

An Analysis of the Feasibility of Revitalizing the Brazilian Defense Industry

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ABSTRACT: Since 2003, the Brazilian government and certain sectors of Brazilian society have been debating the revitalization of the Brazilian defense industry (BDI). This article analyses some of the arguments in these debates (the rights of nations and duties of governments as regards defense, the possibility of coercive action by the great arms exporters, evidence that the defense industry has always run a deficit, and the export needs the country would have if it decided to revitalize its defense industry) and analyzes other questions that merit scrutiny (the causes of the crisis in the BDI that occurred in the 1980s, the causes of low internal demand, the economic and technological impact of the BDI). This is done by comparing these arguments and exploring these questions based on an analysis of documents. In this way, we aim to provide reliable information from Brazil and elsewhere to contribute to this debate.

Keywords: revitalization, defense industry, Brazil

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1. INTRODUCTION

In a pioneering initiative, the Ministry of Defense (MD) invited civil society and members of the military to rethink various questions connected to national defense and security (Almeida Pinto et al., 2004). Since 2003, various debates and meetings have been held to foster discussion of the themes involved. This has been an exemplary initiative, because those in attendance have included the main echelons of the MD and the military services, along with important members of industry and universities and civil society in general, making a fertile ground for discussion. The results can be accessed directly at the site of the MD, such as the *Política Nacional da Indústria e Defesa* (National Policy on Industry and Defense) of July 2005, the creation of the *Centro de Certificação, de Metrologia, de Normalização e de Fomento Industrial* (Center for Industrial Certification, Metrology, Normalization and Encouragement) in February 2005, and MD Edict 611 of May 12, 2005, creating the *Comissão Militar da Indústria e Defesa* (Military Committee on Industry and Defense), among others.

The present work is the fruit of an invitation from the MD to prepare an analysis of the potential of revitalizing the Brazilian defense industry. In response, the article analyzes some of the arguments in this regard, along with other questions that deserve further reflection.

The method followed was to compare these assertions with the proposals and evidence available in specialized books, articles and other sources of information. The data used come from the United States Arms Control and Disarmament Agency (USACDA, 2003) and the Stockholm International Peace Research Institute (SIPRI, 2005), which are the most recent reliable sources available.

The work is organized in three sections. The first section analyzes a series of arguments involved in this overall debate: the right of nations and duties of governments regarding defense; the possibility of coercive action by the large arms-exporting countries; evidence that the defense industry has always produced deficits; and the country's need to export should there be a decision to revitalize its defense industry. The second section looks at the causes of the crisis in the BDI in the 1980s, the causes of low internal demand and the economic and technological impact of the BDI. The third section presents the final considerations and proposes a policy on military production and R&D.

The intention is to provide information and analyses capable of fostering greater reflection, since what is basically at issue is the need to deepen this discussion process regarding R&D and production activities related to national defense.

2. THE FOUR CONCORDANCES

2.1. The first concordance: the right of nations and the duties of their governments regarding defense

The first concordance is the right of nations and the duties of governments to defend national territory (Costa, 2003). Every nation has the right to dissuade would-be aggressors and repel them if necessary through the use of its armed forces, and the government has the duty to prepare for this morally and materially. This consensus assumption obliges countries to spend resources on their armed forces, and if society so desires, to establish a domestic defense industry. Given its essential objective – defense of the country – it does not have to provide any other benefit to its citizens. In reality, it will tend to run deficits. For this reason, the decision to invest in production of the means of defense (instead of acquiring them

abroad) depends on the existence of a level of internal demand coherent with the minimum profitable industrial scale, and also must be subordinated to the country's political capacity to export this very particular type of products (more will be said presently on how difficult this is).

The theme of the defense industry is part of a more general problem of reaching decisions, inevitably *political* ones. However, it is necessary to formulate *policy*, and for this criteria, indicators and descriptive heuristic models are indispensable (one of which is the spin-off model, commented on later). It is also necessary, as in any public policy area, to have institutional models.

Finally regarding the first concordance – the need for nations to have compatible means of defending themselves – mention should be made, on the one hand, of the size of the responsibility that Brazilian society delegates to its leaders, and on the other, in order to honor the commitment they assume, of the need to gain a deeper understanding of the theme, to increase our still incipient capacity for analysis, in order to have a framework to make an appropriate decision.

If the decision democratically reached by Brazilian society is that the right to self-defense needs to be exercised by revitalizing the BDI, then it is the duty of every citizen – soldier, politician, businessperson, academic – to cooperate to meet this need. And it will be the responsibility of the elites of our country to see that this revitalization occurs as closely as possible in line with the interests of the majority of our society.

2.2. The second concordance: the possibility of coercive action by the large arms exporters

Regarding this possibility, there is a long list of past events that can be mentioned. Among the most known are the certification of Embraer airplanes, the case of the Osório tank made by Engesa, the case of satellite orbits, of guidance devices, of spiral antennas and anti-radar technology of the channel switches.

