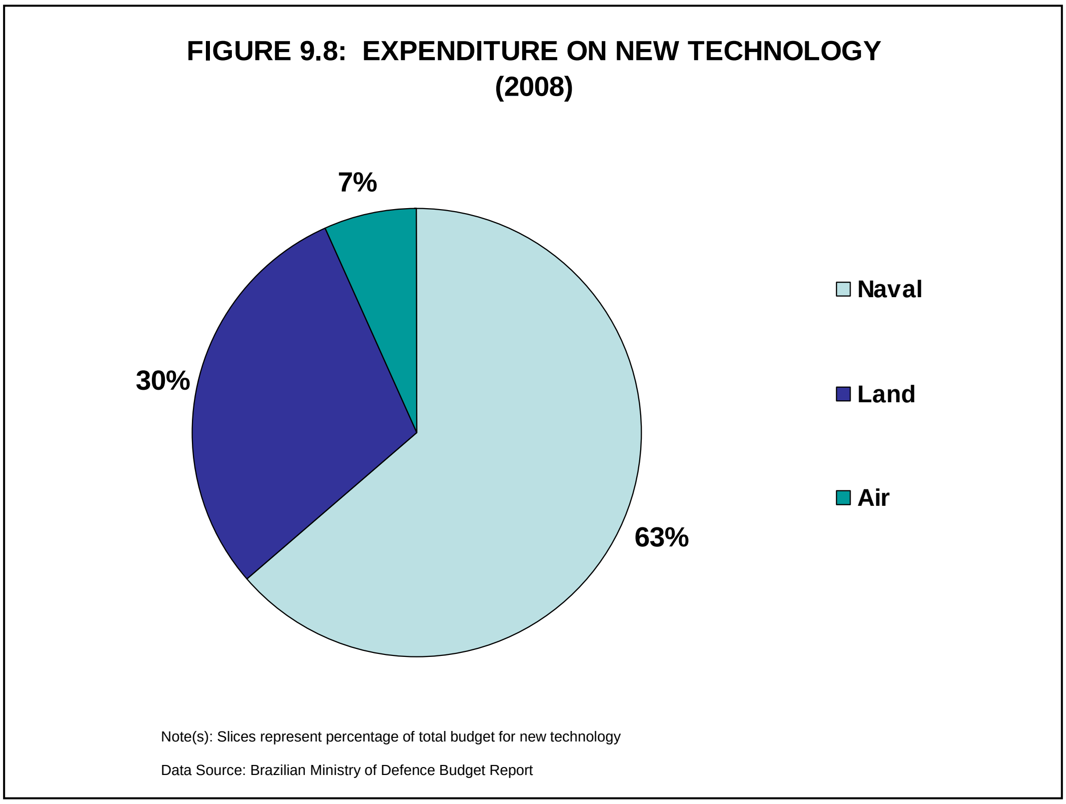
146 http://www.cbers.inpe.br/en/programas/faq.htm

147 See http://www.aviationweek.com/aw/sourcebook/content.jsp?channelName=pro&story=xml/sourcebook_xml/2009/01/26/AW_01_26_2009_p0240-112924-20.xml&headline=World%20Military%20Aircraft%20Inventory%20-%20Brazil.

Knowledge & technology

Data from the Ministry of Defence's budget report can help identify that part which is allocated to procurement of technology and research & development (for modernisation and/or integration of foreign technology). The total budget for 2008 was $115m, and Chart 9.8 shows the split across the three military branches, with Naval technology spending taking the majority of funds in that particular year.

Figure 9.8 Expenditure on New Technology (2008)



9.4 Performance

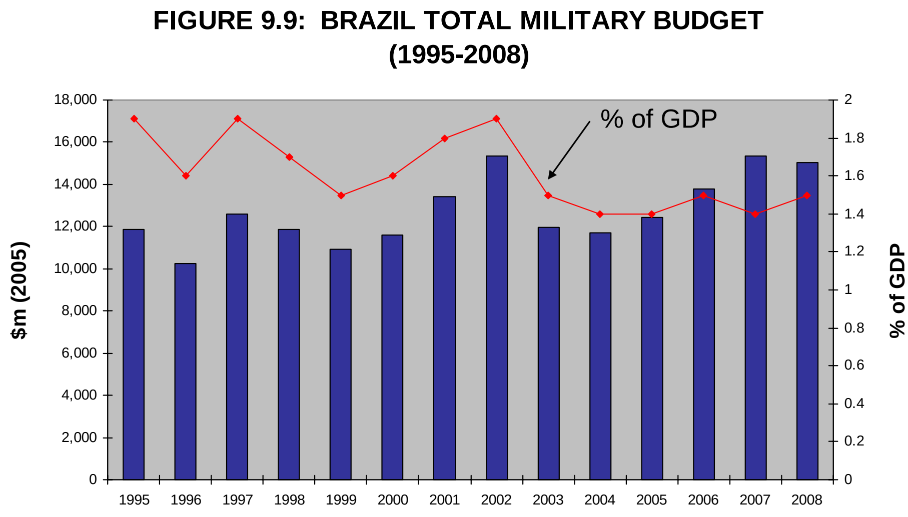
9.4.1 Production and employment trends within the country

Defence spending

As mentioned previously, there are a number of sources to choose from regarding defence budgets, and finding a source which is consistent over a long-enough period of time has proved quite a challenging task. SIPRI provide the longest available series, and this has been extended by using the Ministry of Defence data and then making necessary inflation and currency adjustments, which means that data 2007-08 should be treated with slight caution.

The data show the military budget (adjusted to constant prices) has been on a generally rising trend, albeit with some fluctuations in the late-1990s and the early part of the current decade. As already mentioned, a large part of the military budget is concerned with salaries and pensions, and so is unlikely to show much fluctuation over time. There are also considerations to bear in mind such as the limitations on procurement and operations following the 1998 international financial crisis, which imposed severe fiscal limitations on government spending – some of which still remain today. As a percentage of GDP, military spending has remained within the range of 1½ - 2%, although has been at the lower end of this for much of the past decade.

Figure 9.9 Brazil total Military Budget (1995-2008)



Source: SIPRI, Brazilian Ministry of Defence

In the past couple of years, however, a slight change has occurred with having increased, although the government has announced that the increase in funds is driven primarily by the need to upgrade and modernise parts of its ageing military inventory and not a reaction to developments elsewhere in the region.

To break the military budget down by branch requires, unfortunately, the use of different sources, namely Military Balance. This means that the totals from the branches will not necessarily add up to the totals presented in Figure 9.9. However, as an indicator of relative spending it is sufficient, although there are quite a few gaps in the data as Figure 9.10 shows.

Size of armed forces

In contrast to the budget, the size of the armed forces has remained quite constant over time, at around 0.3 – 0.4% of the labour force, and only in the past couple of years has shown much of an increase above 300,000.

Similarly, when split across the military branches there is a high degree of stability with land-based activities taking the vast majority (around 200,000 or two-thirds) of armed forces employment.

Figure 9.10 Military Budget by Branch

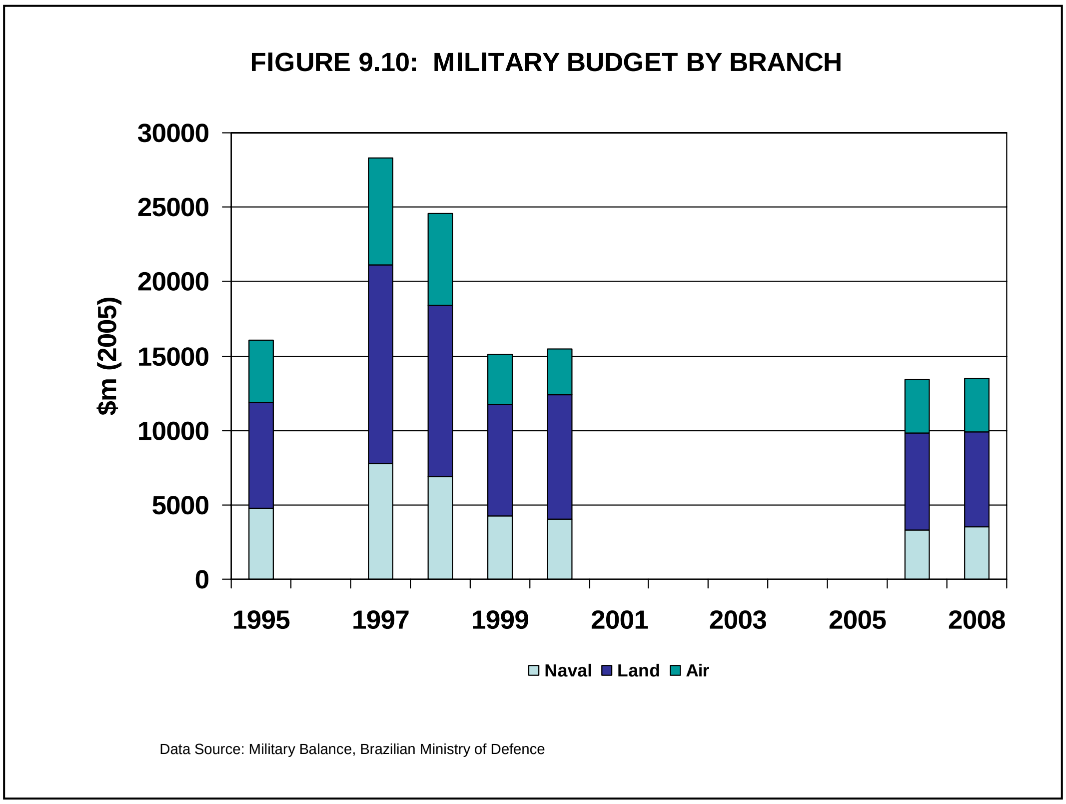


Figure 9.11 Brazil total Armed Forces (1995-2008)

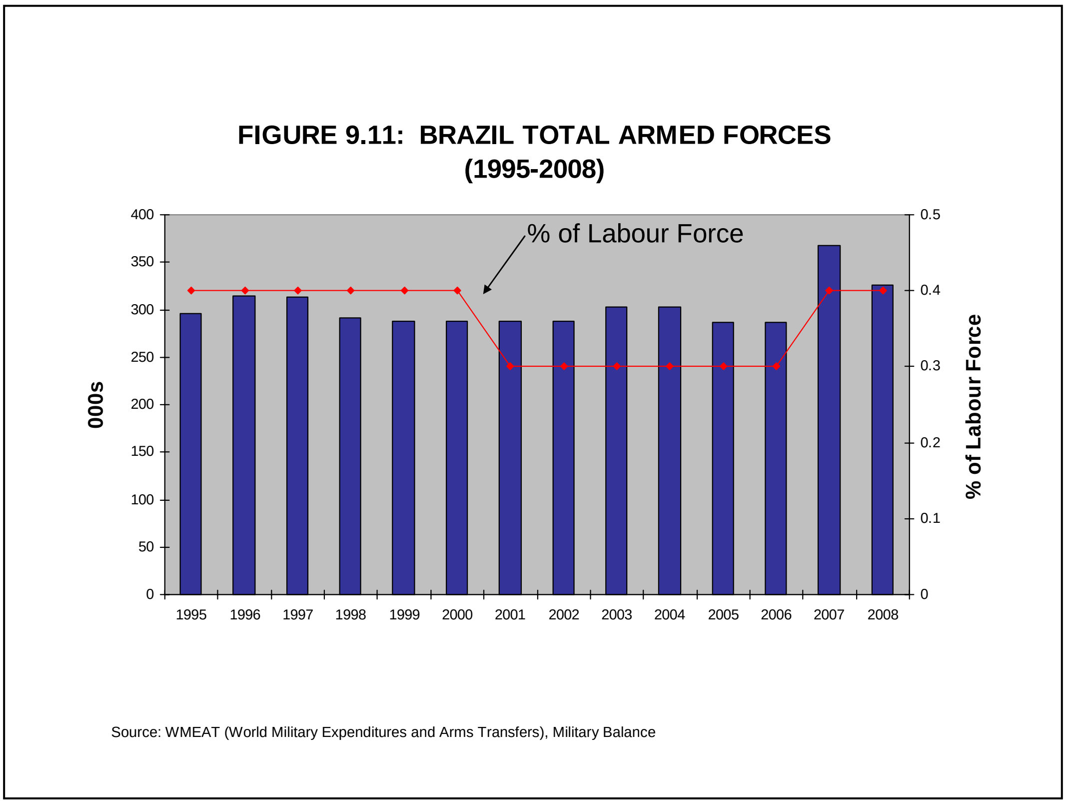
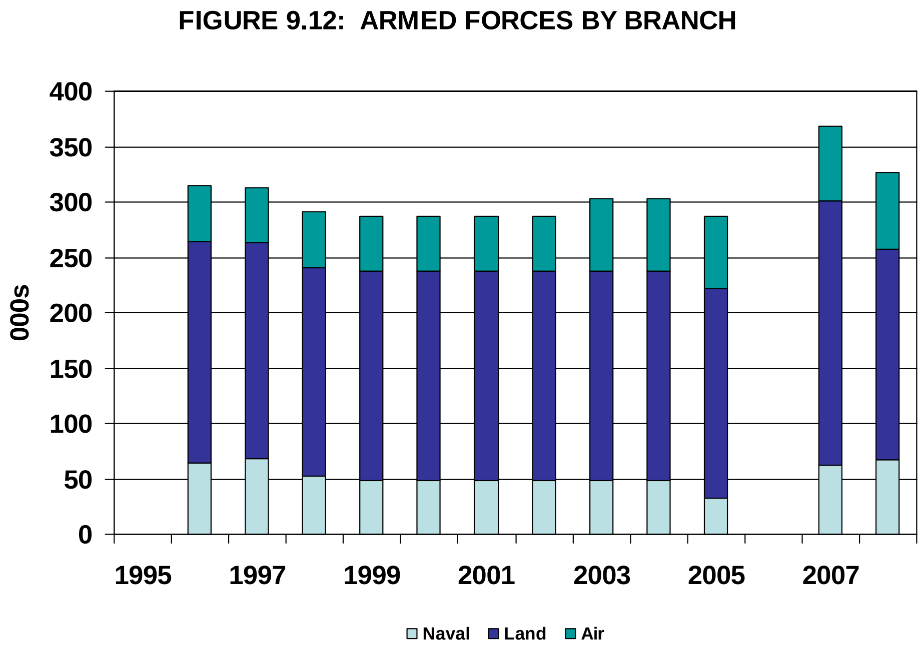


Figure 9.12 Armed Forces by Branch



Data Source: Military Balance

Aerospace

The aerospace sector has enjoyed rapid growth in 2007, following a period of stability over 2004-06. Table 9.1 shows some key indicators of performance for the sector over 2004-07[148]

Table 9.1 Recent Trends in the Brazilian aerospace sector

Sales and Employment in the Brazilian Aerospace Sector				
	2004	2005	2006	2007
Annual Turnover $bn)	4.2	4.3	4.3	6.2
Proportion of GNP (%)	1.9	1.5	1.5	1.9
Exports ($bn)	3.5	3.7	3.9	5.6
Employment (000s)	18.0	19.8	22.0	25.2

Source(s): Aerospace Industries Association of Brazil- AIAB (http://www.aiab.org.br/).

9.4.2 Trade patterns within the country

Imports

Brazil's military imports are dominated by Europe, in particular France, Spain, Italy and Germany; the UK was a major exporter, but this has tailed off since the 1990s. They

[148] Source: Aerospace Industries Association of Brazil- AIAB. In : http://www.aiab.org.br/.

have suffered a significant reduction over the past decade, for financial reasons already mentioned, and are now between a half and a third of what they were in the 1990s. North America and the Middle East (mostly Israel and Kuwait) are the other main exporters to Brazil, mostly of aircraft and related equipment.

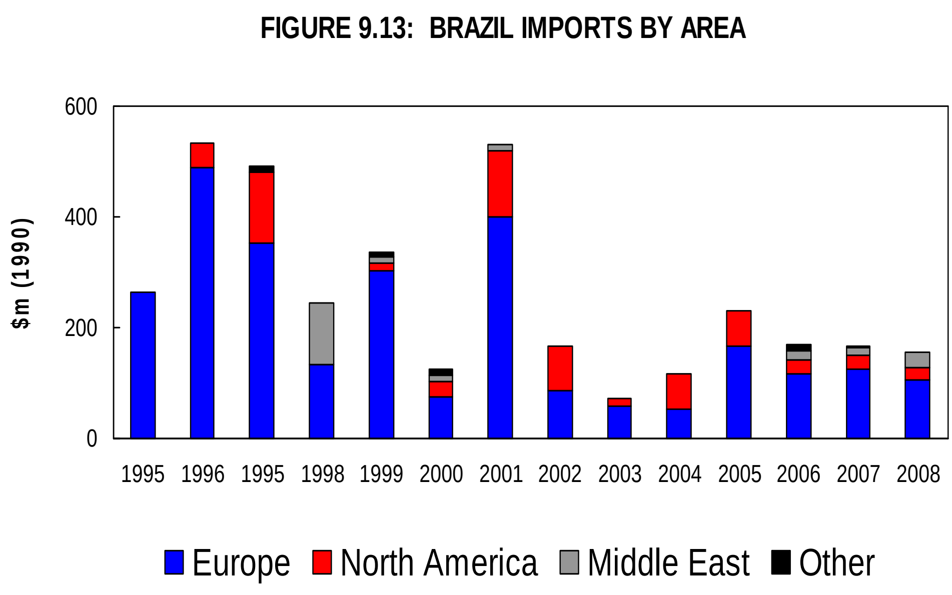
The types of product imported comprise the full range of military equipment, including tanks, guns, missiles, submarines, helicopters and various types of aircraft and boat.

Exports

Exports from Brazil are an order of magnitude lower than their imports, emphasising their position as an NIC. South American countries dominate the order book, particularly in recent years with Columbia and Ecuador. Exports to Europe tend to be more sporadic, with Greece (more recently) and France (in the 1990s) the only countries recording trade over the period shown.

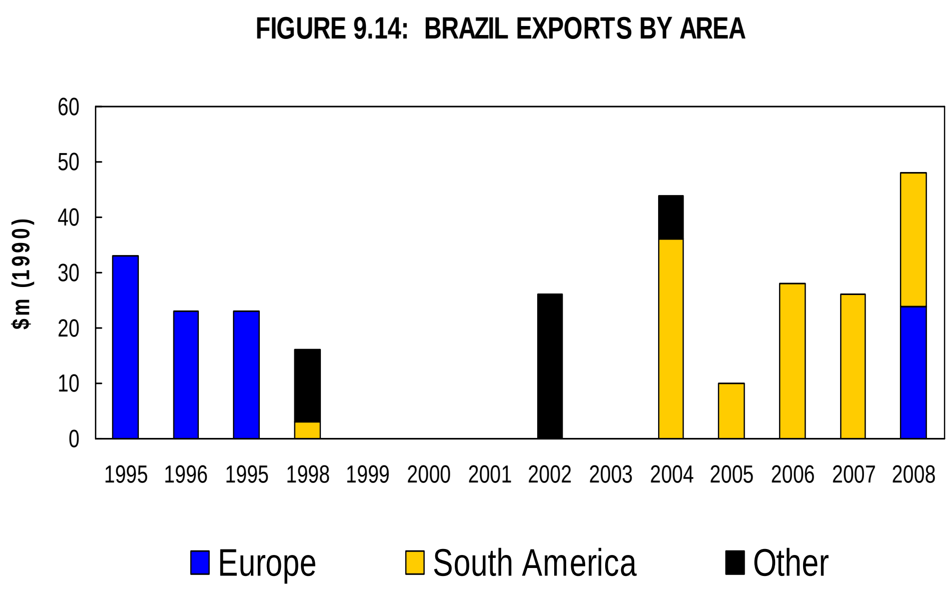
The types of product exported are mostly aircraft (trainer, combat, transport, etc) with some missile systems and radar.

Figure 9.13 Brazil Imports by Area



Source(s) : SIPRI.

Figure 9.14 Brazil Exports by Area



Source(s) : SIPRI.

9.5 Performance and recent trends by domain

9.5.1 Aircraft

Brazil continues to buy western combat aircraft from such manufacturers as Dassault and Northrop, but at the same time it has built up its own strong aviation industry in which the principal producer is Embraer (Empresa Brasileira de Aeronáutica). It should be noted that the Brazilian aviation industry will get offsets in exchange for the announced purchase of combat aircraft.

Embraer started out by producing aircraft under licence, including the Italian Marchetti MB326 for which it developed some upgrades. In its next cooperation with Marchetti Embraer developed the light combat aircraft AMX, which is still in operation.

In the 1980s Embraer developed the Tucano, a training aircraft, which it sold to several countries including the UK, where the RAF used a variant produced by Shorts in Belfast. In the 1990s Embraer designed and produced the Super Tucano, which is an advanced training and light attack aircraft, equipped with modern avionics equipment and a modern combat aircraft cockpit. It is used both as a training aircraft and as a combat and surveillance plane. It has been sold to several countries in South America.

On the basis of its range of business jets, Embraer has developed other types of aircraft for advanced air warning and surveillance missions and electronic warfare.

Low-cost training and light attack aircraft may well be one growth point for the Brazilian aerospace industry. To this end, it is likely that Brazil will seek ways of producing or participating in the production of next-generation fighter aircraft.

Embraer has also announced its willingness to develop (eventually in cooperation with South Africa) a tactical military transport airplane.

9.5.2 Helicopters

Brazil has been active in the production of helicopters for many years thanks to the production under licence of Aerospace and Eurocopter products through the Brazilian company Helibras.

Helibras took a major step towards the acquisition of more modern skills and technology at the end of 2008 when it reached an agreement with Eurocopter to produce EC725 helicopters. The EC725 is a heavy machine (the heaviest helicopter in which Helibras has yet been involved) but it is also an extremely modern and complex helicopter especially when it comes to the combat system and its integration.

However, it needs to be pointed out that Helibras is not an independent company. It was part first of Aerospatiale and now of Eurocopter. It is in fact a subsidiary of Eurocopter, which owns more than 76% of the capital. This puts Eurocopter in a position to control the emergence of a competitor.

Given these circumstances, Brazil does not appear to be in a position to become a competitor in the field of helicopters.

9.5.3 Land armaments

Until 1993 the main producer of armoured vehicles in Brazil was Engesa. In the early 1990s, Engesa employed around 5,000 people. However, in 1993 the firm became bankrupt, brought down by the unilateral termination of a major contract with Saudi Arabia and by competition from former Warsaw Pact countries.

Engesa had in particular designed the EE-T1 Osório, a 39-ton tank, whose first prototype was fitted with a 105mm tank gun made in the UK and a second 120mm gun made by Giat Industries. European companies also supplied the other main armaments and equipment of the tank (Marconi, SFIM, TRT and MWM. The attempt to export Osório tanks to Saudi Arabia failed, largely because, after the US intervention in Iraq in 1991, links between Saudi Arabia and the US became closer and Brazil was squeezed out.

Engesa also produced six-by-six light armoured vehicles (12 tons) for reconnaissance missions (the EE-9 and especially the EE-11). These tanks were offered in several versions: equipped with a machine gun, a 20mm cannon or a 90 mm cannon (manufactured under licence from the Belgian defence company CMI). This product met with a certain export success (eg Bolivia, Chile, Colombia, UAE, Gabon, Guyana, Iraq, Libya, Tunisia and Uruguay).

At present, the Brazilian defence industry is represented mainly by Imbel (Indústria de Material Bélico do Brasil) which took over certain assets of Engesa. Imbel produces portable weapons, artillery (mortars, guns and rocket launchers), electronic equipment (radio and computer terminals), explosives and ammunition.

A survey of the sources of the equipment of the Brazilian Army reveals the weaknesses of the Brazilian defence industry:

- German tanks (Leopard 1) and US tanks (M60)
- US light tank (M41)
- artillery (US, UK, Sweden, Italy)
- missiles (France and Russia)

In contrast to the position in the 1990s when the Brazilian defence industry was a very active and fairly successful exporter of land armaments, its current level of development does not allow the country to compete even in the medium term with the major manufacturers active on the global stage. The leading lights of the Brazilian defence industry now seem more oriented towards aerospace (with Embraer) and shipbuilding (with the project to build a nuclear-powered attack submarine and the development of a nuclear energy industry).

9.5.4 Surface ships

Since the 1950s Brazil has possessed the largest navy in Latin America. One principal reason for keeping so large a navy is the increase of drug trafficking and the need to protect territorial waters, where significant oil and gas reserves have recently been discovered.

However, maintaining a large navy is a financial burden that Brazil has not yet shouldered. The navy is impressive on paper, being a complete navy with one aircraft carrier, some frigates and submarines, but an analysis of the condition of the fleet shows that only 50% of it is operational. A serious financial effort is needed to bring the other 50% up to scratch.

Brazil has shipyards capable of assembling under licence such complex vessels as frigates, but it is still dependent on foreign suppliers for its weapons systems and most of its equipment. The list of major surface ships of the Brazilian Navy reveals much about the capacity of the Brazilian military shipbuilding sector:

- one aircraft-carrier, the São Paulo (the former French vessel Foch, launched in 1960 and sold to Brazil in 2000)
- four Type 22 frigates bought from the UK Royal Navy in the mid-1990s, three of which were modernized in Brazil and are equipped with French MM40 missiles
- six Niterói Class frigates armed with French MM40 Block II missiles, built in the UK by Vosper Thorneycroft in the 1970s
- seven frigates equipped mainly with UK armaments:
    - four anti-submarine frigates built in the UK
    - two less specialized anti-submarine frigates built in Rio de Janeiro
    - a frigate built as a training ship for the Brazilian navy
- four Inhaúma class corvettes equipped with MM40 missiles and built by the naval arsenal in Rio de Janeiro (Arsenal de Marinha do Rio de Janeiro)

- one Barroso class corvette

To date Brazil has not had the capacity to export surface vessels or to become a major player and therefore it remains an importer of such vessels and of their equipment. This state of affairs is expected to last into the medium term.

9.5.5 Submarines

The Brazilian Navy currently possesses five Tupi Class submarines (209-1400 Class) originating from the Howaldtswerke shipyard in Kiel. The first of these submarines was assembled in Kiel; the four following ones were assembled by the naval arsenal in Rio de Janeiro. The equipment of these submarines is European.

It is worth noting that the construction of the fourth of these submarines (the Tikuna), which is an advanced version, required nine years of work, which is twice the time planned. It came into service in 2007. The learning and effort involved in building the Tikuna may well help Brazil acquire the ability to design and build its own nuclear attack submarine in the future.

In the meantime, however, the Brazilian Navy plans to order four Scorpène submarines from the French company DCNS, the shift being partly explained by Brazil's desire to acquire nuclear propulsion technology, something that cannot be supplied by HDW. Brazil sees the following advantages in acquiring these submarines from DCNS:

- maintaining a submarine fleet with a good diving capacity (through anaerobic propulsion);
- preserving the hard-won skills acquired through building the Tikuna;
- receiving technology transfers including those relating to nuclear propulsion.

It is clearly a policy goal to have an industry capable of designing a nuclear-powered attack submarine to come into service in 2020. Nevertheless, Brazil will probably have to remain dependent on foreign suppliers for much of the equipment for such submarines. Possession of a nuclear-powered submarine would give Brazil the operational means to defend its coastline and its oil fields but it would also allow the country through this programme to embark on the production of nuclear energy.

Given this strategy for nuclear propulsion and a certain dependency on foreign suppliers of equipment, Brazil cannot be considered as a potential competitor in the medium term.

9.5.6 Missiles

Brazil embarked on a missiles programme in the 1980s in reaction to the Argentinean Condor II programme. However, Argentina's abandonment of the Condor programme in the early 1990s and the subsequent easing of tensions between the two countries coupled with Brazil's decision against nuclear arms have substantially slowed down the development of the Brazilian missiles industry.

Thus, in contrast to the position in aerospace, Brazil does not have a significant industrial base in the missiles area, either in development or production. The activities of Avibras and the Orbita consortium, created in 1987, have remained limited.

As a result, the Brazilian armed forces are mostly equipped with missiles made by US and European suppliers.

Nevertheless, Brazil has carried out some limited activities in this field, the most recent and important of which is the ongoing development by Orbita, in cooperation with South Africa, of the air-air missile, MAA-1. Should the development of this missile be completed successfully, this system might be chosen to equip the future combat aircraft that Brazil plans to put into service. However, there would seem to be only limited export potential for these missiles unless a systems integrator should select them.

