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O Programa Nuclear Brasileiro

The causes of nuclear proliferation in Brazil through Sagan’s three models

# Abstract

This thesis poses the question whether the motivations for Brazilian nuclear proliferation can be explained by Scott Sagan’s three models, as outlined in his ‘Why do states build nuclear weapons? Three models in search of a bomb’. The academic discourse regarding nuclear proliferation is dissected, leading to the conclusion that the governing neorealist interpretations are incomplete and inadequate. The security model does not provide a comprehensive account of the decision-making with regard to Brazilian nuclear proliferation outside the late 1960s. Domestic factors dominated decision-making on the Brazilian nuclear programme during the 1970s and early 1980s. Norms-based factors spelled the end for Brazil’s nuclear aspirations in the late 1980s. It can be so concluded that Sagan’s framework of three models provides a comprehensive and explanatory approach to decision-making at the inception and the conclusion of, as well as during the Brazilian nuclear programme. This thesis makes use of a great many primary sources, such as Brazilian government documents relating to Brazil’s nuclear programme from the 1960s to the 1990s, newly released by the Fundação Getúlio Vargas in conjunction with the Wilson Center. Also, this thesis is supported by a wide array of secondary literature on nuclear proliferation, such as Shultz and Sagan, as well as literature on Brazil’s nuclear programme, such as Skidmore.

Cover image: Brazilian President Ernesto Geisel (r.) and Minister of Energy Shinseki Ueki (l.) examine objects at the Christmas party at the Alvorada Palace. Photo courtesy of Fundaçao Getúlio Vargas.

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# Introduction

Nuclear proliferation has been a subject that has captured the imagination of scholars and laymen alike. For instance, films such as *Dr. Strangelove, WarGames* or *Red Dawn* have made sure the nuclear proliferation debate is firmly enshrined in popular culture. If one were to be less cinematically inclined, *The Spread of Nuclear Weapons: A Debate Renewed* by Kenneth Waltz and Scott Sagan would be a good place to start for an academic introduction in the field of nuclear proliferation, as it explains the different viewpoints on the causes of nuclear proliferation. Recently, nuclear proliferation has been an especially momentous subject, given recent escalation in the low-intensity conflict between the nuclear powers of India and Pakistan in Kashmir. Also, the shattering of the non-proliferation consensus among superpowers, as exemplified by the Russian rejection of the START treaty has generated a paradigm change in the non-proliferation consensus among the nuclear superpowers. Once again, nuclear capability has entered the world stage as a military-strategic and international relations device. What has not happened however, is analysis of nuclear proliferation outside the scope of military-strategic considerations. Dominant academic discourse on the subject of nuclear proliferation has deeply analysed the way military-strategic considerations have shaped nuclear proliferation in for example India and Pakistan. However, in my thesis I will offer an alternative approach which takes into account not only military-strategic factors. I will seek to answer the question: in what way do the three theoretical frameworks, explicated by Sagan’s ‘Why do states build nuclear weapons?’ as the security, domestic and norms-based models, offer explanations for nuclear proliferation?

## Methodology

It is the goal of this thesis to contribute to the academic discourse on the causes of nuclear proliferation. In order to attain a sense of the academic discourse regarding nuclear proliferation, I will explore several seminal texts on the topic in the first chapter of this thesis. This is a sensible place to start, as this chapter will explore the ‘lay of the land’ in an academic sense. After having introduced the academic consensus on nuclear proliferation, and having identified the lacunas of that discourse, this thesis will seek to answer the thesis main question, which is: in what way do the three theoretical frameworks, explicated by Sagan’s ‘Why do states build nuclear weapons?’ as the security, domestic and norms-based models, offer explanations for nuclear proliferation? This question is the main question of this thesis. In order to answer this question, I will analyse a case study on nuclear proliferation. That case study is the case of Brazil, which possessed a nuclear programme geared towards producing nuclear weapons from 1970 to 1990. History shows that Brazil started developing nuclear capabilities in the late 1960s, escalating the process in the mid-1970s before shutting its programme down in the late 1980s. This thesis will analyse both the process of developing nuclear capability as well as the decision to cease seeking nuclear weapons, in order to answer the main question. The analysis of the case study is divided into three constituent parts. Firstly, I will analyse the military-strategic considerations of the Brazilian nuclear programme throughout its existence, using the abundant academic literature on this subject. After having established the ‘security model’, I will depart from the mainstream literature by secondly looking at the Brazilian nuclear programme through the lens of the ‘domestic model’ from Sagan. Thirdly and finally, I will explore the ‘norms-based model’, and the way in which nuclear proliferation in Brazil has been influenced by this model. The thesis will conclude byexplaining the value of the findings of the case study analysis for the nuclear proliferation debate.

## Sources

Recently, the a team of researchers from the Fundaçao Gétulio Vargas has released, in conjunction with the Wilson Center for International Relations, a treasure trove of documents from Brazilian and U.S. governments relating to the very subject of Brazilian nuclear proliferation. Additionally, the FGV team have conducted interviews with dozens of the key players involved in Brazil’s nuclear programme from 1970 to 1990 and released the unedited transcripts in a primary source designed to aid research into the subject of Brazilian nuclear proliferation. These new publications are, of course, of very high value in shedding new light on the events of Brazilian proliferation in the relevant period, and add an extra dimension to analysis of other primary sources, such as the 1990 Brazilian Senate report on the *Programa Paralelo*. The *Programa Paralelo* (Parallel Programme) entailed the secret nuclear activities of the early 1980s in which Brazil surreptitiously tried to attain nuclear capabilities, without international safeguards.