These recent examples show how much our national initiatives related to sensitive technologies are subject to the interests of the American government, and increasingly to internationally accepted provisions. This obliges decision-makers in the sector to evaluate the opportunity cost of initiatives to produce defense materiel (including the fact this will almost always require importing sensitive technologies) vis-à-vis alternative projects aimed at the country's social, economic, industrial, technological and scientific development. And in particular, regarding exportation of armaments, this involves the opportunity cost of initiatives to circumvent the barriers to the exportation of raw materials, products with some aggregate value such as steel, machinery and equipment (of which Brazil was a large exporter), etc.

What should be emphasized is that, to use the popular expression “poking the wildcat with a short stick”, the government must choose very carefully where it will “poke”. All indications are that initiatives to change the unfair policy of the advanced countries (especially the U.S.) regarding our current exports will be better understood, assimilated, and who knows, even accepted by the international community (increasingly subject to the dictates of the U.S.) than adventures in the hard to justify world arms trade of the twenty-first century.

2.3. The third concordance: the evidence that the defense industry always runs a deficit

The decision to mount a defense industry is always political, not economic. No country in the world has established a defense industry to obtain economic gain, social impact or to

generate employment (Dagnino and Proença Jr., 1998). As already pointed out, the decision is political, since it involves assuring citizens benefits such as security, dissuasion, projection of power, minimization of threats, etc.

The decision to export defense materiel is made after setting up the industry. When a country decides to export weapons, it does so seeking to amortize the investment already made in their production. In other words, the intention is to diminish the losses associated with the use of the country's scarce economic, technological and social resources.

2.4. The fourth concordance: the need to export as an imposition of a decision to revitalize the BDI

The fourth concordance implies that a decision to invest more of the nation's resources in the production of defense equipment must consider the following questions: How is the armaments market organized, who are the competitors and the potential customers? Answering these questions involves analyzing the reasons that allowed Brazil, in its golden years, to expand its arms exports, mainly to countries of the Middle East, and for reasons associated with the current situation, to consider the potential of countries of South America (Brauer, 1998).

Below we present some useful information to assess the size of the potential market for the BDI, and explain some of the difficulties that would stand in the way of its revitalization.

The United States and Great Britain have 56% of the world armaments market. The U.S. alone in 1997 sold 67 billion dollars worth of arms abroad, a 45% share of the world market. Indeed, American exports, which had shrunk between 1991 and 95, have rebounded appreciably in recent years, and this is against a backdrop of relative stagnation of the arms imports by peripheral countries, those of particular importance to the BDI.

Further on the theme of "poking the wildcat with a short stick", it should be stressed that the U.S. has been earmarking sharply rising resources in recent years to military R&D, and intends to maintain this trend over the next five years. This means that actions by competitors that could hinder the amortization of these R&D investments and increasing productive capacity will not be well received.

Turning to the demand side, the world's main importer is Saudi Arabia, which alone accounts for 23% of total global arms purchases. Another large importer is Japan, which has growing defense needs with increased tension in Asia.

A very important market for the BDI in its golden years, the Middle East, for known reasons, was already considerably reduced in 1999, and continues shrinking.

Two important facts for the perspectives of the BDI should be stressed in relation to this market. First, the traditional partner of the BDI - Iraq - is no longer among the main importers in the Middle East (and is included in the "others" category). Second, the region's two main importers (Saudi Arabia and Israel) were in the 1997-1999 period the first and sixth largest buyers from the United States, respectively. Kuwait, which stands in fifth place in the region, is the tenth leading importer of U.S. armaments. The question that arises is: What part of this market could the BDI really hope to dispute?

Besides the high participation of the United States, there is another aspect to assess. This involves the characteristics of the armaments imported by the region's countries vis-à-vis those Brazil could produce. It is hard to calculate the implications of this aspect, but systematic information available from the SIPRI (2005) and USACDA (2003) databases, along with information gleaned from the specialized press, permit stating that there is a huge

disparity between the demand from these countries and our country's capacity to serve it (a matter discussed more later).

The other market considered potentially promising to the BDI, the South American one, imported 2% of the world total in 1989 and continued importing the same 2% in 1999. In this market, Venezuela is the largest buyer after Brazil itself. In contrasting the importation of countries like Colombia, which appears to be motivated by considerations of internal order, and Peru and Ecuador, which appear to be more externally motivated, it is difficult to explain Venezuela's behavior. It does not have what can be properly called an external enemy (at least at the time of these figures) or serious internal conflicts. The main factor appears to be its considerable foreign exchange reserves from oil exports. The case of Chile is also interesting and anomalous, since the law there establishes that a percentage of the revenue from copper exports be allocated to the armed forces. These cases illustrate the admitted fact that the arms trade is not always based on clearly established guidelines, or even predictable and rational ones.

The United States held an average of approximately 40% of the South American market in the period from 1989 to 1999, and in the latter year this share stood at over 60%.

