INSS
INSTITUTE FOR NATIONAL STRATEGIC STUDIES

January 2014

STRATEGIC FORUM

National Defense University

The Defense Acquisition Trilemma: The Case of Brazil

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Key Points

- Brazil is a puzzling new strategic player. Currently, its economic clout is not supported by strong operational military capabilities.
- To make its military instrument commensurate with its new geopolitical weight, Brazil is undergoing military modernization. But it faces a security trilemma: it must choose among long-held aspirations of sovereignty, integration into the global value chain, and economic sustainability.
- Acute tradeoffs are being avoided by leveraging diversification of global partnerships into a wide but shallow defense supply chain integration.
- With its new global reach, the Brazilian defense industrial base is not a continuation of the defense industry of the 1980s. Instead, complex industrial relationships and civil society engagement create a critical disjuncture from the inward looking pattern of the earlier phase.
- Strengthening legal frameworks between the United States and Brazil to support defense cooperation would allow private-sector initiatives to deepen bilateral ties.

Brazil is a puzzling new player in the global system. Emerging as a complex international actor, it has come to be seen as a significant economic competitor and dynamic force in world politics.[1] But transformational changes in the economic and political realms have not been accompanied by advances in military power. While Brazil has entered the world stage as an agile soft power exercising influence in setting global agendas and earning a seat at the economic table of policymakers, its military capacity lags. The national security strategy announced under President Luiz Inácio Lula da Silva 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.

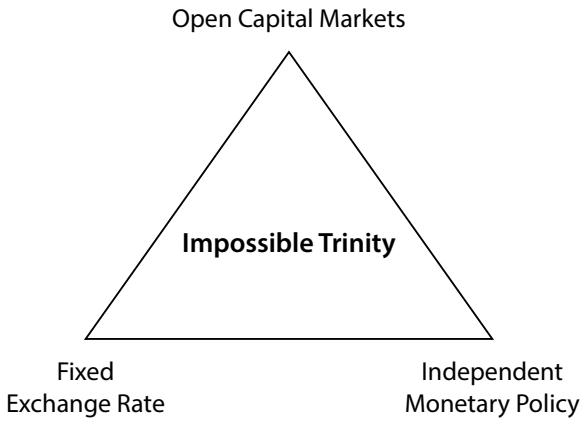
Brazil has developed a framework to deepen its strategic reach. The country remains committed to defending the territorial sovereignty of its 26 states and nearly 17,000 kilometers (km) of borders with 10 neighbors.[2] We observe a multidimensional view of security in Brazil rooted in economic, political, and environmental dimensions. In addition to these more traditional security concerns, Brazil is particularly attentive to the returns from investments in technology and the social sector for national security.[3] The country aspires to deepen its institutional framework in national security and enhance its global profile across political, economic, and military domains.

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 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 options facing Brazilian policymakers as they attempt a military modernization commensurate with Brasília's 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 Brazil's quest for defense re-equipment—if it 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. With the framework for choice among competing ends established, we delve into 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 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 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 suggest that wavering from this economic commitment would be a self-defeating choice in that it would undermine the important soft power that it earned as an emerging global market. Appreciating fiscal constraints, we 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. We also see that new opportunities for U.S.-Brazilian engagement are created through industry partnerships.

Figure 1. The Macroeconomical Trilemma



The Impossible Defense Trinity

Although new to strategic thinking, the concept of trilemma to illustrate tradeoffs is well known to the student of international economics. The 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, preferred by the International Monetary Fund, linked a nation's currency to a globally traded store of value such as the dollar, pound, or gold to promote accountability to a stable monetary policy. But it also meant that the pursuit of an autonomous monetary policy would be difficult. 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 future devaluation. Conversely, a tighter monetary policy would

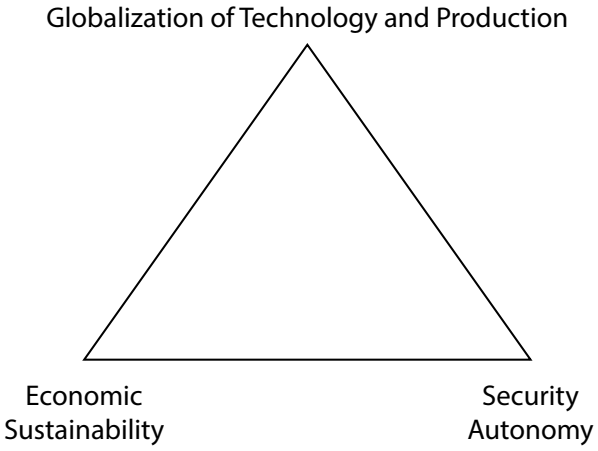
involve an increase in the domestic interest rate, attracting capital to the country. As foreign currency flowed in, the central bank would be forced to increase the supply of local money to maintain the fixed exchange rate—an increase that was the opposite of the contractionary policy move. The lesson 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.