Of course, using this source material on its own would lead to a solely analytical thesis, and for this reason I intend to use an array of secondary sources in order to situate my thesis within the academic discussion regarding the subject of Brazilian-Argentine relations in the field of nuclear proliferation. The first chapter will utilise several seminal texts on nuclear proliferation in order to attain an understanding of the academic debate regarding the subject. I will start with the aforementioned *The Spread of Nuclear Weapons: A Debate Renewed* by Kenneth Waltz and Scott Sagan, in orderto introduce the main argument of the dominant academic narrative with regard to nuclear proliferation. Next, I will analyse articles by Epstein, Jo and Gartzke, as well as T.V. Paul’s tome on nuclear proliferation to analyse the scope of the dominant discourse on the subject. Thirdly, I will use Scott Sagan’s ‘Why do states build nuclear weapons?’ to set out an alternative path for academic analysis of nuclear proliferation, in which factors other than military-strategic objectives are given consideration. The second, third and fourth chapters use the framework of Sagan’s article to place the findings, based on the previously mentioned primary sources into academic context.

## Conclusion

I do not aim to give a definitive account of the nuclear proliferation issue and the Brazilian nuclear programme, nor do I pretend to have the knowledge to do so at this nascent stage of my academic career. However, I am of the belief that I have at least mastered the basics of historical analysis and I hope that this thesis on Brazilian nuclear proliferation will have its very own modest contribution to repositioning the academic debate towards a more holistic view of nuclear proliferation. I wish you, the reader much wisdom in reading this work and I sincerely hope that reading my thesis gives you as much pleasure as I had in writing it.

# Chapter One – Academic positioning

## Introduction

In order to prepare the general scope of my thesis, I conducted several weeks of preliminary research. To position myself within the academic debate regarding nuclear proliferation, I read academic literature on subjects associated with the main question of my thesis, such as the issues of nuclear proliferation, Brazil’s military regime and Brazil’s nuclear programme. As a part of this, I decided to conduct a review of the academic literature on the subject of nuclear proliferation. In this way, I would be able to set out different viewpoints on the subject, as well as sketch out my own position within the academic debate. During this review, I found that the dominant academic discourse on nuclear proliferation is focused solely on military-strategic factors in considering political decision-making with regard to proliferation. However, as I attained an understanding of the Brazilian nuclear programme, a focus on military-strategic factors seemed narrow-minded and inadequate to explain the developments I encountered in Brazil. For this reason, I turned to a different strand of thinking about nuclear proliferation by the name of organisational theory. Scott D. Sagan’s article ‘Why do states build nuclear weapons? Three models in search of a bomb’ outlines the case for an alternative, more holistic approach to nuclear proliferation and in this chapter I will explore this theory in a more comprehensive way, as well as firstly sketching out the academic debate regarding nuclear proliferation.

## Neorealist theory

In the excellent and genre-defining *The Spread of Nuclear Weapons: A Debate Renewed*, arch-neorealist Kenneth Waltz crosses swords with organisational theorist Scott Sagan. In the book, Waltz argues for peace through proliferation, making the assertion that ‘more may be better’ in the sense that new nuclear powers will use their new nuclear capabilities for the deterrence of threats and preservation of peace.[[1]](#footnote-1) On the other hand, Sagan argues that the neorealist theory, while sound from a military-strategic perspective, overlooks the organisational challenges that emerging nuclear states face, increasing the risk of accidental nuclear war or nuclear weaponry falling into the hands of terrorists.[[2]](#footnote-2) In reviewing academic discourse on nuclear proliferation, it became clear that most academic discourse on reasons for proliferation follows the neorealist model of focusing on solely military-strategic factors, as well.[[3]](#footnote-3)

For example, in ‘Why states go – and don’t go – nuclear’, Epstein studies an array of different factors within the neorealist military-strategic framework. Epstein makes the claim that those countries allied with a superpower have reason to seek nuclear capabilities, as they have no valid concerns about their national security with regard to nuclear weapons.[[4]](#footnote-4) Another example of the question of nuclear proliferation being viewed through the neorealist lens of solely taking into account military-strategic considerations is T.V. Paul’s *Power versus prudence*. As Paul puts it: "I contend that whether a non-great-power state acquires or goes without nuclear weapons is determined largely by the level and type of security threats that it faces and the nature of interactions or conflict with its key adversaries and allies in its immediate geo-strategic environment."[[5]](#footnote-5) In the final example of neorealist academic discourse, Jo and Gartzke appear to strike a balance between the neorealist and organisational theorist poles by stating that national security and technological capabilities are important determinants whether states pursue nuclear weapons.[[6]](#footnote-6) However, their article ‘Determinants of nuclear proliferation’ fails to account for socio-economic and political factors on the domestic level, as well as on the international stage. The review of academic literature has produced the conclusion that the neorealist view on nuclear proliferation is both inadequate and incomplete.

## Organisational theory

We therefore move to organisational theory, the theory behind the opposing viewpoint on nuclear proliferation. In his article ‘Why do states build nuclear weapons? Three models in search of a bomb’, Scott Sagan (joined by Bruce G. Blair and Peter Feaver, among others) criticises the neorealist view that is held policymakers and scholars alike, namely the view that ‘states will seek to develop nuclear weapons when they face a significant military threat to their security that cannot be met through alternative means; if they do not face such threats, they will willingly remain non-nuclear states’.[[7]](#footnote-7) According to Sagan, this view is incomplete if not incorrect, as nuclear weapons serve other, more parochial objectives, other than national security. As well as extremely potent weapons, nuclear bombs are ‘political objects of considerable importance in domestic debates and internal bureaucratic struggles and can also serve as international normative symbols of modernity and identity’.[[8]](#footnote-8) Sagan seeks to go beyond the neorealist interpretation of the proliferation dilemma by identifying three different models for nuclear (non)proliferation, supplanting the neorealist singular focus on military-strategic factors.