Besides this aspect of the South American arms trade, and just as in the case of the Middle Eastern market, another aspect needs to be considered to assess the BDI's potential market, namely the characteristics of the defense materiel imported by the region's countries in relation to the weapons that can be produced by Brazil.

To estimate the BDI's potential market in South America, one can look at the situation in 1999 (the last for which reliable information is available). This market amounted to US\$ 800 million a year. Deducting the portion acquired by Brazil, this falls to around US\$ 500 million. The first aspect, the high share of the U.S. (60%), reduces this even more, to US\$ 200 million in that year. This is what would be left to dispute with the other arms producers (Great Britain, Germany, France, Russia, etc.).

In the case of the countries of South America, it is easier to evaluate the impact of the second aspect. Assuming that two-thirds of the region's defense market corresponds to arms systems (major weapons, according to the SIPRI terminology), this would account for US\$ 130 million. Supposing that one-third of this amount corresponds to arms systems with "intermediate technology", which Brazil could produce, we have a potential market worth US\$ 43 million. Of this, how much could the BDI hope to capture? Would this not coincidentally be more or less what the BDI has already been exporting, according to the SIPRI, in recent years (US\$ 26 million a year)?

3. THE FOUR QUESTIONS

3.1. The first question: the causes of the crisis of the BDI

Addressing this issue is fundamental to estimate the possibility of reversing the trend observed over the past 15 years and rebuilding the BDI's installed capacity. The other questions will be held more or less important depending on how one views this trend, and especially what can be called the crisis itself, which occurred at the end of the 1980s.

This crisis coincided with the end of the Iran-Iraq war, but also involved the "conversion" of the military leaders and the civilian and military relations that developed in Brazil at the end of that decade (Proença Jr., 1993 and 1994).

It is hard not to credit the BDI's crisis to the collapse of Iraqi purchases (Franko-Jones, 1991; Conca, 1997), particularly because the period of peak Iraqi arms purchases coincided with the period when Brazil's arms exports were gaining strength.

3.2. The second question: the causes of the low internal demand

The Brazilian armed forces do not necessarily consistently demand the armaments produced locally. Although it has been through their purchasing power that nearly all the weapons produced by the BDI have been made feasible, their orders have clearly been insufficient to prevent the industry's crisis.

Normally the reason cited for the low internal demand is the country's insufficient and declining defense budget. This observation is important, because if the armed forces obtained more funding, this would increase their defense purchases and resolve the problem of internal demand. The BDI could then be revitalized by a "demand shock" without needing other mechanisms other than the government's purchasing power.

This virtuous circle supposes firstly that the increased budget would be allocated to acquiring armaments, and secondly, that this greater purchasing power could be channeled to the domestic industry, something that would not necessarily occur given the probable limitation related to technological "non-substitutability" (discussed later) and the idiosyncrasies of the financing mechanisms of the international arms market.

An analysis of the evolution of military spending, however, indicates that from the end of the Brazilian military regime in 1985 until 1990, it grew quite rapidly, unlike what appears to be the dominant vision. The evolution observed, then, is not coherent with the argument that low internal demand is due to a fall in military spending.

This increase in the amount allocated to each member (active or retired) of the armed forces could be the result of different factors, from a simple increase in spending on pay and benefits to an increase in the equipment available to each soldier and sailor, etc.

There is no updated information publicly available on the acquisition of weapons by the armed forces. Internal demand was important during the years the BDI kept operating. On the other hand, as already observed, it was the dynamic of exports that determined production of Brazilian weapons systems. One of the reasons for this behavior is the fact that in this segment, unlike for other goods with similar technological characteristics (the automotive industry, for example), the logic is "sell to produce" rather than "produce to sell".

The purchases made by the armed forces from the companies then making up the BDI - Embraer, Engesa and Avibrás - were relatively stable. A detailed analysis per company, type and model of product, having as a reference the segment in which each of these companies operated (respectively, airplanes, combat vehicles and rockets) shows that they had a very similar technological and industrial development, in the order they were mentioned, successively. The fact that all of them received a considerable volume of public funding (through government purchases, support for technological development, low-interest loans, etc.), even though only the first company was government owned, is not the only similarity.

More significant than this is the fact that the entrance in the international market of the different product models that each firm had developed over time (in some cases prompted by orders from the armed forces, research grants or joint development) was preceded by the acquisition by the Brazilian military of an important initial output of these products.

The purchases made by countries in the Middle East (especially Iraq) were important for the export success attained by the BDI. The purchases of Brazilian weapons systems by these countries started with the armored vehicles made by Engesa, and then after 1985

concentrated on the Astros rocket launchers made by Avibras. After 1989, Brazil's exports were mainly limited to military airplanes produced by Embraer. And in reality, very few were acquired by these countries.

Information provided by the SIPRI shows that after 1988, with the exception of some rocket launcher replacement units from Avibras, the country only exported military airplanes.