The trilemma therefore focuses our attention on choice sets. We can have a fixed exchange rate and an autonomous monetary policy if we do not allow the free flow of capital.[5] For each case, two of the three objectives are achieved; all three cannot exist simultaneously. We can parallel this logic in defense acquisitions by adapting the monetary case to the defense trilemma shown 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—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 subject to the restrictions that others may place on purchases.

To operationalize such autonomy, however, countries need access to the technology embedded in the global value chains that characterize 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. When 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 ordinarily 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 incentives for greater cooperation in Europe and the United States 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. We also have to wonder about the capability of China to continue to underwrite uneconomical military expansion. As we see in the case of Brazil, a broadly democratic commitment to a responsible defense acquisition strategy constrains the country

Figure 2. The Defense Modernization Trilemma



to sacrificing autonomy or further integrating into the global value chain to meet its national security goals.

Costs of Preserving Autonomy

When we type the term *unholy trinity* into Google Translate, "profane trinity" pops up in Portuguese. Indeed profanities might slip out as frustrated defense policymakers navigate 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 an unsatisfied objective of Brazilian policy.[7] Autonomy can be understood as the means to implement sovereign decisionmaking in a global system. Powerful nations are 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 actors from domestic interference.

the power to influence others in the global system is intricately tied to Brazil's foreign policy

Brazil has been characterized as a nation whose strategy is 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." Brazil's search for autonomy is a guiding concept in its foreign policy.[9] The doctrine articulated by the Escola Superior da Guerra (Superior War College) 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, psychosocial factors, the military, and a scientific and technological base.[10] The long-held objective of autonomy in pursuit of national goals was laid out 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 U.S. Council on Foreign Relations report concluded, Brazil now makes the short list of countries shaping the world.[12] For Brazil, this enhanced global position is largely a function of agile international politicking, a top 10 economy, and 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 expressions of autonomy: distance, participation, and diversification.[14] In the first stage, paralleling the economic approach of import substitution industrialization, 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, Brazil perceived that it needed to play within global regimes. Although suspicious of a close embrace with 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 World Trade Organization to gain leverage and policy space. Pragmatism prevailed. In order 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 U.S. unilateralism became more dominant in the new millennium, Brazil practiced greater assertiveness in international institutions as a counterweight to American power.[21] 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 (Southern Common Market), amplified South Atlantic ties with Africa, and built frameworks for cooperation with other big emerging markets in the BRICS (Brazil, Russia, India, China, and South Africa) club. Autonomy through diversification does not reject the institution-building and rule-setting agendas 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, autonomy 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, thereby enhancing its autonomy at home. Such partnerships with developing countries have been characterized as "consensual hegemony" that rests on shared interests of participating states.[22] 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."[23] 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.

alliances fit a stylized Brazilian characteristic of creatively adapting to circumstances

These alliances are more ad hoc and fluid than institutionalized and rigid. They fit a stylized Brazilian characteristic of *jeitinho* ("finding a way") or creatively adapting to circumstances. As can be illustrated in the case of the South American integration scheme Mercosur, Brazil is interested in levers to adjust asymmetries of power but not in creating binding constraints of new alliances.[24] UNASUR (Union of South American Nations) represents a wider yet shallower integration effort. Its South American Defense Council, formed in 2009, promotes confidence-building without firm strategic commitments.[25] Instead, Brazil sees itself as a "global

trader" with multiple organic links to Asia, Africa, and Europe. To use a soccer analogy, we 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 neighborhood.