Brazil is also developing in cooperation with the Italian firm Otobreda an anti-tank missile, the MSS 12, and Avibras is developing a cruise missile AV-MT300. Both programmes were launched at the beginning of the 2000s and are still in development. It should also be noted that, concerning cruise missiles, Brazil will still have to access or develop several key systems in order to offer a modern cruise missile with all the mission preparation, navigation functions and precision capability that are required, so there is still some way to go before they can be considered a competitive force in this area.

Countries that are able to produce major weapons systems (combat aircraft, surface ships or submarines) find it an advantage to have a complete missiles industry in order to promote exports of weapons systems. Brazil cannot produce major weapons systems, and so it does not need a complete missiles industry for its exports.

At this stage, it would take a special financial effort and considerable time to build up significant expertise and resources in the production and design of missiles. This type of effort does not seem to be part of Brazil's objectives.

In the absence of a substantial industrial base and products developed in complete independence, and lacking a presence in several market segments, Brazil does not appear to be a potential future competitor in the missile area.

9.5.7 Electronic systems & optronics

Brazil is relatively dependent in the field of electronics. Most military equipment is foreign-made: combat aircraft, surface ships, submarines, missiles, tanks (see fact sheets) and a fortiori their electronic equipment.

Major specific electronics systems are also of foreign origin. For example, the US company Raytheon was a major contributor in setting up the complex SIVAM surveillance system of the Amazon.

The electronics sector is represented by national companies like OMNISYS which is active in equipment for electronic warfare, countermeasures, electronic bays for the navy, the air traffic control. Since 2006, Thales has held a majority stake (51%) in Omnisys, which enables it to give a Brazilian component to its offer.

Embraer produces surveillance aircraft fitted with foreign electronic equipment:

- Ericsson Microwave (Sweden) for the EMB-145 Airborne Early Warning plane, used in Brazil and Greece
- DRDO (India) supplies the antenna for the three EMB-145 AEW purchased by India
- US MDA System (radar) and StarSafire (FLIR) for the EMB-145 Remote Sensing / Airborne Ground Surveillance
- Raytheon for the radar of the EMB-145 Maritime Patrol (MP)
- Thales for the equipment of a new version of the EMB-145 MP with anti-surface and anti-submarine warfare equipment.

Because many countries are interested in these surveillance capabilities at low cost offered by Embraer, the export potential of these aircraft is considerable.

In short, Brazil is not currently a threat to European electronics manufacturers. Brazil must rather be considered as a market in which European electronics companies can supply equipment for its domestic needs and for the platforms it is exporting.

9.6 Conclusions

9.6.1 Competitive strength of local industry and likely developments

The main strength of local industry in Brazil seems to reside within the aerospace sector. A significant cluster exists in the state of San Paulo of around 130 companies employing 5,000 people. The cluster involves a mix of domestic and foreign companies, with European firms well represented.

In 2006, a governance group was created by the city of São José dos Campos, FIESP/CIESP (San Paulo industry bodies), SEBRAE (The Brazilian Service of Support for Micro and Small Enterprises) and Cecompi (the cluster competitiveness park). This helped to formalise existing arrangements, which had been developing for some time before this, with additional support from the state and federal government. An example of how the initiative is bearing fruit is the establishment of the Technology Park “Eng. Riugi Kojima”. The park contains several companies, laboratories and research and education institutions and is focused on technology companies operating in the areas of aerospace, automotive, energy, IT, biotechnology and nanotechnology.

This initiative has helped to consolidate the development of the aerospace cluster, by bringing together the various stakeholders (universities, research institutions, private and public sectors) and further enhancing the process and strength of internationalisation. Evidence of how the Brazilian authorities recognise the importance of developing international contacts and partners is the work of the Association of High Technology Aeronautics. The association brings together aerospace companies, aviation parts exporters, suppliers of EMBRAER and the Spanish company EADS-Casa and advises companies in doing international business, thereby boosting exports by Brazilian companies. The sector has already developed partnerships and cooperation with counterparts from Belgium, Chile, China, France, Germany, Italy, Japan, Spain, Sweden, United Kingdom and the United States, among others.

9.6.2 Strengths and weaknesses

Trade data reveal a significant trade deficit for military producers which is unlikely to change in the coming years. Brazil's exports in recent years have tended to be mainly to fellow South American countries, while most imports come from Europe, with the US a long way behind.

The relatively limited level of past US arms exports to Brazil is a function primarily of two factors. First, the US willingness to export advanced weapon systems to Latin America and, second, Brazil's insistence on significant levels of technology transfers in its foreign arms acquisitions, as a means of boosting its domestic arms industry.

The US unwillingness to supply certain advanced military technology to Latin America as an attempt to limit the level of military technology in the region has provided the opportunity for other suppliers — primarily West European countries, Russia and Israel — to have a strong presence in the Latin American arms market. This pattern dates back to the 1960s when the US refused to sell advanced combat aircraft to Latin America, which turned Latin American countries to other suppliers of such aircraft. In 1995, the Clinton Administration added domestic economic consideration, including US defence industrial policy considerations, to the criteria for approving arms exports. However, this does not seem to have resulted in a significant change in US actual exports to the region.

The government of Brazil has announced that all arms procurement deals since mid-2007 will include production in Brazil and significant levels of technology transfer. The suppliers that are most willing to meet those requirements have emerged as the winners of recent arms contracts with Brazil, notably the French Eurocopter and DCNS.

These issues were mentioned in a recent paper by Defesa (2009)[149] which has the following quote in relation to Brazil's recent agreement with France, signed on September 3rd 2009, over the construction of nuclear submarines:

"Vice President Jose Alencar specifically rejected rumours in the press that the 2008 US reactivation of its 4th Fleet, which had aroused intense concern in some circles, had figured in the Brazilian decision to acquire nuclear submarines. While Brazil's overall relations with the United States have been cordial, and the two countries enjoy a strong commercial relationship, fear of domination from the North is an enduring feature of the Brazilian political psyche".

In contrast, imports cover the full range of military equipment, suggesting that Brazil is not particularly self-sufficient in any area and provides a good open market for European producers. Trade data show that European Member States enjoy a healthy export share of the Brazilian defence market.

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[149] Defesa (2009): Why Does Brazil Need Nuclear Submarines?, US Naval Proceedings, Issue June 2009, Vol.135/6/1,26, article available at Defesa@net, web address: http://www.defesanet.com.br/usa1/subs_br.htm.

Since the late 1990s Brazil has been subject to government financial constraints, and in more recent years this has restrained any expansionist ambitions, limiting the budget to maintaining and replacing an increasingly ageing stock of military equipment. The discovery of large oil reserves in Brazilian waters has raised the prospect of a new development plan, however, and in February 2008 the government announced, in collaboration with Argentina, plans to develop a nuclear reactor for a long-held ambition to introduce a nuclear-powered submarine to the navy's fleet. Such developments cannot be undertaken in isolation, however, and this inevitably creates opportunities for collaboration with European companies. In this case, France will provide the basic design of the platform, and the first vessel is due in service around 2020. The trade data have already provided evidence of increasing collaboration between France and Brazil, and this has been reinforced by Eurocopter announcing that it will build an expanded facility in Brazil for the manufacture of its helicopters.

While there is not yet any formal offset policy in Brazil, co-production and technology transfer requirement are a fundamental component of defence contracts signed with overseas suppliers.

10 Future developments in the global defence market

10.1 Scenario development

10.1.1 Overview

Earlier chapters have identified two sets of drivers affecting the defence sector; those for establishing a national defence industry, and those shaping its future prospects in each BRICK country. A summary of these drivers is presented in Table 10.1 below. The aim of this Section is to formulate and analyse different scenarios, representative of potential future outcomes resulting from these drivers.

Table 10.1 BRICK Defence Industries - Summary of Leading Drivers

BRICK Defence Industries - Summary of Leading Drivers	
Drivers for Establishing Defence Industry	**Drivers of the Future Development of Defence Industries**
• Defence and Security Policy • Foreign Policy • Political Pressures and Ambitions • Legacy	• Defence and Security Policy • Foreign Policy • Political Pressures and Ambitions • Industrial Policy (defence and civil) • Economic Growth • Availability of skilled workers and capital • Organisation (management and governance) • Procurement and open tendering (to improve standards and competition) • Structural Factors (ie ownership, vertical ties, lead times, market concentration, etc.) • Technological Factors

10.1.2 Approach

Scenarios allow the evaluation of the future from a 'what if' perspective, combining numerous factors or drivers under a common theme or trend. The advantage is that by simplifying the analysis to scenarios, effort is focussed on the general trend and its potential impacts, rather than on specific details which may have little impact on the end result. Meaningful results and conclusions can therefore be drawn from this type on analysis. This approach is also useful in a high level policy context as the endless uncertainties regarding future outcomes could otherwise make the analysis overly complex.

As a starting point for this assessment, Table 10.1 highlights the importance of government policy for the inception and subsequent development of defence industries in each BRICK country. For example, security and foreign policy often establishes the need for a national defence industry if a nation is to protect itself from potential aggressors or exert increased political influence regionally or globally. Indigenous and independent defence production capability is therefore often an objective of defence industrial policy, contributing to wider security and foreign policy objectives. Once a defence industry is created, the desire to export defence equipment (often a useful foreign policy tool) or to develop indigenous technology to support the wider economy may also emerge as key policy drivers of the defence industry in each BRICK.

While government policy is a leading driver of each defence industry to be explored further in each scenario, it is important to acknowledge the importance of other groups of drivers. For example, supporting the defence industry can have political objectives if it is assumed that political parties gain support from the public or influential backers by helping nationally important industries, such as defence. After all, the defence industry is often a major employer in some countries. The structure of the defence industry is also important as with long lead times from initial project or policy inception to eventual delivery and application, investments and changes to policy may only be realised in excess of 10 years time. In addition, organisational factors such as the degree of state ownership and technological factors can also play an important role in determining the future prospects of each defence industry.

To guide the consultants in the development of each scenario, a workshop was held in Brussels with representatives of the European defence industry. This workshop highlighted that the past should not necessarily be used to inform the future prospects of each BRICK defence industry, as it was suggested that previous difficulties in industrial development and technical advancement experienced by some BRICKs have largely been overcome. For example, with rapid economic growth in civil industry, some BRICK countries previously found it difficult to retain skilled workers and the best scientists in the defence industry resulting in a loss of know-how in each generation of workers. In other cases, production standards and product reliability have been reported as poor as the defence sector was not exposed to the commercial competition and was protected by the state. Resulting project over runs, poor reliability and production quality therefore limited defence industrial development. To support these claims, industry representatives highlighted the substantial investments made in a number of BRICK countries by European industry and technical progress made by many BRICKs, often learning from commercial production standards, techniques and management. In response, the consultants have provided a range of scenarios encompassing some bold assumptions as to the future direction of each BRICKs defence sector as this evidence suggests that BRICK countries have developed the technical know-how and industrial capability much more rapidly than previously reported in the literature.

To account for the long lead times, each scenario shall cover a period of 15 years from 2010 to 2025. This is intended to encompass both short and medium term trends and impacts. A description of each scenario and the assumptions underlining each is provided in the remainder of this chapter.

10.2 Scenario 1: Business as usual (BAU)

10.2.1 Overview

The business as usual, or baseline scenario, is the starting point for any analysis as it assumes existing polices, strategies, rates of growth, etc. continue at the same rate over the assessment period. Deviations in policy, growth or any other factor are therefore assessed against this baseline. The future progression of each defence sector is therefore assumed to follow the trends in economic, political and technological drivers described in previous chapters, achieving the targets and policy objectives identified. A summary of what each scenario assumes is provided below.

10.2.2 Brazil

Based on expert testament and a review of the literature, Brazil's defence policy appears to focus on two objectives, the protection of its natural resources in Amazonia and the Atlantic, and the attainment of international power and influence, worthy of a major player on the world stage[150]. Brazil wishes to increase protection around its existing borders, specifically at sea where this includes an increasing number of offshore oil and gas facilities. On the international stage, it has been suggested by experts that by increasing its military power, Brazil hopes to gain a permanent seat on the UN Security Council gaining influence and prestige as the leading regional economic, political and military power. The priority development of naval capacity, including the capability to produce nuclear powered submarines is therefore foreseen in this scenario. Similarly, present objectives to purchase and then produce a new generation of fighter jets in the future, building on civil aircraft expertise is also expected occur by 2025. Helicopters are also foreseen as a key element in this strategy to ensure the greater unit mobility of ground forces, specifically with Amazonia. The Brazilian national strategic defence plan has included a 50 per cent increase in the defence budget for 2008[151] in order to make these objectives a reality, with subsequent increases in spending expected from 2009-2025 (See assumed expenditure growth below).

At this point, it is clear that the protection and power objectives of defence policy are leading drivers of the need for a more capable military force, including the need for more modern and advanced defence equipment. This demand for new equipment could be fulfilled by importing this technology from leading defence suppliers such as the US, Europe and Russia. However, based on defence policy alone, it is unclear why Brazil wishes to develop its indigenous defence production capability. Brazil may realise that with many growing economies in the region, there is potential for future arms exports. In

150 Muxagato, B. (2009): President Lula's international ambitions and the Franco-Brazilian strategic partnership, article first published in Defense nationale et securite collective, February 2009, pp. 86-93, available at: www.diploweb.com/spip.php?page=imprimer&id_article=400

151 Muxagato, B. (2009): President Lula's international ambitions and the Franco-Brazilian strategic partnership, article first published in Defense nationale et securite collective, February 2009, pp. 86-93, available at: www.diploweb.com/spip.php?page=imprimer&id_article=400

addition, the benefits of defence production to civil industry (technology and skills spillovers) and the international acknowledgment of Brazils increasing power through its industrial capability must also be considered as leading drivers of this defence industrial strategy.

Within the region, Brazil has developed South-South relations by deepening regional integration (MERCOSUR) and reaching strategic agreements with large emerging countries (India, South Africa, China) in order to achieve its two foreign policy objectives: the maintenance of its decisional autonomy, and acquiring greater weight on the world stage[150]. Brazil also foresees a substantial defence market emerging in neighbouring countries and in those countries with which it has reached strategic agreement. It is therefore plausible to suggest that this expected demand for defence equipment and the desire for autonomy within Brazil are the leading motives behind the need to develop its indigenous defence production and technological capability. This also suggests that Brazil expects to be a leading exporter of defence equipment in the future.

In order to realise these objectives, the Brazilian government has chosen to purchase a large proportion of its current equipment needs from foreign suppliers, while making technology transfers a mandatory requirements for all these purchases in order to build domestic industrial capability. While many countries (i.e. the US, UK and Russia) have been unwilling to share advanced technology such as nuclear submarines with Brazil, France has been more cooperative (Russia was only prepared to lease out a submarine like it has with India), establishing a strategic partnership with Brazil. This has enabled France to sign numerous arms contracts helping to support its defence industry, gain access to other markets in the Latin-American subcontinent, gain a friendly ally in which to develop investment, and strengthen democratic ties in Guyana in which Brazil and France both have a mutual interest. For Brazil, building these ties with France (and also Russia), has enabled it to rapidly develop its defence industry and military capability from a situation of disarray in the mid 1990's to a position of regional significance, and it hopes international influence in the future. While no official offset policy exists to determine the level and amount of technology transfer. In practice, the Brazilian government has made clear that those bids that offer the greatest technology transfer and indigenous content will be best placed to win future contracts. Applied on a case-by-case basis, this approach appears to suit Brazil and is assumed to continue in the future.

Although officially the National Defense Strategy of Brazil released on 17 December 2008 provides little military justification for the recently accelerated acquisition of advanced submarine technology[152], the pursuit of advanced technologies to "become an active exporter of arms" has been identified as the key objective[153] of this and other strategic partnerships. Or put more boldly by President Lula, the acquisition of high-tech military capabilities is a key part of Brazil's strategy to become "one of the great powers of the 21st century"[154]. Whether this is a realistic objective of defence industrial policy is discussed further in what follows, as some limitations are likely to exist.

152 Ministerio da Defensa, Estrategia Nacional de Defensa, www.defensa.gov.br, 2008.

153 Defesa (2009): Why Does Brazil Need Nuclear Submarines?, US Naval Proceedings, Issue June 2009, Vol.135/6/1,26, available at Defesa@net, web address: http://www.defesanet.com.br/usa1/subs_br.htm.

154 Breitbart (2008): Sarkozy in Brazil ahead of $4 bln jet decision, article available at: http://www.breitbart.com.

With existing industrial strengths in the civil aviation sector, Brazil is expected to emerge as major producer of military aircraft components and completed platforms by 2025, assisted by the technology available through shared production and technology agreements. In the naval sector, the rapid development of dry dock capabilities and capacity, largely the result of offsets from recent naval procurement contracts and the growth of the oil and gas sector, is likely to see Brazil emerge as a world competitor in smaller ship production. However it is not foreseen that Brazil will independently produce large naval defence platforms by 2025 as although the capability may exist, and provided relations with France and other partners remain friendly, Brazil is likely to remain reliant on foreign partners for some technological content, particularly in larger platforms. Partnerships with France or other countries for advanced technology are therefore expected to continue, particularly in electronics, communications and optronics associated with the revolution in military affairs (RMA)[155] in which Europe is a technology leader. The recent nuclear-powered submarine contract is a case point, as although Brazil has an established shipbuilding record and has developed nuclear technology over a number of years, it is recognised that the sophisticated technology required for a nuclear-sub hull will have to be acquired abroad. Therefore, although foreign countries may be willing to share the “bricks and mortar” of many defence platforms (i.e. power systems, avionics, hulls, etc.), they are unlikely to share the secrets of internal systems and technology which provide strategic military advantages, particularly in relation to RMA (i.e. radar, communications, electronics, etc.). Brazil will therefore need to develop these technologies indigenously, which may take some time and limit industry development. The other limiting factor to consider is one of demand from neighbouring countries, India, China and South Africa. As without customers, the development of indigenous capability could be highly costly to maintain. The importance of exports is therefore likely to increase towards the end of the scenario period and longer term if Brazil wishes to domestically produce many of the advanced technologies it could otherwise import.

The space and land domains are also expected to encounter a similar growth path to that of other defence segments with the basic platform and launch capacity produced in Brazil overtime. However, the technology and sub-systems contained within each platform (i.e. satellites, electronics, communication and some weapons systems) are likely to remain foreign sourced and developed in 2025. This reliance on others for certain technology may also be a limiting factor affecting future exports as US ITAR and similar restrictions imposed by European governments may prevent the export of some otherwise indigenously produced systems. Producing ‘cheap and cheerful’ versions of completed platforms to target developing countries may be one solution to circumvent foreign restrictions on technology usage or a lack of demand within Latin America for defence equipment.

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[155] Information is regarded as the new 5th dimension of warfare in addition to the traditional areas of land, sea, air and space. Revolution in military affairs (RMA) is a term used to describe the required changes in policy, military strategy and technology to integrate information into national security affairs. The implication for defence equipment production is that future platforms will increasingly rely on the quality of their sensors, communication links, avionics and smart munitions, rather than power and size. This means high technology defence and civil industry capability consequently becomes more important with RMA. Thus the defence industry involves and includes new companies with capabilities that were not seen as part of defence in the past.

10.2.3 Russia

Russia, more than any other BRICK country is influenced by its past, specifically the legacy of the USSR, in terms of the political and economic power it once enjoyed, embodied in its substantial defence industrial capacity and military capability. Following the dissolution of the USSR, the defence industry underwent a period of sustained declines in military expenditure and production. Equally, corruption and mismanagement in state enterprises in the formative years of the new Russia also helped to contribute to this decline. Although the technology, skills and capacity to develop and produce a vast array of defence equipment has always existed in Russia, only since investment has increased dramatically in recent years and the management of state enterprises has undergone significant reform, has the industry been able to rebuild. An underlining objective of Russian policy is therefore to revitalise the defence industry.

Internally, the political and military establishment in Russia has also regarded the military and its defence industry as a policy priority, perceiving it to be the best defence against Western threats, specifically the expansion of NATO in Eastern and Central Eurasia, now encompassing previous CIS and CSTO Member States. Within Russia, the military and defence industry is also a large and important employer, as well as a source of national pride. For example, during the recent economic downturn, the Russian government increased expenditure on defence not only to generate growth in the economy, but also protect and nurture the sector as a key export industry and as a source of national confidence.

From a foreign policy perspective, Russian defence industrial policy is also driven by the growth of China as an economic and emerging military superpower to the east, in addition to NATO and the EU in the west, as potential threats to Russian national stability. Russia is also the primary arms supplier to many former Soviet states, India and China, resulting in significant political influence in some countries. It has been suggested[156] that in order to maintain this influence, Russia must intensify its activities in G8, G20, Russia-India-China and Brazil-Russia-India-China political formats. Closer development of relation in the CIS, Eurasian Economic Cooperation organisation, Collective Security Treaty Organisation are also priorities for foreign policy highlighted in its national security strategy[157], indicating that Russia believes these relations are an opportunity to promote its interests and exert influence, in addition to regaining some of its past power. Incidentally, this foreign policy objective may also be an opportunity to export more defence equipment to neighbouring countries and those not able to access or afford European or US defence technology.

This scenario assumes Russian influence and current export markets will gradually diminish as India and China grow economically and politically, as well as increasing their autonomy in defence equipment supplies. Consequently, this scenario assumes that Russia will target countries in Latin America, Africa, South East Asia and the Middle

[156] APA (2008): Russian national security strategy until 2020: Main rival is the United States again in the next 12 years, article published by the APA Azeri Press Agency, 25/12/2008, available at: http://en.apa.az/prit.php?id94381

[157] Published on the website of the Russian Security Council at: http://www.scrf.gov.ru

East for arms sales to sustain its large and diverse defence industrial base. However, it is clear from analysis of BRICK defence industrial development in other countries that this might be more difficult as new competitors emerge (i.e. India, China, and Brazil). In this regard, the lack of interoperability between Russian and Western defence systems means that countries are unlikely to adopt both technologies, given the importance of RMA in advanced systems. Potential markets may also be prevented from acquiring Western content in some defence platforms, in which case a "cheap and cheerful' offering targeted at developing countries may be the best option for Russia longer term.

Despite recent increases in investment in the Russian defence industry, a catching up process is still likely to remain in some domains when compared to Western systems, particularly in electronics and optronics, putting some Russian segments at a distinct competitive disadvantage. For these reasons, Russian equipment is not expected to compete against Western defence equipment in 2025 as it refocuses on developing countries as leading export markets and less electronic and high maintenance dependant solutions in many segments of the market. This view is consistent with that of industry representatives consulted at an industry workshop, which suggested that while Russia produces a wide variety of competitive and advanced defence equipment products at present, often adopting different methods and technology to western competitors, they envisage Russia weakening in industrial capability and competitiveness overtime. As a result, Russian industry was not perceived as a threat to European industry in the longer term.

In terms of how this future environment is likely to affect defence industrial development, it is plausible to suggest that the amount offsets and technology sharing Russia is likely to offer potential customers will increase in order to maintain market share in some key markets with emerging indigenous industries, such as India and China. Within Russia, future investment is likely to focus on those sectors with the greatest export potential and in those advanced technologies where Russia can offer a product that no one else may be willing to supply (e.g. nuclear submarines to India).

Although it is difficult to establish which segments of the Russian defence market are likely to remain the most competitive. Exports indicate which segments have been the most successful at present and therefore competitive. On this basis, aircraft, helicopter, space, land armament (especially tanks), missile, and submarine segments are likely to be maintained due to strong export performance and strategic importance. Russia's limited access to the sea and increased competition in the naval sector from Brazil, India and China, as well as more established defence industries, suggests that naval segment may weaken significantly by 2025. Other weaknesses in electronic systems and optronics are assumed to remain.

10.2.4 India

India has always possessed a defence industry (largely evolving from ex-British armaments production, mainly of small arms). The difficulty has been that India has never had the capacity and capability to produce the modern armaments and defence technologies demanded by a modern army. Consequently, India has been reliant on imports of new and refitted equipment from allies such as Britain, France, the US and

Russia. Demand for this equipment has always existed due to continued hostilities with Pakistan, the more recent threat of terrorism, and numerous border disputes with China. These potential conflicts have therefore been the leading drivers of past and current defence equipment demand.

The need for an indigenous defence industry to supply its military has since been reinforced following embargoes imposed by Europe and the US after India tested its nuclear missile capability, damaging supplies of the equipment needed to maintain the operational ability of its military. Indian defence industrial policy has consequently focussed on increasing indigenous content in defence equipment, diversifying its supplies (currently dominated by Russia, France, the UK and US) as well as modernising its military in order to prevent such a situation occurring again. In addition, the recent rapid economic growth of India and its strategic importance in Asia have added impetus to India's ambitions to become a major player on the world stage. Defence expenditure has consequently increased, as has a desire for more advanced technology solutions, in order to build a military capability worthy of growing international power. Increasing demand for defence equipment has also made India an attractive market for foreign defence suppliers[158], from which India hopes to develop its indigenous defence industrial and technological base.

Although commentators have highlighted that past attempts at defence industry development in India have been less than successful, it was indicated by industry experts that past difficulties have been overcome, and that its defence industry is developing at rapid pace, both in capability and technologically, by learning and adopting management and quality control systems used in civil industry. In fact, it was highlighted that a number of large European defence companies are investing heavily in India to access this growing market and to reduce their cost base[159].

In order to develop its defence industry and acquire the necessary technology, the Indian Defence Procurement Procedure (DPP) reforms have set a target of 70% of defence equipment to be procured from domestic sources by 2020. Consequently, minimum indigenous content requirements of 30% are requested in all contracts and offsets by value from foreign sellers. This scenario assumes that these conditions will be in place throughout the assessment period and that the 70% target for domestic content will be achieved. Significant Indian industrial capability in those domains, where it has recently signed large contracts (i.e. naval and aircraft), is therefore expected to emerge as technology is shared and worker skills are developed. India as an important producer of sub-systems and components for the international defence industry is therefore foreseen. In areas such as electronics and software, where India has developed a highly competitive civil industry, it is likely that spillovers into the defence sector are likely to emerge, resulting in India becoming a leading defence electronics supplier in the future. However, in other segments of the defence industry it may take longer for India to

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[158] A summary of some of the most recent involvement of foreign firms in the Indian defence market is summarised in: Defense & Security News (2009): India defence drive attracts global suppliers, by Agency France-Presse, dated 31/08/09, available at: http://www.defencetalk.com/india-defence-drive-attracts-global-suppliers-21470/.

[159] Asian Defence Industry Monitor (2009): EADS highlights India Partnership Strategy, published in the Asian Defence Industry Monitor 15/02/09

develop indigenous capability as transfers of more advanced technology is likely to be more limited.

In terms of domestically source development, the need for Indian industry to do more to help itself has been highlighted by the Indian Defence Minister Shri A.K. Antony in a recent speech to industry, explaining that "I would like to see the private sector in India gearing up for a long term commitment and be far-sighted, not only in adopting advanced military technologies, but also developing their own" and "help the nation a high degree of self-reliance in defence preparedness"[160]. As suggested, this is likely to begin with electronics and communication technology, but eventually involve aerospace and naval segments as know-how evolves. The leasing of a nuclear submarine and the procurement of a refitted aircraft carrier from Russia do however demonstrate that reliance on foreign countries for more advanced technologies and equipment is likely to remain in 2025.

It is worth noting that another driver of the future Indian defence industry is FDI in private defence enterprises. FDI has been used by foreign defence suppliers to gain access to the Indian market, while also lowering their cost base by producing some components and systems in India. Indian policy has limited the foreign ownership of its defence industry to 26% in most cases, however, a 49% stake in Mahindra Defence Systems by BAE Systems has been permitted, possibly due to the technology that might be shared and the FDI involved. Either way, a win-win situation appears to have evolved and is likely to continue. However, the same limitations on technology transfer are likely to remain with more advanced systems having to be developed and produced outside India.

10.2.5 China

China's security situation is characterised by a need to maintain social cohesion and political stability within its borders (Tibet, Xinjiang) while protecting its external borders from potential aggressors, particularly in disputed border regions. China also wishes to counter a strong US military presence in the region (South Korea, Taiwan and Japan). Strategically, China has also invested in many countries around the world to secure supplies of oil, gas and minerals for its growing economy. This trend suggests that China is more likely to use its economic power as a tool for diplomacy and influence than military force, otherwise known as 'soft power'. Within China, the use of force in Tiananmen Square and elsewhere has resulted in embargoes placed on the export of arms from the EU (See Chapter 3) and US. An arms dependency on Russia has therefore grown overtime from its historical communist ties.

