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The Defense Acquisition Trilemma: The Case of Brazil

Patrice Franko

Brazil is a puzzling new player in the global system. Emerging as a complex international actor, it has come to be seen as significant economic competitor and a dynamic force in world politics.[1] But transformational changes in the economic and political realms have not been accompanied by national advances in military power. While it has entered the world stage as an agile soft power exercising influence in setting global agendas and it has earned a seat at the economic table of policymakers, its military capacity lags. The national security strategy announced under President Lula in 2008 intended to redress this power gap. President Dilma Rousseff's 2011 White Paper—so detailed that it is called a White Book—provides the conceptual roadmap to achieve a new military balance. But military modernization is still a work in progress.

Brazil has developed a framework to deepen its strategic reach. Brazil remains committed to defending the territorial sovereignty of its 26 states and its nearly 17 thousand kilometers of borders with ten neighbors.[2] In table 1 we observe a multidimensional view of security that is rooted in economic, political and environmental dimensions; concerns that fall into a more traditional security category are highlighted. Brazil aspires to an institutional deepening that will continue to strengthen domestic institutions and enhance its global profile across political, economic and military domains.

[1] Julia E. Sweig, "Global Brazil and U.S.-Brazil Relations," Council on Foreign Relations Press July 2011. http://www.cfr.org/brazil/global-brazil-us-brazil-relations/p25407 .

[2] This makes Brazil the country with the 3rd longest land border, after China and Russia. Brazil". CIA - The World Factbook online at https://www.cia.gov/library/publications/the-world-factbook/Đ.

Table 1: ***Fifty Strategic Priorities in Brazil***

Institutional Deepening
Enhance judicial efficiency and flexibility.
Improve federal, state and municipal fiscal policies to enhance the quality and reduce the volume of public expenditures.
Congressional and political party reform to enhance accountability of parties to voters and improve parliamentary responsibility.
Constitutionally reorder political and administrative units in Brazil to contribute to a more balanced social, political and economic federation.
Constitutionally strengthen links between the federal and state entities to foster shared responsibilities to achieve common interests.
Simplify the tax structure.
Build on its recent democratic experience to deepen democratic framework in the law.
Equality & the Social Sector
Promote affirmative action for social inclusion through racial quotas to ensure unsegregated social mobility.
Improve pension rules to promote a financial sustainable social security system.
Improve access to and quality of services in the Unified Health System (SUS).
Strengthen and modernize the police and judiciary to reduce the rate of violence and crime.
Improve labor relations to strengthen the bargaining process between employers and workers to complement relationships governed by law.
Pro job macro and social policies to increase formal sector employment among the labor force participants.
Enhance the quality of urban life by reducing irregular slum settlements through incentives for legal urban growth.
Implement progressive education policies especially at the primary level to position Brazil competitively in the global labor market.
Reduce social inequality to developed country levels.
Rebalance regional inequalities by promoting the potential of each region to reduce geographic dispersion.
Leverage Brazilian cultural diversity in its global trade profile.
Reinforce policies for basic education to achieve MDG and national goals of early childhood, basic and middle level education.
Strengthen access to higher education for those between 18 and 24 to reach levels comparable with developed countries.
Implement new telecommunications policies to promote digital Inclusion elevating access to computers, networks and services.
Address demographic shifts to enhance the ability to meet the needs of dependents (both the aged and the young) in the future.
Environment
Implement new policies for sustainable development in the Amazon, based on national knowledge of biodiversity, establishing international cooperation and reducing external pressures on the region.
Improve environmental policies to permit Brazil to research and explore, in a sovereign manner, its biodiversity resources, preventing international bio-piracy and establishing sustainable management of its ecosystems.
Use and conservation of freshwater resources to avoid water conflicts

Sustainable management of resources in the Brazilian exclusive economic zone, continental shelf and in the coastal zone.
Become a strong actor in the international marketing of carbon credits through the Clean Development Mechanism of the Kyoto Protocol.
Economy
Implement effective industrial, technological and foreign trade policies to increase the share of processed products in Brazilian exports.
Improve agricultural policies to encourage Brazil's growth as major global food producer.
Invest in biotechnology to promote global competitiveness.
Reduce the tax burden to emerging economy levels while stimulating growth.
Reduce the level of debt to GDP to make the net public sector debt consistent with the average of developed countries.
Maintain control of inflation to rates compatible with the international average of developed countries.
Design macro policies to favor investment rates compatible with desired levels of growth.
Implement Information and Communication Technologies (ICTs) policies to place Brazil among the major producers and consumers of ICT goods and services.
Improve Brazilian exports as a percentage of global trade.
Raise infrastructure investment to support the process of social and economic development.
Augment investments in Science, Technology and Innovation to reach level in developed countries.
Enhance biofuels and natural gas in Brazil's energy matrix to meet growing domestic fuel consumption.
Make Brazil an important international actor in Nano science and nanotechnology.
Improve defense as well as science and technology policies to make Brazil an important actor in the development and trade of sensitive technologies.
Balance of Power in an Asymmetric World
Strengthen defense capability, alone or as part of a collective defense system with neighboring countries, to face new threats and challenges, ensuring protection of its territory and support for international accords.
Provide Brazilian leadership to enhance the "integrated economic space" in South America to strengthen economic, social, cultural, political and security policies.
Contribute to deeper integration of Mercosur, establishing a unified market based on free movement of goods and services.
Introduce new foreign policies that, within Brazilian interests, contribute to an equilibrium of interests shared by all nations in the Americas through a free trade accord of the Americas.
Promote new foreign policies encouraging the constitution of a new pole of world power comprised of Brazil, Russia, India and China due to large territories, populations and resource wealth.
Pursue a seat as a permanent member of the UN Security Council.
Facilitate a free trade agreement between Mercosur and the European Union, significantly increasing trade and cultural exchange between the regions.
Improve international relations in light of newly emerging powers on the world stage and the changing global geopolitical scenario.
Work toward UN reform to allocate greater representation to member countries and greater efficiency to their actions.

50 Strategic Themes Developed by the Brazilian Government, Nucleus of Strategic Studies[3]

But Brazil's aspirations to transform hard power relations to match its soft power status involve significant tradeoffs. The current re-equipment program in Brazil may underplay

[3] Presidência Da República, Núcleo De Assuntos Estratégicos, Projeto Brasil 3 Tempos 50 Temas E Metas Estratégicas;; The document presented the objectives in the chronological order in which the group estimates it could be achieved; I reorganized by category. http://www.resdal.org/ultimos-documentos/brasil-estrategia-def-06.pdf.

attention to balancing the costs and benefits to society.[4] This paper explores the choices in the Brazilian quest for greater global balance in military affairs by introducing the concept of the defense trilemma to highlight the tough options facing Brazilian policy makers as they attempt a military modernization commensurate with its soft power status. A trilemma suggests that when a country has three objectives, it must sacrifice one to achieve the remaining two. The defense trilemma introduced here posits that in its quest for defense re-equipment, if Brazil wants to continue on its path of stable economic growth, it must choose between its deep rooted commitment to autonomy and deeper integration in the global defense value chain.