Some additional points should be mentioned. The first is that, as would be expected given the high participation value-wise of the weapons systems in the total amount of armaments imported, the evolution of the value of exports is very similar to that previously shown. The second is that during the period when a BDI can be said to have existed, properly speaking, the country continued importing military goods. The third is that although after the BDI's crisis the country continued to purchase weapons, they were not produced domestically. This can lead to the view that what occurred was a substitution of national production by imports.

In combining this information with that presented previously, it is possible to note an interesting fact regarding the internal demand of the Brazilian armed forces. The value of the domestic defense goods acquired by the armed forces, which can be inferred from adding the internal demand to imports, has been more or less constant. This is especially true when considering the "seasonal" effects typical of the process of acquiring weapons systems in a country with little demand in absolute terms. This is even more notable among peripheral countries like Brazil, where a weapons systems group is only acquired very sporadically, when there is a combination of obsolescence of the existing systems with lack of available resources to buy upgrades.

If this is considered, the idea that a substitution occurred becomes less plausible.

The hypothesis that should be examined, then, is that there was a type of technological saturation of the client Brazilian armed forces in relation to the BDI. That is, the armed forces' demand after the onset of the BDI's crisis was not able to absorb its output, until then aimed at the external market. Additionally, the armed forces' demand for items more intensive in technology, not produced internally, continued existing, generating the need to import.

There appear to have been (and to a certain extent still are) two independent logics or dynamics of importation and internal production. The latter, as observed, was associated with that of exports. This was determined basically by the opportunities to fill a market void (niche) for items less intensive in technology created by the trend toward super-sophisticated armaments produced by the advanced countries in the 70s and 80s (what commentators in these countries call "Baroquization" (Kaldor, 1982)). The dynamic of imports was given by the readiness needs decided by the military command. These were situated in a third zone, of medium technological intensity, not exploited by the BDI. This third zone in reality was not accessible to the country, either for reasons linked to the technological capacity of Brazilian industry in general (and the BDI in particular), or by the questions already discussed related to the power of retaliation of the large arms producers.

This hypothesis leads to the proposition that there was no possibility of substitution between national and imported armaments regarding acquisitions by the armed forces. There was, and still is, a high degree of technological inflexibility regarding the country's military imports. Therefore, it is not by increasing quantitatively the capacity for internal production of those systems that the country can export that will reduce the need to import. The information available from the SIPRI (2005) and USACDA (2003) on the types, models, makers and other characteristics of the weapons imported by the Brazilian armed forces and exported by the BDI leaves no room for doubt. Excluding the common generic denomination – weapons systems – the items imported and exported are generally very different.

To conclude the treatment of this question of the causes of the BDI's crisis, which although longstanding requires consideration of very current aspects, some comments are in order involving the three strategic options facing the country. A more thorough and systematic examination of these options will permit reaching informed decisions in this respect.

The first scenario is that whereby the country readies its armed forces considering what the service branches have been considering their real needs. In this case, maintaining the observed trend, the solution would be to resort to significant importation of items that are reasonably intensive in technology. To meet the demand for other items, a revitalization of the BDI would be fostered, which would only be viable if funding were made available for their acquisition by the armed forces and the country had the political capacity to export them also. It is highly unlikely, however (as will be discussed later) that this option would lead to a scale able to generate a favorable trade balance for the country.

The second scenario would be to set out on a short-term course of autonomy in terms of military supply, limiting the armed forces to acquisition of domestically produced goods, exactly the opposite of Venezuela, which equips its military with imported materiel. In this case, to provide scale to the BDI, the armed forces would have to drastically change their orientation (mission, conflict scenarios, etc.). This could well provoke resistance and might not be the best choice in terms of national defense. But the BDI would have a great endogenous impulse, and because the equipment produced would have relatively low technological intensity, the barriers to export might not be so pronounced.

The third scenario would be to promote a process of technological and industrial training of such scope that it would enable the country to produce all its needed means of defense internally, and dispense with exportation. This would be a long-term route to strong autonomy. This scenario, which certainly appears the most favorable to the agents so far involved with the question (military leaders and businessmen from the BDI), would also surely curry favor with the research community (universities and public research institutes), currently lacking funding to continue with what has been called the linear supply-side institutional model of Brazilian science and technology (S&T) policy.

These agents surely sense, however, the low feasibility and high opportunity cost in relation to the other two options (and of maintaining the current trend), without speaking of the other technological and productivity projects in other areas of public policy. Nevertheless, judging by the political power and social legitimacy these agents currently enjoy, their interests, the difficulties they have been facing and the trajectory observed, it would not be surprising if the strategy contained in this scenario were adopted. It would be the start of a new phase of the BDI and of a process of greater professionalization of the military, which over a decade ago we identified as possible and denominated as "conversion" of Brazilian military affairs. But it could also bring undesirable consequences to the country.