This dependency on Russia is one of the key drivers of defence industrial policy. Reforms have focussed on the restructuring of the defence industry to ensure the capability and capacity exists for indigenous production and the right technologies to develop overtime. The Chinese government's White Paper highlights the need for greater military-civilian interaction and therefore dual-use production in the defence industrial landscape. Foreign investment in the production of civil aircraft and helicopters in China

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[160] India Defence (2007): Official Transcript – Defence Minister's Address at Indian Navy Armaments Exhibition, dated 19/07/2007, available at: http://www.india-defence.com/print/3454.

is one example of this policy in practice as the technology and skills developed can be used or reverse engineered into the production of defence equipment. The key areas of China's focus on dual-use technological development and subsequent spin-on include microelectronics, space systems, new materials (such as composites and alloys), propulsion, missiles, computer-aided manufacturing and particularly information technologies[161]. The beneficiaries of this development according to a study by RAND[162] are the information technology, missile, ship building and combat aircraft sectors. They are therefore assumed to show the greatest growth, technological improvement and export potential over the assessed period, building on current links and capability in the civil sector, including access to private sector management and investment[163].

In other segments, where production is less exposed to civil production or foreign FDI, development is assumed to be much slower, with a reliance on Russia and other countries for specific technology remaining in 2025. Submarine, heavy bomber aircraft, large transport aircraft, tanks and indigenously designed helicopters are some sectors where weaknesses are assumed to remain. However, it should be recognised that the spectacular economic growth in China also embodies technological growth that will ultimately spin into the defence sector from civil industry. Increasing domestic demand for modern military technology as part of its evolution as a lead economic and political power is therefore likely to see China emerge as a leading military power, with defence expenditure plausibly equivalent or greater than that of the US by 2025. For these reasons the development of a complete array of defence equipment systems, and subsequent self sufficiency in supplies, is predicted in the longer term, the only BRICK to do so.

It is worth noting that while China's emergence as a superpower in this scenario is an important driver of the defence industry. Many in China regard the attainment of this status as only natural given its past, its huge population and explosive economic development. It is therefore its growing economic importance and its aspiration to regain its former imperial political, social and cultural superiority over its neighbours that this scenario is intended to highlight as the key drivers of China's military and international power ambitions. This is in contrast to some of the motives behind the development of other BRICK defence industries.

10.2.6 South Korea

For South Korea, foreign policy and the defence industry are driven by the need to defend itself should hostilities escalate with North Korea. Currently, US military and industrial support is provided to assist South Korea, however due to ITAR restrictions, the export of domestic production is limited due to a reliance on licensed production. Consequently, an increased independence in defence production is an important defence industrial policy objective, as is the ability to export to countries like Israel, Brazil and South Africa. Offsets (30% of contract value over $10m) and co-production agreements with Israeli and

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161 See Seng Tan et al. (2005): Rising China – Power and Reassurance, available at: http://epress.anu.edu.au/sdsc/rc/mobile_devices/index.html.

162 RAND (2005): A new direction for China's defense industry, RAND Project Air Force, available at: http://www.rand.org.

163 Hsiao, R. (2009): Chinese Defense-Industrial Reforms, article for the Jamestown China Brief 21/08/09, available at: http://www.ocnus.net/artman2/publish/Analyses_12/Chinese_Defense-Industrial_Reforms.shtml.

European defence producers are important prerequisites in procurement, helping Korea develop a highly competitive defence industrial base in the areas of electronics, light combat aircraft, US-designed helicopters, surface ships and missiles. The civil sector is also a key driver of Korea's defence industrial success as many technologies and skills spin in and out of each sector. Structurally, the defence industry is also composed of many conglomerates (*chaebols*) with both military and civil production, aiding the transfer of technology and expertise between civil commercial and defence sectors. Ship building, electronics, automotive and civil aircraft sub-system manufacturing are good examples of this. The defence industry in Korea is therefore often a tool for civil industry development and competitiveness, with the defence industry producing many highly competitive technologies.

It is assumed in this scenario that considerable export potential exists in each of these segments. However, dependence on imports for fighter aircraft, submarines and a lack of domestic capability in land armaments are assumed to limit the potential for exports in these market segments.

10.2.7 Summary

A summary of the assumed policy directions and priority domains of the BRICKs in this scenario are presented in Table 10.2 below. This table also presents the most recent defence budget figures in each BRICK and the assumed growth in expenditure over the assessed period from 2008/09 to 2025[164].

Table 10.2 Business as Usual Scenario - Summary of Assumed Conditions

Business as Usual Scenario - Summary of Assumed Conditions					
Factor	**Brazil**	**Russia**	**India**	**China**	**South Korea**
Principle Security and Defence Policy Driver	Increased Power	Regaining Power	Security	Increased Autonomy and Internal Security	Security
Principle Defence Industrial Policy / Strategy	Increased Production for Domestic and Export Markets	High Exports	Increased Indigenous Content in Arms Procurement	Increased Domestic Development of Military Technology	Increased Indigenous Content in Arms Procurement
Defence Industrial Policy Element		Seek New Export Markets	Diversification of Foreign Suppliers, Offsets	Dual-use Technological Development, Reverse Engineering	Offsets and International Co-production
Offset Policy	Unofficial	N/A	30%	Unofficial	30%
FDI Policy	Unrestricted	Restricted	26% Limit	Restricted	Restricted

[164] Percentage annual growth figures were obtained from official BRICK government budget reports, where possible. Where this was not possible, defence expenditure figures as a percentage of GDP were assumed to remain constant, therefore BRICK budget growth was assumed to equal that of GDP growth published by GoldmanSachs (2007): BRICs and Beyond, published by Goldman Sachs global Economics Group November 2007, available at: http://www2.goldmansachs.com/ideas/brics/BRICs-and-Beyond.html.

Business as Usual Scenario - Summary of Assumed Conditions					
Factor	**Brazil**	**Russia**	**India**	**China**	**South Korea**
Priority Domains (Strengths)	Naval, Submarine, Small Aerospace	Land (Tank) , Aerospace, Nuclear	Aerospace, Naval, Land, IT	Aerospace, Naval, Space, Missile, IT	Electronics, Naval, Land
Domain Weaknesses	Land, Large Aircraft, Helicopter	Electronic, Naval	Submarine, Aerospace	Large Aircraft, Submarine, Land	Aircraft
Defence Budget in 2008 (*2009)	$23.3 Billion	$35 Billion	$30.8 Billion*	$61.1 Billion	$24.6 Billion
Forecast Defence Budget in 2025	$47.1 Billion	$56.2 Billion	$82.1Billion	$160.7 Billion	$43.7 Billion
Export Market Potential	Largely Regional	Focussed on Developing Countries and former Soviet States	Limited	International	International
Potential for Increased Indigenous Content[1]	Medium	Low	Medium	High	Low
Probability of Success in Attaining Policy Goals[2]	80%	50%	65%	99%	60%

1 Highlights the relative ability of each BRICK to increase indigenous production of defence equipment. For example, BRICKs where a high proportion of defence equipment is indigenously produced, the potential to increase this level is likely to be low compared to those where the majority of defence equipment is currently imported.
2 Based on defence expert opinion

10.3 Scenario 2a: Korean Unification

10.3.1 Overview

Current and prolonged hostility between North and South Korea is a significant driver of political strategy, military development and to some degree the economic development of defence industries in the East-Asian region. For China, Russia and Japan, the threat of potential conflict is a key justification for maintaining a strong military force and consequently the need for independence in military supplies and support for indigenous defence industries. Additionally, the political, strategic, and military support of the United States in South Korea and Japan is justified by US foreign policy objectives to uphold the sovereignty of South Korea, Taiwan and Japan from potential aggressors. The US has therefore maintained a military presence in these countries as well as providing the technology and economic support to develop indigenous defence production through licenses. This scenario assumes that with unification of North and South Korea, the political situation changes for both the US and those countries in the region, with knock on implications for military and defence industry development. The following text summarises the assumed implications.

10.3.2 United States

Should a peaceful solution to the North and South Korean conflict emerge by 2025 it is clear that some political objectives of Washington would be fulfilled and the demands placed on its military in the region would be significantly reduced. However, strategically and due to the unresolved issue of Taiwan, a substantial US presence is still expected to remain in this scenario, particularly in Japan. For Korea, a significant reduction in US personnel and equipment is foreseen (assume a 50% reduction for the purposes of this analysis). Despite this, advanced defence equipment produced in Korea under license from the US is likely to remain an important commercial revenue stream for US defence suppliers and a potential source of political leverage for the US government. Continuation of the US strategic partnership is therefore expected, although less significant as demand for US and Korean equipment is reduced as the de-militarisation of Korea takes place.

Unification and a reduced US military presence could also have other implications. Chief of which could be a new era of cooperation and dialogue between China and Russia on one side and Japan, South Korea and other regional powers on the other. In the absence of the Korean conflict to divide political opinion and a much reduced US presence, it is plausible to suggest that greater political and economic cooperation is possible.

10.3.3 North and South Korea

Unification should lead to a de-militarisation of both countries in personnel, equipment and reduced defence budgets. However, South Korea is also likely to view China as a rival in many areas of commercial activity, investment and politics, in which case a preference for US military equipment and associated political support in the region is assumed to remain in 2025.

For the Korean domestic defence industry, cuts in defence spending and investment are foreseen, forcing those that remain to export or position themselves closer to commercial markets in order to secure investment and sales. Electronic, land vehicle, communication and naval segments have long developed defence and civil businesses, sharing technology to mutual benefit. This scenario suggests that this restructuring of the defence industry to more of a dual use focus will occur by 2025 as defence spending is significantly reduced and resources are diverted into the reconstruction of North Korea. Similarly, ITAR restriction on many defence equipment products may prevent Korean exports, particularly to China which is likely to emerge as substantial importer of civil and defence related equipment and components in the region. For these reasons, it is assumed that Korea will indigenously develop and produce a larger proportion of key components and systems in priority export domains. Dual-use components and sub-systems for aircraft, such as wings, tails and landing gear are examples of where Korean exports could excel as China tries to develop its own military transport, tanker and civil aircraft to compete with the likes of Boeing and EADS.

In other areas, demand for military and associated technology is unlikely to be sufficient for economically viable and independent defence production in Korea at current levels. Therefore, a reliance on FDI from outside to acquire enterprises and the technology they develop will emerge, leading to a small degree of consolidation in the international defence market. In other cases, the potential for more joint venture projects such as JSF are likely in order to bring together individual country defence budgets and the supply capabilities of individual producers. A 'go it alone' or independent capable defence industrial strategy is therefore not foreseen as economically viable in this scenario.

10.3.4 China

As the other major power in the region, the unification of Korea should generate numerous opportunities for closer cooperation on issues such security and defence. Commercially, opportunities to share technology and invest in the new united Korea are likely to increase, enabling Chinese dual-use industries to acquire advanced technology in those areas where Korean industry is strongest and the Chinese weakest (See Table 10.2). This is assumed to assist China in the development of its own defence industrial and technological base.

10.4 Scenario 2b: Economic Stagnation

10.4.1 Overview

The BAU scenario presents a situation where China and Brazil are emerging as the key economic power houses of Asia and Latin America in the 21st Century. Together with the political power and growing international status each nation now possesses, an aspiration to acquire the equivalent military capability is emerging. In both cases, the BAU has identified these drivers as important for the future progression of each defence industry, reliant largely on continued economic growth to generate wealth, increase living standards, lower unemployment, create political stability and increase defence equipment expenditure and investment in R&D. This scenario intends to represent a situation where current and future expected economic growth fails to materialise, resulting in a period of stagnation in military expenditure between 2015 and 2025. This scenario therefore intends to highlight the implications of changes to economic growth on individual BRICK defence industries and the wider international market.

10.4.2 Brazil

Uniquely among BRICKs, Brazil is not threatened by aggressors, border disputes or ongoing conflicts that would significantly threaten its sovereignty or require aggressive military action in the foreseeable future. Similarly, Brazil is not reliant on other countries for strategic supplies of energy or raw materials as it is blessed with substantial natural resources to sustain its growing economy. As discussed in the BAU scenario, Brazil's policy objectives to develop its defence industrial capacity and military capability rely on its ability to continue to grow its economy and therefore provide the necessary economic support the defence industry needs in terms of procurement and investment. The

Brazilian government has already increased defence spending on equipment by 50% in 2008[165].

This scenario assumes that economic growth slows significantly, resulting in stagnation in defence equipment expenditure (i.e. a real term decrease over the 2015-2025 period). The assumed consequences for the Brazilian defence industry are summarised as follows:

- with many contracts ongoing or soon to be completed (eg submarine, helicopter and fighter aircraft defence systems), a large proportion of defence expenditure may already be accounted for, crowding out investment in other areas which may be important for the future development of the defence industry;

- with real cuts in training expenditure for the military personnel intended to operate and maintain the planned new defence equipment, in addition to potential cuts in the construction of maintenance facilities, Brazil's military capability may be severely restricted until all systems, personnel and facilities are operational;

- Brazil's indigenous defence R&D, development and testing is likely to be constrained as the Brazilian government is tied to long and expense defence contracts with foreign strategic partners. Some domestic defence industries may therefore suffer weaker competitiveness in the longer-term; and

- Other defence segments such as land based systems, missiles, transport aircraft and small naval craft not covered by these larger defence contracts, could suffer cuts to procurement, adversely impacting the existing defence industrial base in Brazil.

10.4.3 China

As with Brazil, China is largely dependent on continued economic growth for sustained social and political stability and increased defence equipment and research expenditure. While current economic and defence expenditure growth is rapid, a slowing of this growth in the period 2015-2025 could have a number of implications, potentially quite different to that of Brazil, which this scenario intends to highlight.

In contrast to Brazil, stagnation in defence expenditure growth is unlikely to have a significant impact on defence industry development. This is firstly due to a much larger amount of expenditure on defence in China compared to Brazil, and secondly a large proportion of this expenditure is not tied to specific contracts or foreign partnerships.

However, without sustained economic growth in the real economy, it is more likely that China may go through a period of social, political and economic upheaval. Instability

165 Muxagato, B. (2009): President Lula's international ambitions and the Franco-Brazilian strategic partnership, article first published in Defense nationale et securite collective, February 2009, pp. 86-93, available at: www.diploweb.com/spip.php?page=imprimer&id_article=400

and likely response of the Chinese government to maintain control in this scenario will likely require increased expenditure on security and defence. The wider consequences of this assumed action by the Chinese government could however isolate China on the international stage and make the acquisition of advanced technology for civil and defence use much more difficult (similar to the international response to China's actions in 1989). The development of the Chinese defence industrial base would therefore most likely suffer, but to a less extent than in the past, as the defence industry and expenditure has evolved.

In conclusion, this scenario demonstrates that Chinese defence industrial and technological development is unlikely to change substantially should its relations with the international community worsen or if its rapid economic growth were to stagnate.

10.5 Scenario 2c: Bi-polar World

10.5.1 Overview

Commentators have suggested that the rise of China as a potential superpower by 2025 and the re-emergence of Russia as an international power driven by energy resources and military capability might result in a bi-polar political landscape emerging in international relations, with China and Russia on one side and the United States plus allies on the other. This scenario goes further by suggesting that bi-polar technologies will also emerge, resulting in a distinct lack of interoperability between Russian and Western based defence systems. The international defence equipment market could therefore reflect this split by producing two different products, for essentially different markets. This could have implications for the defence market and for dual-use civil markets, where compatibility is often a prerequisite of commercial success.

As Western defence suppliers are outside the scope of this study, this analysis will focus on the implications for Russia.

10.5.2 Russia

The incompatibility of Russian defence systems with those of the West is likely to limit Russia's export market in countries like Brazil, South Africa and India as they procure or adopt the approaches of the West through strategic partnerships, industry led FDI or offsets. Due to the RMA, it is also more important than ever to be able to communicate and operate across all platforms using a compatible technology, from GPS to networked communications and software. Therefore, if a potential export client has already purchased western equipment for its ground forces and navy, it seems rationale to expect that they will procure compatible equipment for its air force. Consequently, in countries which already adopt, afford, and are licensed to receive western technology, the market may be closed to Russian suppliers. Should Russian suppliers compete, they would find it very challenging given Russian weaknesses in electronics and optronics.

The consequence of this scenario is that Russia would have to search for alternative export markets in developing countries: As developing defence needs are likely to be quite different to Brazil's and South Africa's. Production of 'cheap and cheerful' versions of equipment may therefore be the best response for the Russian defence industry. Another solution is to increase exports to countries that the West is unwilling to supply, due to the imposition of UN or EU embargoes. Examples include Iran and Venezuela to which Russia has already exported defence equipment.

11 Implications of future developments for the EU defence sector

11.1 Overview

Chapter 10 formulated a ‘business as usual’ (BAU) scenario for the BRICKs countries, based on an assessment of the likely future developments as a result of the drivers identified in earlier chapters. This chapter considers what the likely implications of these developments in the BRICKs countries are for the EU defence sector.

11.2 Approach

Clearly the evaluation of the possible implications of changes in the BRICKs on the EU defence sector is sensitive to the assumptions made, but these are developed in detail in the earlier chapters and were discussed in detail at the workshop in Brussels with representatives of the European industry and other defence experts.

In all cases and options of our BAU scenario it is assumed that the BRICKs countries trends in defence spending would at least remain the same defence budgets would at least remain constant and that consequently their defence industries are likely to continue to be able to develop local programmes and develop know-how.

This implies a potentially positive scenario for the EU defence market as the BRICKs countries remain a good market, to the extent that they buy imports directly, use import offset deals and cooperative projects to develop indigenous capabilities. Relations and trade with individual countries do of course differ and prospects will depend upon political and strategic constancy and the EU companies remaining competitive. Alternatively it could imply increasing competition for the EU companies as the BRICKs countries develop capabilities and move into their markets. This chapter will assess the implications of the likely future developments.

11.3 Context

The global defence sector has been transformed over the last decade by trends in military expenditures, changing defence requirement and technology that have reinforced US dominance. With the end of the Cold War military spending declined, but it has since rebounded and US defence spending has grown rapidly. The fixed costs of R&D for major systems continue to grow, both for platforms and for the infrastructure (eg satellites, strategic air assets) and information systems (despite the savings from increasing use of civil products) needed to support network-centred warfare. The so called 'Revolution in Military Affairs has led to growth in IT and communications company involvement in the industry

Many countries are unable to afford the fixed costs and have sought to replace conventional military capability with modern systems comparable to those of the US. At the same time there has been an increasing use of civil technology components in weapons systems.

Developments in the industry include the increasing internationalisation of production, increasing importance of IT companies within the defence sector and the 'privatisation' of services that were once provided by the military. There has also been an increasing concentration in the arms industry, but commentators suggest there is likely to be more – certainly as we have seen this is likely in Europe. Developments within the BRICKs countries need to be seen within this context

The future of the European industry depends mainly on its position compared to the U.S. industry, which will also remain the main competitor for Europeans according to BAU assumptions. To a lesser degree it will depend on the strategy of emerging non-BRICKs countries already present on the armament market (Israel, South Africa, Turkey, etc).

The BAU assumptions do not imply a rosy future for the European defence industry. It is still facing a major funding issue, due to the size of its local market and overcapacity in a number of areas. There is likely to be some form of restructuring of procurement and production across Europe at some time in the future. The pressure to export to continue to support its technological and industrial base (EDTIB) will also remain.

11.4 BRICKs competition for European Defence Industry?

A major consideration in evaluating the likely impact of the BRICKs countries on the EU defence sector is the possibility that they may become competitor in the international defence market. Certainly we are expecting an increase in capability, but even if this leads to price competitive systems it will not necessarily mean that the countries will become important competitors. This is due to the nature of the industry. The arms market is at heart political. Competition is not simply based on price. More than in other sectors, exports must be compatible with the foreign policy of the country of origin and large defence export deals often start with military cooperation between countries.

Having the capacity to export is more than simply being able to produce weapon systems at a competitive price. For many weapons systems deals will most likely continue to be made government to government, or at least the government will be involved at some level and so issues of foreign policy, strategic and political pressures will remain important. A first requirement is that defence companies will be able to sell their products to their own national armed forces. This acts as a guarantee of operational and technological reliability of the equipment and so make exports credible. The BRICKs countries are all developing their capacity to supply their own armed forces, but for this to lead to exports the produced equipment must correspond to the requirements of potential customers, which will not be straightforward. Thus, the effort of some BRICKs countries in the field of strategic and power projection weapons can absorb a huge share of their resources without necessarily helping exports. The effort of India and Brazil in nuclear submarines may therefore be, as it has historically been the case in France, at the expense of export markets.

For major systems companies need to provide credible offers of continued support and supply of spare parts throughout the life cycle of the weapon system. At present, this capability is far from being proven for some BRICKs countries. India, for example, is in a phase of R&D work on a wide range of defence equipment, but its credibility in the long term remains to be demonstrated.

To export items of military equipment also requires true ownership of the key equipment and the embedded technologies. If this is not the case, ie if key components and subsystems are imported, then the supplier country of the component can block the export

They may also need to offer offsets, which provide a whole new dimension to trade deals, though these may be organised through governments. Other forms of government support are common in the arms trade, such as export credits and contract insurance and marketing and corruption is an ever present concern.

11.5 How competition and cooperation with BRICKs countries can emerge

The basic assumption is that not all of the BRICKs defence industries could enter into global competition. By being focussed on serving their own domestic market, various emerging defence suppliers are or will not really be, in a position to seriously enter into competition with other suppliers on export markets - though they may be able to compete in lower-tech markets in developing countries. It is also worth noting that what is not developed in the BAU scenario, namely the role played by the European Defence Industry during the emergence phase of the BRICKs industries notably through offset and cooperation.

In general, for countries with an ambition to maintain a national defence industrial base, theoretically there are four major options (Table 11.1). As regards the BRICKs countries these options are as follows:

11.5.1 Comprehensive defence industrial base

This is not really relevant for any country other than the US these days and they increasingly rely on international cooperation to develop advanced technologies, allowing foreign firms to operate in the US, such as BAE Systems, but with restrictive secrecy rules. They also use a range of foreign components in weapons systems.

Table 11.1 Main options for BRICKs defence industry

Option	Description
Comprehensive	With the changes in the nature of the market there is no country that can really maintain a comprehensive defence industrial base.. Even Russia and China would struggle to maintain a presence in all segments of the defence equipment market and keep pace with technological evolution without the cooperation of other countries.
Specialisation	Countries are likely to need to specialise in particular segments and so make decisions on whether to develop the industry to ensure a degree of autonomy for their armed forces (maintenance, servicing, spares) ; to provide strategic equipment not available on the market ; or to focus on niche products with a view to exports.
Cooperation	Defence industrial cooperation between European and BRICKs countries, in the production of complete systems or components, or indeed in joint ventures. Such programmes of international cooperation could be similar to those in commercial aircraft.
Segmentation	Defence production not at the boundary of technological development, but lower tech alternatives. Target different markets to the major producers, both types and location. They may then rely on US and/or European manufacturers for imports of high tech equipment.

11.5.2 Specialisation

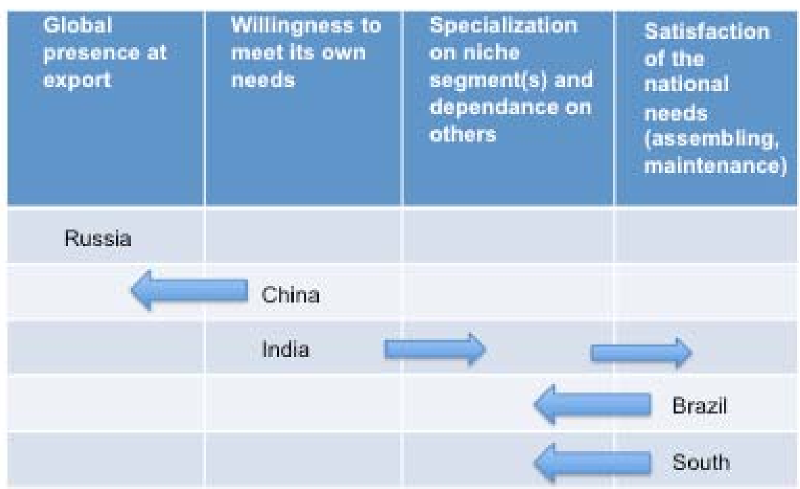
At present, only Russia seems able to maintain and develop a presence across the range of defence related products. They have technical and industrial skills and the willingness of the state to maintain its strategic position and to provide financial support. They are also heavily influenced by the legacy of the USSR, giving substantial military capacity and defence industrial capacity. But this legacy is also a different technological paradigm to the West and one that is eroding.

China and India show willingness to offer a wide range of materials, but only China seems likely to be able to achieve this, even if at the moment their equipment is not at the technological level of competitors. They also show no inclination to focus on export markets. Indeed, India has not yet demonstrated either its ability to conduct long-term programmes to maturity or a strength in depth to export the full range of equipment. Moreover, India remains dependent on certain technologies (fighter jet engines, missiles, etc). This lack of choice (eg a limited presence in certain niches of excellence) forces India to meet only its national needs (strategic materials not available on the market, assembly and maintenance).

Brazil and South Korea differ in size, military needs, and means from the other three countries. Both seem set on a strategy of specialisation in certain niches areas in line with the capabilities of their civilian industry (eg, surface ships for South Korea and aeronautics for Brazil). They have also accepted the need to rely on Western industry to meet some of their national defence needs. South Korea is already equipped with Western surface vessels and equipment (notably American), while the integration and the combat systems are provided by South Korea while Brazil produces training and turboprop support aircraft and in this niche Brazil encounters little competition. Brazil also supplies airframes for surveillance aircraft, which are equipped with Western surveillance systems.

So in terms of specialist areas there seems little for the European defence sector to be concerned about. The only real potential competitor in export markets is likely to be Russia, but Russia is offering products that are not in direct competition, targeted at different markets and so is not an important competitor. Development of indigenous capability is expensive, however, and in the future BRICKs countries may be forced to see export orders as an attempt to claw some money back. Indeed some of them already have this as an aim, but realistically it will only be a serious policy some way into the future and is unlikely to be successful in most cases. For the moment there is little direct competition and even in the longer term it is not clear that there is much to concern the European defence sector.

Figure 11.1: Specialisation of certain BRICKs countries



11.5.3 Cooperation

There is certainly considerable potential for cooperation between the European defence producers and the BRICKs countries. This is likely to be limited with Russia and will require political and strategic changes for China to be involved, changes that are more than likely in the developing strategic and economic environment, but there is already a degree of cooperation with the others. Industrial cooperation in the form of international cooperation is becoming important in aerospace and provides both affordable ways of being part of advanced weapons production and of ensuring sales, through partner country commitments.

While such cooperative programmes have been around for a while they seldom involve non-developed economies. Aside from limited technical resources, such countries often have restrictions, eg the level of technical skill of forces, type of terrain etc- that best suit buying ready-made equipment and then having it customised to meet military and environmental requirements of the customer. They do of course have advantages and disadvantages for both the EU and BRICKs countries

Table 11.2 Cooperation between BRICKs countries and Western manufacturers

Advantages	Disadvantages
Means to fund new projects	Limits focus to certain areas
Enabling access to markets	Increases complexity of management
Alternative to US dependence for BRICK	Means dependence on reliability of partners

11.5.4 Market segmentation

One alternative is to focus on the lower tech market, a few steps behind state of the art products. Russia is already positioned as an independent industry with high-tech equipment. In time China may well be similar, as it develops towards an industrially and technologically advanced country; and continues to move away from its military strategy based on quantity of troops and arms to lower numbers and higher quality.

India, even though it displays the ambition of developing indigenous technology, has not yet demonstrated a capability to complete large-scale programmes. Its dependence on third supplier countries is obvious in many areas, such as combat aircraft, submarines, equipment and tanks. The key challenge for India is probably to develop indigenous skills in strategic areas for import substitution purposes.

Brazil and South Korea have less need to be producing the whole range of high-tech armaments. Thought they have different military needs, they know they can rely on Western suppliers. So the industries of these countries are likely to move toward specialisation rather than segmentation. India may also move in this direction, but its different military requirements make this less certain.

11.6 Capacity to export

Clearly all of the BRICKs countries have some capacity to develop exports and some have highlighted a role for exports in their defence industrial policy –Brazil, Russia and South Korea. Of these, realistically only Russia has any hope of developing substantial export presence –which indeed it already has. Within the 2010-2035 timeframe, however, China may also have the capability to do so, even if they may not have the intention. It really depends upon strategic changes and the general development of the international arms market.

For the others the development of their industry is more a consequence or an expression of new economic prosperity and/or willingness to gain more independence in terms of their defence capability. They are unlikely to be in a position to offer comparable products and to enter market of countries that are usually targeted by European defence industry.