We begin by detailing the concept of the trilemma in the first section. With the framework for choice among competing ends established, we delve into the Brazil's distinct notion of autonomy. Presented as a principle that has historically guided strategic thinking but has adapted to new forces in the global system, we note the distinctions between traditional desires for sovereignty and autonomy and how these have been shaped by globalization and a rebalancing of political and economic power. Even if autonomy is understood in its most recent manifestation as engaging a diverse set of partners, we will see that some autonomy must be sacrificed to achieve the competing goal of modernization in defense equipment. The Brazilian military has long prioritized acquiring technology and productive know-how for sustained military production. But the national defense industrialization strategy of Brazilian pursued in the 1970s and 1980s now confronts global value chains in defense production. If Brazil chooses to deepen its integration in the global value chain, it will need to sacrifice autonomy. Of course there remains one option—undermining economic sustainability to gain autonomy. Brazil's commitment to macroeconomic stability is therefore introduced. We will suggest that wavering from this economic commitment would be a self-defeating choice, in that it would undermine the very important soft power it earned as an emerging global market. Appreciating fiscal constraints, we will conclude by showing that Brazil's balanced autonomy exercised through participation in the global value chain is fundamentally different from the strategy Brazil pursued in the past to promote defense modernization.

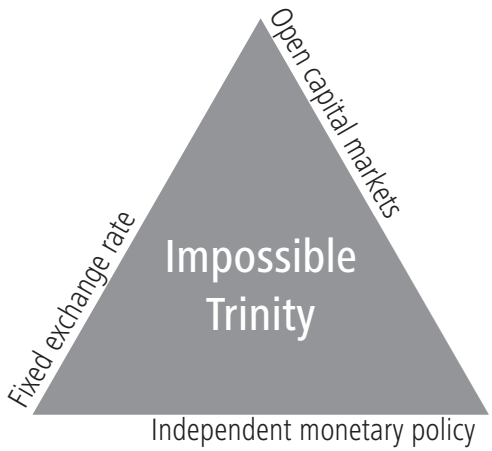
The Impossible Defense Trinity

Although new to strategic thinking, the concept of the trilemma to illustrate tradeoffs is well known to the student of international economics. This monetary trilemma is often dubbed the impossibly trinity. As shown in figure 1, the triangular shape illustrates that if exchange rate stability is a key objective, it cannot be achieved if the economy is open to inflows from global capital while also pursuing an independent monetary policy. The trilemma focuses on the tradeoffs between open capital markets and the desire for monetary autonomy under a fixed exchange rate regime. Prior to the mid-1990s, countries pursuing policy goals of price stability were counseled to choose a fixed exchange rate regime. The prescription, preferenced by the IMF, linked a nation's currency to a globally traded store of value such as the dollar, pound or gold, to promote accountability

[4] Paulo Roberto De Almeida, "Estratégia Nacional de Defesa: comentários dissidents," Meridiano 47 n. 104, mar. 2009 [p. 5 a 9]. (pralmeida@mac.com).

to a stable monetary policy. But it also meant that it would be difficult to pursue an autonomous monetary policy. If the policy goal was exchange rate stability, increasing the money supply would put downward pressure on the currency. National investors would perceive this, and put their money elsewhere as they anticipated a future devaluation. Conversely, a tighter monetary policy would involve an increase in the domestic interest rate, attracting capital to the country. As foreign currency flowed in, the central bank would be forced to increase the supply of local money to maintain the fixed exchange rate—an increase that was the opposite of the contractionary policy move. The lesson is that freely mobile capital impedes the discretion of central bankers to set autonomous monetary policy under a fixed exchange rate regime. Any attempt to ease pressure on the economy is thwarted by the need to defend the exchange rate.

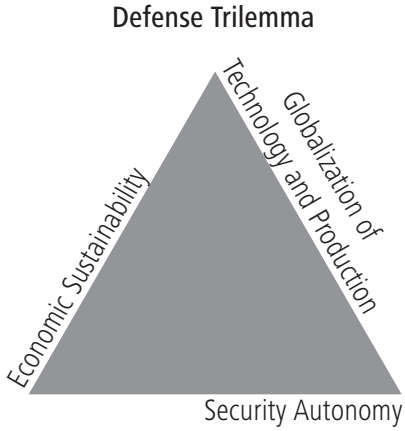
Figure 1: ***The Macroeconomic Trilemma***



The trilemma therefore focuses our attention on choice sets. One can have a fixed exchange rate and an autonomous monetary policy if one does not allow the free flow of capital.[5] For each case, two of the three objectives is achieved; all three cannot exist simultaneously. We can parallel this logic in defense acquisitions by adapting the monetary case to the defense trilemma in figure 2. Like independence in monetary policymaking, autonomy to pursue sovereign goals is a coveted aim. Nations have long held autonomy as central to their national security objectives. A primary goal of most security policies is the ability to defend national interests and objectives against aggression—and without debilitating dependence on the consent of others. The ability to procure defense material is therefore seen as central to military sovereignty. If a nation does not have the capability to produce equipment internally, it is always subject to the restrictions others may place on purchases.

[5] We can see in Europe that its policy goal of exchange rate stability (fixed in the form of the euro) is won at the expense of each country having an independent monetary policy because it very much welcomes open capital flows. China also prioritizes a steady exchange rate and monetary independence; it has therefore restricted the free mobility of capital. In the United States, very open capital markets and a desire for national monetary levers to fight inflation and unemployment mean that the exchange rate has been left to float in practice.

Figure 2: ***The Trilemma in Defense Modernization***



To operationalize such autonomy, however, countries need access to the technology embedded in the global value chains characterizing defense production. Of course pure autonomy is an illusion when confronted with economies of scale in defense production. Defense production is peculiar in that it normally involves a technological edge procured at high cost. But these investments in advanced systems cannot be amortized over a large production scale. Ordinarily facing a limited number of clients—one's national armed forces and perhaps a few friendly military forces—the opportunity to push down the cost curve to take advantage of scale is limited. This begins to explain the difference between producing a truck and a sophisticated armored tank. The design and production costs involved in truck manufacturing can be spread across the millions of units sold. Sophisticated tanks are another story; costs remain high as the demanding technologies are spread over barely a thousand vehicles in a comparable period. Even in the United States, the country with the largest defense production capability in the world, autonomy is limited by its integration in the global supply chain for defense. It partners with allies to allow for the expansion of scale to drive down the costs of high technology items. The global economic crisis has created pressure for greater cooperation in Europe and the US to share development costs.[6]

Constraints on autonomous procurement in the global supply chain can be overcome by pouring resources into defense acquisition. With ample budgets, a country can purchase the systems and the science to meet national security objectives. Nonetheless, forfeiting economic stability can paradoxically undermine aspirations for global power. We witnessed the destructive results of unbridled Cold War spending; one also wonders about the capability of China to continue to underwrite uneconomical military expansion. As we will see in the case of Brazil, a broadly democratic commitment to a responsible

[6] "The impact of austerity on military expenditure in Europe," SIPRI Yearbook 2012. An example of cooperative development is unmanned aerial systems (UASs). Stockholm International Peace Institute www.sipri.org.

defense acquisition strategy constrains the country to sacrificing autonomy or further integrating in the global value chain to meet its national security goals. Let's turn to the details of the Brazilian defense trilemma to illustrate these tradeoffs.

The Profane Trinity in Brazil: The Costs of Preserving Autonomy

When one dumps the English term "unholy trinity" into Google Translate, "profane trinity" pops up in Portuguese. Perhaps this profanity is indicative of the frustrations of defense policymakers in navigating the tough tradeoffs between defense modernization and autonomy with a relatively fixed pool of budgetary resources. Sovereignty, or the ability to implement self-rule without being constrained by others, has long been a unsatisfied objective of Brazilian policy.[7] Autonomy can be understood as the means to implement sovereign decision-making in a global system. Powerful nations are those able to exercise autonomy in the pursuit of sovereign goals. Although a country may be seen as sovereign in a legal sense, in practice less powerful countries have been unable to control territorial incursions or exclude external actives from domestic interference.