At the start of the 1990s, because of the pressure the large arms producers (particularly the United States) had been exerting to keep the BDI from moving toward a technological upgrade of its products, in emulation of the big players, the industry implemented a "conversion strategy". This can be seen in the programs of the three service branches seeking to gain qualification in areas of sensitive (or dual-use) technology that were compatible with the changes that were occurring after the end of the Cold War. But when these R&D programs started to take form, another change in the global scenario began posing an obstacle once again to these agents' space for action.

The attention of the United States was now turned to the threat posed to world peace by the proliferation of "weapons of mass destruction". And once again those agents, subserviently in some eyes, but more realistically and carefully for others, had to sacrifice

their desires. The photo of President Collor throwing a shovelful of lime in the hole of Serra do Cachimbo (symbolically ending Brazil's nuclear weapons program) is the icon of this moment that marks the end of the "conversion" phase and the start of a new phase in civilian-military relations (Dagnino and Proença Jr., 1998). The professionalism and social legitimacy of the three military services ceased being sought through the proactive strategy of dual-technology R&D programs. The next decade was marked by the vegetative life of these programs and a reactive or survival strategy centered around the valorization by the government (and society) of the social role and the effort for territorial integration of the armed forces.

Perhaps perceiving that this path would lead to a change of institutional character, these agents began to conceive a new strategy.

This is how we reach the start of the current government. Whether due to the pressures built up over the past ten years in which the reactive strategy predominated, or the desire to make a break with the strategy of the previous administration regarding the role of the armed forces and the importance of national autonomy, or perhaps just because of the momentum of military R&D activities, the fact is that a new phase seems to be starting.

Another important characteristic of this new phase is the "politicization" of the environment in which defense policy is formulated and implemented (Proença Jr. and Diniz, 1996 and 1998). Rules and procedures usual in other areas of public policy and some ministries have begun to take effect. Among these are unwritten rules, such as that the importance of an agency or ministry is proportional to the funding it control or spends, that to obtain a larger slice of public funding depends less and less on the pressure of the minister responsible for the agency on the decision-making levels and more on the mobilization of the non-government agents involved in that public policy, have started to guide the actions of the Defense Ministry. The reflection of this process of "politicization" of those who are affected by military production and R&D deserves detailed analysis so as to inhibit its potentially negative effects.

3.3. The third question: the economic impact of the BDI

Researchers in advanced countries have for several decades been studying the economic and social impact of military spending and weapons production (Markusen and Costigan, 1999). Regarding military spending, the approach has been basically macroeconomic in nature, focused on the traditional economic aggregates – income, investment, exports, imports, employment, etc. – as well as social indicators. A well-known controversy, also involving researchers from peripheral countries, is whether military spending promotes economic development, or more precisely, whether the short-term Keynesian multiplying effect, without being associated with a long-term acceleration effect, can be used as an anti-cyclical regulator of developed capitalism. Although the debate can hardly be said to have ended, since it is influenced by antagonistic ideological views, social objectives and economic interests, some relations obtained from laborious empirical research of the relation between public spending and job generation, carried out in the 1980s in the central economies, have taken hold in academe and policymaking circles.

In the microeconomic plane, the works are in general oriented toward analysis of procurement programs (United States of America, 2003; Kausal, 1999 and 2000) and military R&D (Dagnino, 2000), and the critical position many of them take is the disproportionately high cost of military spending, often caused by defective contracting procedures or the inefficient practices that dominate the systems of military production and R&D.

An important line of investigation that occupied research groups at the most important institutions studying the theme in the 1980s was whether the performance of the armaments produced by the defense industries of the advanced countries was really up to snuff. Terms like “Baroque arsenal”, coined by one of the most important English researchers (Kaldor, 1982) on the theme, served to underpin the claim that, just as in art, the introduction of excessively sophisticated weapons wound up having a negative effect.

Examinations of the economic impact of an initiative to revitalize the BDI require, in the current Brazilian context, an assessment of the past experience in terms of foreign trade, output and employment.

A first look at the economic impact in terms of foreign trade shows the value of Brazilian exports of weapons systems from 1975 to 2002 (in constant 1990 US\$ million). Data from the SIPRI (2005) show that arms systems exports peaked in 1984, when they reached US\$ 250 million. According to the USACDA (2003), the peak came in 1987, at US\$ 570 million.

We will return to this theme later, when addressing the target projected for the BDI of exporting US\$ 1 billion a year, according to pronouncements from agents involved in the question. But whatever the past peak was, in the last ten years the average amount of exports by the BDI has been only US\$ 26 million a year, roughly one-fortieth of the projected goal.

Another way to evaluate the foreign trade element is to look at the coefficients of importation and exportation of the BDI, called the coefficient of enclave. Due to the particularity of the segment, of having to “sell to produce”, it can be said that to produce US\$ 100, the BDI had to import US\$ 30 and export US\$ 60. This high exportation coefficient demanded a considerable capacity for political influence in the external market (through the concerted action of the diplomatic corps), the use of funds to make purchases, etc. All this was required to make it possible to produce that US\$ 100.