Lula, and later Rousseff, 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 nonconfrontational, placing primacy on the ability of other 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 weaknesses on technological and military fronts.[26] Without appropriate instruments of power, Brazil cannot be seen as a credible global player acting in its own sovereign interests.[27] 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 titled 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 as PAC-defense. In light of strategic objectives, it was charged with reactivating the national armaments industry to promote autonomy in defense and realigning defense personnel to new threats and identifying internal roles for the armed forces in maintaining law and order.[28] Table 1 provides a glimpse of some of the modernization programs, but these programs demand defense industrial partners.

redressing asymmetries of hard power is most problematic in the military sector

Constraints to Modernization

Technology is central to the equation for global power. As the Política Nacional de Defesa (National Defense Policy) notes, technology is fundamental to national defense.[29] But technology has increasingly become embedded in complex global value chains.[30] 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, production control exercised over sensitive or dual technologies limits integration of Southern partners in defense.[31] Legal constraints by the United States and Europe, imposed for security reasons, limit the transfer of knowledge to the periphery.[32] 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, 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 Brazil's nationally produced defense systems, firms already participate in the global value chain. But according to the Organisation for Economic Co-operation and Development (OECD), Brazil also has one of the lowest rates of participation by large firms in collaboration on innovation activities, with under 20 percent as opposed to nearly 60 percent in the United Kingdom or over 40 percent in France.[33] Brazilian participation in defense industrial systems is even further limited. Yet as retired

Table 1. Brazilian Military Modernization Priorities

Army	Navy	Air Force
Fleet of wheeled armored vehicles (Guarani)	Surveillance for the Blue Amazon Management System	Fighter jets
Operation of special forces brigades	Ocean patrol boats through Programa de Obtençâo de Meios de Superficie	AMX and expand fleet of Super Tucanos for training and counter insurgency operations
Antiaircraft and communication capacity	Prosub construction of nuclear-propelled submarine and modernization of conventional submarines	KC-390 tactical transport and humanitarian missions
Astros 2020 (missiles)	Torpedoes, missiles, helicopters, and command and control systems	Management of resources, operational capacity, and human resource investments
Critical infrastructure protection through PROTEGER	Deployment of shipyard and naval base	Monitoring and surveillance via unmanned aerial vehicles (UAVs)
Bridges and boats for Amazon	Logistical support ship	Air traffic control
Via Integrated Border Monitoring System, maintain control of Brazil's borders with 10 neighbors via radars, communications networks, UAVs, and armored vehicles	Seahawk helicopters	Blackhawk helicopter modernization
First Brazilian geostationary satellite		
Pantera helicopter modernization		

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," *Revista Brasileira de Política Internacional* 53, no. 2 (2010), 107–124; SIPRI, "Transparency in milex"; Projetos prioritários da Força Aérea Brasileira [Brazilian Air Force Priorities], available at <http://aerospacedefensebr.blogspot.com/2012/09/projetos-prioritarios-da-forca-aerea.html>; Max G. Manwaring and Andrew Fishman, *Brazil's Security Strategy and Defense Doctrine*, Colloquium Brief (Carlisle Barracks, PA: Strategic Studies Institute, 2011), available at <www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=1049>; Luis Aguiar, presentation to the Brazil-American Chamber of Commerce, New York, NY, April 23, 2013.

Brazilian General Jose Carlos Amarante notes, no country can meet its defense needs in isolation.[34] The conundrum is that military technology is expensive to develop. To understand technology acquisition in defense production, consider an adaptation of C.K. Prahalad and R.A. Mashelkar's "Innovation's Holy Grail" on civilian technology in developing countries (see table 2).[35] 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 systems, a country might elect to cooperate with either the government or firms in other nations to develop systems.[36] These options are represented on the horizontal axis of table 2. To innovate and gain an advantage in the production of a technological system, Prahalad and Mashelkar suggest that firms pursue three strategies, represented on the vertical axis of the table. Firms might implement new business models and take 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 table.