Brazil has been characterized as a nation whose strategy has been grounded by nationalism in the service of sovereignty.[8] As the celebrated Brazilian strategist General Carlos Meira Mattos opined, "We possess all the conditions that enable us to aspire to a place among the world's great powers." Its search for autonomy is a guiding concept in its foreign policy.[9] The doctrine was articulated in the Superior War College, ESG, which defines national power as the capacity to act independently supported by an array of men and means to reach and maintain national objectives. Such national power is expressed through five elements: politics, economics, psycho-social, military, and the scientific and technological base.[10] The long held objective of autonomy in pursuit of national goals was laid clear by Brazilian Foreign Minister Antonio Azeredo da Silveira in 1975 when he stated that Brazil must achieve "an outstanding position in the world," free from the "paths of hegemonic construction of the past."[11] The power to influence others in the global system is intricately tied to Brazil's foreign policy. As noted by Ambassador Samuel Pinheiro Guimarães, sovereign control over the means of power is the only way for a country to achieve national goals; for Guimarães, these strategies of national defense are clearly tied to foreign policy.

Yet for Brazil, autonomy has been an elusive quest. Brazilian political and economic power has quickly advanced in the 21st century. As a US Council of Foreign Relations report concluded, Brazil now makes the short list of countries shaping the world.[12] For Brazil, this

[7] Tullo Vigevani and Gabriel Cepaluni. Brazilian Foreign Policy in Changing Times: The Quest for Autonomy From Sarney to Lula Translated by Leandro Moura Lexington Books 2009.

[8] Almeida, 2009.

[9] Vigevani and Cepaluni, 2009.

[10] Paulo Roberto Laraburu Nascimento, (Colonel and member of the Center of Strategic Studies of the Brazilian Army), in "A Inserção Internacional do Brasil e os Novos Desafios à Política de Defesa Nacional," www.eme.eb.mil.br/ceeex/artigos 2008.

[11] Lecture Delivered by Antonio F. Azeredo da Silveira, March 4, 1975 quoted by Hal Brands, Dilemmas of Brazilian Grand Strategy. Strategic Studies Institute, US Army War College, September, 2010, 6.

[12] Peter Dauvergne & Déborah BL Farias, "The Rise of Brazil as a Global Development Power," Third World Quarterly, 2012: 33:5, 903-917.

enhanced global position is largely a function of agile international politicking, a top ten economy and a new national confidence that the nation has arrived. Yet there remains a good deal of uncertainty as to Brazil's sovereign capabilities in the security arena.

Affirming Brazilian national interests involves contesting the asymmetries of power in the global system.[13] Brazil has taken on asymmetries of power through three different expressions of autonomy: through distance, participation and diversification.[14] Paralleling the economic approach of import substitution industrialization, in the first stage Brazil turned inward and engaged in a foreign policy that imposed distance between itself and hegemonic powers. It diversified its diplomatic and trade relations and formalized its identity as a representative of the Third World in North South relations. 15 During this period, which largely dates from the beginning of the military regime in 1964 through the transition to democracy in the early 1980s, the country condemned the control of international trade, finance and nuclear regimes by the hegemonic North while forging alternative relationships among Southern partners.[16] Autonomy through distance largely opposed the international order of the time, preferring greater autarky from the great powers to preserve sovereignty.[17]

The expression of Brazilian autonomy was transformed by changes in the global economy. As the import substitution model was thwarted by the global debt crises of the 1980s, a change in approach became necessary.[18] Reluctantly at first, Brazilian policymakers slowly became convinced of the need to participate in global political and economic institutions in order to acquire power. First led by Fernando Collor de Melo and then Fernando Henrique Cardoso, Brazil edged toward greater participation in multilateral forums as a means of achieving its goal of autonomy. Autonomy came to be seen as the ability to influence world affairs.[19] To become an international force it was perceived that Brazil needed to be a player within global regimes. Although suspicious of a close embrace of the United States, Brazil began a systematic insertion in global institutions. Rather than rejecting the neoliberal order, it began to use institutions such as the WTO to gain leverage and policy space. Pragmatism prevailed. To be seen as a cooperative player in economic and environmental spheres, Brazil accepted international norms in the security sector. It renounced the right to conduct nuclear tests, even for peaceful purposes and introduced nuclear safeguards and protection of sensitive military technologies.[20] Competitive insertion in the international economy and leadership in the environmental arena were traded for strategic autonomy.

As the US unilateralism became more dominant in the new millennium, Brazil practiced greater assertiveness in international institutions as a counterweight to American power.

[13] Nascimento 2008.

[14] Vigevani and Cepaluni, 2009.

[15] Rafael Antonio Duarte Villa and Manuela Trindade Viana . Questões de segurança no governo Lula: da perspectiva reativa para a afirmativa Rev. Bras. Polít. Int. 53 2010 special edition: 91-114.

[16] Villa and Viana, 2010.

[17] Vigevani and Cepaluni, 2009.

[18] Brands, Dilemmas of Brazilian Grand Strategy, pp 604-606, 616-618.

[19] Vigevani and Cepaluni, 2009. Vigevani and Cepaluni quote Russell and Tokatlan to make this argument.

[20] Vigevani and Cepaluni, 2009.

But rather than retreating into autarky to preserve autonomy, Brazil built strength within global institutions by widening its cooperative base. With the goal of redressing asymmetries in the international arena, Brazil pursued its new foreign policy agenda of human and social rights, environmentalism, technology and managed financial flows in concert with other developing country partners. Autonomy through diversification therefore embraced South American neighbors through Mercosur, amplified South Atlantic ties with Africa, and build frameworks for cooperation with other big emerging markets in the BRICS club. Autonomy through diversification doesn't reject the institution building and rule setting agenda of participation; rather, it shifts the locus of engagement from a broader multilateral stage to a South-South approach. In the service of creating a greater equilibrium in global affairs, it intensified relations with emerging market partners to propel a Southern momentum in foreign policy. Attempting to leverage the global economic rebalancing toward the South, Brazil has been pushing for more policy space at the strategic level for developing country partners, enhancing its autonomy at home. Such partnerships with developing countries have been characterized as "consensual hegemony" that rests on shared interests of participating states.[21] Celso Amorim, Brazilian Minister of Foreign Affairs (and later Defense Minister), situates this as the nation's comparative strategic advantage: "Brazil's great skill is to be friends with everyone."[22] President Lula elevated the strategic focus on cooperation even further. His goal was to increase Brazil's 'weight' in international affairs through coalition building in order to 'soft balance' against powerful Northern structures that he saw as detrimental.

It should be noted that these alliances are more ad hoc and fluid than institutionalized and rigid. They fit a stylized Brazilian characteristic of "finding a way" or "jeitinho" that creatively adapts to the circumstances. As can be illustrated in the case of Mercosur, the South American Integration scheme, Brazil is interested in levers to adjust asymmetries of power but not in creating binding constraints of new alliances.[23] Unasur represents a wider yet shallower integration effort. Its South American Defense Council (CDS) formed in 2009 promotes confidence building without firm strategic commitments.[24] Instead, Brazil sees itself as a "global trader" with multiple organic links to Asia, Africa and Europe. To use a soccer analogy, one could think of Brazil as a premier league player. It is happy to practice and play in the local league, but fields a traveling team in foreign policy that extends beyond its natural neighborhood.