During that period, Embraer imported US\$ 59 and exported US\$ 58. Considering the naval segment, which never constituted what can be called an industry, the relation was around US\$ 30 of imports for US\$ 40 of exports. Now incorporating the weapons acquired by the Brazilian armed forces, the overall balance was around US\$ 53 of imports and US\$ 40 of exports.

These indicators, combined with the participation of exports of weapons systems in the country’s total exports, give an idea of the scant importance that the BDI had for the country.

Regarding the economic impact of production in its golden years, taking as the size of the BDI its peak value (although the average figure estimated for the 1975-1988 period was under US\$ 200 million yearly), the situation does not change much. The joint participation of the three companies and their suppliers in the country’s industrial output never reached 1%; and never surpassed 0.15% of overall GDP.

On the matter of employment, again taking the peak year (1986) and including the civil part of Embraer, there were 24 thousand jobs created. Adding all the people of the Navy Arsenal (roughly 15 thousand) gives a figure, if anything overestimated, of 40 thousand. The represented 0.4% of industrial employment and only 0.06% of the total labor force!

3.4. The fourth question: the technological impact of the BDI

This last question is perhaps the most important, in the current situation in which a strategy is emerging as depicted in the third option outlined above.

The idea of the spin off of military spending to the civilian sector, arising after World War II by virtue of the transfer to the civilian economy of the stock of innovations developed

intensely during the war effort, has become one of the pillars of the ideological legitimacy of what President Eisenhower dubbed the “military industrial complex” (and has subsequently become the scientific-military-industrial complex).

This general idea that there is an intrinsic tendency for military research, because of its high technology content, to produce a positive impact in the civilian sector and in this way the economy as a whole, led to the idea that military R&D should be stimulated. This is despite its growing opportunity cost and the social, economic and moral harm it causes. This feeling reached the point where the arms race that characterized the Cold War was seen by many researchers as having a scientific-technological dynamic that was independent of the geopolitical and military factors *per se*.

Disseminated by the establishment of the central countries, but also sharply criticized by eminent scientists and sectors of society, the spin-off idea has been the object of intense debate within academic and military institutions and governmental bodies of these countries. Various researchers from the advanced countries have shown that the idea of spin off is nothing but a myth, unlike what is the accepted wisdom by society in general thanks to the efficient propaganda and disinformation effort of those interested in maintaining what many consider, after the drug trade, to be the most lucrative business in the world. In fact, some studies in developed countries have been showing the opposite effect, that of spin in, that is, where innovations in the civilian sector, after suitably tested there, are applied successfully in the military sector. To wrap up this brief retrospective, it is worth mentioning the studies with sociological and psychological focus. They have been showing that the climate that characterizes military research – secrecy, segmentation of content, inhibition to exchange information and experiences, etc. – tends to create a mindset among military researchers that causes them to shy away from innovation.

But even if one accepts the idea of spin off as true in the advanced economies, it still needs a specific analysis in peripheral countries, endowed with a considerably smaller scientific-technological and industrial capacity, not to mention less money to invest in the public sector. This is certainly true for Brazil. Any effort to revitalize the defense industry must consider to what extent the technology possibly developed in (or for) the military sector would be applied in other sectors.

In this respect, it is pertinent to consider the following questions: What is the economic weight of the sectors where military R&D could be applied? What is the capital ownership structure of these sectors? And what is the trend of these sectors regarding adoption of locally developed technology?

To answer these questions, albeit preliminarily, one can first estimate the relative importance of the industrial sectors where the technologies developed for military aims (or the so-called dual technologies) could be applied.

Employing the standard classification of the OECD, which considers as high-tech the sectors where companies spend on average 4% or more of their turnover in R&D, as medium tech those whose firms spend between 1% and 4%, and as low-tech those whose companies spend less than 1%, it can be said that of Brazil’s 27 industrial sectors, none can be classified as high-tech. The six sectors that can be considered as medium technology are composed of companies that invest between 1.2% and 2.7% of their revenues in R&D. Together they account for only 16% of industrial output. The low-technology firms are responsible for the remaining 84%.

This situation is quite different from that in the world’s leading arms producer, the United States, where the high-tech sectors contribute 15% of its industrial output. It is within these sectors that the companies forming the American defense industry are located. And it is

they that absorb the roughly US\$ 60 billion that the U.S. spent in 2003 on defense R&D. These sectors most committed to military production are also where the effort is greatest to stimulate civilian applications of the technology developed for military purposes. Indeed, this can even be viewed as an artificial effort to create a spin-off effect to reduce the socioeconomic and scientific-technological opportunity cost which that country's military, because of geopolitical considerations, is forced to develop.

Another important point in analyzing the pertinence of the spin-off idea in the Brazilian case involves the ownership of the companies that make up the sectors most intensive in technology and their behavior regarding their innovation activities. The question boils down to whether or not they would really use the technology developed for military purposes.