Table 11.3 Summary of BRICKs capacity to export

Country	Current capacity to export
Russia	Already strong
China	Currently poor.
Brazil	Currently poor
India	Currently poor
South Korea	Currently low to medium

This suggests that there is unlikely to be a substantial change in the competition from the BRICKs countries for the European Defence industry. The existence and development of the BRICKs defence industry in general might lead to increased competition in the international market, simply because their import substitution behaviour will limit the market for the major suppliers, European or US.

11.7 Implications for the European defence industry

The potential consequences of the BAU scenario for European industry are firstly, the possible appearance of China as a competitor, to add to the US and Russia. Second, the other BRICK countries are likely to act as competitors on some definite niche products providing outlets for products and providing new opportunities for cooperation.

Russia’s defence industry is already a global player. It is mainly focused in maintaining its military position and possibly reducing the technological gap with the US, though it is more likely to be able to prevent the gap from widening than reducing it. As the European industry stakeholders argued, the impact of Russian defence industry development is likely to have limited impact on the European industry and it may well have difficulties enlarging its area of influence in markets targeted by European industry.

China could become a third global competitor beside Russia and the US. But at the moment there is no evidence to suggest it is aiming for this. Even pushing exports China might be a minor threat to European producers, but a larger one for Russia, as they share similar potential markets eg in Africa.

India seems able to achieve various objectives but not to develop a comprehensive production capability. It is focussing upon developing domestic capabilities, but remains a major customer for a range of countries, including not only the EU, but also Russia, Ukraine, China, USA, Israel, etc. Certainly Europe is likely to retain India as an export market, but the major problem is likely to be the competition from other countries as much as India’s growing domestic capability. India would need to allocate much more resources to the development of it own industry and technology or to focus on particular areas (specialisation) in order to achieve export capability.

Brazil has been more focussed on particular sectors than India, with the development of its aerospace industry and its cancellation of the development of the armoured vehicles. It is in a position to use offsets to develop capability and be partner to European firms in certain areas (combat aircraft, submarines) and a complementary player on others (early warning and light tactical transport).

South Korea is already a competitor with Europe in high-end civil products and military components, matching Western standards for quality and performance. As a result of its engagement in international armaments collaboration and the existence of a major civil electronic industry, South Korea possesses a real capacity to integrate faster or develop new technologies (eg development of a guidance system based on Russian technology to be adapted to a US missile). It is already a competitor for European industry in surface ships and light combat/training aircraft, in markets such as Indonesia, Singapore and UAE. It is today the most important competitor for European industry, targeting similar customers.

This development of capability does have benefits for the EU industry as the provision of FDI as part of cooperation in developing indigenous capabilities in the BRICKs countries does provide lower cost sources of components and subsystems for the EU industry. It also provides the possibility of introducing BRICKs companies into the international supply chains that the prime international contractors are developing as part of the globalisation of the industry. This could be an important development in competition with the US.

Chapter 10 considered a number of variants on the business as usual scenario that would impact on particular BRICKs countries, Korean unification; economic stagnation; bi-polar world. It is not obvious how this would change the impact of the BRICKs countries defence industrial development on the European industry, though economic stagnation might compound the problems faced in Europe and lead to more rapid consolidation within Europe.

11.8 Conclusions

A clear conclusion from the analysis in this chapter is that there seems likely to be little direct effect on the European defence sector of the emergence of the BRICKs countries as defence producers. This does not mean that the BAU scenario implies stable market conditions for the European defence industry, which will continue to face funding concerns, as procurement reforms take place and industrial restructuring continues. Exports are still likely to play an important role in the maintenance of the European defence, technological and industrial base (EDTIB).

What is clear from the analysis is that competition from the BRICKs in the international defence market is unlikely to a major concern.

- Access to the defence market in BRICKs countries

There is considerable potential for benefits from exports by European companies, as the BRICKs countries develop capability, but it does provide challenges as offset requirements (including for technology transfers) provide increased requirements and changed relations. Indeed, the European Defence Industry stakeholders at the Workshop considered the main concern to be not the direct consequence of the potential emergence of the BRICKs countries as producers, but the changing requirements placed on them while trying to access BRICKs markets. The offsets requirements can also provide more scope for other competitors, such as the US, to break in to what had been European markets.

- Cooperation and investment to gain access to BRICKs markets

The need for FDI by the BRICKs to develop their defence industrial capabilities provides an opportunity for the European defence industry. It is unlikely that this will lead to serious direct competition emerging, at least not in the medium term. Indeed cooperation in the development and production of major weapons system might be considered to provide a potential means of preventing the possible emergence of new competitors, by turning them into partners.

- Cooperation to reduce costs and integrate into supply chains

Given the internationalisation taking place in the arms industry and the growth of international supply chains, the involvement of the European companies in the BRICKs countries' defence industrial development provides opportunities to reduce costs. It has risks for the EU as it could lead to production leaving Europe, maintain or allow further fragmentation of European industry when it needs to be restructuring and consolidating for its long run survival.

12 Conclusions

12.1 Introduction

This study is concerned with the impact of emerging defence markets and competitors on the competitiveness of the European defence sector, where emerging defence markets and competitors are defined by Brazil, Russia, India, China, and South Korea (collectively known as the BRICKs). In measuring this impact, the study provides a clear and up-to-date understanding of current and likely future developments in the BRICKs defence markets and industries by:

- providing a snapshot of the structure of defence equipment markets and competitors in the key emerging BRICKs countries;
- highlighting likely future developments (through scenario analysis) in the BRICKs markets;
- setting out the competitive implications of such developments for the EU-based industry.

The intention is for the European Commission to use the findings presented in this study to better understand the impact of the emerging BRICKs defence markets on the European Defence Technological and Industrial Base (EDTIB). It is not intended that the study should be used to promote the general sale of EU arms to the world.

12.2 The current structure of defence equipment markets

12.2.1 The European defence market

EU defence sector

While the defence industry is present in most Member States, activity is concentrated in just a few. This is partly a reflection of the size of the military branches (in terms of personnel) and the defence budgets in the Member States. Around 60-65% of EU military personnel are based in just five countries (France, Germany, Italy, Spain and the UK). France typically accounts for the largest share (15-20%) of total EU military personnel; Spain accounts for 5-10%.

Historically, France and the UK spend the most on defence. In 2007 they spent €44bn and €50bn respectively and together accounted for 47% of total EU defence spending. Behind France and the UK, Germany and Italy are the next largest spenders on defence, typically accounting for 10-15% each of total EU defence spending. Given this, France and the UK are the largest employers in the defence sector, employing 240,000 and 200,000 respectively in 2003, and accounting for 57% of all employment in the EU defence sector. Thereafter, Germany (80,000), Poland (50,000) and Italy (26,000) have the next largest defence-sector workforces. Most of the major EU defence firms are based in France, Germany, Italy or the UK: 37 of the top 48 EU defence firms are based in one of these Member States.

Total EU defence spending remains smaller compared to US levels of spending. EU spending has been falling from 2% of GDP in the late-1990s to 1.7% of GDP in 2007. US spending has picked up from around 3% of GDP in 2000 to 4.5% of GDP in 2007. In 2007 total US military spending was 2¼ times greater than total EU military spending.

Domains

European aerospace is an economically strategic industry characterised by increasing costs, high R&D intensity and technology spin-offs. It is a leading defence sector in both the EU and the US and it has made a distinctive contribution to the development of European collaborative defence programmes. The distinctive features of the EU naval sector are its large number of relatively small firms, excess capacity and a lack of European collaborative programmes; while, in contrast to the EU aerospace equipment sector, the EU land equipment sector is smaller, less technically-progressive and lacks European collaborative programmes.

The aerospace sector has the capability to deliver key military capabilities and there is no gap in what it can deliver on export markets (the most advanced aircraft from US industry are not supposed to be exported to third countries). The EU naval sector has the requisite industrial capabilities to design, develop, produce and maintain modern complex warships over their life-cycle. However, the EU has too much capacity operating at a relatively small scale. The result is costly and wasteful duplication of industrial capability. The EU land sector has the capability for delivering and sustaining key military capabilities. However, these industrial capabilities are more concentrated than in the naval domain, with fewer countries offering advance solutions (mainly France, Germany and the UK), and it is also suffering from over capacity.

The aerospace sector, dominated by France and the UK, is competitive as reflected in its export performance for a range of products. The industry has some world-class firms (eg BAE; Rolls-Royce; SAFRAN; EADS; MBDA; Dassault Aviation), and is also involved in co-operation with non-European partners (e.g. US and the F-35 combat aircraft/JSF). The naval sector is competitive in some product sub-sectors. The naval sectors in Member States such as France and Germany are successful in exporting significant shares of their output. However, this reflects demand for modestly-priced, less advanced ships, often with offsets included. The demand for the most advanced and most expensive ships is limited by other countries ability to pay and competition from other suppliers. As a result, while some major EU shipyards are rivals in world export markets, others focus on supplying their national naval requirements. Future threats to EU warship builders are likely to come from Asian firms (the US doesn't export advanced warships, instead it exports the AEGIS arms system provided by Lockheed-Martin). With some notable export successes, there are reservations about the land sector's competitiveness, due to the lack of export or domestic competition for advanced products in recent years - today's market is also more oriented towards lower end material, and European products can appear too sophisticated. At the same time, the prevalence of state-ownership in some nations hampers the sector's ability to evolve and adapt.

Performance

It is difficult to assess the performance of the EU defence sector due to the lack of transparent and comparable defence-specific time-series data. Data on trade show that over 1995-2008 there were some transfers of major weapons from the BRICKs to the EU. Most of these were accounted for by arms transfers from Russia to the former communist countries for central and Eastern Europe in the late-1990s and early-2000s. In some cases, arms transfers from the BRICKs were a significant proportion of total arms imports. Among the major EU producers, only France and the UK received arms from BRICKs countries over 1995-2008 (Brazil and Russia respectively). The major supplier to the main EU defence markets was the US. With regard to exports, the importance of the BRICKs markets to the EU defence sector varied considerably. In terms of value, the most important market over 1995-2008 was South Korea, which received \$3.7bn (constant 1990 prices) worth of arms transfers from the EU. This is followed by India and then Brazil. Russia imported just \$5m worth of major weapons from the EU over 1995-2008. In Brazil major arms transfers from the EU accounted for 76% of all arms imports over 1995-2008. By contrast, in Russia, which is the smallest export market among the BRICKs, weapons transferred from the EU accounted for just 3½% of all arms imports over 1995-2008.

12.2.2 International framework conditions

Framework conditions have been identified as potentially significant drivers of the defence sector both internationally and nationally. While these conditions are often reflections of the political landscape, determining how arms trades are conducted and to whom technology is shared, framework conditions are also drivers of political developments as national policy is often introduced in response to international regulation or the strategic actions of neighbouring countries – Table 12.1 provides a summary.

Table 12.1 BRICK Defence Industries - Summary of Leading Drivers

Summary of Leading Drivers for the Future Development of Defence Industries
• Defence and Security Policy • Foreign Policy • Political Pressures and Ambitions • Industrial Policy (defence and civil) • Economic Growth • Availability of skilled workers and capital • Organisation (management and governance) • Procurement and open tendering (to improve standards and competition) • Structural Factors (ie ownership, vertical ties, lead times, market concentration, etc.) • Technological Factors

Those framework conditions of the greatest importance to the competitiveness of Brazilian, Russian, Indian, Chinese and South Korean defence industries are:

- Embargoes or the threat of arms embargoes are leading drivers of future self-reliance and indigenous production objectives emerging in the defence policy of BRICKs countries;

- Membership of regional organisations whether economic, security, or defence focused, often provides a forum for the future development of defence-oriented cooperation and collaboration;

- US technology content in the majority of EU produced defence equipment places EU defence equipment under US ITAR export controls. This 'reality check' with the US' 'right to veto' any exports can act as a barrier to EU trade in some circumstances;

- Political developments and the policies/strategies that emerge from such developments is identified as the leading driver of all defence industries;

- There is no level playing field in the export of defence equipment and dual use goods, enhancing/diminishing the competitiveness of some European producers in BRICKs countries; and,

- Historical political, military, and economic ties/conflicts are key indicators of future opportunities for trade, technology transfer and investment in defence industries between nations.

12.2.3 BRICKs global position

Market size

Data on military expenditure show that China is the largest-spending BRICKs country by some margin, with over double the expenditure of India, Russia and South Korea, with Brazil some way behind. Unfortunately, this data concerns total military expenditure and budgets, the vast majority of which is made up from pensions and salaries. Of more interest would be expenditure on R&D and procurement, but unfortunately a consistent dataset which would allow a proper comparison across the BRICKs is not possible. Nevertheless, on the assumption that salaries and pensions represent similar proportions of spending in most countries, the volume of spending is comparable with some of the larger European economies, but is dwarfed by the US which spent almost 10 times as much as China in 2008. As a proportion of GDP, spending is again broadly similar (perhaps slightly higher) compared to major European countries, and again behind the US (although not so far). Figure 12.1 summarises this finding, while Figure 12.2 shows that, over time, military expenditure has tended to decline over time as a % of GDP, with the exception of China which have increased slightly and the US which has increased substantially.

Figure 12.1 Total Military Expenditure (2008)

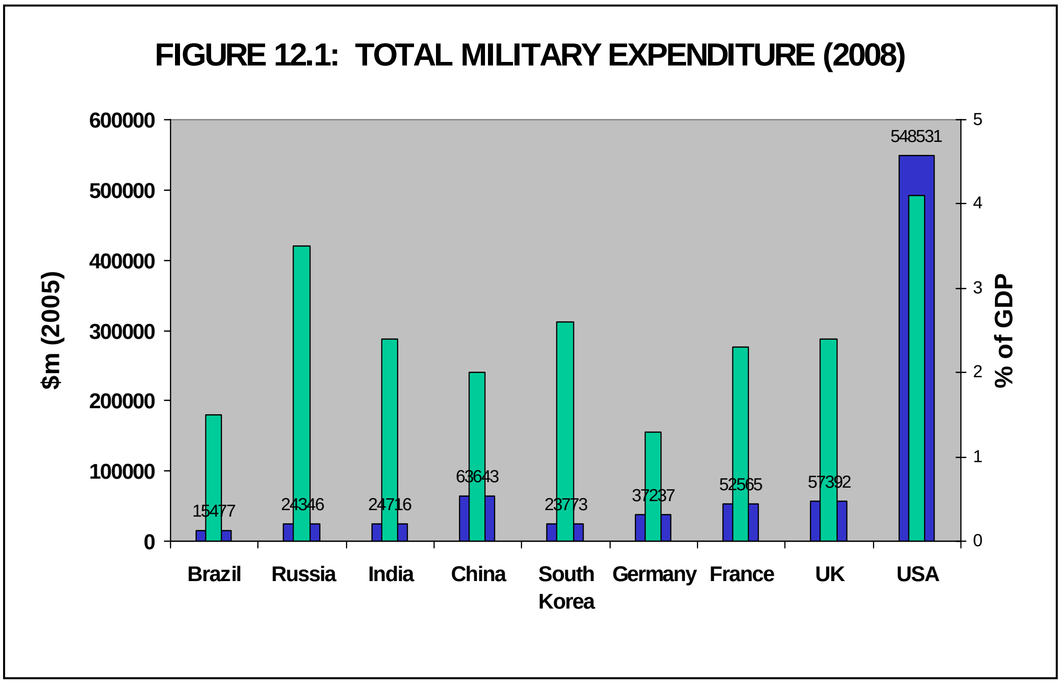
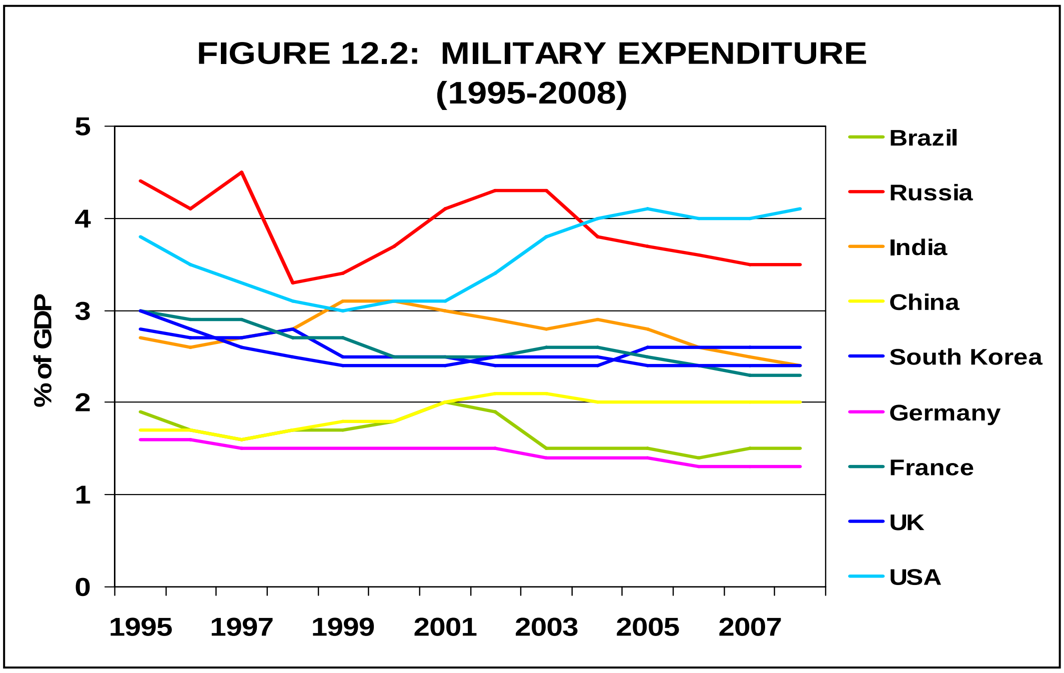
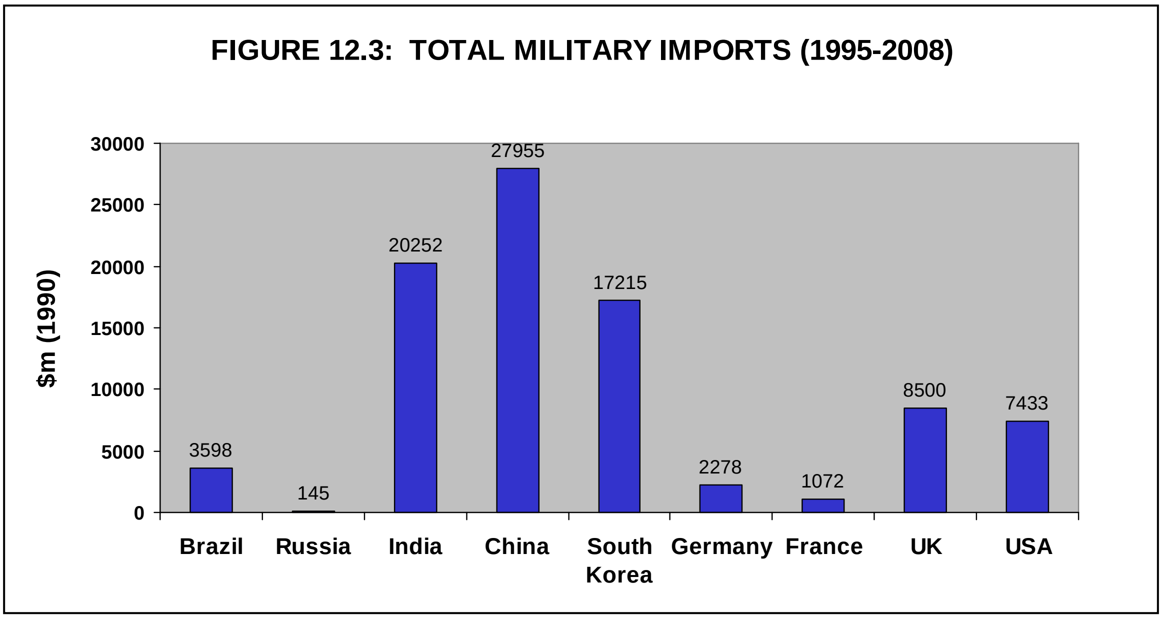


Figure 12.2 Military expenditure (1995-2008)



Looking at total import volume over the period 1995-2008 gives a different picture on the size of the BRICKs markets, and arguably a more interesting one than that of expenditures because imports are mostly about procurement and not labour expenses. However, broadly speaking Figure 12.3 shows how BRICKs total imports are comparable to the volumes of military expenditure, and in the case of India, China and South Korea are greatly in excess of EU Member States and the US. The exception to the rule is Russia, where the import market is extremely small in comparison both to its own size and to the other BRICKs, underlining the closed nature of the country as an export destination.

Figure 12.3 Total Military Imports (1995-2008)



BRICKs as import markets

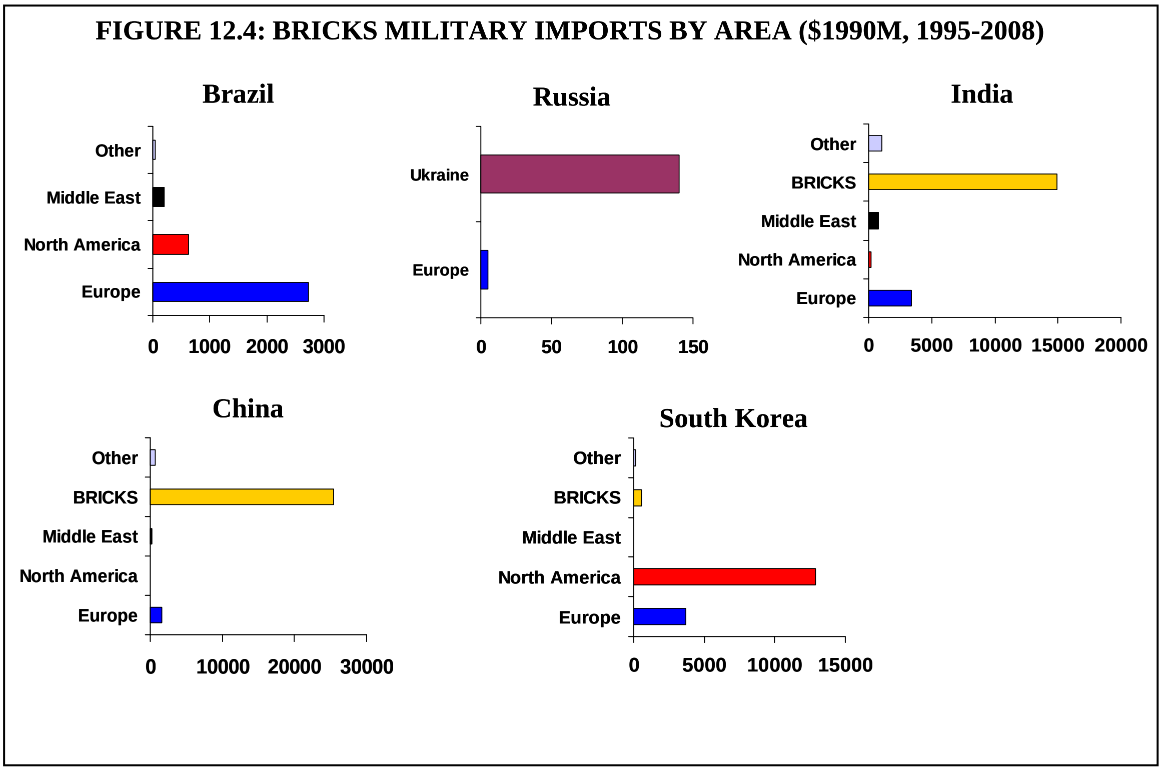
European companies do best (in terms of % share) in Brazil (around three quarters), followed by South Korea and India (around a fifth market share), and then China and Russia (minimal exposure). It should be borne in mind that, until recently, the Brazilian total import market for military equipment has been small in comparison to that of China, India and South Korea, so that in terms of absolute size over the 1995-2008 period, South Korea has been the largest market, followed closely by India and then Brazil. Figure 12.4 demonstrates this by splitting up the BRICKs military imports totals across geographical areas of interest.

Intra-BRICKs trade

Intra-BRICKs trade is most important for India and China, again as shown in Figure 12.4, where the majority of supplies come from Russia. Indeed, the data show that Russia is the only BRICKs country that has traded with the others over the period of analysis, which again underlines how Russia is different from any other BRICKs country. Also of interest here is a changing pattern of trade between Russia, India and China, with India the more important destination in recent years - something that average period analysis can hide.

South Korea is the only BRICKs country dominated by North American imports (mostly from the US), which is as much a reflection of political allegiances and regulatory control as anything else.

Figure 12.4 BRICKs Military Imports by Area ($1990M, 1995-2008)



Foreign Direct Investment

Detailed FDI data would be a good complement to the trade data, as it would enable the investigation of an alternative route to market access, i.e. the decision to invest in the country rather than trade more remotely with it. Unfortunately, although Eurostat data do permit a detailed bilateral analysis it is still not possible to identify the defence sector or related activities. Aggregate data show that:

- the BRICKs are predominantly net recipients of FDI;
- the US is a dominant FDI provider in most BRICKs with the exception of Russia;
- among the EU Member States, there are clear patterns / links with some of the BRICKs.

Having made these points, it should be borne in mind that in the defence sector, more than in most other (civilian) sectors, FDI is driven by political considerations rather than purely competitive positions.

BRICKs as exporters

Figure 12.5 shows that, in contrast to the size of the import volumes, exports are very small by comparison, indicating a huge trade deficit in most BRICKs - the exception is Russia, where export values dominate the other BRICKs, again underlining the difference between Russia and the rest.

As noted from the import data, Russia exports quite heavily to the other BRICKs (mostly India and China) and also across a wide range of armament domains, making it an important competitor to EU suppliers, as demonstrated in Figure 12.6.

Figure 12.5 Total Military Exports (1995-2008)

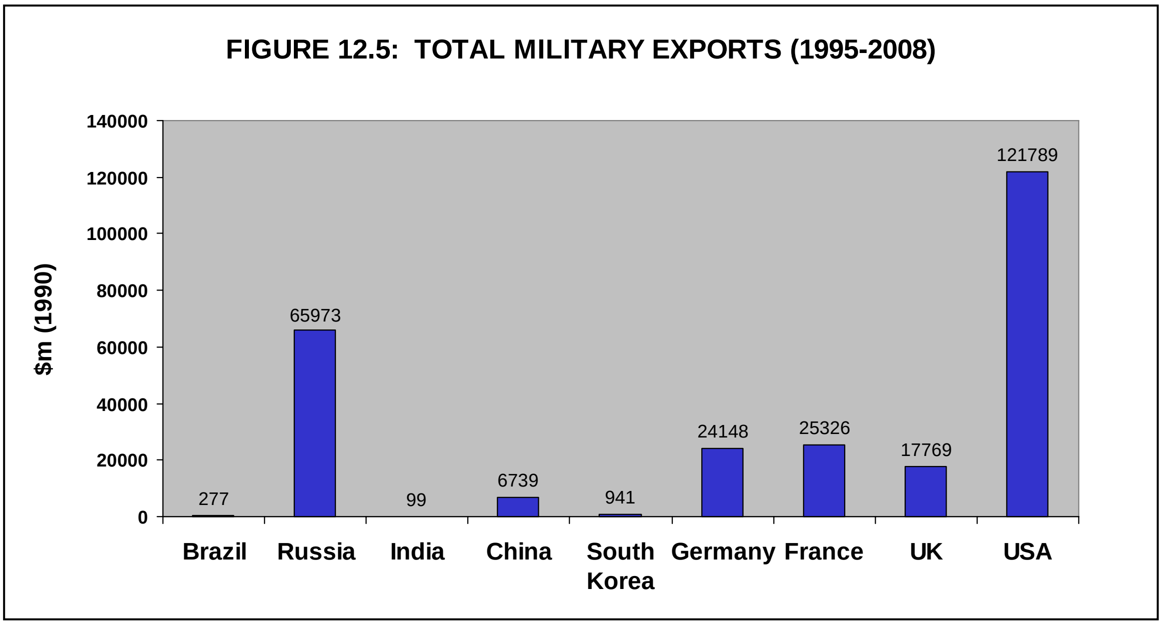
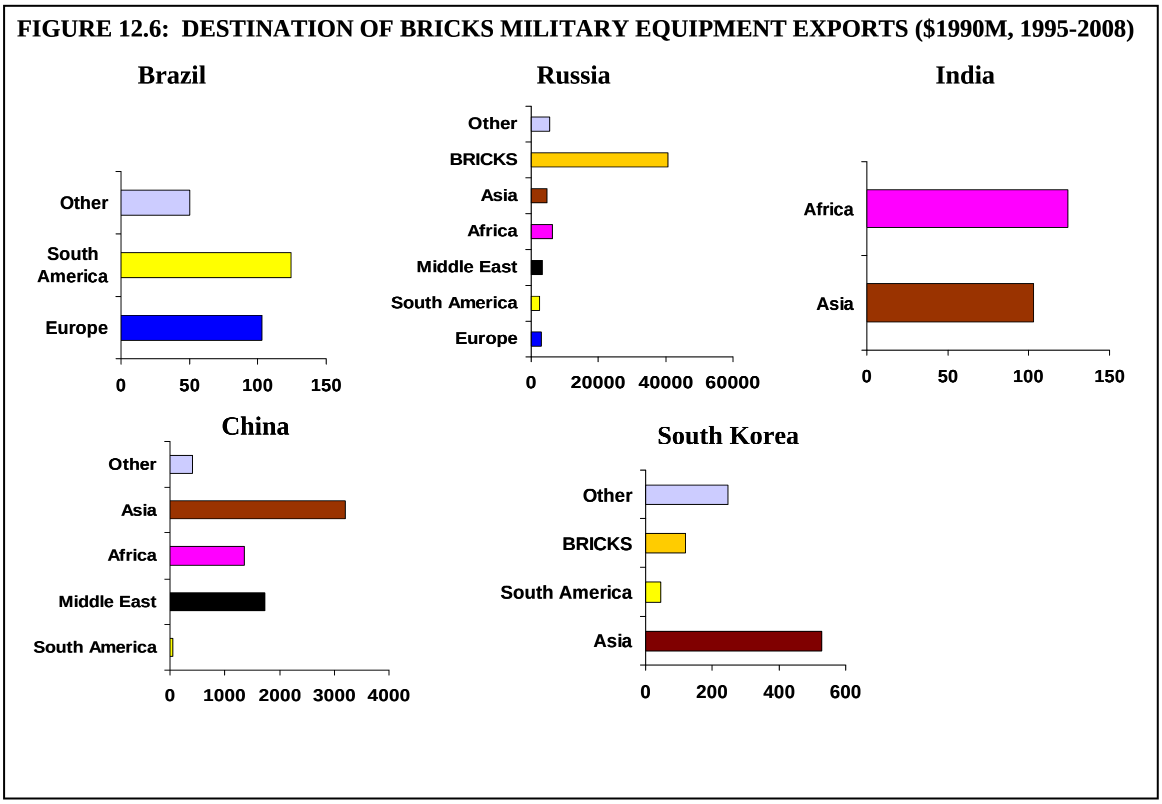


Figure 12.6 Destination of BRICKs Military Equipment Exports ($1990M, 1995-2008)



Most other BRICKs export mainly to a limited number of neighbouring areas or other developing countries, and in a limited range of domains (mostly Asia and Africa).