Lula, and later Dilma, pursued a soft balancing against the United States to shape a world more favorable to Brazil's interests. The administrations have presented a dissuasive defense, designed to guarantee sovereignty, national patrimony and territorial integrity through the dual strategies of dissuasion and diversified cooperation. Its approach is inherently non-confrontational, placing primacy on the ability of other

[21] Sean W. Burges, "Consensual Hegemony: Theorizing Brazilian Foreign Policy after the Cold War," International Relations 2008; 22; 65.

[22] Dauvergne & Farias 2012.

[23] Vigevani and Cepaluni, 2009. Vigevani and Cepaluni discuss Mercosur in depth, suggesting the institutionalizing Brazilian regional integration would detract from its ability to be a global trader.

[24] Juliana Bertazzo. "Brazilian Security and Defence Policy under President Dilma Rousseff: Transition and Initial Challenges," Critical Sociology, November 2012 vol. 38 no. 6 809-821.

countries to exercise sovereignty within their borders. This new Brazilian notion of autonomy has adapted to a multipolar globalized system. But the ability to exercise influence in foreign relations and the global economy is limited by Brazil's weakness on the technological and military front.[25] Without appropriate instruments of power, Brazil cannot be seen as a credible global player acting in its sovereign interests.[26] Redressing asymmetries of hard power is most problematic in the control of technology and production processes in the military sector. In September 2007, President Lula announced a new working group to structure a modernization plan for the Armed Forces called The Strategic Plan of National Defense. It fell within a broader plan of economic modernization called the Plan to Accelerate Growth (PAC) and so became known at PAC-defense. In light of strategic objectives, it was charged with reactivating the national armaments industry to promote autonomy in defense, realigning defense personnel to new threats and identifying internal roles for the Armed Forces in maintaining law and order.27 Table 2 provides a glimpse of some of the modernization programs. But these programs demand defense industrial partners. It is to this domination of the global value chain by traditional hegemons, and Brazil's aspiring place in that chain, that we now turn.

Table 2: ***Brazilian Military Modernization Priorities***

Modernization Priorities		
Army	Navy	Air Force
New fleet of wheeled armored vehicles (Guarani) Operation of the new Special Forces brigades Antiaircraft and communication capacity Astros 2020 (missiles) Critical infrastructure protection through PROTEGER Bridges and boats for Amazon Via SISFRON maintain control of Brazil's borders with ten neighbors via radars, communications networks, UAVs and armored vehicles First Brazilian Geostationary Satellite	Surveillance System for the Blue Amazon, SISGAAZ Ocean patrol boats through Programa de Obtençâo de Meios de Superficie, PROSUPER Prosub Construction of nuclear-propelled submarine and modernization of conventional submarines New torpedoes, helicopters and command and control systems Deployment of the shipyard and naval base Logistical support ship	New fighter jets Modernize the AMX and expand fleet of Super Tucanos for training and counter insurgency operations. KC-390 tactical transport and humanitarian missions Improving management of resources, operational capacity and human resource investments Monitoring and surveillance via UAVs. Air Traffic Control

Sources: Aggregated by the author from: João Fábio Bertonha, "Brazil: an emerging military power? The problem of the use of force in Brazilian international relations," Rev. Bras. Polít. Int. 53 (2): 107-124 [2010]; SIPRI "Transparency in milex ,"; Projetos prioritários da Força Aérea Brasileira http://aerospacedefensebr.blogspot.com/2012/09/projetos-prioritarios-da-forca-aerea.html; Colloquium Brief U.S. Army War College and Presentation by Luis Aguiar, president EDS, Brazil-American Chamber of Commerce New York, April 23, 2013.

[25] Marco César de Moraes, "A Estratégia Nacional De Defesa E O Orçamento Da União," O autor é o Coronel de Intendência do Exército Brasileiro, Doutor em Ciências Militares pela Escola de Comando e Estado-Maior do Exército. Atualmente é o Instrutor-chefe do Curso de Gestão e Assessoramento de Estado-Maior da ECEME (CGAEM). Online posting.

[26] João Fábio Bertonha, "Brazil: an emerging military power? The problem of the use of force in Brazilian international relations." Rev. Bras. Polít. Int. 53 (2): 107-124 [2010] < Professor of History at Maringá State University – UEM, Brazil (fabiobertonha@hotmail.com). >

[27] Rafael Antonio Duarte Villa and Manuela Trindade Viana . "Questões de segurança no governo Lula: da perspectiva reativa para a afirmativa," Rev. Bras. Polít. Int. 53 (special edition): 91-114 [2010].

The Global Value Chain and Defense Modernization: Constraints in Technology for Modernization

Technology is central to the equation for global power; as the Brazilian PND notes, technology is fundamental to national defense.28 But technology has increasingly become embedded in complex global value chains.[29] Production no longer takes place by country and product. Rather, firms have evolved a new geography of production that is driven by the management of information and processes over geographical space. Although in the general case this new geography of growth has favored the relocation of power from the former industrial centers to emerging markets such as Brazil,[30] in defense production control exercised over sensitive or dual technologies limits integration of Southern partners. Legal constraints by the United States and Europe imposed for security reasons have limited the transfer of knowledge to the periphery.[31] Defense technologies are tightly controlled within production networks. A central challenge for Brazilian defense modernization is how to capture spillovers from global innovation networks in security products. Given the high degree of knowledge asymmetry in the defense sector, the participation is crucial to meet modernization goals. Yet such participation will also create tradeoffs in achieving the goal of autonomy. To meet the conditions set by the Pentagon or European Defense ministries, Brazil's firms and its foreign policies must become more closely aligned with Western interests—a compromise of autonomy.

This is not an all or nothing proposition. Across its nationally produced defense systems, Brazilian firms already participate in the global value chain. But according to the OECD, it also has one of the lowest rates of participation by large firms in collaboration on innovation activities with under 20% as opposed to nearly 60% in the UK or over 40% in France.[32] Brazilian participation in defense industrial systems is even further limited. Yet as retired Brazilian General Jose Carlos Amarante notes, no country can meet its defense needs in isolation.[33] The conundrum is that military technology is expensive to develop. To understand technology acquisition in defense production, consider an adaptation of Innovation's Holy Grail by C.K. Prahalad and R.A. Mashelkar on civilian technology in developing countries presented in figure 3.[34] To ensure complete autonomy in operations, a country might choose to develop technology embedded in systems. At the opposite end of the spectrum, it could attempt to purchase the know-how. In between the two poles of this classic make-buy dichotomy in defense system,

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28 João Fábio Bertonha, "Uma política de defesa nacional," Meridiano 47 n. 103, Fev. 2009 [p. 24 a 28].

29 OECD (2011) Executive summary, Science Technology and Industry Scoreboard 2011.

30 Vandana Chandra, Deniz Erocal, Pier Carlo Padoan and Carlos Primo Braga (ed) Innovation and Growth: Chasing a Moving Frontier OECD and World Bank 2009.

31 I'd like to thank Professor Eduardo Siqueira Brick, researcher in the Nucleus of Strategic Studies at Universidade Federal Fluminense, (UFF) for emphasizing this point in a workshop of my paper at UFF in November 2012.