First of all, Sagan does not write off the neorealist view of nuclear proliferation. He views it as holding explanatory power for some aspects of proliferation cases, but it is considered incomplete as a universal theory.[[9]](#footnote-9) What Sagan describes as the security model considers the classical academic view of proliferation being a question of military strategic considerations. The theory on this model is sound, the academic path Sagan goes down in this chapter is well-trodden and the resulting policy recommendations are clear. However, Sagan lays out the argument that historical evidence suggests that this model does not begin to constitute a serious analysis, and that therefore two more models are needed.[[10]](#footnote-10) The first of these other models, or the second in the grand total of Sagan models, is the domestic model. Herein Sagan takes into account the domestic actors and factors which alternatively encourage and discourage nuclear proliferation within a state. One can think of individual politicians or even scientists in this respect, but also the socio-economic conditions within a country. And thirdly, Sagan introduces the norm-based model, which bases itself on sociological analysis of the symbolism of nuclear politics as reflecting a state’s identity and values. Likewise the previous two models, norms-based factors can also encourage as well as discourage nuclear proliferation, depending on which norms govern the society the state is seeking to fit into.[[11]](#footnote-11)

## Conclusion

In conclusion, the nuclear proliferation debate is governed by two theories, the neorealist camp on the one hand, and the organisational theory side on the other. The neorealist theory has been established as being the most dominant in academic discourse as well as policy, with marquee names like Waltz, Epstein and Paul attaching their name to the neorealist label. However, the neorealist view fails to take factors outside military-strategic considerations into account, such as socio-economic and international factors, and is therefore limited to the point of inadequacy. The organisational theory propagated by Scott Sagan, seeks to challenge the neorealist consensus and offer an approach to the nuclear proliferation debate which would analyse factors other than military-strategic considerations, as well. In his article, Sagan lays out three theories: the security model, the domestic model, and the norms-based model which seek to furnish the nuclear proliferation scholar with enough tools to attain an understanding of the motivations on whether or not to seek nuclear weapons. After having laid out the academic foundations of my thesis, I will utilise the following three chapters to consider in what way Sagan’s three models provide a satisfactory framework for the Brazilian nuclear programme of the 1970s and the 1980s.

# Chapter Two – the security model

## Introduction

As outlined in the previous chapter, Sagan’s security model subscribes to the neorealist view of international politics in the sense that it considers that each state must guarantee its own national security. With regard to nuclear weapons, that means that the strong states ‘do what they can’, balancing any rival with nuclear capability with nuclear weapons of its own, while the weak states ‘do what they must’, pursuing a policy of ‘extended deterrence’, wherein a weaker nation receives a guarantee of nuclear retaliation in the event of an attack on that weak state.[[12]](#footnote-12) However, the efficacy of extended deterrence is questionable if one envisions the needless escalation extended deterrence might bring to a superpower, especially if several superpowers have extended deterrence over several states. Such a situation would drastically heighten the risk of an all-out nuclear war, and it is therefore highly unlikely that extended deterrence would actually deter a determined enemy. As Argentina and Brazil found themselves in exactly this position during the 1970s and 1980s (with as prime example the Falklands War, when the US supported a non-American state on American soil), they sought to address this national security issue. In the mid-1960s, Argentine authorities made the decision to initiate a nuclear programme, leading to a profound change in the military-strategic calculus for Brazil.[[13]](#footnote-13) In accordance with the neorealist view of ‘proliferation begets proliferation’, the Argentine decision to pursue nuclear weapons was followed by a Brazilian decision to do the same. However, the question posed in this chapter is whether this was justified by the military considerations, or whether other factors might have been considered. In this chapter, I will explore whether this change is adequate in explaining why Brazil sought nuclear capabilities from 1970 to 1990.

## The neorealist argument

Since the Second World War, both Brazilian economic and demographic growth rates had been higher than that of Argentina. In the 1970s Argentina had one-fourth the population, less than one-third the GNP, and about one-third the military expenditure of Brazil.[[14]](#footnote-14) Of course, this imbalance manifested itself in military strength, with Brazil having 81 percent more military personnel, 61 percent more aircraft and 26 percent more major warships than Argentina in 1975.[[15]](#footnote-15) The comparative demographic and growth rates meant that for Argentina, Brazil became relatively stronger every year. Measured in conventional military strength, this trend indicated that Argentine military strength would increasingly fall behind that of Brazil. For Argentina, the doom scenario of Brazil roaming freely through South America could possibly have come to pass with Brazil as the sole power in the Southern Cone. Developing nuclear weapons would have arrested this harmful trend for Argentina, for it would have deterred Brazilian forces and could have been used as a credible threat to Brazilian built-up areas, including cities and infrastructure. It is therefore not hard to see the reasoning behind the Argentine nuclear developments of the early 1970s.