Penetration into European markets has been very limited over the 1995-2008 period, with only Brazil and Russia showing any export trade. Although the share of exports over this period was important to Brazil, the small value of its total military exports compared with

Russia means that Russian exports to Europe were around 30 times the scale of those from Brazil, again underlining the importance of Russia as a competitor relative to other BRICKs.

12.2.4 BRICKs summary positions by arms domain

Aircraft

To export a combat aircraft with total independence, it requires, in addition to the airframe, an engine, weapons (including missiles) and elaborated electronic equipments. Thus, one of the main criteria to sell a fighter for export is to be able to provide a multifunction radar (scanning and Solid State). The latest US technical references cover the stealth of second generation (with weapons bays). In this array, the F35 (JSF) is exported to cooperating countries, while the F22 is not exported. References to export remain essentially the US-made F16 and F18 E/F, the Russians Su-27 and MiG 29, plus the Europeans Rafale, Eurofigther and Gripen.

If many projects and combat aircraft or advanced jet training prototypes are developed in emerging countries, their stage of development should be assessed according to:
- the level of technical progress;
- the level of operational maturity;
- the country's independence on the primary equipment.

Over the longer term, it should be noted that fighter UAV (type Neuron) will be able to redefine the field of action of combat aircraft. In this perspective, the ability to control in real-time a UCAV (Unmanned Combat Air Vehicle) will become a paramount criterion (information systems and real-time control). This concept can lead new entrants to tap the combat aircraft segment.

However, the UAV (Unmanned Air Vehicle) segment, except UCAV, is currently controlled outside of Europe by a limited number of nations (the United States and Israel). In addition to the traditional technologies necessary for the design of an aircraft, the UAV's technology requires expertise in data transmission, security and encryption.

Apart from Russia, no country of the study has started a substantial program in the field of UAVs and has skills to become a potential competitor in the next twenty years. Russia, which is one of the most technologically and industrially advanced BRICKs countries, is lagging behind in this area and uses Israeli products or cooperates with this country. It is likely that Russia will compete with its own material in this segment in the long term, but it is unlikely to be a competitive threat in the short and medium term.

It is likely that little or no new material will really come into service by 2030. The emergence of a new stakeholder capable of designing and producing its own combat aircraft engines seem to be excluded as proved by the difficulties faced by India in this field. The concept of combat drones that can sometimes be satisfied with already existing engines (possibly civilian) can provide opportunities for 2nd tier players.

Figure 12.7 BRICKs achievement matrix by domain: Aircraft

Country	Capacity to export	National programmes	Cooperation	Import
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Helicopters

In order to export a military helicopter in total independence, it requires, in addition to the airframe, an engine, eventually weapons and an increasing number of complex electronic equipments. Thus, one of the main issues is to be able to provide a helicopter equipped with a fully integrated weapon system. This is particularly important for combat helicopters, helicopters dedicated to surveillance, anti submarine and anti-surface missions as well as helicopters for combat Search and Rescue (SAR) operations.

Performance in terms of sound discretion, infrared and radar are also particularly important. The same importance is accorded to vulnerability and the Human–Machine Interaction (HMI) considering the complexity of the missions in a hostile environment. To be noticed is that more and more complex and integrated equipment set up genuine mission systems. They equipped helicopters dedicated to para-governmental missions (rescue, surveillance, fight against illicit trade), which gets them close to military helicopters. The civilian-military duality is growing up on mission systems.

The latest American and European technical references focus on fly-by-wire control systems, composite structures and system integration. The civilian-military technological duality concerning the platform and the engine entails less export restrictions, especially on transport helicopters, than on combat aircraft upon which military specificity is total.

For export, the standard remains the U.S. Apache, the Russian MI24/35 for combat helicopters; the American Blackhawk, Russians MI8/MI17, the French Puma/Super Puma family and the European NH90 for transport; and for naval versions, the U.S. Seahawk, the British Lynx and the NH90. If tiltrotor technology is one of the paths for the future, especially due to improvements in speed, it remains complex and requires a very high skill level as highlighted by the difficulties encountered by Bell and Boeing on the V-22 and Augusta-Bell on its BA-609.

For both civilian and military needs, improvements in speed will be a key issue to which answers must be brought. This will include technological leaps and new approaches that only major helicopter manufacturers will be able to make. The number of civilian and military helicopter projects in emerging countries remains limited. The following should also be taken into consideration:

- The independence of the country regarding the design of a basic helicopter and its primary equipment;
- The dedicated missions;

- The technical and operational progress on projects;
- The technical level of the system and its integration into the helicopter.

In the longer term, UAVs (rotorcraft or tiltrotor ones) as well as machines with higher speed than the current helicopters (tiltrotor or anything else) will be able to make a difference in the concepts of employment and the tasks entrusted to rotary wing aircraft, including all civil and paragovernmental sectors.
From this perspective, the ability to evolve towards new configurations of helicopters, to integrate complex mission systems and to fly in real time an UAV system will become a key criteria (information systems and real time control). It will be the same regarding the ability to deal with discretion and HCI issues.

All these elements make it very tough for new and completely independent major players to emerge over the next two decades. But it does not prevent them from tapping the market through specific niches that can later serve as a stepping stone.

In the field of engines, the civilian/military duality is particularly strong. However, the emergence of a new player capable of independently producing a range of turbo shaft helicopters remains unlikely as the cost to penetrate the market is high and because there are already several players in existence. Thus, this new competition on specific segments cannot be excluded. Nevertheless, beyond financial market access issues, the implementation of standards of noise and pollution will require complex technology that only major engine manufacturers will be able to master. The area in which competitors are likely to emerge are those of equipment and mission systems, where players from emerging markets already offer (and will continue to offer) credible products.

Figure 12.8 BRICKs achievement matrix by domain: Helicopters

Country	Capacity to export	National programmes	Cooperation	Import
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Land armaments[166]

The "capacity" in land armaments is assessed here in terms of skills to design and manufacture tanks, armoured tracked or wheel vehicles or artillery pieces.

Artillery still remains a specific type of combat armament. Moreover, the latest developments in this field (elaborated and guided ammunitions or networked artillery systems equipped with counter-battery radars) push back the technological barrier, a fact which limits the original attempts to develop such an up-to-date system in at least three of the studied countries (Brazil, India, Republic of South Korea). The development of

[166] Main battle tanks and other armoured vehicles, artillery, and ammunition.

vehicles (even tanks) seems more accessible to countries which have an already existing industry (production of means of transport for example) and which want to accept a certain level of dependence (propulsion, artillery, electronics and optronics).

The five studied countries launched their own tank programs during the last 30 years. Besides Russia, whose ability to fully develop such a program no one doubts, only two countries have led their projects to full-term: China (extrapolation of the last Russo-Ukrainian tanks) and South Korea (development entrusted to an American industrialist). But only Russia exports.

On the light armoured vehicle segment, conducting programs and exporting appears to be more accessible as the examples of Brazil, China or Korea have shown, in addition to Russia. India seems hampered by inadequate facilities, a lack of monitoring and continuity in the programs. It fails to meet its own needs and remains an importer for the major equipment such as tanks. The Republic of South Korea owns competitive facilities capable of churning goods out (in quality and quantity). South Korea aims to become more self-sufficient regarding its defence and, therefore, could become a successful competitor in this area in the future.

Based on the above discussion, the situation is quite contrasted. For the time being, competition comes from Russia (better technology, great production capacity and competitive prices). Its only field of dependence lies in optronics.

Figure 12.9 BRICKs achievement matrix by domain: Land armaments

Country	Capacity to export	National programmes	Cooperation	Import
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Surface ships[167]

Many shipyards all over the world are able to design simple and lightly armed surface vessels. Designing a complicated ship such as an anti-aircraft or anti-submarine combat frigate requires skills that are not accessible to all countries because it implies long-lasting investments. In order to design and construct its own ships, a country must overcome two difficulties:

- the integration of the combat system (from the physical point of view but also regarding the IT system);
- to have access to highly specialized equipment (radars, sonar, communications, missile systems and other weapons).

[167] Attack surface ships: aircraft carrier, frigate, patrol, etc and utility and support to the fleet.

The Asia Pacific region is experiencing rapid economic expansion and is increasingly dependent on its maritime trade, and now accounts for more than 25% of the world shipbuilding market. Linked to this trend, the effort to equip local naval forces is rising as sources of tension in the area are numerous (control of straits, islands and islets).

India, China and Brazil are currently rebuilding their navy and the developing their industrial skills. On a longer term, their competition will have to be taken into consideration, particularly that of China on the export markets. South Korea is already a serious competitor on the export markets for patrol boat or corvettes with the help of foreign manufacturers (American and European). As for Russia, it is a major competitor able to offer the full range of vessels and equipments that meet the needs of a modern naval force.

Figure 12.10 BRICKs achievement matrix by domain: Surface Ships

Country	Capacity to export	National programmes	Cooperation	Import
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Submarines[168]

Currently, the capacity to design and manufacture a submarine remains limited to a few countries. There are as few countries capable of making a combat aircraft as there are able to manufacture a submarine. Barriers to entry remain high and encourage companies to invest massively on the long-run, especially if the concerned country wants to be independent from a technological point of view (coating, equipments, and weapons).

However, many countries have expressed their willingness to get access to submarine operational capacity:

- On the one hand, an attack submarine is a relatively “low cost” solution compare to its relatively high efficiency in controlling or restricting access to a sea area;
- On the other hand, nuclear-armed States aim to own SLBMs (Submarine-Launched Ballistic Missiles), which increases the threat of their nuclear deterrent. Thus, they aim to develop their own industry in order to provide such technology.

As a result, the submarine export market is one of the most important markets of the naval sector. The difficulties to overcome in order to design and build submarines, by your own means, are the following ones:

- To control the architecture and the assembly of the hull and the systems (the importance of acoustic dispersion)[169];
- To control the architecture and the integration of the combat system;

[168] Conventional and nuclear propelled tactical submarines with the exclusion of ballistic missile launchers.

[169] Architectural design and assembly is a key issue in achieving acoustic dispersion, which is an essential element in the development of modern and advanced submarines.

- The availability of materials for the body: titanium (mainly used in Russia), steels; the development of these materials is specific, their implementation is delicate and requires a learning process. Nevertheless we must point out that long-term research is aimed at developing the use of composite materials;
- The availability of equipment like: underwater airlocks, air treatment, anaerobic propulsion, telescopic masts, etc;
- The availability of mission equipment like: sonar, optronics, and torpedoes.

The local assembly of submarines is often a condition for entering the export markets. If it allows the importing country to acquire a certain autonomy, notably for the overhaul of its future ships, it cannot be considered as a sufficient stage of development to obtain the transfer of the whole skills necessary for the design and the shipbuilding.

BRICKs countries have been renewing their fleet of submarines of late. Among them, only the Russian industry has the historical background, gets the best technological level and has the capacity to export. Therefore, Russia will stay the main competitor in the mid- to long-term on the submarine market. Russia has access to the AIP technology (anaerobic propulsion), which is now offered on its Kilo Class submarines for exports.

Brazil and India have shown limited success in their attempt to launch their home-made (conception and building) submarines. Both countries have shown a keen interest in developing nuclear-propulsion of submarines, which won't lead them to export activities. South Korea for the moment is dependent to the license of the German shipyards HDW. China, which produced and put in operation some SLBMs, is, beside Russia, the most technologically advanced country among the BRICKs. Nevertheless, the recent purchase of Kilo Class submarines (type 877 and type 636, of which last deliveries took place in 2006) from Russia shows that China is not yet self-sufficient and in the medium term it is unlikely to pose a credible threat in the export market.

Figure 12.11 BRICKs achievement matrix by domain: Submarines

Country	Capacity to export	National programmes	Cooperation	Imports
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Missiles[170]

The missile segment is analysed here without taking into account ballistic missiles because they constitute a weapon of sovereignty, which currently equips few countries in the world. Besides, as it is a specific weapon, it is concerned neither by an export, nor by a competition policy in the same way the other weapon systems are.

[170] All missiles (surface, air to air, anti-armour, tactical, etc.) and missile systems with the exception of strategic missiles (nuclear bomb vector, ballistic range).

Missiles are a key component of modern air, naval or land weapons systems. They compose a set of critical equipment regarding the export of weapon systems such as surface ships, submarines and combat aircraft or helicopters. For a client, the availability is one of the major selling points in the choice of equipments he wants to purchase. Apart from the personal portable systems (anti-tank and anti-aircraft), skills of the missile industry go beyond the single ability to design and produce ammunition. Indeed, in most systems, the missile is called to interact with a carrier, whether it is a land, naval or aerial one. A missile is also intended to interact with a combat system with which it will have to exchange information in order to receive or beam data related to its mission.

The ability to work, in conjunction with the relevant industry, in the area of integration of the weapon on the carrier and its adaptation to the carrier's combat system are key elements for the export of a missile, particularly when this adjustment must be made on a carrier and a system that does not come from a domestic industry (especially because of the compulsory technical data exchange between carrier and missile system). In addition to the key competencies in the field of seeker, in the field of the vector itself, where warhead and propulsion (powder, liquid fuel or turbojet) are particularly complex systems, the new programmes also involve new capacities in terms of intensification and resistance to wave scrambling, manoeuvrability, discretion and precision.

Only some major suppliers in the United States, Europe and Russia now get all these elements. They are the result of a long-standing presence in this area associated with investments that only countries with a full industrial value chain in the field of defence could make. In addition, investment is one of the key elements for exporting defence equipment and to provide complete turnkey systems.

If competitors can appear here and there on certain market niches and on simple systems (anti-tank missiles and anti aerial ones that are fired from the shoulder for example), the emergence of a major competitor able to present a full range of missiles and which is in a position to provide integration across multiple carriers (in addition to any national carriers), seems unlikely in the short and medium term. Indeed, levels of performance and of integration achieved by the Western Countries and by the Russian manufacturers are very high. Hence, in order to catch up potential competitors would need to invest massively over the long term.

It should also be noted that, compared with carriers, the supply of weapons such as missiles has a very strong political symbol, and the decision to give or not to different countries a certain type of weapon and some data relating to such weapons is particularly sensitive. In this context, new entrants could try to take advantage of an export refusal to a country in order to place their products and thus gain commercial positions.

Figure 12.13 BRICKs achievement matrix by domain: Missiles

Country	Capacity to export	National programmes	Cooperation	Import
Brazil				
Russia				
China				
India				
South Korea				

Source: DECISION

Electronic systems & optronics [171]

The electronics industry is essentially driven by the civil sector, its market spreads worldwide. Electronic components, which 20 years ago were still under embargo, are nowadays widely available (microprocessors, Digital Signal Processor, etc). Furthermore, a great part of the value added stems from the ability to control the design of the software, which is a skill available to all countries without any industrial investment. But it requires simulation systems and test development devices so as to certify such software.

The specificity of military electronics now resides in a few specific components:

- Electromagnetic screening:
  - Speciality components: Gallium nitride (GaN), Tx/Rx modules, etc;
  - Processing algorithms, etc;
- Navigation Guidance
  - Sensors technologies: MEMS, Hemispheric Resonator Gyro (HRG);
  - Algorithms, hybridization;
  - Clocks, etc;
- Optronics
  - Infra-Red (IR) sensors;
  - Photon Sensor Technology for Night Vision (image intensifier tube): Microchannel Plate (MCP), Electronic Bombarded Complementary Metal-Oxide Semiconductor (EBCMOS);
- Integration, certification.

With the global know-how (architecture, modularity, etc), it is essentially against these few specificities that the level of a military electronics industry must be assessed today.

Finally in this sector and more than ever, Russia is far ahead of all other BRICKs countries. While some gaps exist, cooperation with Western companies allows meeting national and export needs. In parallel, Russian industrialists lead programs in order to overcome these hindrances.

[171] Electronic technologies cover a wide scope - from dedicated components to large tactical, command and communication systems such as radar, navigation guidance, optronics, electronic warfare, telecommunications, etc.).

Figure 12.14 BRICKs achievement matrix by domain: Electronic systems & components

Country	Capacity to export	National programmes	Cooperation	Imports
Brazil				
Russia	Only on Russians platforms		A few dependences	
China				
India				
South Korea				

Source: DECISION

12.3 Likely future developments

12.3.1 Developing a forward-looking perspective

Having reviewed the many features of the current situation regarding the structure and operating features of the BRICKs defence industry and markets, the next stage was to look forward and consider future developments. In doing so, one possible way of working would be to consider a whole range of possible developments around the world (some plausible, some less so) and attempt to weave together a convincing storyline for how the global defence sector might evolve. Such a task would be immensely difficult, however, as the defence sector is so closely entwined in geo-political developments that these scenarios would become overly complex and so the implications and recommendations for the European defence sector would be dependent on very intricate assumptions about how the world might evolve, and rendering them less useful if events unfolded in a different way.

Instead, it was considered a better plan to place more emphasis on the most likely outcome over the short-to-medium term, summarised through a Business as Usual (BAU) scenario. From this central view, certain significant events could be pushed outwards for each BRICKs countries to consider how they might affect developments in more detail.

12.3.2 Key drivers

Government policy, along with other key economic and organisational factors, is a clear driver for the defence sector, both in terms of set up and subsequent development. It should of course be stressed that none of the drivers are purely independent and reality usually presents itself as an interwoven set of factors that have different strengths and influences at different times.

12.3.3 Business as Usual (BAU) scenario

The future progression of each defence sector is therefore assumed to follow the trends in economic, political and technological drivers described in Chapters 4-9, achieving the targets and policy objectives identified. To account for the long lead times, each scenario shall cover a period of 15 years from 2010 to 2025. This is intended to encompass both short and medium term trends and impacts.

A summary of what each scenario assumes is provided below.

Table 12.2 Business as Usual Scenario - Summary of Assumed Conditions

Business as Usual Scenario - Summary of Assumed Conditions					
Factor	**Brazil**	**Russia**	**India**	**China**	**South Korea**
Principle Security and Defence Policy Driver	Increased Power	Regaining Power	Security	Increased Autonomy and Internal Security	Security
Principle Defence Industrial Policy / Strategy	Increased Production for Domestic and Export Markets	High Exports	Increased Indigenous Content in Arms Procurement	Increased Domestic Development of Military Technology	Increased Indigenous Content in Arms Procurement
Defence Industrial Policy Element		Seek New Export Markets	Diversification of Foreign Suppliers, Offsets	Dual-use Technological Development, Reverse Engineering	Offsets and International Co-production
Offset Policy	Unofficial	N/A	30%	Unofficial	30%
FDI Policy	Unrestricted	Restricted	26% Limit	Restricted	Restricted
Priority Domains (Strengths)	Naval, Submarine, Small Aerospace	Land (Tank) , Aerospace, Nuclear	Aerospace, Naval, Land, IT	Aerospace, Naval, Space, Missile, IT	Electronics, Naval, Land
Domain Weaknesses	Land, Large Aircraft, Helicopter	Electronic, Naval	Submarine, Aerospace	Large Aircraft, Submarine, Land	Aircraft
Defence Budget in 2008 (*2009)	$23.3 Billion	$35 Billion	$30.8 Billion*	$61.1 Billion	$24.6 Billion
Forecast Defence Budget in 2025	$47.1 Billion	$56.2 Billion	$82.1Billion	$160.7 Billion	$43.7 Billion
Export Market Potential	Largely Regional	Focussed on Developing Countries and former Soviet States	Limited	International	International
Potential for Increased Indigenous Content[1]	Medium	Low	Medium	High	Low
Probability of Success in Attaining Policy Goals[2]	80%	50%	65%	99%	60%

[1] Highlights the relative ability of each BRICK to increase indigenous production of defence equipment. For example, BRICKs where a high proportion of defence equipment is indigenously produced, the potential to increase this level is likely to be low compared to those where the majority of defence equipment is currently imported.

[2] Based on defence expert opinion

Having stated the BAU as a broad continuation of trends as previously described, it should be noted that at a stakeholder workshop held in Brussels the importance of not relying too much on the past to predict the future was stressed, particularly when it comes to the BRICKs. Previous difficulties in industrial development and technical advancement experienced by some BRICKs countries have largely been overcome, while on the other hand, some previous fast growth and development might in the future face bottlenecks such as skilled labour shortages.

12.3.4 Other (event-driven) scenarios

Building on the BAU, additional scenarios have been developed to investigate the potential implications of political, economic and technological changes to the assumptions made in the BAU. Each scenario is built around a hypothetical event taking place, before assessing its implications for individual BRICKs in the field of defence.

The three scenarios are:

- **Korean-unification**

Assumes a peaceful settlement is reached between North and South Korea resulting in de-militarisation in the region, including a reduced US military presence. This scenario is, therefore, intended to highlight the implications of changes to political and foreign policy on defence industries;

- **Economic stagnation**

Highlights the importance of economic growth to two rapidly growing BRICK defence industries (Brazil and China) with different defence industry growth strategies, structures and budgets; and

- **Bi-polar World**

Reflects the emergence of a bi-polar political and technological world, such that two types of incompatible defence equipment are available on the international market, each with a different approach to an identified military need. The Revolution in Military Affairs (RMA) increasingly requires technology to be interconnected for the purposes of communication and navigation between armed forces. This scenario intends to indicate the implications for the defence industry where interconnection and networking is not possible between defence systems, focusing on Russia which currently adopts a different technological approach to most other defence industries.

Table 12.3 provides a summary of the assumed conditions under each event driven scenario in relation to the BAU. For simplicity the same policy objectives are assumed to exist as in the BAU under each scenario.

Table 12.3 Event-Driven Scenario - Summary of Assumed Conditions

Event-Driven Scenarios - Summary of Assumed Conditions				
Scenario	**Korean Unification**	**Economic Stagnation**		**Bi-polar World**
Factor	**South Korea**	**Brazil**	**China**	**Russia**
Forecast Defence Budget in 2025 (relative to BAU)	Decreasing	Decreasing	Decreasing	No Change
Export Market Potential (compared to BAU)	No Change	Reduced	No Change	Bi-polar market, reducing export potential
Potential for Increased Indigenous Content[1]	Significantly Reduced	Significantly Reduced	No Change	No Change
Probability of Success in Attaining Policy Goals[2]	40%	40%	90%	70%

[1] Highlights the relative ability of each BRICK to increase indigenous production of defence equipment compared to the BAU scenario.
[2] Based on defence expert opinion.

12.4 Implications for the EU defence sector

12.4.1 Background

From the possible outcomes as described in the scenario analysis it is possible to derive the likely implications for the EU defence sector, at least based on an assumption of no significant changes in government or EU policy.

Assuming BRICKs countries trends in defence spending would at least remain the same and so their defence industries can continue to be able to develop local programmes and develop know-how, implies a potentially positive scenario for the EU defence market. It also requires that the BRICKs countries remain a good market, to the extent that they buy imports directly, use import offset deals and cooperative projects to develop indigenous capabilities. Relations and trade with individual countries do of course differ and prospects will depend upon political and strategic constancy and the EU companies remaining competitive.

On the other hand, the BRICKs anticipated development could imply increasing competition for the EU companies as these countries develop capabilities and move into their markets. The future of the European industry depends mainly on its position compared to the US industry, which will also remain the main competitor for Europeans according to BAU assumptions. To a lesser degree it will depend on the strategy of emerging non-BRICKs countries already present on the armament market (Israel, South Africa, Turkey, etc).

On the whole, the BAU assumptions do not imply a rosy future for the European defence industry. It is still facing a major funding issue, due to the size of its local market and overcapacity in a number of areas. There is likely to be some form of restructuring of procurement and production across Europe at some time in the future and the pressure to export to continue to support its technological and industrial base (EDTIB) is likely to remain.

12.4.2 The BRICKs as competitors

The country analyses implied that not all of the BRICKs defence industries could enter into global competition. By being focussed on serving their own domestic market, various emerging defence suppliers are not, or will not be, really in a position to seriously enter into competition with other suppliers on export markets. Though they may be able to compete in lower-tech markets in developing countries, it is also worth noting that what is not developed in the BAU scenario, namely the role played by the European Defence Industry during the emergence phase of the BRICKs industries notably through offset and cooperation.

In general, for countries with an ambition to maintain a national defence industrial base, theoretically there are four major options, as summarised in the table below.

Table 12.4 Main options for BRICKs defence industry

Option	Description
Comprehensive	With the changes in the nature of the market there is no country that can really maintain a comprehensive defence industrial base. Even Russia and China would struggle to maintain a presence in all segments of the defence equipment market and keep pace with technological evolution without the cooperation of other countries.
Specialisation	Countries are likely to need to specialise in particular segments and so make decisions on whether to develop the industry to ensure a degree of autonomy for their armed forces (maintenance, servicing, spares); to provide strategic equipment not available on the market; or to focus on niche products with a view to exports.
Cooperation	Defence industrial cooperation between European and BRICKs countries, in the production of complete systems or components, or indeed in joint ventures. Such programmes of international cooperation could be similar to those in commercial aircraft.
Segmentation	Defence production not at the boundary of technological development, but lower tech alternatives. Target different markets to the major producers, both types and location. They may then rely on US and/or European manufacturers for imports of high tech equipment.

Concerning the capacity to export and compete head-to-head with the EU defence sector, clearly all of the BRICKs countries have some capacity to develop exports and some (Brazil, Russia and South Korea) have highlighted a role for exports in their defence industrial policy.

Brazil

Brazil has been more focused on particular sectors than India, with the development of its aerospace industry and the cancellation of the development of armoured vehicles, and is keen to further develop an offset policy and technology transfer requirements, to help domestic industry develop further. The EU defence industry is certainly in a position to help develop capability, to partner local firms in certain areas (combat aircraft, submarines) and to act as a complementary player on others (early warning and light tactical transport). Plans to develop a nuclear reactor and to produce nuclear-powered submarines present opportunities for European companies, some of which are already being exploited by France. Europe is already the principal exporter to Brazil, ahead of the US, suggesting that many opportunities are already being taken advantage of. Also, the risk in terms of third or home-market competition from Brazil is minimal in most domains.