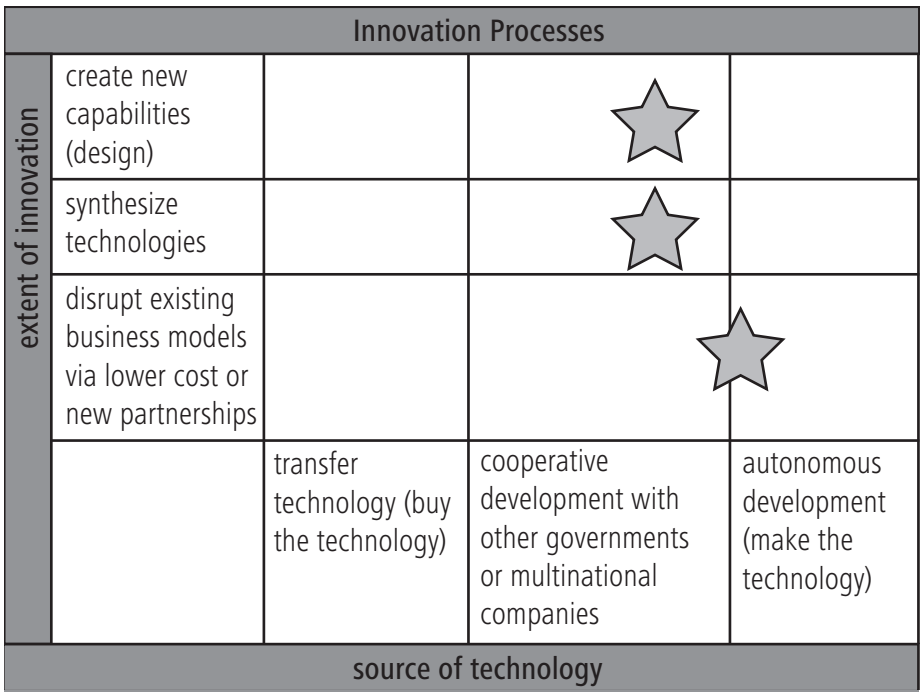
32 Collaboration in business value chains - OECD iLibrary, Chart "Firms collaborating on innovation activities with suppliers and clients, by firm size, 2006-08 as a percentage of innovative firms" http://www.oecdilibrary.org/docserver/download/9211041ec029.pdf?expires=1361906510&id=id&accname=guest&checksum=7087540C0C908779C57767150FB507EE. Also see OECD 2011, Collaboration in Business Value Chains in OECD Science, Technology and Industry Scoreboard 2011 OECD Publishing.

33 José Carlos Albano do Amarante, "A base industrial de defesa brasileira,". Ipea, Texto para discussão 1758, 2012.

34 Prahalad, C. K., & Mashelkar, R. A. "Innovation's Holy Grail," Harvard Business Review, (2010). 88 (7).

a country might elect to cooperate with other either the government or firms in other nations to develop systems.[35] These options are represented on the horizontal plane of the matrix below. To innovate and gain an advantage in the production of a technological system, Prahalad and Mashelkar suggest that firms pursue three strategies; they are represented on the vertical axis. They might implement new business models, taking advantage of lower labor or input costs or original delivery mechanisms. That is, the innovation takes place in the process, not the product. Alternatively, the firm might synthesize existing technologies, offering a variation on an existing product that better meets requirements—especially if it is also able to do so at lower cost. Finally, innovation may take place through creating genuinely new capabilities through ground-breaking design, the top row in the grid.

Figure 3: ***Innovation: Sources of Technology and Extent of Innovation***



Adapted from Prahalad and Mashelkar, Innovation's Holy Grail, HBR's Must Reads on Innovation 2011 and Jose Carlos Albano do Amarante, A Base Industrial de Defesa Brasileira, IPEA Texto para Discussao 1758

We can place Brazilian strategic projects on this grid to characterize their innovation approaches. First consider the case of Iveco. Part of the Italian Fiat Group, its Brazilian division has developed an armored car in conjunction with the Brazilian army. It received approximately R$1.527 B (US$.75 b) as part of the government's broad investment program PAC; the line is expected to engage 110 direct and 600 indirect suppliers

[35] I'd like to thank General José Carlos Amarante for pointing out this distinction.

with a national content of 60%.[36] Iveco is banking on offering a lower price armored car to its UNASUR neighbors (including Argentina, Chile, Colombia and Ecuador) where the product innovation is a modular design that will permit the incorporation of different turrets, sensors and ammunition systems.[37]

Iveco might be represented by the middle star in the grid. The Guarani was designed in cooperation with the needs of the Brazilian army, adapting systems to the tough tropical conditions in Brazil. The Italian parent company passed know-how largely through investment in Brazilian engineers training in Europe. Key adaptations were made in terms of weight, amphibious capabilities, and electronic information systems.

Below and to the right we might place the submarine project, Prosub, that aims to build 4 conventional and one nuclear submarine. Brazilian collaboration with the French DCNS and the Brazilian subsidiary of Odebrecht provided the foundation for the development of a national submarine. The navy has committed to developing the capacity for domestic production of four Scorpene conventional-propulsion submarines and one nuclear sub to protect the country's 8,500 m of coastline and its undersea oil reserves.[39] Rather than a turnkey approach, Brazilian engineers spent several years in France to gain the expertise necessary for technological development at home. Odebrecht operates as an integrator; drawing upon its extensive experience in long term construction projects, its advantage is in project management and the ability to assimilate technology.[40] Overseen by the Brazilian navy, the potential for spillovers into dual use technologies dominated only by global powers has warranted a slower but autonomous process of national production. In addition to dominating the technology, the Brazilian navy hopes to decrease the cost on an order of 50% by the choice of less expensive materials in construction.[41] Prosub is placed between cooperative development and autonomy; the goal of the navy is to dominate the technology nationally, but it has been drawing upon cooperation to achieve autonomy.

At the top-center of the grid we might place Embraer's KC -390. This medium-lift military transport aircraft specifically designed to conduct troop and cargo transport in Antarctica and Amazon regions is expected to set new standards for performance, cargo capacity, flexibility and life cycle costs.[38] It will allow aerial delivery and in-flight refueling and support search and rescue (SAR) and medical evacuation missions. Its adaptability to tropical conditions provides value added to customers operating in difficult environments. Some call the redesign to operate in high heat and humidity the "tropicalization" of technology.[39] The $1.6 billion Brazilian air force contract intended to replace the Lockheed Martin C-130 may also find roles in Argentina, Chile, Colombia, the Czech Republic and Portugal. The KC-390 will not fly until late 2014 and is five years from service entry, but already accounts for the largest share of EDS annual revenues, bringing in about $400 million in 2012.[40]

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[36] Brazilian Army orders Guarani APCs from Iveco 13 August 2012 http://www.army-technology.com/news/newsbrazilian-army-orders-guarani-apcs-from-iveco as well as interview with Iveco, LAAD 2013, Rio Centro, Brasil April 10, 2013.

[37] Defesanet.com

[38] "Embraer taps Northrop Grumman for KC-390 nav system," Airline Industry Information September 12, 2012.

[39] LAAD interview with Iveco, April 9, 2013.

[40] "Embraer goes on defensive; Brazil's aerospace champion has global ambition in the military, security and space arena,"

The KC 390 is placed in the center of the source of technology axis to reflect the new role of Embraer as a systems integrator.[41] As Luiz Carlos Aguiar, President of Embraer Defense & Security (EDS) notes, Embraer is squarely positioned in the global value chain to deliver products designed to meet the needs of its customers by drawing together top suppliers of aeronautical subsystems.[42] Aguiar sees Embraer as a manager of complex systems, acknowledging that it is impossible in today's market to develop aircraft alone.[43] EDS adds value in marrying high technology subsystems such that the pilot in the cockpit operates a seamlessly integrated piece of equipment. A modification of one part of the aircraft will require modifications in others for the pilot to experience an integrated interface.[44] The KC390 is place in the uppermost vertical segment in that it appears to offer new capacities in large scale lift with abilities to operate in challenging environments.