However, once Argentina initiated its nuclear programme, for Brazil, its response seemed simple. If Brazil developed nuclear capabilities itself, the strategic imbalance would be resolved and once the nuclear capabilities had cancelled each other out, Brazilian conventional strength would once again do the trick. But closer analysis of nuclear deterrence changes this outlook, in effect emphasising the Brazilian advantage of possession of nuclear weapons, even if Argentina would have nuclear capabilities as well. Deterrence can be defined as ‘a political-psychological relationship between two states in which one (or both) seeks to convince the other that the cost in terms of nuclear retaliation for a given action will far exceed the anticipated benefits of proceeding’.[[16]](#footnote-16) The effectiveness of deterrence hinges on accurately gauging the level of threatened damage the opponent views as unacceptable in relation to his goals, and being able to credibly threaten the use of nuclear weapons to inflict that level of damage. The geographical and demographical composition of Argentina and Brazil ensure that Brazil is heavily favoured in any confrontation involving nuclear weapons. Firstly, as mentioned, Brazil possesses more resources and has a higher population than Argentina, ensuring that Brazil simply has more manpower. Secondly, the Argentine population is highly concentrated in the Buenos Aires metropolitan area, where 35 percent of the population resides. Additionally, the Buenos Aires-Santa Fe area contains 85 percent of the country’s GDP.[[17]](#footnote-17) Brazil, on the other hand, has both a decentralised population and industry, with population centres such as Rio de Janeiro, Sao Paulo and Salvador being hundreds to thousands of miles apart.[[18]](#footnote-18) Furthermore, the Buenos Aires metropolitan area lies only 500 miles from Brazil, exposing a large part of the Argentine economy and population to Brazilian fire. The course of action that these three factors would entail in a nuclear war between the two states is that firstly, greater manpower would enable Brazil to inflict higher casualties on Argentina in an absolute sense. Because of Brazil’s bigger population, these absolute differences would grow even more lopsided in a relative sense. Secondly, Brazil would have to hit a smaller surface area than Argentina. If Brazil were to detonate an atomic device in Buenos Aires, Argentina’s military command structure, continuity of government and 35 percent of the country’s population would be instantly vaporised. If Argentina targeted Sao Paulo, there still would be Rio de Janeiro left, and Salvador, Recife, Belo Horizonte and Brasília among others. Lastly, Brazil quite simply has to fire its guns a much shorter distance, with Buenos Aires barely 500 miles from the Brazilian border. Argentina would have to acquire long-range missiles and delivery missiles to even get to Brazilian population centres, and subsequently fire much more of them to get the same absolute amount of Brazilian casualties, which would still be less than the Argentine figure in a relative sense. For comparison, it would take more than three times more nuclear warheads, delivery vehicles and manpower for Argentina to strike the four biggest Brazilian cities, numbering a total of 50.7 million people and representing about 25 percent of the Brazilian population, than it would take Brazil to strike Buenos Aires alone, numbering over 15 million people but housing 42% of the Argentine population.[[19]](#footnote-19) The introduction of nuclear weapons in the Southern Cone would thus favour Brazil over Argentina, more heavily than conventional forces could ever do. It would therefore seem logical that military-strategic considerations ensured Brazil would develop nuclear weapons, once Argentina initiated its nuclear programme.

## Rebuttal

However, when one attains a deeper understanding of the military-strategic considerations, it becomes clear that the security model does not explain the continuing development of Brazil’s nuclear programme from 1970 to 1990. It so turns out that in exploring the case for nuclear weapons, Argentine national security staff saw the introduction of Argentine nuclear weapons into the Southern Cone as wholly separate from Brazil’s considerations in seeking nuclear capability, hereby forgetting a general rule from the proliferation world: proliferation begets proliferation.[[20]](#footnote-20) Following the Argentine line of thinking, the ideal scenario would be that Argentina developed nuclear weapons and Brazil would not, thus leading to the Argentine conclusion that it should pursue nuclear weapons to improve its precarious position relative to Brazil. Upon the previous analysis of military-strategic factors, it becomes clear that the case for Brazil to develop nuclear weapons is a reactive one: the entire argument hinges on the Argentine development of nuclear arms, as the conventional balance of power was clearly in Brazil’s favour. Not only that, but if Argentina were to develop nuclear weapons, Brazil would be forced to follow, thus skewing the balance of power even more in favour of Brazil, for the reasons outlined in Chapter One. Consequently, the aforementioned ‘ideal’ outcome for Argentina becomes impossible, as the possibility of Brazil refraining from developing nuclear capability if Argentina chose to do so is nil. If Argentina would choose to not pursue nuclear weapons, the military-strategic case for Brazil to attain nuclear capability would become virtually non-existent, as Brazil already had a (constantly increasing) conventional superiority over Argentine forces. Therefore, only two outcomes remain. Firstly, Argentina chooses to attain nuclear weapons, forcing Brazil to do so too. Doing so would place Argentina at an even greater disadvantage given the factors outlined in Chapter One. Secondly, Argentina chooses not to pursue nuclear capability, maintaining the status quo. Taking this option would remove the military-strategic rationale for Brazil continuing to pursue nuclear weapons. It would still place Argentina at a disadvantage, but, a lesser disadvantage for Argentina than the first option.