Russia

Russia's defence industry is already a global player. It is mainly focused in maintaining its military position and possibly reducing the technological gap with the US, though it is more likely to be able to prevent the gap from widening than reduce it. A major concern for Russia is the sustainability of its capacity to produce across all domains, and this might present a market opportunity/weakness for the EU defence sector to exploit, or an avenue to explore collaboration with the Russian defence sector, and capitalise on Russia's share of the export market and the strength of demand to modernise Russia's own forces. Certainly, Russia lags behind in electronics & optronics and this presents an opportunity for EU producers, given that Russia has shown some willingness to allow collaboration in this area.

With strong government support for exports Russia could be an important and extremely competitive (even aggressive) competitor to the EU defence sector in the medium term, both in other BRICKs countries and third markets. It's most important markets are China and India, but their increasing independence means Russia is likely to continue to seek new export markets in the medium term. Russia's strengths and main sources of export revenues are the aircraft and missile sub-sectors. These are areas in which the EU industry will need to compete or collaborate. Though Rosobornexport has no official offset policy, it appears to be willing to negotiate very hard to secure orders and market share on behalf of the Russian defence market. Stakeholders at the Brussels workshop suggested, however, that the impact of Russian defence industry development is likely to have limited impact on the European industry and it may well have difficulties enlarging its area of influence in markets targeted by European industry.

India

India seems able to achieve various objectives but not to develop a comprehensive production capability. It is focusing on developing domestic capabilities, but remains a major customer for a range of countries, including not only the EU, but also Russia, Ukraine, China, USA, Israel, etc. If recent reforms, outlined in the India Defence Procurement Policy 2008, achieve their objectives, a much stronger domestic defence industry could emerge, which may push European companies out of the Indian market over time. Indian state rules prohibit more than 26% Foreign Direct Investment (FDI) in the national defence industry, but joint ventures are considered on a case by case basis[172]. Certainly, Europe is likely to retain India as an export market, but the major problem is likely to be the competition from other countries as much as India's growing domestic capability.

China

China could become a third global competitor beside Russia and the US but, at the moment, there is no evidence to suggest it is aiming for this. Certainly, China is looking to further reform its management system of defence related science, technology and industry, specifically with regards to investment for arms companies. Procurement gives priority to the Chinese private firms and domestic scientific research institutions and universities. However, the Chinese policy also encourages foreign investment, particularly through joint ventures. This presents enormous opportunities for EU firms, subject to the existing embargo, especially given that these firms are most likely to be able to provide equipment and technological support that China's main export supplier Russia has not been able to provide. Even on exports, China might be a minor threat to European producers, but a larger one for Russia, as they share similar potential markets e.g. Africa.

South Korea

South Korea is already a competitor with Europe in high-end civil products and military components, matching Western standards for quality and performance. Procurement in South Korea is openly biased in favour of domestic firms, and there are strong offset (30% for purchases over $10m) and technology transfer rules. Given the high levels of technology and expertise among South Korean companies, this requirement seems likely to encourage potentially rewarding joint ventures and other forms of cooperation. This suggests that the EC's best action lies in encouraging joint ventures and creating a more level playing field by lobbying against offsets. South Korea possesses a real capacity to integrate faster or develop new technologies and in some areas is the most important competitor for European industry, targeting similar customers.

Overall, it would appear that only Russia has any hope of developing substantial export presence – which indeed it already has. Within the 2010-2025 timeframe, however, China may also have the capability to do so, even if they may not have the intention. It really depends upon strategic changes and the general development of the international arms market. For the other BRICK countries the development of their industry is more a consequence or an expression of new economic prosperity and/or willingness to gain more independence in terms of their defence capability. They are unlikely to be in a position to offer comparable products and to enter the markets that are usually targeted by European defence industry.

The potential consequences of the BAU scenario for European industry are firstly, the possible appearance of China as a competitor, to add to the US and Russia. Second, the other BRICK countries are likely to act as competitors on some niche products, but also provide outlets for products and provide new opportunities for cooperation. In respect of

[172] Illustrated by BAE Systems 49% joint venture with Mahindra Defence Systems (MDS).

the variants on the BAU scenario that would impact on particular BRICKs countries, it is not obvious how these would change the impact on the European industry, though economic stagnation might compound the problems faced in Europe and lead to more rapid consolidation within Europe.

12.4.3 The BRICKs as collaborators

In developing their defence industry capability, all of the BRICKs seem committed to using some form of foreign direct investment and technology transfer and in some cases strong offset requirements. Thus, offsets may at present be important for EU competitiveness in exports, but there are also opportunities to collaborate with these countries, through joint ventures, by acquiring firms and perhaps through dual use technology transfers.

- Brazil is keen to further develop an offset policy and technology transfer requirements and the EU industry is already the most important player and well placed to help develop capability in certain areas.
- Russia is likely to show more resistance given its strengths, but it does lag behind in some important areas, such as electronics & optronics and this may provide opportunities for future collaboration for the EU defence sector.
- India is likely to become an increasing source of collaboration as it strives to develop its indigenous industry and move away from its dependence on Russia.
- China's encouragement of foreign investment, particularly through joint ventures, creates enormous opportunities for EU firms[173].
- South Korea is openly biased in favour of domestic firms, and there are strong offset and technology transfer rules. The technology and expertise of the local companies suggest successful joint ventures and other forms of cooperation.

Table 12.5 presents the main collaborations (co-development, licence production) as quoted in the report – it is not exhaustive but gives a reasonable picture of the current situation, both of arrangements with EU Member States and others, e.g. BRICKs-to-BRICKs and BRICKs-to-third countries.

Table 12.5 Summary of BRICKs Collaborative Arrangements

BRICK	Domain	Technology Provider	and Product Developed
Brazil	Space	China	CBERS
	Aircraft	Italy	MB326, AMX
	Helicopter	France	EC275
	Land	Various EU	Components for several vehicles
	Submarine	Germany France	Final assembly of Tupi class models Scopene
	Missiles	Italy South Africa	MSS 12 anti tank MAA-1 air-air
	Electronics	Sweden France	EMB 145 Airborne Early Warning Anti-surface and anti-submarine equipment for the EMB 145 MP

173 This collaboration refers to the civil sector at present, but from this there is potential for defence sector developments.

BRICK	Domain	Technology Provider	and Product Developed
		US	MDA radar Radar for the MP version of the EMB 145
Russia	Helictopter (civil)	EU US Western countries	Other European sub-systems (eg communications, cockpits) Mi24/3 or Mi8/17 with US engines Russian – Western cooperation to offer products with Western components
	Electronics	France	Inertial navigation unit, thermal camera, Helmet mounted display (HMD)
India	Aircraft	France / UK US / UK Russia	Gnat, Jaguar, Hawk Various UK or US components for the TEJAS LCA (head mounted display, engine, etc.) Mig-21/23/27 Su-30
	Helicopter	Germany	Dhruv
	Land	Germany Russia Isreal	Components for the Arjun MBT Plan for final assembly of T90 MBT Battlefield management system
	Naval	France Russia & Italy	Propulsion pack for AWS corvette Sub-system for an aircraft carrier
	Submarine	France	Local production of type 209/Scorpène
	Missiles	Europe (MBDA) Russia	Milan missile licence production BraMos JV to produce hypersonic missile for submarines
	Electronics	Israel / France	Radar
China	Space		
	Aircraft	Russia Pakistan Israel	Sukhoi 33 (licence) K8; JF-17 J-10
	Helicopter (civil)	France	EC120 (licence, in production) ; EC175 (development)
	Land	Russia Ukraine	Development of the Type 98 based upon Russian model T80 and T90 Al Kahlid MBT for Pakistan (same Russian base T80/T90)
	Missiles	Russia	Uses a Russian platform for various models
South Korea	Aircraft	US	T-50
	Helicopter	France US	KPH UH-60 licence 500 MD/M licence
	Land	US and UK US	Component and design for the KIFFIV K1 MBT
	Naval	US, EU US	Various components (engines, missiles, etc.) KDX destroyer
	Submarine	Germany	Type 209 / 214 submarine license
	Missiles	France Russia	Pegasus (Crotale) KP-SAM seeker Cheolmae II

BRICK	Domain	Technology Provider	and Product Developed
		US	M-SAM Various programmes
	Electronics	France	Fire control systems

It is important to emphasise that collaboration does not simply lead to the benefits of exports, with the downside of developing potential future competitors, but also provides lower cost sources of components and subsystems for EU industry. It might also prevent them from developing separate products, with the BRICKs companies becoming integral parts of the international supply chains that the prime international contractors are developing as part of the globalisation of the industry. This could be an important development in Europe's competition with the US defence industry.

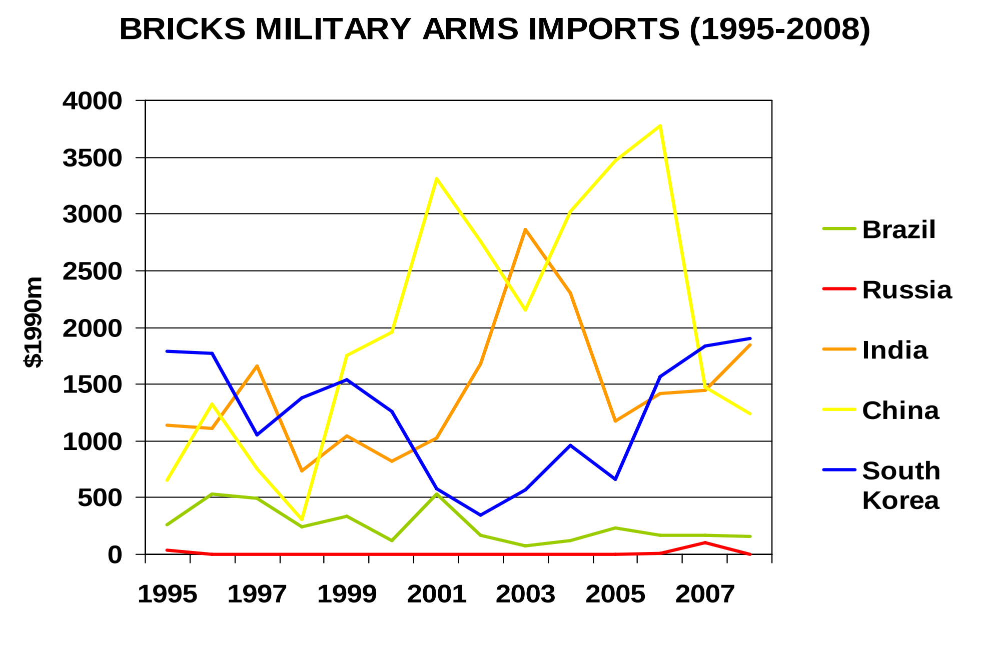
12.4.4 The BRICKs as export markets

In the BAU scenario the assumption that the BRICKs countries' trends in defence spending would at least remain the same implies real export opportunities for the EU defence, assuming that they buy imports directly and/or use import offset and cooperation to develop their indigenous capabilities. The US industry will remain the main competitor though there may be some competition in specific niches from emerging non-BRICKs defence industries (Israel, South Africa, Turkey, etc). The likely importance of the BRICKs for exports does vary:

- Europe is already the principal exporter to Brazil, ahead of the US. While this suggests that many opportunities are already being taken advantage of, there are likely to be further opportunities as the country develops its indigenous capability.
- Russia is not an important export market for the EU and this is unlikely to change in any significant way. There are possibilities that declines in sub-sectors and continuing willingness to engage in co-operation will lead to the opening up of the Russian market and provide future opportunities.
- Europe is likely to retain India as an export market and there are likely to be opportunities to develop exports, but the major problem is likely to be the competition from other countries as much as India's growing domestic capability.
- China's move away from a dependence on Russian exports could well provide opportunities for EU exports, though the magnitude of this will depend upon how EU policy towards China changes, in particular the embargo on lethal military sales.
- South Korea provides export opportunities, tied in with the development of cooperative projects.

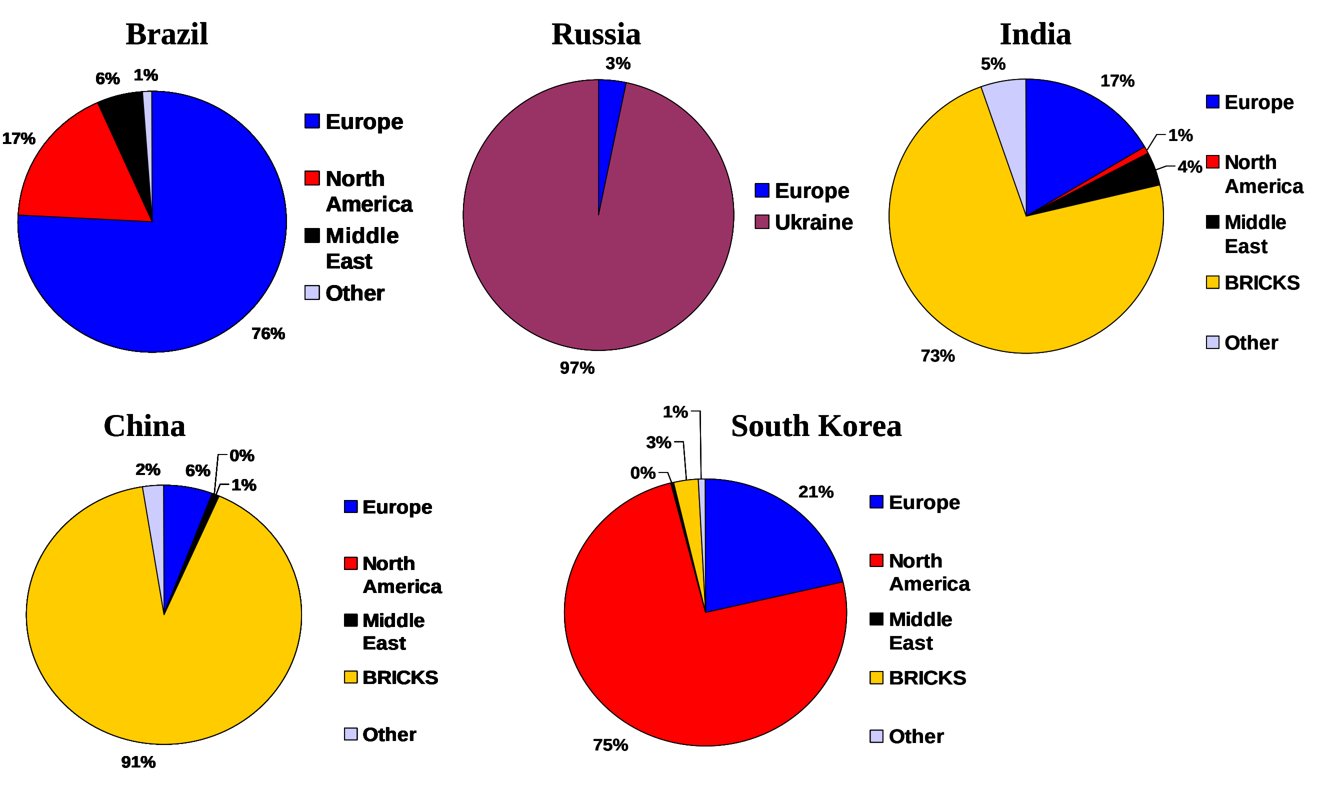
These themes are summarised by Figures 12.8 and 12.9 which show the evolution of total defence imports from each of the BRICKs since 1995, and the origin of these imports split across the major world areas.

Figure 12.15 BRICKs Military Arms Imports (1995-2008)



Source: SIPRI arms transfer database

Figure 12.16 Origin of BRICKs Military Imports (% shares, 1995-2008)



Source: SIPRI arms transfer database

Overall, the BRICKs should continue to provide export opportunities for the EU industry, though in the longer run these could decline as the indigenous capabilities develop. The EU companies will also need to deal with competition from the US and other non-BRICK emerging producers.

12.5 Recommendations for the EU defence sector

12.5.1 Background and conditioning statements

A clear conclusion from the analysis is that there seems likely to be little direct effect on competition for the European defence sector of the emergence of the BRICK countries as defence producers. This does not mean that the BAU scenario implies stable market conditions for the European defence industry, which will continue to face funding concerns, as procurement reforms take place and industrial restructuring continues. While extra-European exports are often seen to play an important role in the maintenance of the European defence, technological and industrial base (EDTIB), direct export sales may face increasing concern in domestic European constituencies, foreign sales from market presence is a more viable route towards maintaining, or increasing, market shares in a potentially shrinking international arms market.

The nature of the industry and the importance of political and strategic drivers, mean that recommendations are limited and likely to be more general than for other industry studies.

12.5.2 General recommendations

Promoting the provision of improved data and analysis

A major problem in analysing the defence sector is the paucity of information that is available, so an important recommendation would be to promote the provision and reporting of improved information.

- Better data on FDI which captures bilateral flows, would allow an evaluation of the extent of collaboration between the EU Member States and the BRICKs. UNCTAD may have this information, but were unable to supply anything more detailed than what is currently in their World Investment Report. Eurostat trade data are better, in that they capture bilateral flows, but without sufficient detail to identify the defence sector or even related areas such as aerospace.
- Improved data on defence R&D across countries
- Improved data on defence procurement. At present it is often necessary to rely on total military expenditure which includes salary and pension payments - not something of particular strategic importance.
- Improved data on trade by, for example, encouraging improved reporting to UN Register on Conventional Arms.

Better data would allow improved understanding of the developments in the sector and the implications for the EU. A related recommendation would be to promote further research as the data become available.

Promoting investment in European R&D

The Business as Usual (BAU) scenario illustrates the most likely evolution of each BRICK defence industry in the future. The BAU predicts that by 2025, each BRICK country will have the capability and capacity to produce the 'bricks and mortar' of most defence equipment, while competing with Europe in the international defence market within specialised niches. However, this scenario also predicts that BRICKs will rely to varying degrees on foreign suppliers for more advanced technologies in the short to medium term. In the longer term, if the European defence industry is to continue to be a leading producer and supplier of more advanced technologies to the BRICK and other states it must maintain its technological 'edge' in engineering, design, research, etc. The 2007 European Commission's Strategy for a stronger and more competitive European defence industry[174] acknowledges this as an important objective, suggesting there are important technology spillovers generated by the defence industry[175]. However, it is important to recognise the changing nature of defence production and the increasing importance of developments in advanced commercial technology, such as in information and communication industries for the defence sector. Thus, the importance of future R&D in the European defence industry highlighted in this study should be seen in the context of overall R&D. One recommendation would be to promote increases in R&D investment and intensify efforts at collaboration, within European industry in general.

The European strategy for a stronger and more competitive European defence industry has already made suggestions to Member States on how they could pool demand and R&D investment and supporting legislation to improve the functioning of the internal market for defence products has been introduced. It is recommended that further measures be promoted by the Commission to encourage coordinated activities, by Member States, the EDA and the security related research programmes of FP7[176]. The Commission can play important roles in facilitating dialogue and debate, encouraging Member State collaboration and making clear the importance of considering the health of the civil sector R&D in the modern global defence market[177]. Joint research in areas such

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[174] EC(2007): COM(2007) 764 final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Strategy for a Stronger and More Competitive European Defence Industry, Brussels 5/12/2007.

[175] Though this is contested by some commentators who see 'spin in' from the civil sector becoming increasingly important and 'spin off' from the defence sector waning. This cross-fertilisation is also important for Europe's Lisbon Strategy for Growth and Jobs EC(2005): COM(2005) 330 final – Communication from the Commission to the Council and the European Parliament: Common actions for Growth and Employment – The Community Lisbon Programme, Brussels 20/7/05, available at Lisbon Strategy Website: http://ec.europa.eu/growthandjobs/documentation/index_en.htm.

[176] Indeed Article 163 (a)1 of the Lisbon Treaty suggests that there may be an opportunity for the Commission to have a greater input into how R&D is funded and implemented. Article 163 (a)1: "the Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry,..."

[177] Article 28 a(1): "Member States shall undertake progressively to improve their military capabilities. The Agency in the field of defence capabilities development, research, acquisition and armaments (hereinafter referred to as "the European Defence Agency") shall identify operational requirements, shall promote measures to satisfy those requirements, shall contribute to identifying and, where appropriate, implementing any measure needed to strengthen the industrial and technological base of the defence sector, shall participate in defining a European capabilities and armaments policy, and shall assist the Council in evaluating the improvement of military capabilities".

as electronics, communications, and nanotechnology in the civil sector is likely to have knock on consequences for defence oriented R&D.

Promoting understanding of the changing nature of the international defence industry

The international defence industry has undergone considerable change, with considerable consolidation and internationalisation (though companies still rely on domestic support through procurement and support for exports). The costs of high technology R&D, combined with smaller national production runs led to the pursuit of economies of scale through international collaboration, the development of international supply chains and industrial restructuring. At the same time civil innovations are increasingly 'spinning in' to arms production, increasing the links with the civil sector and bringing in new types of company. Companies in the electronics and IT sectors that in the past had little involvement with arms production are finding themselves part of the defence industrial base. This trend could lead to a reduction in the defence specialisation of all but the major contractors and further cuts in defence spending resulting form the global economic downturn could lead to further consolidation[178]. Certainly the EU defence sector is likely to see further restructuring and consolidation of the industry, with ever more complex cross-border supply chains.

In order to prepare for the potential impacts of these developments, it would be valuable to better understand the changing nature of the industry and its relation to the civil sector and the EC should encourage further research. At the same time the EC should encourage Member States to cooperate with EDA and industry to plan necessary restructuring and consolidation in areas of overcapacity and to plan the application of structural funds to assist regions to move from dependence on defence production[179]. As highlighted in 12.4, the BRICKs have not been seen as an important competitive threat and they provide potentially important purchasing or partnering opportunities, to lower production costs, acquire niche technology and access markets. The EC might consider cooperating with the EDA in establishing a defence industrial monitoring service and organising, together with ASD, conferences and forums with industries and customers from BRICK countries, such as India, South Korea and Brazil.

Promoting the establishment of a level playing field

Offsets are an important component of trade in the international defence market. As seen in the individual country studies many of the BRICKS are increasing their offset requirements. This presents a significant challenge for European industry, as offset demands can affect competitiveness in the event that other competitors can offer more generous offset arrangements. Consequently, "there is a danger that buying states are less concerned about the competitiveness of the product than the attractiveness of the proposed offsets"[180].

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[178] Skons and Dunne (2008).

[179] Efforts at further collaboration or consolidation should probably be aimed at the land or naval sector, rather than the aerospace sector. Cross-border, cross-firm collaborations in the land or naval sectors have not been as successful as those in aerospace.

[180] EC(2007): COM(2007) 764 final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Strategy for a Stronger and More Competitive European Defence Industry, Brussels 5/12/2007.

This suggests that the EC should advise on the benefits of establishing a 'level playing field' internationally with more equitable, non-discriminatory procurement regimes, by lobbying against offsets and emphasising the opportunities offered by co-production and cooperative industry activity. Developing a Code of Conduct through discussions with the US and other major competitors would be extremely valuable.

Certainly, to meet the challenges identified it would be valuable for the EC at this stage to facilitate discussions between Member States and industry to encourage collective behaviour in creating a 'level playing field', continuing developments within the EU and promoting developments outside the EU. Creating an EDEM, with stringent implementation of procurement and transfer directives, possibly complemented by an initiative on Security of Information might be a good starting point, followed by dialogue with Member States on how to come to a more harmonised arms export policy, using the Code of Conduct, and between the US and Member States on a coordinated approach to arms export control linked to the Arms Trade Treaty initiative that the UK and French governments support and is in the process of negotiation within the UN.

12.5.3 Summary of general recommendations

Table 12.6 presents a summary of the preceding discussion with the main recommendations for EU policy.

Table 12.6 Summary Recommendations

Recommendation	Description
Promote provision of improved data and analysis	• Encourage production of better data on procurement and trade • Encourage provision of better data on defence FDI • Encourage further analysis with the improved data
Promote investment in European R&D	• Encourage increases in EU R&D expenditures, civil and defence (stressing the important impact of civil R&D on defence), in order to keep up with the US and maintain a competitive advantage over emerging countries • Facilitate dialogue and promote collaboration in R&D within Europe and between Europe and other countries, including the BRICKs
Promote understanding of the changing nature of the defence industry	• Encourage further analysis of the international defence market • Encourage further debate and dialogue between stakeholders over the future of the EU defence industry
Promote the establishment of a level playing field internationally	• Encourage the creation of more equitable and non-discriminatory procurement processes internationally • Work towards the elimination of offsets • Encourage collaboration and cooperation internationally • Facilitate the development of a code of conduct linked to the attempts to implement an international Arms Trade Treaty

12.5.4 Specific recommendations.

Context

As argued earlier government policy, along with other key economic and organisational factors, is a clear driver for the defence sector, both in terms of set up and subsequent development. This can mean that the behaviour of the industry does not reflect commercial and economic realities, making specific recommendations difficult to design and clearly contingent and historically specific.

In many cases the success of the EU contractors results from a failure of the US to meet the needs of the BRICK countries in terms of knowledge transfers and the provision of vital central processing information for advanced systems.

A major concern is that the EU market has overcapacity in most of the systems considered and, as argued, is likely to see future consolidation. Exports provide a means of retaining a larger industry after restructuring, but if this is not coordinated at the EU level it could lead to implicit subsidies by Member States and the maintenance of uneconomic programmes.

Realistically EU contractors will need to provide their most advanced systems to be able to win orders subject to national export controls, the EU Code of Conduct on the Export of Arms and trade embargoes. It would be useful if this were not left to individual contractors and instead considered at EU level, along with the implications for the EU industry as a whole. In addition, Member States should consider whether collaborative projects could be the best way to access these markets in the face of competition from non-European countries.

Aerospace

Clearly the aerospace sector in the BRICKs provides great scope for the EU contractors and many member states are presently taking advantage of opportunities. The EU contractors are clearly technologically superior to all but the US in the world market.

While only Russia has comprehensive capabilities, Brazil has niche capabilities in aircraft while South Korea has capability in components. India and China are building up indigenous capacity. There is some evidence that Russia is interested in joint ventures, while all other BRICKs are very clearly interested. In particular the major markets are likely to be in India and China as the former builds up indigenous capacity and the latter develops capacity should the arms embargo be removed. Thus all countries provide opportunities which individual contractors are already investigating opportunities.

Recommendations:

- Develop an EU wide policy on the technology transfers involved in deals;
- Make offsets deals transparent and encourage cooperation between contractors;
- Encourage member states to deal with all BRICKs countries in a transparent and cooperative manner;
- Assist in knowledge sharing between EU contractors on internationalisation of supply chains and the potential for cooperation;
- Support EDTIB to develop UAV technology; explore possibility of collaborating with/ supporting Russia to develop technology;
- Support EDTIB to develop tiltrotor technology and improvements in speed for helicopters;

- Help EU helicopter defence industry to exploit the gaps (exports or collaborations) in the capabilities of the BRICK countries (excluding Russia) to independently develop and manufacture military helicopters.

Land equipment

There is less potential for export and collaborative agreements in land systems, because of their less technical nature. Brazil has some potential, Russia none, but India has plenty as it moves from past Russian dependence and if the embargo is lifted so will China. South Korea will provide some opportunities, but the US is likely to benefit most.

Recommendations:

- Make offsets deals transparent and encourage cooperation between contractors;
- Encourage member states to deal with all BRICKs countries in a transparent and cooperative manner;
- Investigate possible cooperation between EU and US contractors;
- Support export of latest developments (elaborated and guided ammunitions; networked artillery systems with counter-battery radars) where appropriate to BRICK countries (who struggle or lag behind leaders). Explore avenues for collaboration with respect to more conventional equipment;
- Target India and Brazil as tank export markets and for exploring possibilities for collaboration (with respect to tanks);
- Explore opportunities for EU firms to collaborate with South Korean armoured vehicle/tank producers.

Naval

All the BRICK countries have access to the sea and, in most cases, have long coastlines. BRICK countries have come to realise the strategic importance of protecting and controlling the coastline and surrounding waters. There is considerable potential for naval exports and cooperative arrangements (in platforms and hull/mission equipment) in a number of the BRICKs, in particular Brazil and India, and potentially China. Contractors in Germany and France are already successfully exploiting opportunities.

Recommendations:

- Coordinate the EU activities in these countries and try to develop a cooperative approach across member states, which may involve consolidation;
- Coordinate export orders and share information;
- Make offsets deals transparent and encourage cooperation between contractors;
- Assist in knowledge sharing between EU contractors on internationalisation of supply chains and the potential for cooperation;
- There may be a benefit to negotiating agreements at the EU level, given that there are several different EU producers competing in this domain;
- Focus on India and Brazil for developing collaborative ventures. Explore opportunities for exports (although this may be limited due to desire of BRICK countries to develop own industry);
- Explore potential to collaborate on, or export, advanced electronics technology to Russia where appropriate;
- Support EDTIB to seek out export and collaboration opportunities in relation to conventional submarines, in particular Brazil and India.