In each of these three cases we can see Brazil's engagement in the global value chain—but with varying levels of innovation in the product development. Brazilian defense modernization strategies evidence an appreciation for the role of defense value chains. In 2010 Defense Minister Jobim emphasized the need for joint ventures with shared production responsibilities and technology transfer to promote the domestic defense industry so that in the future it may independently produce its own military equipment.[45] His successor in defense, Minister Amorim—who has also served as foreign affairs minister—has highlighted the need for investments in the defense industry to promote a "reasonable degree of technological autonomy" and stimulate overall industrial growth.[46]

As a means to preserve autonomy while procuring technology, Brazil has followed its foreign policy of diversification in the defense sector. Brazil entertains diverse develop production partnership. As represented in figure 4, we can trace agreements with European, North American, South American, Middle Eastern and BRICs partners in defense modernization. Paralleling changes from autonomy through distance to autonomy through participation, this re-equipment is squarely different from that pursued in the 1970 through 1990 period. Promotion of the defense sector in its earlier incarnation was inwardly oriented, utilizing international technology transfer when necessary but focused on the promotion of a national defense industry in Brazil. Ownership was both public and private; at the time aircraft producer EMBRAER was state owned and armored vehicle firm ENGESA and the missile entity AVIBRAS were privately financed. Each was strongly connected to national military programs to promote defense

Flight International September 4, 2012.

41 Conversation with Patrizia Xavier, Senior Manger, Institutional Relations, Embraer at LAAD 2013 Rio de Janeiro. April 10, 2013.

42 Luiz Carlos Aguiar, President of Embraer Defense & Security Brazil Summit, Brazilian-American Chamber of Commerce, NYC April 21, 2013.

43 Aguiar, Brazil Summit

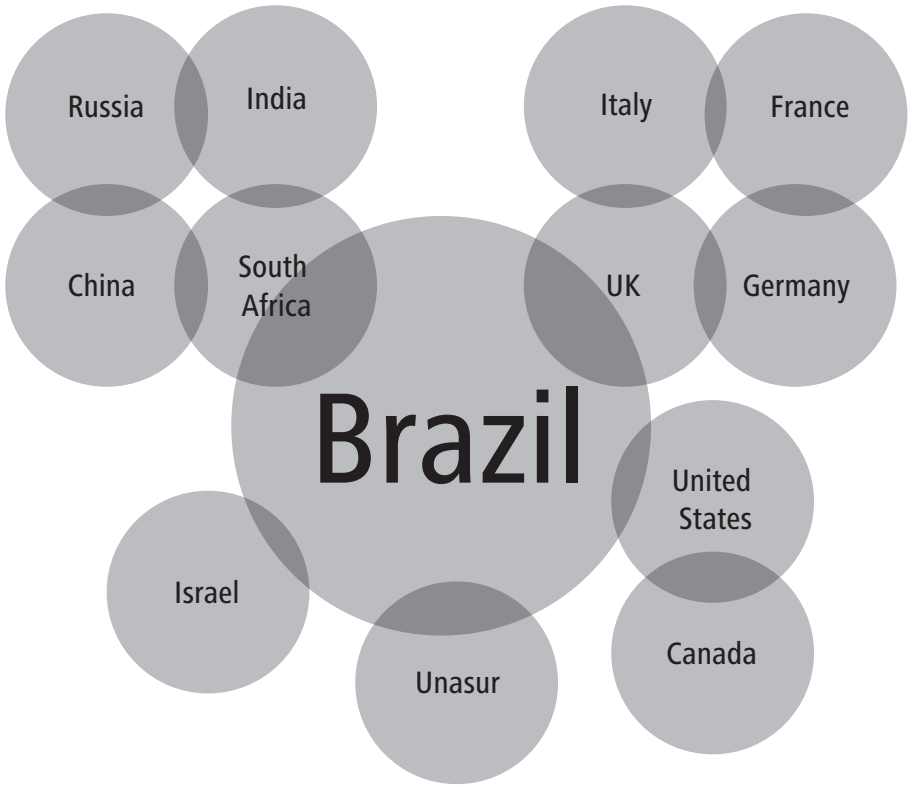
44 Conversation with Patrizia Xavier, Senior Manger, Institutional Relations, Embraer at LAAD 2013 Rio de Janeiro. April 10, 2013.

45 Max Manwaring and Andrew Fishman , "Brazil's Security Strategy And Defense Doctrine" Colloquium Brief U.S. Army War College, The George Washington University Compiled and The Center for Latin American Issues 2010.

46 "Essas medidas legislativas são importantes, não só porque a defesa é um estímulo importante para a indústria em qualquer país do mundo, mas também porque é preciso ter um grau razoável de autonomia tecnológica e industrial para garantirmos a defesa. Interessa ao governo promover os dois lados — disse o ministro" Eliane Oliveira and Danilo Fariello O Globo 17 February 2013 accessed via Defesanet.com.br.

production at home.[47] In contrast, the 21st century Brazilian defense industrial base is squarely integrated into global value chains, paradoxically promoting autonomy in re-equipment.

Figure 4: ***Linkages between Brazil and partners in its defense value chain***



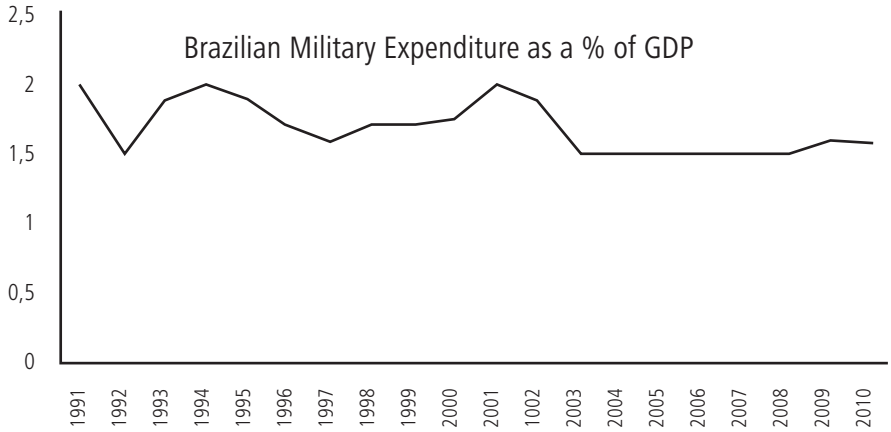
The Spending Constraint: Brazil's Commitment to Budgetary Stability

Brazil could escape the tension of choosing between autonomy and national technological development if budgets weren't an issue. In the abstract it is conceivable that Brazil could spend its way out of the defense modernization trilemma—but this would come at an enormous cost and ultimately undermine its source of soft power. Brazilian economic stabilization in the mid-1990s was hard-won. Following two decades of inflation fueled growth and stagnation, administrations as different as Cardoso and Lula held to fiscal restraint and goals of monetary stability. In policy circles there is a deep acceptance of the need to reduce the so-called "Brazil cost" in order to grow. In addition to needed changes in the unwieldy business environment and deficits in infrastructure, this elevated Brazil cost is a legacy of years of spiraling inflation and default risk. Although Brazil no longer faces uncontrollable

[47] See Patrice Franko (Jones), The Brazilian Defense Industry Boulder, CO:Westview Press, 1992.

prices or unstable debt, the price it must pay in global capital markets remains high. Its penance for decades of profligacy is the need to constantly assure markets of its current good behavior. This has involved meeting primary budgetary surpluses of between 2 and 3%of GDP. Since a primary surplus measures the current fiscal stance of a government (it doesn't include past debt due), it indicates the future sustainability of public finances. By keeping these within a target of 2 to 3%--a range more constricting than economies the size and depth of Brazil might ordinarily need—Brazil is able to maintain investment grade credit, lowering the costs of borrowing for both firms and the state.[48] A big burst of defense spending that upset this capital markets balance would ripple throughout the economy, raising capital costs and lowering Brazil's global growth potential. When one overlays pressing needs of infrastructure investments in advance of the World Cup and the Olympics as well as a firm commitment to social spending to eradicate the worst pockets of poverty, defense spending in Brazil is hardly poised for a grand take off.