After considering its options (roughly described as a choice between ‘bad’ and ‘worse’), Argentina chose to take the least bad option and cease developing nuclear capabilities. Argentina took a different approach to Argentine-Brazilian relations than it had taken since the Treaty of Tordesillas and instead of assuming a combat position, it initiated a dialogue on several outstanding issues between Argentina and Brazil, among which was also nuclear technology.[[21]](#footnote-21) The October 1979 Tripartite Corpus-Itaipu Agreement aimed to resolve a longstanding dispute over hydroelectric projects in the Upper Parana River, a dispute that in the early 1970s had been considered a potential flashpoint between Argentina and Brazil.[[22]](#footnote-22) Barely six months later, in May 1980, the countries signed the Accord on Cooperation for the Development and Application for the Peaceful Uses of Nuclear Energy, which established a general framework for sharing nuclear research and technology for civil purposes.[[23]](#footnote-23) From here, Argentina and Brazil intensified their cooperation on a nuclear level, with Brazil seeking Argentine technological expertise in exchange for Brazilian nuclear equipment and closer partnership. President Figueiredo remarked in 1981: "Argentine technology is several steps ahead of our own. Brazil, for its part, is well positioned to provide some heavy equipment".[[24]](#footnote-24) Argentine General Jorge Videla observed that Argentina was willing to "offer its experience in the research and application of nuclear energy for peaceful purposes".[[25]](#footnote-25) Under the 1985 Joint Declaration of Iguazú, Brazil and Argentina renounced nuclear research for military applications. Building on that very declaration, the countries signed a memorandum of understanding regarding Brazilian-Argentine cooperation on an economic level, leading to a treaty on cooperation between the two countries in 1988.[[26]](#footnote-26) It was this *Argentina-Brazil Integration and Economics Cooperation Program* or PICE that led to the establishment of Mercosul, the South American trade organisation, in 1991. Also in 1990, Brazil and Argentina expanded the nuclear security regime to include the IAEA and the Organization for the Prohibition of Nuclear Weapons in Latin America (OPANAL). Cooperation in the field of nuclear technology cleared the path for cooperation for political and economic purposes, with the establishment of Mercosul as a prime example.

## Conclusion

Concluding this section, it can be established that from a military-strategic point of view, Brazil was ahead of Argentina in conventional military capability. This moved Argentina to develop nuclear weapons, in order to close the ever-widening conventional military gap. However, if Brazil were to develop nuclear weapons in response to Argentina’s nuclear programme, Argentina would be even worse off than before. Accordingly, Brazil initiated its own nuclear programme, in order to cancel out the Argentine project. In the early 1970s, Argentina ceased its nuclear programme and “turned necessity into virtue as it sought to protect its long-term position in the Basin and to neutralize Brazil in the South Atlantic disputes.”[[27]](#footnote-27) Nevertheless, Brazil continued its nuclear programme throughout the 1970s and 1980s. For Brazil, cooperation was a means towards attaining nuclear technology in the short term, and eliminating the only rival in the region in a peaceful manner in the long term. It becomes clear that neorealist theory does not provide for a comprehensive explanation of why Brazil sought nuclear capabilities in the 1970s and 1980s. Once the (nuclear) threat of Argentina had dissipated, Brazil continued to pursue nuclear weapons. Therefore, we move away from the security model in the following chapters, on to firstly the domestic model and secondly the norms-based model.

# Chapter Three: the domestic model

## Introduction

Sagan names domestic issues and specifically domestic actors as the second model influencing nuclear proliferation. It, according to Sagan, ‘focuses on the domestic actors who encourage or discourage governments from pursuing the bomb’.[[28]](#footnote-28) Domestic political, economic and technological issues play defining roles in creating a support base for pursuing, or not pursuing, nuclear capabilities. Regardless of the military-strategic considerations, domestic actors influence events, for example by encouraging or discouraging the development of nuclear weapons, in order to serve their own parochial interests. Sagan mentions the scientists who clamour for more funding for their work, or the politicians who see a chance to make a name for themselves.[[29]](#footnote-29) Additionally, a state with nuclear ambitions must have the financial muscle, as well as the technological nous, to facilitate these aims in the first place. In this chapter I will analyse the domestic situation in Brazil from the coup that brought the military into power in 1964, to the day the final shovel was thrown into the nuclear test shaft at Angra. I will pay particular attention to the steering role of the military leaders that governed the country for over twenty years, as it was the military regime that dreamt up the idea of Brazil as a nuclear power and who raised and spent the billions of dollars on acquisition and research. Leaders like Geisel, Figueiredo and Sarney left an indelible mark on the Brazilian nuclear programme by way of their policies. I have also taken this model to include foreign actors who seek to interfere in a state’s domestic affairs, such as the Westinghouse Company and the US Atomic Energy Commission, for without them, the domestic Brazilian picture would be incomplete.