Various studies in advanced and peripheral countries have shown that multinational companies prefer to develop their technologies in their home countries, and that the recent trend of decentralizing R&D activities in the direction of overseas branches will be unlikely to affect countries like Brazil.

A factor that aggravates this situation in the case of Brazilian industry is its low propensity to innovate by incorporating new technology developed locally. According to recent surveys from entities like the National Confederation of Industry (a trade organization) and the Brazilian Institute of Geography and Statistics (the Brazilian census bureau) show that over 70% of companies consider the acquisition of newer machinery and equipment to be their main source of technological development, and that universities and research institutes, public and private, rank 10th and 11th (next to last) among their sources of knowledge (Dagnino, 2000).

This situation is determined by structural questions associated with our peripheral condition and is worsened by the lowering of trade barriers, and in general by globalization. It will be hard to reverse this in the medium term. This lends even less credence to the spin-off idea in Brazil (increasingly criticized, it is worth remembering, even in the central countries).

4. FINAL CONSIDERATIONS

Although the discussion of each of the concordances and questions has already presented some conclusive considerations on the most important aspects of the issues proposed, this section seeks to complement it in two directions. The first includes some prospective exercises on the implications of a possible revitalization of the BDI. The second, outlined in the second item of this section, returns to the question already posed regarding the capacity of the agents involved with defense policy, more specifically with policy on military production and R&D (MPRD), to face the challenge that the subject entails. This item presents a proposal for creating within the state apparatus an organ that can definitively assume the leadership with the other agents involved with this policy in searching for decisions on this subject.

4.1. Some further prospective exercises

As a conclusion to the treatment given the question of revitalizing the BDI, it appears appropriate to undertake some further numerical exercises simulating the implications of some official declarations from the agents involved in the theme at hand here. The first involves the publicized projection that the country could, in the short term, export US\$ 1 billion a year worth of military goods. The following shows this is highly unlikely.

- currently Brazil, according to the Ministry of Science and Technology, spends roughly R\$ 30 million a year on military R&D (1% of overall military spending of R\$ 30 billion and 10% of the federal government's R&D spending of R\$ 3 billion);
- the United States in 2003 spent US\$ 58 billion on military R&D (16% of its overall military spending of US\$ 364 billion), and was able to supply its armed forces with about US\$ 70 billion in armaments and to export roughly the same amount;
- taking the American example as a base, to export US\$ 1 billion of military goods, Brazil would have to acquire the same amount and spend US\$ 830 million on military R&D, which would vertiginously increase the share of military R&D in the overall federal R&D expenditures, to 37%;
- maintaining the distribution of military spending, in which R&D accounts for 1% of the total, the military outlay would jump from R\$ 30 to R\$ 250 billion, a nearly nine-fold increase from the current level;

Another official declaration that has seen light is that because Brazil has a small ratio of military spending to GDP in relation to its neighbors (although in absolute value, which is what really matters in terms of national defense, its military spending is more than adequate), it should increase it to 3.5%.

- if this occurred, yearly spending on military R&D (maintaining the current proportion) would reach R\$ 900 million;
- once again taking the U.S. as a basis for comparison, Brazil could export R\$ 750 million, or R\$ 250 million and the armed forces would have to acquire the same amount.

Two interesting considerations follow from this analysis. The first is the fact, already indicated, that in the past ten years, Brazil has only managed to export an annual average of US\$ 26 million, i.e., about one-fortieth of the projected target of US\$ 1 billion a year. This alone makes the result of this exercise even more worrying.

Even disregarding the probability of a coercive action from the leading countries in the world arms trade, the possibility that the international community would interpret the reactivation of the BDI as abandonment of the peaceful stance that has characterized the country, and in consequence would resist its export pretensions; the incapacity the defense industries have been showing in leveraging economic and social development; the evidence against the spin-off idea, all lead to a question: are the elites of the military, political, business and academic classes, in which society has placed the responsibility for providing the elements to make the decision at hand, really ready for this?

4.2. A proposal on military production and R&D policy

The activities of military production and R&D are closely related to defense policy (Molas-Gallart, 1998 and 2001). First, the results of these means activities – the means of defense itself and the qualifications of the nation's public and private agents – are inputs to carry out the main mission. Second, in the sense of inverse causation, the future outlines the armed forces will take and the potential for defense policy largely depend on them. Third, it is through them that important flows of information, political influence, formation of opinion and (last but not least) funding are established among national agents, and between these and foreigners and the so-called military "sector". Fourth, during the military government an idea that is still dominant and coherent with national security doctrine was planted that they strengthen the country's development by generating scientific and technical knowledge and the manufacture of high-tech products.

If after evaluating the opportunity cost a political decision is made to support the internal production of defense means, and the R&D that this will demand, and these activities are organized according to the institutional and productive arrangement known as the defense industry, supposing there is a suitable level of R&D, a set of interrelated decisions and actions will have to be taken.