Figure 5: ***Brazilian Military Expenditures as a percent of GDP***



This is not to say, however, that defense spending won't increase at significant but incremental rates. Defense budgets in Brazil have been noticeably flat as a percentage of GDP. Figure 5 indicates that the commitment to military spending has narrowly ranged between 1.5 and 2% of GDP for the last two decades. Relative to its size, Brazil underspends on its defense. As Thomas Sheetz has documents, gross dollars spent even overstate its re-equipment potential as 75% of the budget is driven by personnel costs, with pensions along eating up 40% of spending in the country.[49] Increasing defense spending must be done carefully so as not to undermine its economic foundation.

Not only is the level lower that other BRICs or many OECD nations, the rate of increase in the past decade has not kept up with expansion in other big emerging markets. 50 While military

[48] For a discussion of Brazilian interest rates please see Alex Segura-Ubiergo "The Puzzle of Brazil's High Interest Rates," IMF Working Paper February 2012 www.imf.org/external/pubs/ft/wp/2012/wp1262.pdf.

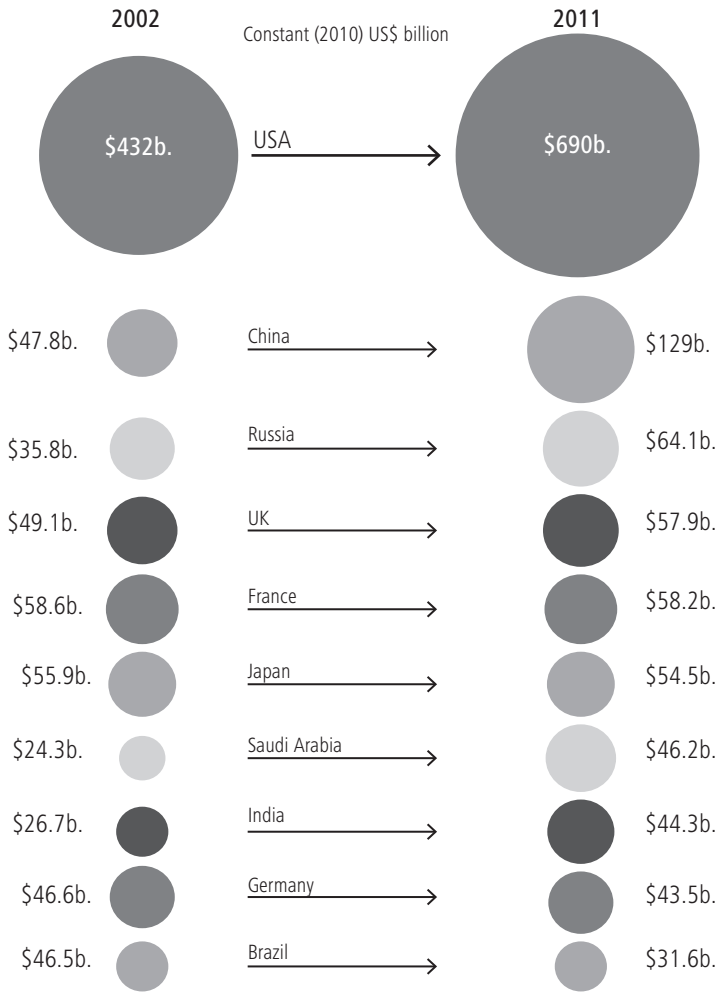
[49] Thomas Scheetz "El impacto de la crisis financiera en el gasto militar sudamericano,"Tecnología militar, Año 34, Nº. Extra 5, 2012 (Ejemplar dedicado a: LADA: Latin American Defence Almanac 2012/2013): 8-10.

[50] http://www.sipri.org/research/armaments/milex/resultoutput/trendgraphs/Top10bubble/top10bubble2010/

spending in China, Russia, and India increased from 2002 to 2011 by 170%, 79% and 66% respectively, as shown in Figure 6 Brazilian spending only grew by 22% in this period.[51] This gap has not gone unnoticed by Brazilian strategists. Minister of Defense Celso Amorim argued before Congress that if Brazil is to assume its role as a world power, it must invest in defense at the BRIC level.[52] Amorim has signaled a doubling of the acquisition budget, but achieving this is most likely to come by introducing efficiencies in personnel costs.

Figure 6: ***Changes by the Top Military Spenders***

The change in military expenditure from 2002 to 2011 for the top 10 military spenders in constant (2010) US$ billion. (The area of each circle is proportional to the level of spending.)



image_view_fullscreen. If using this graphic need to get permission from SIPRI—just involves writing them.

[51] Measured in constant dollars by SIPRI. See footnote 31.

[52] Orçamento da Defesa no Brasil deveria ser igual ao dos Brics, diz ministro 26/04/2012 20:23 - Portal Brasil http://www.brasil.gov.br/noticias/arquivos/2012/04/26/orcamento-da-defesa-no-brasil-deveria-ser-igual-ao-dos-brics-diz-ministro

The Defense Trilemma: Ameliorating Acute Tradeoffs

To promote sustainability, relieving tension on the economic lever pushes the country toward the global value chain. With responsible defense spending, tradeoffs in defense modernization have been made less painful through the reconceptualization of Brazilian autonomy as a globally diversified endeavor as well as expanding production in a newly defined geo-economic landscape. The overarching Brazilian foreign policy of achieving autonomy through divergent participation has been reinforced by a set of agreements between Brazil and technological partners in defense production.

To borrow a phrase from the American advertising media campaign for the Oldsmobile, "this is not your father's defense industry." Although promotion of the defense industry is part of Brazil's strategic focus, its implementation is far more nuanced in its integration into the broader Brazilian industrial landscape as well as its appreciation for the global defense value chain. New Brazilian missions are grounded on the precept that national defense and security activities are highly interrelated, and involve the economy, politics, environment, national productive potential, science, and technology. Brazilian policymakers anticipate that the investments made with global partners in support of military autonomy may have positive spinoffs for the domestic economy.

Acquisition programs are more thoroughly integrated into a redeployment of defense assets to enhance homeland security and protect Brazil's exclusive economic zone and petroleum assets. This requires investment in systems of surveillance and control with stronger connections to civilian technologies. The needs of Brazilian defense may drive greater expression for innovation in both defense and civilian systems.