## The new military regime

After the 1964 overthrow of civilian president José Goulart, the new military regime passed measures that eliminated regulations and promoted exports.[[30]](#footnote-30) Brazilian utilities were privatised, with foreign companies benefiting in particular. Within two years after the military coup, half of Brazilian industry was in foreign hands. In 1971, of the 19 biggest privately-owned companies, 14 were foreign-owned.[[31]](#footnote-31) These measures generated foreign investments and kick-started the Brazilian economy. Brazil's industrial exports increased from US$1.4 billion in 1963 to US$6.2 billion in 1973. Also, in that period, the average annual rate of growth of GDP jumped to 11.1%, led by industry with a 13.1% average.[[32]](#footnote-32) Brazil was booming, and suddenly the military regime had money to spend on its nuclear aspirations. Nuclear material was never a problem, either, as explorations in the 1970s showed that Brazil had known resources of over 278,000 tonnes of uranium: over five percent of the known world total.[[33]](#footnote-33) The Pocos de Caldas, Lagoa Real and Santa Quitéria uranium mines, each opened throughout the 1970s, contain enough uranium to build the world’s biggest stockpile of nuclear weapons. However, in order to be used for either civil or military purposes, uranium must progress through a series of stages of processing, from the mining itself, through enrichment and reactor operation, to the decommissioning of spent nuclear fuel. This process is known as the fuel cycle and mastering every component of the fuel cycle is crucial to the development of nuclear energy, whether in a civil or military form. Mastering the fuel cycle is also incredibly difficult, and in the 1970s and 1980s represented the pinnacle of research in the nuclear field. When the Brazilian regime decided to accelerate its nuclear programme in 1971, Brazil did not master the nuclear fuel cycle, nor did it have the research capability to attain mastery of the fuel cycle within a time period acceptable to the military regime. Instead, when Brazilian President Médici’s government decided to construct a nuclear reactor on the Itaorna Beach in Angra dos Reis, the decision was made to look abroad for knowhow on the fuel cycle.[[34]](#footnote-34) The US company Westinghouse, a leading provider of nuclear technologies, was subcontracted to build the structure for the fee of USD 2 billion. However, the ascension of Gerald Ford to the US presidency in 1974, combined with the 1973 India nuclear test, reversed US policy regarding nuclear proliferation, and in June of that year the US Atomic Energy Commission shot down the continued supply of enriched uranium to the Angra I plant, claiming insufficient capacity.[[35]](#footnote-35) The policy shift on the part of the United States solidified the sentiment in Brazilian government circles that US commitment to nuclear cooperation was shaky at best and could not be exclusively relied on.[[36]](#footnote-36) Brazil had already established a cooperation agreement in the field of science and technology with West Germany in 1969, but had kept nuclear cooperation with West Germany on the back burner considering the deal with Westinghouse. As Westinghouse withdrew, however, Brazil escalated its discussions with West Germany and in 1975 signed a deal that allowed for the construction of two new nuclear reactors at Angra for the payment of a total of four billion USD. However, the Brazilian-West-German deal was a costly disappointment, as the usage of the new jet nozzle technology in the fuel cycle proved to be costly and ineffective.[[37]](#footnote-37) The United States had pressured West Germany into using this technology at Angra, instead of the usual centrifuge programme. The centrifuge programme was proven and cost-effective, and for that reason the United States sought to prevent Brazil from attaining the technology after it became clear that the US was unable to torpedo the entire agreement altogether. The military regime became convinced that Brazil would have to master the fuel cycle autonomously, which would free Brazil’s nuclear programme from foreign influence.[[38]](#footnote-38)

## Geisel and the *Programa Paralelo*

As Ernesto Geisel took the oath of office in 1974, there was a sense among the military hard-liners who had pushed for the establishment of the Brazilian nuclear programme that their project was in mortal danger. The officers had pushed for Silvio Frota as president, a hard-line, authoritarian candidate more in line with the previous president Emilio Médici, who had imprisoned and killed political opponents, suspended *habeas corpus* and assisted in the military coup in Chile in 1973, replacing democratically elected president Salvador Allende with an authoritarian military junta similar to Médici’s own government.[[39]](#footnote-39) Due to political manoeuvring and the fine art of wheeling and dealing, Geisel had positioned himself for the presidency following the resignation of Médici. The military feared the dissolution of the nuclear development programme as part of Geisel’s reforms.[[40]](#footnote-40) In office, Geisel indeed turned out to be a less authoritarian president, seeking the democratisation and ‘opening’ of Brazilian politics and society. However, Geisel also was an incrementalist, seeking to change the dictatorship not by decree, but gradually, as to not lose the support of the military, which would have exposed the president to another military coup. Ten years before Gorbachev announced his programmes of *glasnost* and *perestroika*, Geisel spoke of his measures furthering *abertura* and *distensão*.[[41]](#footnote-41) *Abertura* is Portuguese for ‘opening’, and entailed the opening of Brazilian society to dissenters by, for example, allowing elections through a dual-party system and allowing exiles to return to Brazil. *Distensão* means ‘distension’, and in this context, meant the nascent separation of state and military, which had been inseparable to the point of being indistinguishable. Of course, the military hard-liners were diametrically opposed to these moves of *abertura* and *distensão* and the balance of power between moderates and hard-liners was delicate throughout Geisel’s presidency.[[42]](#footnote-42) Accordingly, Geisel was forced to move slowly and deliberately in liberalising Brazilian society. In order to appease the military, he paired his domestic policy of *abertura* and *distensão* with a nationalistic foreign policy. To this end, Geisel used the nuclear deal with West Germany to assert Brazil’s independence from the United States. Nuclear research was framed as a way to achieve energy independence by way of civil nuclear power, and to pursue the militarist sub-imperialist dream of a dominant Brazil in the region and on the world stage.[[43]](#footnote-43) For this reason, the nuclear programme was not included in the *abertura* and *distensão* of Geisel, even as his steps toward democratisation became more significant towards the end of his term in 1979. As he restored *habeas corpus*, accorded political rights to politicians and repealed the extraordinary powers given to the president by an emergency act passed by president Médici, president Geisel also struck the nuclear deal with West Germany, built Angra II and accelerated Brazil’s domestic nuclear programme. The *coup de grâce* came in 1979 when Geisel accommodated a peaceful presidential transition to fellow moderate João Figueiredo while simultaneously ordering the military to undertake aclandestine nuclear development project by the name of the *Programa Paralelo*.(‘parallel programme’, so named for its existence parallel to Brazil’s public, civil nuclear development programme).[[44]](#footnote-44) This project existed outside international safeguards and was administered by the different branches of the military. The programme had as goal to develop centrifugal technology by which Brazil hoped to conquer the nuclear fuel cycle. While the Air Force’s development phase stalled and the Army project never really got off the ground, the Brazilian Navy actually succeeded in developing the capability of producing a nuclear missile for use on a submarine.[[45]](#footnote-45)