The financing of these activities has two aspects that are manifested, respectively, in the external and internal spheres of R&D. The first, the high opportunity cost of these activities in relation to others that serve areas with high economic, social or even electoral appeal, cause the agents to take a defensive and often counterproductive and unconvincing posture in trying to justify support them by their supposed economic, technological, employment, etc. impact. The second is associated with the sizable volume of “new” funds (although not in relation to the earmarked ones) that flow in the internal ambit. This demands that the interest of the agents directly involved with these activities be expressed with a level of rationality and transparency beyond that which the Ministry of Defense has been trying to achieve.

This reason, among others indicated below, is what informs the considerations presented here about that set of decisions and actions – the process of preparing the policy on military production and R&D (MPRD) – and the proposal to establish a team within the Defense Ministry.

Like other public policies, MPRD consists of three stages (formulation, implementation and evaluation), which although interrelated and interdependent, can also be distinguished sufficiently to be addressed in that order.

Among the decisions involved in formulating MPRD are those of the following nature:

- logistical, associated, for example, with the characteristics of the means of defense to be produced locally (technological intensity, index of national content and verticalization of the productive activity, degree of technological autonomy, training required for their operation and maintenance) vis-à-vis those that will be imported, the location of the installations, the relative weight of the concept of mobilization, etc.;
- technical, derived from the previous category, to propose optimal courses of action in the sphere of MPRD based on technical and economic criteria, including in view of their potential to induce dual use and spin off, the potential export markets and import sources of inputs and technology;
- political, associated, for example, with the probability of retaliatory actions from arms exporting countries, the balance between public and private activities and the form of their participation in the decisions, and the level of oligopoly projected for the defense industry.

Although the above list of considerations and requirements that the formulation of MPRD must satisfy is not intended to be exhaustive, it is fitting now to turn to the implementation phase of this policy, again in preliminary form.

The primary and key activity of the implementation phase is the process through which the resources available are allocated to meet the targets that have been formulated.

The condition imposed by the characteristics of MPRD, that it must encompass integrated and systemic actions normally ascribed to more than one public policy – and especially that of fostering industry and science and technology – each of which has its own specific financing entities, makes allocation truly complex. It can only occur if there exists a mechanism for cooperation among these entities (and ministries) under the coordination of the MD; which involves questions related to its power to marshal other parts of government and its technical and political capacity.

The most suitable arrangement, in view of the current situation, appears to be to set up a fund, similar to the sectorial funds, although in this case not only dedicated only to R&D activity, but also to production activities, and always as suitable, sets of both. The complexity and time involved in establishing a political articulation able to generate this arrangement suggests that the implementation of MPRD should occur through other possibilities taking less time to mature.

The MPRD process must (a) be transparent, (b) give equal opportunities to all agents involved, (c) ensure the independence of the MD in relation to them, to avoid coalitions of interest and undue pressures from the defense industry (which can lead to “corporatization” and “privatization” of the – public – defense policy), (d) promote a signaling of demand coherent with the impositions made by defense policy, and (e) assure the forthrightness and optimization of the use of resources, which suggests that MPRD will need to involve public bidding. This implies sets of specifications widely disclosed (relative to content, time limit for execution, volume and form of using resources, etc.) that the projects for military production and R&D submitted must satisfy, launched with the frequency and thematic orientation to be defined by the MD in function of the above considerations.

The drafting of the invitations to bid by the MD, the submission of projects by the interested companies and institutions and their classification and approval by the MD would lead to their execution, which can be considered the implementation phase of MPRD.

This set of activities related to the bidding processes will have as an enabling agent a team within the MD with a high level of expertise regarding the technical, economic and political aspects involved in MPRD and with the peculiarities of the BDI, with capacity to articulate with other government entities as indicated above. The arrangement for financing the projects would be backed by the competence of this team and the respectability of the MD. Each bid process would be preceded by a coordinated action aiming at financing the winning projects by the currently existing entities (and mechanisms).

From the outset, and including as a function of its interaction with those other entities, the team will be generating necessary cognitive elements to promote the political articulation that will enable that arrangement considered most suitable for financing the projects. Additionally, its interaction with the companies and institutions that form the defense industry should give rise to a virtuous movement of better qualification and the adoption of practices coherent with the orientation of MPRD and the consequent optimization of use of the available resources.

The activity regarding evaluation, as explained, is distributed along the other two phases. Nevertheless, since it is at the end of a cycle of the process that failures of formulation and implementation are identified and the attempt is made to correct them, and that define the subsequent characteristics, each bid process must be carefully evaluated by the team.

A small team, with the characteristics described, would complement without overlapping the existing capacities within the MD and its bodies inside the armed forces and other government bodies. The importance of its participation in preparing MPRD based on criteria specific to disciplinary territories and government action until now without interpenetration, providing more effective conduction of MPRD, appears to justify its creation.

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