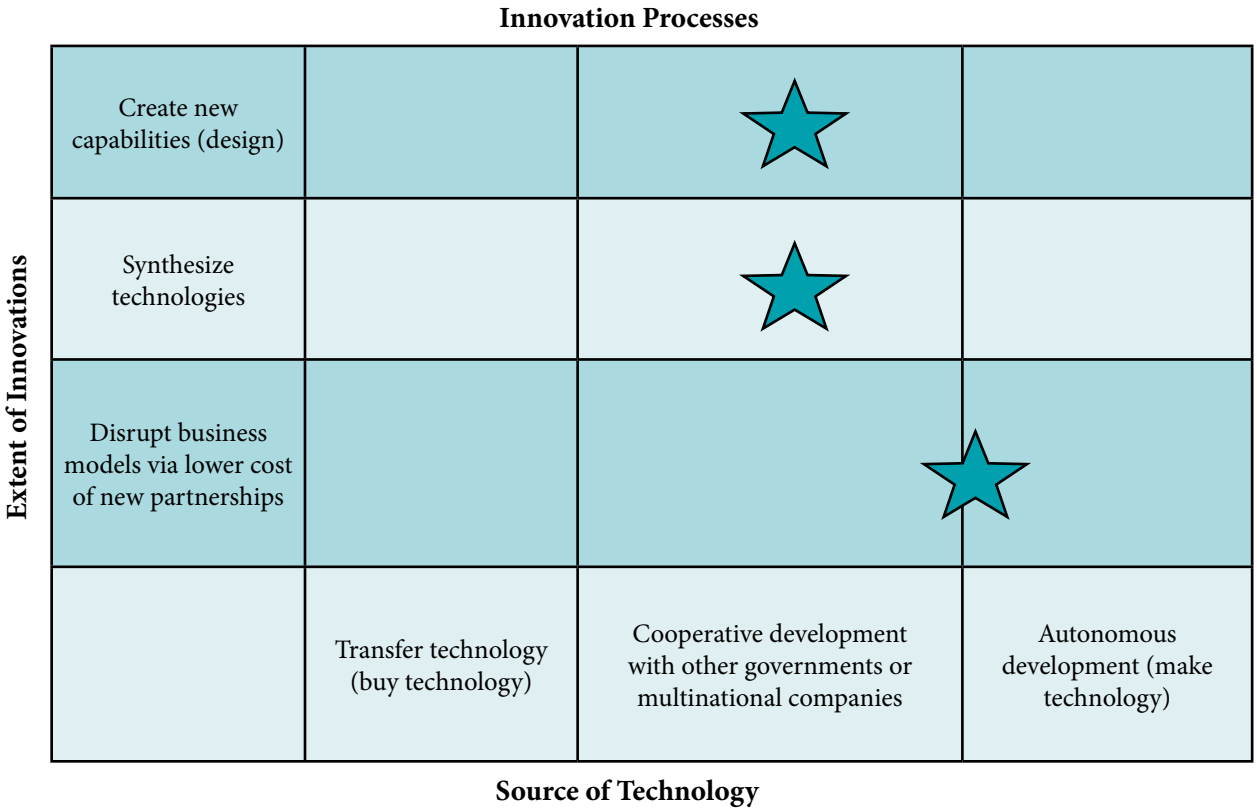
We can place Brazilian strategic projects on this grid to characterize their innovation approaches. First consider

the case of Iveco. Part of the Italian Fiat Group, Iveco's Brazilian division has developed the Guarani, an armored car, in conjunction with the Brazilian army. It received approximately 1.527 billion reais (USD 0.75 billion) as part of the government's Plan to Accelerate Growth program. The line is expected to engage 110 direct and 600 indirect suppliers with a national content of 60 percent.[37] 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.[38]

Iveco might be represented by the middle star in table 2. The Guarani was designed in cooperation with the needs of the Brazilian army, adapting systems to tough tropical conditions. 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, which aims to build four conventional and one nuclear submarine. The Brazilian navy created a joint venture called CBS (Cónsorcio Baía de Sepetiba) with the French DCNS and the Brazilian subsidiary of Odebrecht, providing 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 submarine to protect the country's 8,500 km of coastline and its undersea oil reserves. Rather than a turnkey approach, Brazilian engineers spent several years in France to gain

Table 2. Sources of Technology and Extent of Innovation



Source: Adapted from C.K. Prahalad and R.A. Mashelkar, "Innovation's Holy Grail," *Harvard Business Review* 88, no. 7 (July–August 2010), 132–144; and José Carlos Albano do Amarante, "A base industrial de defesa brasileira" [The Industrial Base of Brazilian Defense], Institute of Applied Economic Research Working Paper 1758, 2012.