Missiles

Only a few major suppliers in the US, the EU and Russia are fully capable of delivering missiles compatible with associated hardware and software platforms. Thus, the ability of the BRICK countries to compete in this domain is limited to niche areas and simple products/systems.

Recommendations:

- Develop an EU wide policy on the technology transfers involved in deals;
- Make offsets deals transparent and encourage cooperation between contractors;
- Encourage member states to deal with all BRICKs countries in a transparent and cooperative manner;
- Assist in knowledge sharing between EU contractors on internationalisation of supply chains and the potential for cooperation;

Electronics/optronics

In this domain, the BRICK countries are behind EU and US producers. Russia is the most advanced of the BRICK countries, but some gaps exist in its capabilities. Russia cooperates with Western producers to fill these gaps and is investing in order to fill these gaps in the long term. There is considerable potential for collaboration in electronics and optronics. Exports are likely to involve technology transfer. The main export markets are likely to be India, Brazil and China. There is also great potential for EU contractors to include BRICKS in their international supply chains. The main countries here are South Korea and China, the former having advanced producers. Of course, any exports to or collaboration with China is dependent on the arms embargo being lifted.

Recommendations:

- EU coordination in the major BRICK markets to prevent competition between EU contractors;
- Coordinate export orders and share information;
- Develop an EU wide policy on the technology transfers involved in deals;
- Assist in knowledge sharing between EU contractors on internationalisation of supply chains and the potential for cooperation;
- Support EDTIB export electronics and optronics to India and Brazil (and to a lesser extent, South Korea), and to invest in domestic design and production capabilities, with a view to developing the role of Indian & Brazilian facilities in the supply chain.

Potential for exports and/or collaboration

Table 12.7 summarises a subjective assessment of the areas which are likely to be of greatest interest to EU defence industry stakeholders and offer the greatest potential for exports and/or collaboration. The table presents these by domain by BRICK region. A score of 1 represents the greatest potential (relative to the other countries) and score of 5 represents the smallest potential. The scores for China are in brackets in recognition of the EU embargo that is currently in place.

Table 12.7 Summary of potential for exports and/or collaboration

Domain	Brazil	China	India	Russia	South Korea
Aerospace	3	(1)	1	5	3
Land	3	(1)	1	-	3
Naval	1	(1)	1	-	-
Electronics/optronics	1	(3)	1	5	3

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South Korea

http://www.dapa.go.kr – Korean defence department website in English focussing on legislation, R&D and industrial policy.

http://www.kdia.or.kr – Korean Defence Industry Association (KDIA) - publications, data, company links, etc.

http://www.kida.re.kr – publishes details of Korea's Defence Budget 2002-2007.

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14 Annex 1 - Data Sources

14.1 Introduction

In the process of producing the report, a number of different data sources have been used in order to present indicators relating to different areas of competitiveness. This multitude of sources reflects a difficulty in obtaining consistent and comparable data on the defence sector, as no single unifying source currently exists.

Furthermore, the following caveats should be noted:
- data on arms production are not shown separately in the official industrial statistics, since the arms industry is not treated as an industrial sector of its own but cuts across several industrial sectors, such as aircraft and spacecraft, chemicals, motor vehicles, transport equipment, and weapons and ammunition;
- state secrecy rules often limits disclosure;
- available data are based on different types of surveys of the industry, conducted by governments, industry associations and research institutes;
- company practices of releasing data on their defence production vary widely;
- aggregate data at the national level of the output and/or employment in arms production are provided by a few governments, although not always on a regular basis. Some countries have national defence industry associations, which also provide such data for their member companies;
- data on national arms production are difficult to interpret and must be treated with caution;
- the difficulties of obtaining data vary between countries - for some, like China, very little data are available on the defence sector, and the available data have a rather significant margin of error.

The next section presents a summary of the main findings by data source, while the final section provides a detailed summary by type of indicator.

14.2 Summary of data sources

Table 14.1 Summary of generic data and information sources used or investigated as part of the study

Name	Website	Details
Bonn International Conversion Centre (BICC)	http://www.bicc.de/	Global arms industry employment published in the BICC conversion surveys on Global Disarmament, Demilitarisation and Demobilisation (latest edition 2005). Data covers armed forces personnel and industry employment, major companies and arms

Name	Website	Details
		transfers, arms control and disarmament agreements.
Business Monitor International (BMI)	http://www.businessmonitor.com/bmo/defence/	BMI produce a quarterly Defence and Security Industry Report for all BRICKs and European countries. It is available from the British Library and online, although either way there is a charge.
Global Security	http://www.globalsecurity.org	Provides a brief defence industry summary of each country, including historical development, and a summary of leading companies active in that country, including links. More descriptive source than database.
International Institute for Strategic Studies (IISS)	http://www.iiss.org/	Policy documents and strategic analysis. Also publishes an annual report called "The Military Balance", which includes area-specific chapters on recent developments and recent data on government budgets, expenditures, numbers of armed forces (by type), and equipment inventories.
Jane's Defence	http://www.janes.com/news/defence/	Recent facts, figures and news by area of armed forces (not country specific and not a data source).
Stockholm International Peace Research Institute (SIPRI)	http://www.sipri.org/	Chapters of annual yearbook and policy documents provide a good time series database for industry structure, statistics, official web addresses, etc. Indicators covered include government military expenditure, arms transfer ($ volume measures, by country or weapon category), and data on the world's largest arms-producing companies.
US CIA	http://www.cia.gov	Research publications with links to US Department of Defence publications – not a data source.
World Bank/UNCTAD FDI database and report	http://stats.unctad.org/fdi/ http://www.unctad.org/en/docs/wir2008_en.pdf	Foreign direct investment inflows and outflows by country and sector (latest year 2008). Detail lacking to identify defence industry, however.
World Military Expenditures and Arms Transfers	http://www.state.gov/t/vci/rls/rpt/wmeat/	Collated by the US Department of State, includes a database containing annual military expenditures, arms transfers, armed forces numbers, selected economic data, and relative indicators consisting of various military-economic ratios, eg military expenditure as % of GDP. Time series available: 1995-2005.

14.3 Summary of indicator findings

14.3.1 Structure of the defence market

Production

Total national defence production: no good consistent data readily available for any of the BRICKs countries. Thus, even less for production by sub-sector.

Employment

Total employment in defence production. The BICC Conversion Survey provides rough magnitudes of such employment. It is not produced any longer, but data for earlier years can be obtained from the volumes that were published previously. Employment by sub-sector are not readily available for any of these countries.

Size distribution

Size distribution of companies: not readily available, but SIPRI has information on the top 100 and some other large companies

Trade

Total arms exports and arms imports: SIPRI provides data online for all countries. These are not for financial values, but indicate the volume of technology transfers. But they can be used to make comparison between the BRICKs countries and EU.

Main companies

Principal defence firms. Can be identified for all BRICKs countries. Data on the arms sales, total sales and total employment (defence and non-defence) are also usually available for the major defence companies.

Government budget / expenditure

Value of the defence budget are available from SIPRI.
Number of armed forces are available from IISS.

Access to market / FDI

Some information available about all BRICKs countries, but needs to be compiled from a range of sources (eg defence journals, news items and research reports). No single source provides such information in a readily accessible form.

Data on foreign direct investment are available from the World Bank/UNCTAD World Investment Report, but is not detailed enough to separately identify the defence industry. This means any attempt to construct such a series must be compiled from a range of sources.

14.3.2 Drivers

Defence and industrial policy

Something can be said about all the BRICKs countries with research. There is no up-to-date information source easily available, however.

Regulatory and framework conditions
Information is available through detailed literature and web searches.

Defence programmes.
Information is available through detailed literature and web searches.

Production processes in defence production.
Needs detailed search – no single source available.

Intra-industry relations in the defence industry
Needs detailed search – no single source available.

Organisation of the defence industry
A lot of information available, but needs to be compiled from a variety of sources.

14.3.3 Inputs

Skill profile of employment.
No known hard data sources, so must rely on the general level of employment skills in these countries.

Capital for the defence industry.
No single source, but should be possible to find out BRICKs countries.

Intermediate goods and services.
Difficult to find out specifically for defence production, but could be based on studies on the overall industry in these countries.

Knowledge and technology
Some comment can be made on the type of military systems developed and produced in the respective countries.

14.3.4 Performance

Output of the defence industry
Information available for most countries, though may be difficult to get. Available for Russia (on the vpk website, in Russian), and probably also for Brazil, India (In the MoD Annual Report) and South Korea (in their Defence White Paper), both of which may be available on the Internet, otherwise at SIPRI. Not available for China.

Employment
BICC until some years ago.
Productivity
Unlikely to find hard data – possibly for India, since the Indian government is publishing all sorts of reports on the defence industry. However, these would probably have to be ordered from India, unless a contact person in India is available. However, there are also

more general research reports about the state of the defence industry in some of these countries.

Arms trade
SIPRI has data that could indicate the general trend.

Profitability
SIPRI has data for some of the major companies, but not for the overall defence industry,

Defence industrial structure
Is generally known, but requires going through a variety of sources. Not likely to be possible to identify a recent trend.

Investment in the defence industry
Trend data probably difficult to get.

Government defence spending / budget
SIPRI data are available.

Number of the armed forces
IISS data.

14.4 SIPRI data on trade with China

The following tables are taken from the SIPRI database and concern trade with China, showing the type of domain involved and the period over which this took place.

Transfers of major conventional weapons: sorted by supplier. Deals with deliveries or orders made for year range 1995 to 2008

Note: The 'No. delivered/produced' and the 'Year(s) of deliveries' columns refer to all deliveries since the beginning of the contract. Deals in which the recipient was involved in the production of the weapon system are listed separately. The 'Comments' column includes publicly reported information on the value of the deal. Information on the sources and methods used in the collection of the data, and explanations of the conventions, abbreviations and acronyms, can be found at URL <http://armstrade.sipri.org/>. The SIPRI Arms Transfers Database is continuously updated as new information becomes available.

(i) Chinese imports from the EU

Supplier/ recipient (R) or licenser (L)	No. ordered	Weapon designation	Weapon description	Year of order/ licence	Year(s) of deliveries	No. delivered/ produced	Comments
France							
R: China	(6)	DRBV-15 Sea Tiger	Air/sea surv radar	1986	1987-1999	(6)	For 2 Luhu (Type-052) and 2 Luhai and modernization of 2 Luda-1 (Type-051) destroyers; probably produced in China
	2	DUBV-23	ASW sonar	(1990)	1994-1996	2	For 2 Type-052 (Luhu) frigates produced in China; produced in China as SJD-7
	2	DUBV-43	VDS sonar	(1990)	1994-1996	2	For 2 Type-052 (Luhu) frigates produced in China; produced in China as SJD-7
	(25)	SS-12	ASW sonar	(1991)	1993-2001	(25)	For 25 Type-037/1 (Haiqing) patrol craft produced in China
	1	DUBV-23	ASW sonar	(1996)	1999	1	For 1 Type-051B (Luhai) frigate produced in China; produced in China as SJD-7
	4	PC-2.5	Diesel engine (SH)	(2001)	2004	4	For 2 Fuchi support ships produced in China; designation uncertain
	4	PC-2.5	Diesel engine (SH)	(2006)	2008	4	PC-2.6 version; for 1 Type-071 (Yuzhao) AALS produced in China
L:	. .	Crotale	SAM system	(1978)	1992-2008	(34)	Produced in China as HQ-7 (FM-80) and FM-90
	. .	R-440 Crotale	SAM	(1978)	1990-2008	(1045)	R-440N version; for Type-052 (Luhu), Type-051B (Luhai) and modernized Type-051 (Luda-1) destroyers and Type-054 (Jiangkai) and Type-053H3 (Jiangwei-2) frigates; Chinese designation HQ-7 (US designation CSA-N-4)
	. .	AS-565SA Panther	ASW helicopter	(1980)	1989-2008	(28)	AS-365F version; Chinese designation Z-9C Haitun
	(12)	SA-321H Super Frelon	Helicopter	(1981)	1989-1997	(12)	Chinese designation Z-8
	(14)	Castor-2	Fire control radar	(1986)	1994-2002	(14)	For 2 Luhu (Type-052), 1 Luhai and modernization of 3 Luda-1 (Type-051) destroyers and for 8 Jiangwei-2 frigates; probably

							assembled/produced in China; for use with Crotale EDIR (Chinese designation HQ-7) SAM system
	. .	AS-365/AS-565 Panther	Helicopter	1988	1992-2008	(58)	Chinese designation Z-9A or Z-9A-100 Haitun and Z-9B/G; incl WZ-9 anti-tank version
	(29)	PA-6	Diesel engine (SH)	(1990)	1991-2005	29	For 2 Type-054 (Jiangkai-1) frigates and 7 Type-037/2 (Houjian or Huang) FAC(M) produced in China
	. .	AS-350/AS-550 Fennec	Light helicopter	(1992)	1995-2008	(47)	Chinese designation Z-11; incl Z-11W armed version
	(12)	Compact 100mm	Naval gun	(2001)	2004-2007	10	For 2 Type-051C and 4 Luyang (Type-052) destroyers and 6 Jiankai (Type-054) frigates produced in China
Germany (FRG)							
R: China	14	MTU-1163	Diesel engine (SH)	(1987)	1994-2005	14	For 4 Luyang, 1 Luhai and 2 Luhu destroyers produced in China
	(4)	MTU-493	Diesel engine (SH)	(1989)	1999	4	For 1 Type-039 (Song) submarine produced in China
	. .	MTU-883	Diesel engine (AV)	(1989)	1998-2008	(220)	For Type-98 (ZTZ-98) and Type-99 (ZTZ-99) tanks produced in China; Incl 150HB883 version
	(50)	BF-12L413	Diesel engine (AV)	(1995)	1996-2000	(50)	For PZL-45 self-propelled gun produced in China; BF12L413FC version; probably assembled/produced in China
L:	(4000)	BF8L	Diesel engine (AV)	(1981)	1982-2006	(4000)	For YW-531/Type-63, YW-531H/Type-85, YW-534/Type-89, Type-90/YW-535, WZ-551 and WMZ-551 APC (incl IFV and other versions), Assaulter tank destroyer and Type-85 self-propelled gun produced in China; BF-8L413 and BF-8L513 version
	(48)	MTU-396	Diesel engine (AV/SH)	(2000)	2001-2006	(48)	For 12 Type-039G (Song) submarines produced in China; probably produced in China
Italy							
R: China	(17)	RTN-20X Orion	Fire control radar	(1985)	1991-2001	(17)	For 2 Luhu, 1 Luda-3 and 1 Luhai destroyers and 6 or 7 Houjian FAC produced in China; Chinese designation Type-347G
UK							
R: China	140	Spey	Turbofan	(1988)	1988-2006	(140)	For JH-7 combat aircraft produced in China (including for prototypes); incl some 80 ex-UK
	(6)	Searchwater	AEW aircraft radar	1996	1999-2001	(2)	$62-66 m deal; for Y-8 AEW and MP aircraft; no. may be up to 8; uncertain if all delivered or used in operational AEW aircraft

L:	. .	Spey	Turbofan	(1988)	2007-2008	(30)	For JH-7 combat aircraft produced in China; Chinese designation WS-9

(ii) South Korean and Indian exports of ships

Recipient/ supplier (S) or licenser (L)	**No. ordered**	**Weapon designation**	**Weapon description**	**Year of order/ licence**	**Year(s) of deliveries**	**No. delivered/ produced**	**Comments**
Australia							
S: South Korea	1	Delos	Tanker	2004	2006	1	AUD50 m ($35 m) deal; modified for AUD60 m in Australia to support ship; Australian designation Sirius
Bangladesh							
S: South Korea	1	Sea Dragon	OPV	1995	1997	1	Bangladeshi designation Madhumati
	1	DW-2000H	Frigate	1998	2001	1	$100 m deal; Bangladeshi designation Bangabandhu
	2	Sea Dolphin	Patrol craft	2000	2000	2	Ex-South Korean; aid
India							
L:	3	Samar	OPV	1991	1996-1998	3	For coast guard
Indonesia							
S: South Korea	1	LPD-122m	AALS	(2000)	2003	1	Part of $50 m deal; Indonesian designation Dalpele
L:	4	LPD-122m	AALS	2004	2007-2008	2	$150 m deal; incl 2 produced in Indonesia; incl 1 for use as command ship; Indonesian designation Makassar; delivery 2007-2010
Kazakhstan							
S: South Korea	3	Sea Dolphin	Patrol craft	2005	2006	3	Ex-South Korean; aid
Philippines							
S: South Korea	5	Sea Dolphin	Patrol craft	1995	1995-1996	5	Ex-South Korean; aid; Philippine designation Batilo
	2	Sea Dolphin	Patrol craft	(2004)	2006	2	Ex-South Korean

Venezuela							
S: South Korea	1	Ciudad Bolivar	Support ship	1999	2001	1	$57 m deal; Venezuelan designation Ciudad Bolivar

Recipient/ supplier (S) or licenser (L)	No. ordered	Weapon designation	Weapon description	Year of order/ licence	Year(s) of deliveries	No. delivered/ produced	Comments
Mauritius							
S: India	1	SDB Mk-5	Patrol craft	(2005)	2006	1	Ex-Indian
Seychelles							
S: India	1	SDB Mk-5	Patrol craft	2004	2005	1	Ex-Indian (but only 3 years old)
Sri Lanka							
S: India	1	Sukanya	OPV	2000	2000	1	Ex-Indian; for use against LTTE rebels; plan for 1 more cancelled after Indian change in policy towards Sri Lanka-LTTE conflict; Sri Lankan designation Sayura
	1	Vikram	OPV	2007	2007	1	Ex-Indian; lease or gift; Sri Lankan designation Sagara

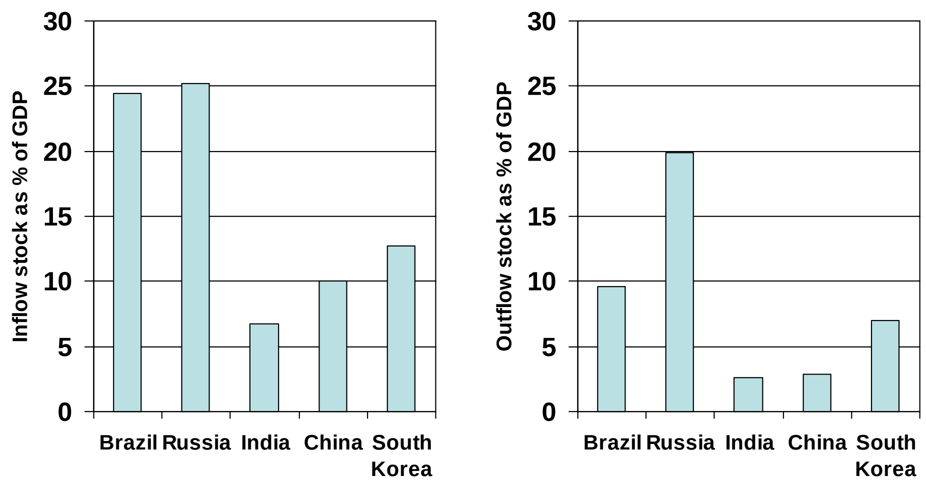
(iii) Russian exports to Brazil

Recipient/ supplier (S) or licenser (L)	No. ordered	Weapon designation	Weapon description	Year of order/ licence	Year(s) of deliveries	No. delivered/ produced	Comments
Brazil							
S: Russia	12	Mi-35M/Hind	Combat helicopter	(2008)			Contract not yet signed

14.5 BRICKs FDI data

As mentioned in Chapter 4, all that can be inferred from the data is, mostly as expected, that the BRICKs are largely net recipients of FDI as they are still in development stage compared to European counterparts, and that this pattern is probably repeated in the defence sector as well, although certain limitations may be imposed due to national security. The pattern of total FDI stocks for 2007 (the most recent year available in the UNCTAD report) is shown in Figure 14.1.

CHART 14.1: BRICKS TOTAL FDI STOCKS (2007)

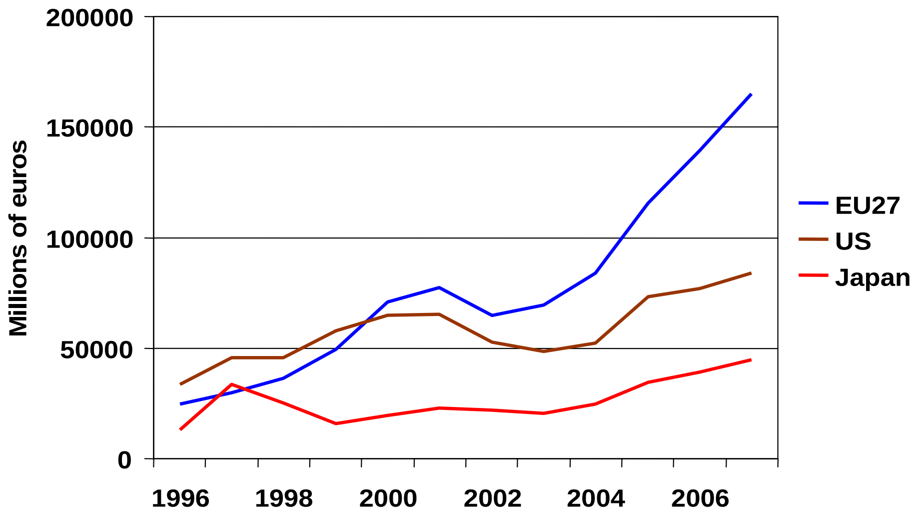


Data Source: UNCTAD WIR (2008)

Looked at across time, for all BRICKs the stock of FDI has increased as a % of GDP – the exception here is China, where the pace of GDP growth has out-stripped FDI inflows. Outflows have grown more modestly, with Russia showing the sharpest increase over the 1995-2007 period.

There is however, another source of FDI data which covers EU Member States, namely the Eurostat FDI database. These data have been investigated and, although detailed sectoral data is sparse and so specific military-related FDI cannot be presented, bilateral flows are available. The data are available in current price euros, and so interpretation could be distorted through exchange rate and price effects. However, presenting the raw data does give some idea of magnitude and rate of change, and various experimentation with constant exchange rate and price adjustments do not change the overall picture presented in Figure 14.2, which shows the EU27 overtaking the US as the predominant investor in the BRICKs in 1999 and widening the gap thereafter.

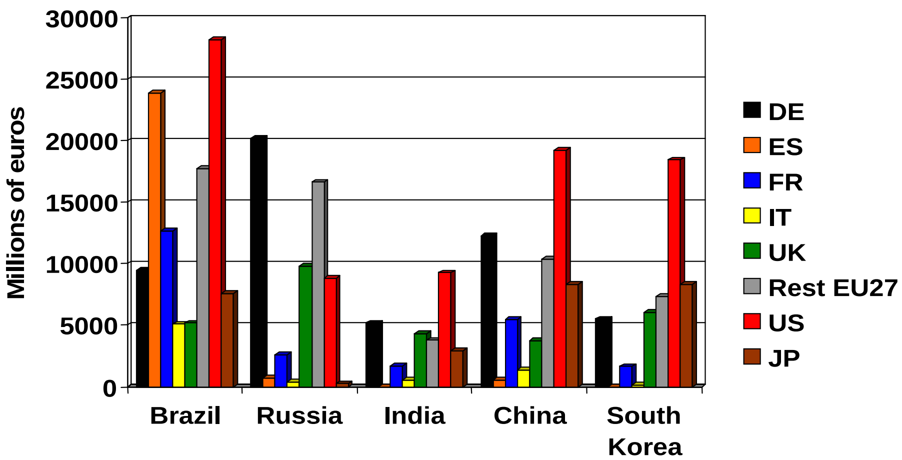
FIGURE 14.2: BRICK FDI STOCKS BY ORIGIN



Source: Eurostat

If we take the BRICKs individually and look to see how FDI stock differs by Member State for 2007, which is arguably the most complete and up-to-date / recent data available, the following picture emerges, as shown in Figure 14.3. Again, it must be stressed that these are FDI totals, spread across all activities. Nonetheless, the links between some Member States and the BRICKs are evident, for example Spain and Brazil, Germany (and a few other smaller Member States such as Sweden and the Netherlands) and Russia, the UK and India, France and China / Brazil, etc. The dominance of the US over all Member States in Brazil, China and South Korea is also clear.

FIGURE 14.3: BRICK FDI STOCK BY COUNTRY OF ORIGIN (2007)



Source: Eurostat

15 Annex 2 - Overview of International Framework Conditions

15.1 International Regulatory Conditions

The principle international regulatory conditions of importance to this study and introduced in the main report are summarised as follows.

15.2 The United Nations Arms Embargo

Mandated under the UN Charter to maintain international peace and security since 1945[181], the United Nations Security Council has the power to use sanctions as an international response, stronger than a diplomatic note but falling short of a declaration of war, to achieve its objective of peace and security. The goal of each sanction is often more specific, referring to either countering threats against global security, strengthening legitimate government authority or achieving peaceful political settlement of a violent armed conflict through conflict management[182].

The principle sanction adopted by the Security Council is the imposition of an arms embargo on conventional military equipment and on dual use technology, for example to prevent countries obtaining nuclear capabilities. Restrictions on the supply of arms and related technology can be increased in scale and scope to affect other areas of economic activity in the target state. At present, none of the BRICKs countries or European Member States covered in this study has any sanctions placed upon it by the United Nations. However, their involvement in negotiating embargoes on other countries may have repercussions for relationships between EU Member States and BRICKs countries, where countries disagree on policy and/or suspect each other of violating embargoes[183].

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[181] UN Charter available at: http://www.un.org/aboutun/charter/

[182] SIPRI & SPITS (2007): United Nations Arms Embargoes: Their Impact on Arms Flows and Target Behaviour, report by SIPRI Arms Transfer Project and Special Program on the Implementation of Targeted Sanctions (SPITS) Department of Peace and Conflict Research, Uppsala University, 2007, available from: http://www.sipri.org

[183] For example, China views the current EU arms embargo as a significant obstacle to future economic cooperation with the EU in many military and economic areas, as set out in its "Policy Paper on the EU"; (Xinhua [New China News Agency], October 13, 2003, available at: http://news.xinhuanet.com/english/2003-10/13/content_1120500.htm), while Chinese and Russian involvement with Iran (an embargoed nation) in the Shanghai Cooperation Organisation may make the US reluctant to export or share technology with EU Member States and companies if there is a risk that technology is transferred to China and/or Russia. This is issue is discussed well in: CRS (2006): European Union's Arms Embargo on China: Implications and Options for US policy, CRS Report for Congress, Updated January 26, 2006, available at: http://italy.usembassy.gov/pdf/other/RL32870.pdf

15.3 United Nations Register of Conventional Arms (UNROCA)

Established in 1991, by Resolution 46/36 of the United Nations General Assembly[184], the UNROCA is a voluntary mechanism to which nations are invited to report their imports and exports of certain types of conventional weapons on an annual basis. The goals of the UNROCA are:

1) implementing new confidence-building measures;
2) the reduction of arms transfers;
3) addressing the problem of the illicit and covert arms trade, including it effects on human rights;
4) reducing the burden placed by arms acquisitions on countries economies, and
5) the reduction of military expenditures.

Although the UNROCA has been criticised for its limited success[185] (primarily due to low regular participation by many states, its limited applicability to major conventional weapons such as tanks and aircraft and not small arms which are equally destructive, minimal reporting requirements regarding export and customer details and its voluntary status), the UNROCA is an important forerunner to other regional and national regulatory conditions that have a more direct impact on the activities of the defence industry (for example, the EU Code of Conduct).

The success of the UNROCA and other similar agreements depends principally on the participation and transparency of individual nation states. Political priorities can therefore be important drivers for the defence sector at all levels.

15.3.1 Wassenaar Arrangements

The Wassenaar Arrangements (WA) on Export Controls for Conventional Arms and Dual-Use Goods and Technology is the post Cold-war successor[186] to the Coordinating Committee on Multilateral Export Controls (COCOM) established during the Cold war to limit Western high-technology exports to strategic adversaries. Its objective is to contribute to regional and international security and stability by promoting transparency and greater responsibility in transfers of conventional arms and dual use goods and technologies, thus preventing destabilising accumulations of arms.