We also see an institutional deepening in the design of the defense policy. As shown in table 3, we can see that programs are far more articulated in concert with civil society, putting the armed forces in dialogue with congress, the executive branch, industry and the university system. President Rousseff's approach very much links the promotion of the defense sector to a broader strategy of incentives toward the technology sector. Expanding links into university programs is investing in future capacity to manage defense systems.[53]

[53] David C. Mowery, "The need for a new generation of policy instruments to respond to the Grand Challenge," Research Policy Vol 41, Issue 10, December 2012, 1703–1715.

Table 3: ***Civil Society and Defense Policy***

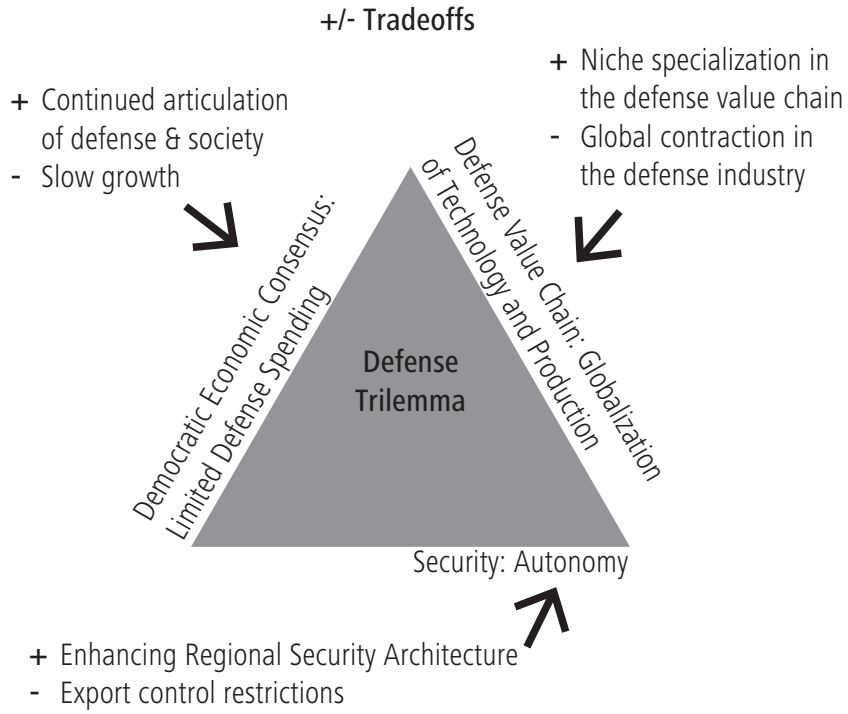
Institutional Deepening in Defense Production	
2005	MOD (Ministry of Defense) created the military commission defense industry (CMID), permanent space of dialogue between the government and the defense industry.
2005	National Defense Industry Policy (PNID) addressed the importance of industry revitalization.
2005	National Policy for Defense Industry (pnid) established guidelines to encourage the industry
2008	Production Development Policy (PDP) considered the defense industrial complex as one of Mobilization Programs in Strategic Areas.
2008	National Defense Strategy (END) established a revitalized military industry as one of three structural axes for the defense of the country (other 2 are restructuring armed forces & policy of effective composition).
2011	Integrated the defense industry into "Brazil Maior," the plan for national investment and growth; Provisional Measure 544 gave incentives to companies for national defense production.
2012	Provisional measure converted into Law 12 598 Act of industrial incentives and protection for national defense production. This establishes norms for purchasing, contracting and developing defense systems. It created the category EED, strategic defense firm, that will permit special tax status.

Source: Flávia de Holanda Schmidt, Rodrigo Fracalossi de Moraes, Lucas Rocha Soares de Assis "A Dinâmica Recente Do Setor De Defesa No Brasil," IPEA RADAR: Tecnologia, produção e comércio exterior, No. 19, 4/2012.

Although the policy mix to deepen defense production in Brazil is significantly different from attempts 30 years ago, tradeoffs must still be considered. Figure 7 summarizes the opportunities and constraints in minimizing the costs of tradeoffs. Integration into the global value chain comes at a cost to a nationalist's view of maximizing autonomy. The ability to integrate deeply into the value chain is itself compromised by decisions made in Western Europe and North America to limit the acquisition of sophisticated systems by the Global South. Such export control restrictions act as a barrier to partnerships within the defense value chain.[54] Nonetheless, as Brazil builds confidence among central players that it is a responsible participant in the international system, these barriers may erodeRegional alliances such as UNASUR that encourage transparency and cooperation may be useful in offsetting mistrust with NATO countries worried about secret deals between Brazil and countries such as Iraq or Libya. There will also likely be a greater demand on the part of North America and Western Europe to offset their own defense contractions through partnerships with the global south. Recent activity between Boeing and Embraer may be indicative of future trends in this direction.

[54] Discussed by Waldimir Pirró e Longo, "Indústria de Defesa: Pesquisa, Desenvolvimento Experimental e Engenharia," Revista da Escola Superior de Guerra,Vol.25, n.52, p. 7-37, Rio de Janeiro, RJ, (2011).

Figure 7: ***Minimizing Tradeoffs in the Brazilian Defense Trilemma***



Brazil may also decrease tensions in integrating in the global value chain by defining a clear specialization in defense production. The unique characteristics of defense production of high R&D requirements paired with a small number of potential buys help those with niche markets to succeed. Replicating what NATO countries already offer is a risky strategy. As demonstrated above, firms need to innovate in either production costs or by products, moving higher on our grid of innovation. This premium on specialization will increase as North American and European defense producers feel the pinch of further budget cuts. One should expect a scramble to protect jobs in each country. Unless a country is willing to pour more resources into the defense sector, the survivors of the global contraction in military production will be those best able to offer premium products at low costs.

Brazil enjoys a certain advantage in such frugal innovation. Indeed, the success of EMBRAER has been predicated on identifying lucrative market niches in aviation. The risk at this stage is that promotion of incentives in the defense sector in Brazil will not adequately address the global marketability of systems. Brazilian growth is slowing. As the allocation of national resources has become deeply democratized, the armed forces modernization funds compete with needs across a wide range of sectors. Institutional ties to civil society may be used to articulate the case for stronger investments in national security, but these must contend with infrastructure and social sector priorities. Defense modernization may become a slower or less ambitious process than envisioned by policymakers. Overreaching could undermine the economic viability of the

defense industrial base in Brazil. This was the ill-fated result of expansion in the 1980s. Integration into the global value chain supported by a new articulation of sovereignty through partnerships bode well if the open political system can efficiently manage defense resources. It remains to be seen if indeed this is not your father's defense industry in Brazil or it policymakers have better learned to balance the constraints of the defense trilemma.

Endnotes

[1] 01 de Fevereiro, 2013 - 01:00 (Brasília) ABIMDE - Nova Diretoria Velhos Desafios .A posse das novas Diretoria da ABIMDE e SIMDE mostram luta do setor industrial de defesa e segurança pela manutenção de suas atividades

Another version of this paper is being published by National Defense University, Institute for National Security Studies, INSS, Washington DC forthcoming fall 2013. This paper owes a debt to my students at IUPERJ at the Candido Mendes University in Rio as its formulation came in teaching this material in a graduate course in economic globalization during my Fulbright Fellowship in Rio de Janeiro in 2012. Thanks also go to Dr. Clóvis Brigagão, who in working with the Konrad Adenauer Stifling Foundation invited me to present at the Forte de Copacabana Conference September 18, 2012 where I first introduced this framework of the defense trilemma.