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.[39] 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 percent by the choice of less expensive materials in construction. 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 table 2 we could place Embraer's KC-390. This medium-lift military transport aircraft, specifically designed to conduct troop and cargo transport in the Antarctic and Amazon regions, is expected to set new standards for performance, cargo capacity, flexibility, and lifecycle costs.[40] It would allow aerial delivery and in-flight refueling and support search-and-rescue and medical evacuation missions. Its adaptability to tropical conditions provides value to customers operating in difficult environments. Some call the redesign to operate in high heat and humidity the "tropicalization" of technology.[41] 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 5 years from service entry, but it already accounts for the largest share of Embraer Defense and Security (EDS) annual revenues, bringing in about $400 million in 2012.[42]

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.[43] As Luiz Carlos Aguiar, president of 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.[44] Aguiar sees Embraer as a manager of complex systems, acknowledging that it is impossible in today's market to develop aircraft alone.[45] EDS adds value in marrying high technology subsystems such that the pilot operates a seamlessly integrated piece of equipment. A modification of one part of the aircraft would require modifications in others for the pilot to experience an integrated interface.[46] The KC-390 is placed in the uppermost vertical segment of table 2 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 see Brazil's engagement in the global value chain—but with varying levels of innovation in product development. Brazilian defense modernization strategies evidence an appreciation for the role of defense value chains. In 2010, Defense Minister Nelson 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.[47] His successor, Minister Celso Amorim—who has also served as foreign affairs minister—has highlighted the need for investments in the defense industry in order to promote a "reasonable degree of technological autonomy" and stimulate overall industrial growth.[48]

Brazil has followed its foreign policy of diversification in the defense sector

As a means of preserving autonomy while procuring technology, Brazil has followed its foreign policy of diversification in the defense sector. Brazil has developed diverse defense production partnerships. 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 1970–1990 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, 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 production at home.[49] In contrast, the 21st-century Brazilian defense industrial base is squarely integrated into global value chains, paradoxically promoting autonomy in re-equipment.

The Spending Constraint

Brazil could escape the tension of choosing between autonomy and national technological development if budgets were not 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, the Brazil cost is a legacy of years of spiraling inflation and default risk. Although Brazil no longer faces uncontrollable 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 percent of gross domestic product (GDP). Since a primary surplus measures the current fiscal stance of a government (it does not include past debt due), it indicates the future sustainability of public finances. By keeping these within a target of 2–3 percent—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.[50] 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 takeoff.

relative to its size, Brazil underspends on its defense

This is not to say, however, that defense spending will not increase at significant but incremental rates. Defense budgets in Brazil have been noticeably flat as a percentage of GDP. Its commitment to military spending has narrowly ranged between 1.5 and 2 percent of GDP for the last two decades. Relative to its size, Brazil underspends on its defense. As Thomas Sheetz documents, gross dollars spent even overstate its re-equipment potential as 75 percent of the budget is driven by personnel costs, with pensions alone eating up 40 percent of spending in the country.[51] Increasing defense spending must be done carefully so as not to undermine Brazil's economic foundation.

Not only is the level lower than other BRICS or many OECD nations, but the rate of increase in the past decade has not kept up with expansion in other large emerging markets.[52] While military spending in China, Russia, and India increased from 2002–2011 by 170 percent, 79 percent, and 66 percent, respectively, Brazilian spending only grew by 22 percent in this period.[53] 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 BRICS level.[54] Amorim has signaled a doubling of the acquisition budget, but achieving this is most likely to come by introducing efficiencies in personnel costs.

Opportunities for U.S.-Brazil Relations

There will 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. As sequestration in the United States and fiscal contraction in Europe wither defense budgets, the motivation to appropriate scale economies through collaboration is increased. From the U.S. side, the groundwork has been laid with the Obama administration welcoming increased frequency of high-level visits with Brazil. The 2010 Defense Cooperation Agreement signed by Defense Minister Jobim and Defense Secretary Robert Gates opened the parameters for enhanced dialogue.[55] In 2012, the U.S.-Brazil Defense Cooperation Dialogue identified six priority areas for partnership: science innovation and technology transfer, logistics, communications, humanitarian assistance and disaster response, cooperation in support of African nations, and cyber security. Shared strategic interests in counternarcotics and border control create openings as U.S. and Brazilian firms hold a wide array of win-win opportunities in these areas. With limited scale, few firms can dominate all stages of production; through partnerships, national and global interests can be achieved. As a former Deputy Assistant of Defense for Western Hemisphere Affairs noted, transnational problems require multilateral solutions.[56] Brazil's diversified partnerships open opportunities to enhance multilateral options for the United States. In particular, development of programs on the nonlethal spectrum—which by constitutional design is squarely the Brazilian niche—can reinforce capabilities in areas such as monitoring, navigation, and control that are central to the new Brazil national defense strategy. There is significant space for what Ambassador Luigi Einaudi has characterized as mutually beneficial engagement.[57]