WA Participating States[187] are requested to maintain national export controls, implemented via national legislation, on listed items (the Munitions List contains 22 entries of products designed for military use). Participating States have also agreed to report on transfers and denials of specified controlled items to destinations outside the

[184] Available at: http://disarmament.un.org/cab/register.html.
[185] See: Wezeman, S.T. (2003): The Future of the United Nations Register of Conventional Arms, SIPRI Policy Paper No.4, August 2003.
[186] See the Wassenaar Arrangements website for further details at: http://www.wassenaar.org/.
[187] Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and United States.

Arrangement, and to exchange information on sensitive dual use goods and technologies, guided in each case by best practices or guidelines.

Within the WA, participating states should benefit from the additional transparency offered and responsibilities undertaken by other participants, therefore easing controls on transfers of defence related goods and technologies between some BRICKs countries (Russian Federation and Republic of Korea) and key markets in Europe and the US. For BRICKs countries outside the WA, such as Brazil, China and India, the WA potentially represents a barrier to further cooperation, technology transfer and access to participating markets.

15.4 European Regulatory Conditions

15.4.1 EU Defence Equipment Policy (EU "Defence Package")

Adopted in December 2007, the EU Defence Package was introduced to prevent the further "fragmentation of the European defence market and divergent national policies… [that]… hamper innovation, competitiveness and, ultimately, weaken the European Security and Defence Policy (ESDP)"[188].

The Defence Package is composed of three elements:

1) Communication "A Strategy for a Stronger and more Competitive European Defence Industry", COM(2007) 764 final[189];
2) A Proposal for a Directive on Intra-EU transfers of Defence Products, COM(2007) 765 final[190]; and
3) A Proposal for a Directive on Defence Procurement, COM(2007) 766 final[191].

Each of the above measures is focussed on improving the functioning of the internal market for defence products through increased transparency, standardisation of products where possible and clear and open procurement systems. The purpose is to contribute to the progressive establishment of a European Defence Equipment Market (EDEM); where suppliers established in one Member State can serve, with out restrictions, all Member States. Thus, the defence package represents a significant driver of defence market reform and of it future competitiveness compared to other major defence markets, specifically that of the United States.

Under Article 296 of the Treaty of the European Community (TEC), Member States are able to derogate from the rules of the internal market for the procurement of "arms, munitions and war material". According to the European Court of Justice (ECJ), this derogation can only be applied under community rules where certain conditions are met:

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188 EC(2007): Press Release IP/07/1860 – Commission Proposes New Competitive Measures for Defence Industries and Markets, Brussels, 5/12/2007.

189 EC(2007): COM(2007) 764 final – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Strategy for a Stronger and More Competitive European Defence Industry, Brussels 5/12/2007.

190 EC(2007): COM(2007) 765 final – Proposal for a Directive of the European Parliament and of the Council: on Simplifying Terms and Conditions of Transfers of Defence-related Products within the Community, Brussels 5/12/2007.

191 EC(2007): COM(2007) 766 final - Proposal for a Directive of the European Parliament and of the Council: on Defence Procurement, Brussels 5/12/2007'

- the product must safeguard the essential security interests invoked; and
- Member States must assess, on a case-by-case basis, whether defence contracts are covered by the exemption.

National procurement laws vary by Member State; however, the objectives are consistent; to favour domestic purchases in order to safeguard employment, maintain national pride and secure technology and innovation advances within that domestic economy. By preserving a manufacturing capability in a specific area such as aeronautics, for example, capabilities and skills can be maintained[192].

The proposed Directive on Defence Procurement establishes new rules to limit the use of Article 296 to exceptional cases, as stipulated by the European Court of Justice. The proposed Directive on Intra-EU transfers focuses on simplifying the licensing process for defence transfers within the EU and establishes new rules to enable the opening up of supply chain opportunities to competitive SME tenders, helping to make the European market more dynamic.

On 16 December 2008, the European Parliament endorsed the proposed Directive on intra-EU transfers of Defence Products[193]. Similarly, on 14 January 2009, the Parliament approved a first reading of the proposed Directive on defence procurement[194]. The success or failure of these regulatory measures is likely to have a substantial influence on the future competitiveness of the European and international defence industry, as a more dynamic, efficient and innovative sector will be able to compete more aggressively on the international stage, and could make market conditions more difficult for emerging industries in BRICKs countries.

15.4.2 European Defence Agency (EDA) Initiatives

The European Defence Agency (EDA) and its participating Member States[195] have introduced various measures to stimulate the emergence of a European market. Although partly superseded by the Commission's recently proposed Directives, the EDA initiatives are an important driver of these regulatory changes and are indicative of the process by which initially voluntary actions are evolving and cooperation among European states is growing. The main EDA initiatives can be summarised as follows:

- The Code of Conduct on Defence Procurement

The Code of Conduct is intended to inject transparency and competition into national defence procurement as a means to strengthen the European Defence Technological and Industrial Base (EDTIB) through the European Defence Equipment Market (EDEM). Twenty-two of the 24 participating EU Member States of the EDA, and industry through

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192 However, some open procurement initiatives have been adopted between specific Member States outside the framework of the European Commission or European Defence Agency. Although often voluntary in nature, the promotion of open procurement has been included in the Wassenaar Agreement, the Letter of Intent and subsequent Farnborough Framework Agreement.

193 See: http://ec.europa.eu/enterprise/regulation/inst_sp/defense_en.htm.

194 EurActiv (2009): Parliament paves way for single EU Defence Market, new article published 15 January 2009, available at: http://www.euractiv.com/en/trade/parliament-paves-way-single-eu-defence-market/article-178515

195 EU-27 minus Denmark, see: http://www.eda.europa.eu/genericitem.aspx?area=Background&id=79.

its associations, subscribe to the Code of Conduct. In practice, the implementation of the Code will work through an Electronic Bulletin Board operated by EDA on its website to publish all new defence procurement opportunities communicated to the EDA by the respective Member States. Exemptions from the Code include nuclear propulsion and cryptographic equipment. EDA will also set up a reporting and monitoring system to help ensuring mutual transparency and mutual accountability among subscribing Member States.

- The Code of Best Practice in the Supply Chain (CoBPSC)

As an integral part of the Code of Conduct, the CoBPSC is a voluntary initiative for use when Article 296 of the Treaty of the European Community (TEC) is invoked, in order to promote competition in the supply chain and encourage the participation of SMEs in defence contracts. It specifically refers to the prompt publication of contract and subcontract opportunities in various bulletins and websites in order to facilitate this process.

Another tool introduced to facilitate the development of the internal market for Defence equipment within Europe is the European Handbook for Defence Procurement (EHDP)[196] which is promoted by the EDA through the Codes described above. The EHDP is produced under the framework of CEN Workshop 10 on Standardisation for Defence Procurement managed by the European Committee for Standardisation (CEN)[197]. It contains references to standards and standard-like specifications commonly used to support defence procurement contracts, as well as guidance on the selection of standards and standard-like specifications to optimise effectiveness, efficiency and interoperability. Advice and information is also provided on different procurement arrangements in different countries (Member States and key export markets like Japan, US and Canada), describing the different structures, authorities and processes involved.

As the degree of harmonisation increases, such that individual components and subsystems can be produced and assembled anywhere within the EU or in third countries to a recognised quality standard and specification, import/export controls can become more important, thus increasing the significance of export controls on European and BRICKs competitiveness.

15.4.3 Letter of Intent and Farnborough Framework Agreement

Outside of the European institutions presented above, A Letter of Intent (LoI) was signed by Defence Ministers of France, Germany, Italy, Spain, Sweden and UK in 1998 to facilitate intra-Community trade of defence products by replacing national licensing systems. The LoI set up six specialist working groups to investigate how trade could be facilitated and to propose concrete measures to achieve this objective. These measures were consolidated into the Farnborough Framework Agreement, signed by all six LoI signatories in 2000. The Agreement covers the following areas.

196 Available at www.defence-handbook.org.

197 It is important to note that NATO, which includes the NATO Standardisation Organisation (NSO) to promote both standardisation and interoperability amongst its members, was one of the contributors to the EHDP.

1) Security of Supply

It was acknowledged that increased trans-national co-operation could affect security of supply. It was therefore agreed that signatories: (i) could not hinder the delivery of military goods and services produced on their territory to another LoI country, and should provide supplies from their own reserves if necessary; (ii) should put in place information exchange mechanisms allowing LoI signatories to inform each other of changes in industrial structures; and (iii) encourage national industries to adopt codes of conduct including a commitment to accept priorities and re-introduce production capabilities in the event of a crisis.

2) Export Procedures

The agreement commits participating nations to: apply simplified export licensing arrangements to transfers made in the course of joint development and production programmes and to transfers for each other's national military requirements; and to develop lists of permitted export destinations for jointly produced military goods on a consensual, project-by-project basis. Export license decisions will continue to be taken according to the principles of the EU Code of Conduct on Arms Exports.

3) Security of Classified Information

New simplified security provisions will be introduced for exchanges of classified information between countries or their defence industries that do not undermine the security of that information.

4) Treatment of Technical Information

The Agreement directs the Parties to harmonise their contracting processes for the disclosure, transfer, use and ownership of technical information to facilitate the restructuring and subsequent operation of the European defence industry.

5) Research and Technology

Co-ordination of joint research activities will be fostered to increase the advanced knowledge base and thus encourage technological development and innovation.

6) Harmonisation of Military Requirements

Parties are committed to further work on improving harmonisation of military requirements. It is envisaged that this will lead to co-operative equipment planning to identify and formulate common military requirements rather than attempting to harmonise existing "national" requirements.

15.5 US Regulatory Conditions

15.5.1 Buy American Provisions and Other Procurement Restrictions[198]

Buy American Provisions

The Buy American Act (BAA), initially enacted in 1933, is the core domestic preference statute governing US procurement. It was amended in 1954, to expand the scope of the BAA to allow procuring parties to set aside procurement for small businesses and firms in labour surplus areas within the USA, and to reject foreign bids either for national interest or national security reasons[199].

In relation to the defence, civil and dual-use sectors of EU and BRICKs industry, the BAA prevents any US government department from procuring from non-US suppliers. Critically, the BAA also discourages US bidders from using EU or BRICKs originating products or services; in these cases, trade is restricted directly by the buyer or indirectly through subcontracting restrictions. A potential outcome of these procurement rules is that if a BRICKs supplier cannot sell to a US government department, its own government may be more reluctant to purchase defence equipment from a US supplier, and may instead opt for European products or services. Alternatively, an EU or BRICKs supplier might be encouraged to establish production facilities in the US or purchase a US contractor in order to enter this lucrative defence market.

The US government body administering the BAA restrictions in relation to defence is the Department for Defence (DoD). It must apply the BAA requirements to contracts exceeding the $2,500 micro-purchase ceiling and to service contracts that involve finishing of supplies when the supply proportion exceeds this ceiling. For reasons of 'national security', the BAA is often extended well beyond the limits set by the WTO's Government Procurement Agreement (GPA)[200]. Other DoD restrictions include the National Security Act of 1947 and the Defence Production Act of 1950, which give authority to the DoD to impose restrictions on foreign supplies in order to preserve the "domestic mobilisation base and the overall preparedness posture" of the US - in effect to ensure security of supply. These restrictions could influence the decisions of BRICKs countries to purchase or collaborate with the US in the field of defence and dual use technologies.

Production on US Soil

Where exports to the US are permitted, the DoD programme approval procedure requires that any major defence items must be produced on US soil. As a result, EU and BRICKs companies can only do business in the US if they are willing to sell licenses to manufacture. Licensing the production of EU goods in this way not only costs jobs

[198] RPA (2006): Study on the Impact of Options which may be included in the Communication on stimulating EU-wide Efforts to ensure Competitive Security and Defence Related Industries, final report the European Commission DG Enterprise, December 2006.

[199] European Commission (2006a): United States Barriers to Trade and Investment: Report for 2005, DG Trade dated March 2006 available at www.europa.eu.int/comm/trade.

[200] For example, the Berry Amendment (1941) extends DoD's scope by applying requiring all acquisitions by the DoD at or above $100,000 to be domestically sourced. For details see: Ashbourne, A. (2000): Opening the US Defence Market, report for the Centre for European Reform (CER) dated November 2000 and available at www.cer.org.uk.

within the EU or BRICKs country, but also reduces domestic capacity. However, it does provide valuable export revenues to aid the sustainability and future of the industry outside the US.

Foreign Comparative Tests

Foreign Comparative Tests (FCTs) are carried out to assess the best sources of goods not produced in the US. FCTs can act as a significant barrier to trade in terms of the time it may take to complete the test and to authorise the product for procurement, giving rise to considerable uncertainty for suppliers. Where the FCT identifies a successful product, the DoD seeks a licence to make that product in the US rather than entering into a direct supply contract with the offshore producer, for reasons of security of supply. Consequently, non-US companies look for a US production partner early on in the procurement process.

No Grant-back

A generally accepted element of the licensing systems in the area of non-defence goods is that the original owner benefits from any changes or modifications made to the product following export or production overseas. In this way, if a customer or co-producer discovers an additional use or an improvement in the production process, then the original supplier would benefit from this knowledge as the owner of the property rights. However, within the US defence market, no 'grant-back' is given for changes made to products by the licensee.

Foreign Military Sales Regulation

The Foreign Military Sales Regulation (FMSR) introduces maximum foreign content threshold requirements for products exported with foreign military sales support. This means that US prime contractors willing to seek FMSR support are reluctant to design foreign content into their products. Instead, they prefer replacing any foreign content by US production under licence.

Foreign Ownership & Acquisition

One method to enter the defence procurement market and circumnavigate the various legislative barriers is for EU or BRICKs companies to acquire US companies, or to set up a US subsidiary to supply defence products to the DoD. In recent years, many European companies have acquired a range of US businesses although there are still obstacles to this route in the form of 'Proxy Boards' or 'Special Security Agreements' (SSAs).

The favoured approach of the US government is to impose 'Proxy Boards' on foreign-owned US companies. These Boards are comprised entirely of US citizens to oversee the day to day running of the American company. In this way, the US maintains national security, national control and employment within the US. Proxy Boards are much disliked by EU companies, causing many to sell US companies or not to enter the market. Some companies have accepted the burden with mixed results. On the US side, it has created a significant barrier to mergers, regardless of competition policy and procurement rules.

National Space Policy Directive

The National Space Policy Directive of 1990 and 1994 precludes US Government agencies from using foreign launch services (except in the case of NASA, in collaborative projects not involving an exchange of funds). The Commercial Space Act of 1998 calls on Federal agencies to buy space launch services rather than launch vehicles, but requires these services to be procured from "US commercial providers", subject to certain exceptions such as collaborative international research.

Even at the R&D stage of many projects, NASA, the Department for Energy, the National Sciences Foundation and DoD often entrust activities to:

"private companies and universities under "management and operating (M&O) contracts". These contracts do not follow the open competition procedures required under the Federal Acquisitions Regulations. Very few M&O contracts have been subject to competitive procedures and often the procurement procedures adopted by these companies impose Buy America requirements. M&O contracts are also excluded from US offerings in the GPA [WTO Government Procurement Agreement]."[201]

Thus, EU and BRICKs companies have little prospect of entering the market as access is restricted through such controls. An innovative solution applied by many European defence producers has been to establish production facilities in the US and/or acquire US businesses in order to enter US government competitions.

15.5.2 US Export Controls

In common with procurement controls, the US also imposes export controls. The main controls are presented below.

International Trade in Armaments Regulations (ITARS)

The International Trade in Armaments Regulations (ITARS) are the main tool applied by the US government to control the transfer of defence related articles, including technical data (which can often be more valuable to the importing country as it can provide the knowledge and specifications required to replicate a specific technology)..

The ITARS make it mandatory for defence products and technical data to carry an export licence if listed on the United States Munitions List (USML), which defines all products and services under 21 different categories. If an item is listed, then it requires a licence, issued by the Department of Defence, through the joint decision making of many government agencies, including the State Department and the Commerce Department. Consistent with the rules on procurement, Congress is also involved, as it can veto any waiver or control imposed by either department.

It is important at this stage to highlight the fact that ITAR measures have proved to be a significant disadvantage to US businesses, particular with regards dual-use goods and services indicated in the USML. For example, without ITAR approval, US satellite

[201] European Commission (2006): United States Barriers to Trade and Investment: Report for 2005, DG Trade dated March 2006 available at europa.eu.int/comm/trade.

manufacturers are unable to discuss technical performance details with the customer, obtain insurance for a satellite (most insurers for spacecraft are in London), export a satellite to a launch site or assist ground operators with flying instructions. Due to the size and cost of launch vehicles and other spacecraft, Congressional approval is also required, extending the time it takes ITARS to be approved.

Consequently, European and Russian manufacturers have been quick to offer "ITAR-free" products and services, consequently gaining significant market share in recent years; this has made the European industry the market leader in this market. A recent report by the International Space Business Council[202] cites US export regulations under ITAR as 'what were initially a nuisance to businesses have evolved into a serious problem for US industry'. It is described as 'the industry's most serious issue'. Overall, such developments have created a barrier to exports by US manufacturers.

Extending this analysis to US R&D, often carried out in academic institutions and located within a technology cluster close to industry, ITARS have restricted US non-nations from access to many research areas. In many cases, research is carried out in a commercial environment and defence is inseparable from civil work. By restricting access, the ability and efficiency by which innovations and advancements in technology are made can therefore be affected.

National Disclosure Process

The inter-agency National Disclosure Process (NDP), regulating technology transfers between governments, adds another level of complication to the process. Chaired by the DoD, its role is to determine what technology and classified information to share with other countries acquiring US defence equipment or services. Information is only disclosed to another country where there is a clearly defined advantage to the US in doing so. The NDP decision making process is time consuming, with each case taking between 30 and 270 days on top of the ITAR requirements.

15.6 Other Regional Framework Conditions

Supplementary to the main text, a number further regional framework conditions are presented below. These conditions are more important as opportunities for BRICKs countries to coordinate and cooperate on defence related matters, rather than as key drivers of the defence sector in these countries.

15.6.1 South Asian Association for Regional Cooperation (SAARC)

Established in 1985 by India, Pakistan, Bangladesh, Sri Lanka, Nepal, Maldives and Bhutan, this economic and political organisation represents almost 1.5 billion people. Afghanistan has since become the eight member of SAARC in 2007.

[202] ISBC (2005): State of the Space Industry 2005, International Space Business Council, August 2005.

The objectives of the Association as defined by its Charter[203], that includes a focus on the welfare, economic, cultural and social objectives through development, understanding and collaboration in common fields of interest.

In order to achieve its objectives, SAARC has established an integrated program of action in agreed areas, excluding military, defence or security activities. It has, however, introduced a series of specific measures, policies and programmes to strengthen and enhance intra-regional cooperation in the fields of trade and economic relations. The key product of this has been the SAARC Preferential Trading Arrangement (SAPTA) which grants preferential tariff concessions to member countries on nearly 5,000 products. The SAPTA was original envisaged as a first step to a South Asian Free Trade Area (SAFTA) leading to a Customs Union, Common Market and Economic Union, however little progress has thus far been achieved. Other initiatives have included trade fairs to promote South Asian products and investment opportunities.

With regards this study, the most important measure undertaken by SAARC has been the signing of a Memorandum of Understanding on Administrative Cooperation between the SAARC and the European Commission[204]. Specific areas of cooperation agreed on under the MoU include:

- facilitating access into the Single European Market;
- implementation of the EU-GSP Scheme including cumulative rules of origin;
- drawing on the EU experience for the SAFTA process; and
- evolving common SAARC standards and harmonisation with international obligations including certification, testing, etc.

Progress in cooperation with the EU could be important to the defence industry as more competitive suppliers emerge in India and European manufacturers need to be assured of product quality and reliability. Co-operation could also facilitate greater access to the Indian defence market for European equipment suppliers

15.6.2 Association of South East Asian Nations (ASEAN) and ASEAN Regional Forum (ARF)

Formed in 1967 as a political and economic organisation, ASEAN currently has 10 member countries located in South East Asia (none are BRICKs countries). The organisation has led efforts to create the ASEAN Free Trade Area (AFTA) with a common external preferential tariff scheme to promote the free flow of goods within the region. In addition, free trade agreements have been concluded or are being negotiated with many neighbouring countries including China, South Korea, India and the European Union[205].

In the field of defence and security (and most relevance to this study), ASEAN's most significant contribution has been the establishment of the ASEAN Regional Forum

[203] http://www.saarc-sec.org/data/docs/charter.pdf.
[204] http://www.south-asia.com/saarc/chapter10.htm.
[205] http://www.aseansec.org.

(ARF). The ARF has two main objectives building upon the ASEA goals of regional harmony and stability, these are[206]:

- to foster constructive dialogue and consultation on political and security issues of common interest and concern; and
- to contribute to efforts towards confidence building and preventing diplomacy in the Asia-Pacific region.

Since ARF's formation in 1993, it has provided a forum for participating states to discuss multilateral and bilateral issues and to enhance cooperation, regional security, promote mutual confidence and increase transparency. Current participants include Australia, Bangladesh, Brunei Darussalam, Cambodia, Canada, China, European Union, India, Indonesia, Japan, Democratic People's Republic of Korea, Republic of Korea, Laos, Malaysia, Myanmar, Mongolia, New Zealand, Pakistan, Papua New Guinea, Philippines, Russian Federation, Singapore, Sri Lanka, Thailand, Timor Leste, United States, and Vietnam.

15.6.3 Eurasian Economic Community (EurAsEC)

Originally established as a customs union between Belarus, Russia and Kazakhstan in 1996, the Eurasian Economic Community (EAEC or EurAsEC) came into being in October 2000 following the signing of its founding Treaty by Belarus, Russia, Kazakhstan, Tajikistan and later Uzbekistan in October 2005. Moldova and Ukraine have since gained observer status in EurAsEC.

The Organisation of Central Asian Cooperation (OCAC) has since merged with the EurAsEC in order to create a much larger and politically significant organisation in the region. However, it is unclear what the status of observer states in the OCAC (Turkey and Georgia) is in the new merged entity.

Based on the unofficial translation of the Treaty establishing the EurAsEC[207], the goals of the community are the effective promotion and creation by the Customs Union Member States of a Single Economic Space and for coordinating their approaches while integrating into the world economy and the international trade system. Among the principal tasks of the Community, are efforts to harmonise customs regulations, tarriffs and foreign exchange controls. Equally it is involved in economic and social development through the establishment of a common market.

Comments from the Russian President indicate that the creation of a common economic space may begin as early as January 1st 2010[208]. The strengthening and prioritisation of EurAsEC's goals by Russia and other regional states in preference to the CIS, which has seen some members depart, suggests a strong desire for economic cooperation above security and military objectives. Russia has even proposed the creation of a common

[206] http://www.aseanregionalforum.org/.
[207] www.evrazes.com/files/bpage/1/e_evrazes.pdf.
[208] http://www.rbcnews.com/free/20081225170003.shtml.

economic space with the EU and US[209] within the EurAsEC framework. The EU is also conducting an EU-Russia Industrialist's Round Table in this area in order to liberalise trade and investment, promote regulatory convergence in priority economic fields, integrating the EU's and Russia's infrastructure systems in energy and transport and enhancing cooperation in areas such as the environment and space[210].

Should these potential opportunities for cooperation at a regional level be realised, the impact on the defence industry of Europe and Russia could be significant, particularly in a dual-use sector such as space.

15.6.4 Mercosur

Created in 1991, Mercosur[211] is a common market comprising Argentina, Brazil, Paraguay and Uruguay. Its purpose is to promote free trade and the fluid movement of goods, people and currency in the region.

Bolivia. Chile, Colombia, Ecuador and Peru currently have associate member status of Mercosur, while Venezuela signed a membership agreement in 2006, which has yet to be ratified by Paraguay and Brazil. Integration with other South American states is increasing through the signing of cooperation agreement in 2004 with the Andean Community of Nations trade bloc (CAN) which included the publication of a joint letter of intent for negotiations aimed at further integration.

The emerging free trade area created by Mercosur gives Brazilian industry a distinct advantage versus international competitors in what is a fast growing economic region. This should help strengthen Brazilian defence suppliers, generating further competition for European producers in certain market segments. At the same time, the EU and Mercosur have signed an Interregional Framework Cooperation Agreement[212], entering into force in 1999, and issued a joint communiqué in 2007 to strengthen cooperation between the two regions, creating potential future opportunities for both European and Brazilian industry. The Mercosur-EU Business Forum (MEBF)[213] is another initiative launched in 1997 with the aim of fostering trade and business relations between South America and the EU. Working groups in fields of market access; investment and

[209] EU business (2008): Russia hopes for common economic space with US, EU, article downloaded from: http://www.eubusiness.com/news-eu/1228905121.09/.
[210] See EU-Russia Industrialist Round Table website at: http://www.eu-russia-industrialists.org/index.php.
[211] http://www.mercosur.int/msweb/ [in Spanish/Portuguese].
[212] EC (2009): Mercosur – Common Market of the South, summary available at: http://ec.europa.eu/external_relations/mercosur/index_en.htm.
[213] http://ec.europa.eu/enterprise/enterprise_policy/business_dialogues/mebf/mebfoverview.htm.

privatisation; services and business could therefore be important to coordinating further cooperation in the defence sector.

16 Annex 3 – Results of Stakeholder Interviews

16.1 Introduction

In addition to a stakeholder workshop (held on 23 September 2009 in Brussels), additional telephone-based interviews were undertaken with experts in the BRICKs in an attempt to get a different perspective on the issues being studied by the report. Ultimately it proved difficult task to get people to talk over the phone about such a politically sensitive sector, and this is reflected in the fact that only two BRICKs interviews were successfully[214] concluded (for Russia and South Korea).

The general feeling was that, even with these interviews having taken place, there was not much forthcoming that is not already in the report. However, the details of these two interviews are presented in this annex for the sake of completeness. For reasons of anonymity, the names of the interviewees are not included in this report.

16.2 Interview on Russia

16.2.1 Relationship between India and other BRICKs?

Russia – India
Regular summits (every two years) but only real co-operation is in defence trade, India has an ambition of being a regional power and Russia has price advantage when it comes to arms deliveries.

Russia – Brazil
New relationship.

China – Russia
Russia would be a junior partner in such a relationship but Russia does 'do junior partners'.

16.2.2 Destinations of Russian arms exports

No political constraints on where they export to but sometimes deny that they have exported somewhere, eg 2006 Israel-Lebanon conflict, Russia claimed they were not exporting to Hezbollah but the Israelis brought captured Russian-made weapons and brought to put on show in Moscow. The only area that Russia will not export to is North

[214] Following numerous attempts at finding a suitable contact, an interview was arranged to discuss the situation in India but the contact cancelled at the last minute and no replacement was found.

Korea. Afghanistan could be a potential future market as they are used to operating Russian weaponry.

16.2.3 Domestic defence spending?

Russia's present strategic plans are a carbon copy of the Soviet military doctrine and focuses on competition with the US. Another important factor in Russia's military doctrine is the desire to be self-sufficient in producing weaponry (see next point).

16.2.4 Structure of the defence industry

There is a high integration of the Russian and Ukrainian defence industries. For the past 18 years, 'not one bullet' in Russia can be produced without some Ukrainian input. Example: aircraft manufacturing. However, Russia is striving to be self-sufficient.

16.3 Interview on South Korea

16.3.1 Potential for EU companies to do business in South Korea?

There is a market potential as there may be 'an arms race in the making' with the dynamics responsible being tensions within the Korean peninsula (North-South) and rivalry with China (all countries in the region feel rivalry against China) and Japan (resources in South China sees). However, at the same time opportunities are limited due to South Korea's strategic alliance with the US.

At the same time, it is not possible to precisely determine the plausibility of the various scenarios of future development – there may be a nuclear arms race between North and South Korea (but there may not be one), there have been efforts to include reduction of conventional weapons in talks between North and South Korea but without success so far (but may happen in the future).

But overall we expect stability rather than abrupt changes.

16.3.2 South Korean economy

While there was a year-on-year decline in GDP but recently quarterly increase and their unemployment is only 3.8% so from the global perspective South Korea is in a comparatively good shape. This may be a result of the government's pretty robust stimulus packages.

An important factor in the South Korean economy is the perception of the necessity to compete with China.

16.3.3 Any problems with access of EU companies to public contracts or investing in South Korea?

Best source of information would be the EU Chamber of Commerce in Korea Aerospace and Defence Sectoral Committee. There may be some hurdles but a lot will change with the EU-South Korea Free Trade Agreement.

16.3.4 Scenarios of future development?

It is not difficult to construct several scenarios of future development but it is difficult to attach any degree of plausibility to each. One key uncertainty includes the relationship between North and South Korea including any developments should the North Korean regime collapse (reunification straight away, step-by-step reunification, confederation). A recent report on reunification is one by Goldman Sachs.