## Economic problems

When President Emilio Médici initiated the nuclear programme in 1971, Brazil was, to put it simply, booming. Growth rates were in the double digits, foreign investment was pouring into the country and the government was minded to invest. However, the global oil crisis stemming from the OPEC embargo in 1973 hit Brazil exceptionally hard. Brazil was reliant on oil imports from the Middle East but had always been a steadfast ally of Israel, for the simple reason that Israel was an ally of the United States. Oil price rises of 400 percent crippled the Brazilian economy and brought growth back down to single digits.[[46]](#footnote-46) Upon taking office, president Geisel tried to offset the decline in market growth and foreign investment by increasing government spending to keep up demand. The national debt exploded, attracting the attention of the International Monetary Fund. Upon taking office in 1979, João Figueiredo inherited a deeply indebted country with a bloated public sector. As growth became anaemic, Brazil’s debt spiralled out of control and Figueiredo was forced to impose an austerity programme in order to rein in Brazil’s public finances. As Figueiredo’s term progressed, Brazil sank into recession, with GDP declining by five percent in 1983.[[47]](#footnote-47) The International Monetary Fund, commercial banks and US and European governments were determined to keep Brazil on a short leash and demanded deep cutbacks in public spending.[[48]](#footnote-48) As public unease over the decline in living standards grew, the billions spent on nuclear development were left alone. Although the ongoing construction of Angra III was halted due to lack of funds in 1984, the *Programa Paralelo* was hardly touched and the Navy was finally making significant progress towards developing nuclear missiles.[[49]](#footnote-49) However, a campaign for direct presidential elections, instead of the indirect system of electors that entrenched the status quo, became a lightning rod for the dissatisfaction with the economic situation, the slow pace of reforms and the regime being perceived as getting its priorities wrong. Although the protest movement, known as *Diretas Já!* (*Direct, Now!*), was unsuccessful in achieving its aim of direct presidential elections, public discontent was such that even with the indirect electoral system, the opposition candidate Tancredo Neves was swept into office by a landslide, thus ending over twenty years of military rule in Brazil.

## Conclusion

After the elections of 1985, the unfortunate president-elect Neves fell ill and died of cancer before his inauguration, so his vice-president José Sarney took office instead. One of his first acts as president was to withhold funding for the *Programa Paralelo*, deeming it an unnecessary and exorbitant waste of public finances and a relic from the military regime. In September 1987 president Sarney at long last revealed the existence of the *Programa Paralelo* to the general public, and the progress made within the project. Although there had been rumours about the existence of clandestine nuclear development within Brazil, the existence of such a comprehensive, technologically advanced and deeply funded programme came as a shock to the Brazilian general public and condemnation of the military was swift and vigorous.[[50]](#footnote-50) Sarney was in fact unwilling to entirely dismantle the clandestine programme and let it continue under a skeleton crew. It took the election of a new president, Fernando Collor de Mello, to finally decommission the *Programa Paralelo* with a 118-page Senate report and the symbolic gesture of dropping the shovels in the nuclear test shaft at Angra. Brazil’s nuclear ambitions were dead at long last, over twenty years after the first exploratory steps taken by the military regime. The nuclear programme had outlasted the military years, but could not outlive the lack of finances and popular support that the military had ignored for so long.

# Chapter Four – the norms-based model

## Introduction

After fifteen years of intensive research and development in the field of nuclear weapons, fifteen long years of great expenditure on acquisition of nuclear technology and construction of reactors, Brazil’s nuclear ambitions came to a close in the mid- and late eighties. The programme to develop nuclear weapons was effectively neutered in 1985, when president Sarney closed down the Brazilian military project that had produced nuclear missile-making capabilities.[[51]](#footnote-51) Five years later, the newly elected president Fernando Collor de Mello threw two shovels into the old shaft at Itaorna Beach, which was used for nuclear testing at Angra I, symbolically denouncing the *Programa Paralelo*:the project that had existed for the previous ten years with the goal of developing nuclear weapons without international oversight or safeguards.[[52]](#footnote-52) As explained in the previous chapter, Brazil in 1985 was not too far from finally attaining nuclear capability, becoming a nuclear power and fulfilling the goal set fifteen years earlier. So why did Brazil cease development of nuclear weapons at that time? Why did it expend so many resources for fifteen years, only to turn back in sight of what was arguably the finish line? In order to answer this question, I will analyse the political situation within Brazil, as well as on the international stage through Sagan’s third model, the norms-based model. This model, as Sagan explains, “focuses on norms concerning weapons acquisition, seeing nuclear decisions as serving important symbolic functions-both shaping and reflecting a state’s identity. According to this perspective, state behaviour is determined not by leaders’ cold calculations about the national security interests or their parochial bureaucratic interests, but rather by deeper norms and shared beliefs about what actions are legitimate and appropriate in international relations”.[[53]](#footnote-53) This chapter will firstly deal with Brazil’s attaining nuclear capability, after which it will analyse the role of the NPT-based international consensus in terminating Brazil’s nuclear programme.