The foundation for high-tech trade has been laid by bilateral agreements, and taking full advantage of these advances requires passage by the Brazilian congress. But even without changes in the legal environment, firms can signal their commitment to work in and with Brazil. Recent activity between Boeing and Embraer may be indicative of future trends in this direction. Boeing has recognized the long-term potential of Brazil with the inauguration of its sixth global center for science and technology. This is not only about making the big sale of F-18 fighter jets. Although this sale is undeniably important, Boeing sees the synergies in partnering with Embraer to jointly contest new markets. The partnership goes two ways. Embraer brings capabilities in the medium-lift market where Boeing aspires to remain a supplier to the Brazilian firm. This Sao Jose dos Campos company in turn has a long history of integrating systems into Boeing planes.

shared interests create openings as U.S. and Brazilian firms hold a wide array of win-win opportunities

In addition to large-scale aerospace production, there may also be space for cooperation in unmanned aerial vehicles (UAVs). This area of technology is particularly important to the Brazilians in their objectives of monitoring and controlling the Amazon, natural disasters, and as security measures in large urban spaces. The World Cup and the Olympics heighten this need for eyes in the skies. Beyond industrial partnerships, the opportunity here is to partner with Brazil on developing international norms for the use of UAVs. This debate, tied to armed drones, has escalated in the United States. President Barack Obama has recently articulated guidelines for oversight of U.S. use.[58] Brazil's diversified international relationships and its reputation for

Table 3. Civil Society and Defense Policy

Year	Policy
2005	Ministry of Defense created the military commission defense industry, a permanent space of dialogue between the government and defense industry.
2005	National Defense Industry Policy addressed the importance of industry revitalization and established guidelines to encourage the industry.
2008	Production Development Policy considered the defense industrial complex as one of the Mobilization Programs in Strategic Areas.
2008	National Defense Strategy established a revitalized military industry as one of three structural axes for the defense of the country (the other two are restructuring armed forces and 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," the strategic defense firm to permit special tax status.

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

reaching cooperative solutions position it well to promote dialogue on establishing ethical use parameters for UAVs. Doing this in partnership with the United States would send a strong signal about new geometries of global power.

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 a reconceptualization of Brazilian autonomy as a globally diversified endeavor paired with 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 rephrase an advertising media campaign for 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 to 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, 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 connects 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.[59]

Although the policy mix to deepen defense production in Brazil is significantly different from attempts 30 years ago, tradeoffs must still be considered. 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.[60] Nonetheless, as Brazil builds confidence among central players that it is a responsible participant in the international system, these barriers may erode. Regional alliances such as UNASUR that encourage transparency and cooperation may be useful in minimizing mistrust with North Atlantic Treaty Organization (NATO) countries worried about secret deals between Brazil and countries such as Iraq or Libya.

Brazil may decrease tensions in integrating into the global value chain by defining a clear specialization in defense production. Defense production's unique characteristics of high research and development requirements paired with a small number of potential buyers help those with niche markets succeed. Replicating what NATO countries already offer is a risky strategy. As demonstrated, we need to innovate either in lowering production costs or by offering new products, moving the product higher on our grid of innovation processes. This premium on specialization will increase as North American and European defense producers feel the pinch of further budget cuts. We 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 democratized, 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 bodes well if the open political system can efficiently manage defense resources. We will see if policymakers promoting the sector have also learned to balance the constraints of the defense trilemma.

Acknowledgments

I gratefully acknowledge my 2012 Fulbright Fellowship in the University Research Institute of Rio de Janeiro at the Candido Mendes University, as well as Dr. Clóvis Brigagão and the Konrad Adenauer Stifling Foundation's invitation to present the defense trilemma at the Forte de Copacabana Conference, September 18, 2012. I would also like to thank participants in various Brazilian workshops and John A. Cope and his colleagues in the Institute for National Strategic Studies for their seminar feedback. *Muito obrigada!*

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