## Aspirations for greatness

Brazil has a history of aspiring for greatness on the international stage, explained thusly by Joaquim Nabuco, Brazil’s first ambassador to the United States from 1905-1910: ‘Brazil has always been conscious of its size, and it has been governed by a prophetic sense with regard to its future’.[[54]](#footnote-54) Since its independence from Portugal in 1822, Brazilians have been marked by a belief that their nation, as the biggest country in South America, is a great power and should be treated as such. In addition, the great powers of the day have often turned to Brazil for economic and diplomatic issues in the reason, by virtue of its status as the dominant country in South America. However, Brazil has never possessed the military or economic might to actually stake a claim for a status as ‘great power’.[[55]](#footnote-55) Twice before had Brazil undertaken a concerted effort to gain a ‘seat at the table’ on the international stage. During both world wars, Brazil became actively involved despite no significant threat to the country itself. During World War I Brazil sent a naval detachment to patrol the Atlantic Ocean for the Allies, becoming involved in the establishment of the League of Nations after the war.[[56]](#footnote-56) Disappointingly for Brazil, it was only offered what amounted to second-class membership of the League. Insulted and disillusioned, president Brás declined. When the world found itself at war once more in the 1940s, Brazil took on a more active role, sending an expeditionary force of about 25,000 men, who mainly fought in the Italy Campaign during 1944. Upon the end of the Second World War, President Vargas made the case to the Allied Powers that Brazil, by virtue of its dominant status in South America, its vast natural resources and its contribution to the war effort, be involved in the establishment of the post-war Bretton Woods institutions and be admitted to the newly-formed UN Security Council as a permanent, veto-carrying member.[[57]](#footnote-57) US President Roosevelt admired Vargas and was open to the idea, but the United Kingdom and the Soviet Union were worried that Vargas was too close to the United States and accordingly vetoed the plan, leaving Brazil out in the cold once again. By becoming an active participant in two world wars, for which the rationale from a military-strategic standpoint was questionable to say the least, Brazil sought to show the world it was ready to actively participate in world affairs. There was little to no strategic value in sending a couple of warships into the Atlantic, or the deployment of a comparatively minuscule expeditionary force of 25,000 men, but then again, that was not the point. It was the symbolism of using force, of fighting in a World War that was seen as a signifier of a country that mattered. For the Brazilians, at least, because when Brazil sought outside support in order to gain more symbols of international relevance, such as membership of the League of Nations or of the UN Security Council, it was rebuffed.

In keeping with this Brazilian tradition of aspiring to play an important role on the world stage, the military regime that came to power in the coup of 1964 had high hopes for Brazil in the international arena. It wanted the country to dominate South America in the same way the United States had done when establishing its Monroe Doctrine, to be able to in effect, treat [South America] as its backyard.[[58]](#footnote-58) Furthermore, the regime had ambitions for Brazil on the world stage, eyeing a permanent seat on the UN Security Council once again and a seat at the table for important global talks. In the 1960s, nuclear capability no longer was property of the superpowers. Ambitious states which were not part of the post-war global elite, but were keen to fulfil their potential on the international stage, sought to increase their geopolitical clout by attaining nuclear capability.[[59]](#footnote-59) In this way, acquiring nuclear power became a signifier of international importance in the same way membership of the League of Nations had been in the 1920s and a seat on the Security Council had been in 1945 (and still was in the late 1960s). In addition to the US (1945) and the Soviet Union (1949), the United Kingdom (1952), France (1960), China (1964) and Israel (1966) had developed nuclear weapons by the time the Brazilian government took steps towards starting a development programme. Developing states like India, Pakistan, South Africa and Brazil’s regional rival Argentina initiated nuclear programmes aiming to harness nuclear power in both a civil and military capacity. Brazil could not be left behind in this battle for international relevance, the norms of international relations dictating that Brazil either initiate a nuclear programme as well, or drop its lofty ambitions on the world stage. Accordingly, the Brazilian government set up a task force to explore the viability of developing nuclear weapons.

## Shift in norms

What is interesting about norms is that they are not innately so. Norms are agreed (and sometimes disagreed) upon by those to whom the norms apply. Accordingly, norms are continuously contested, ever-changing and unique to time and place. The norms regarding nuclear proliferation are a prime example of this variability, due to a sea change in what was considered as normative for nations seeking prestige. As outlined earlier, the post-war period up to the late 1960s can be termed as a golden age of nuclear development, as it was the period when countries actively sought nuclear capability as a means of attaining prestige and status on the world stage. It was the period when all five members of the UN Security Council attained nuclear capability, while developing nations sought to cement their up-and-coming, emerging country status by establishing a nuclear programme. It was a time, in short, when the norms of the international community actively encouraged emerging states such as Brazil to develop nuclear capabilities. However, the 1970s brought a new paradigm on nuclear proliferation, which emerged from the institution of the NPT.

The Treaty on the Non-Proliferation of Nuclear Weapons, commonly known as the NPT, was established in 1968 with the objective to ‘prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy and to further the goal of achieving nuclear disarmament and general and complete disarmament’.[[60]](#footnote-60) Since its inception, only four countries have not signed the agreement. For the 191 countries that have signed the agreement including Brazil, it is the NPT that governs their nuclear (foreign) policy. Acting in violation of the NPT carries the threat of condemnation, economic sanctions and international isolation, primarily by its key guarantor: the United States. The deal between nuclear and non-nuclear states was that non-nuclear states would commit to refraining from developing nuclear weapons, for which in exchange, the nuclear nations would share their civil nuclear technology with the countries without nuclear weapons.[[61]](#footnote-61) Accordingly, the establishment of the NPT engendered a paradigm shift in nuclear proliferation politics. Whereas going nuclear was formerly regarded as the pinnacle of technological prowess for a country and as a statement of intent regarding the international ambitions of said country, the inception of the NPT entrenched a nuclear order upon the world. The NPT entrenched existing geopolitical power structures by allowing the existing five nuclear states to keep their weapons and capabilities, while prohibiting other states from ‘going nuclear’. The former Brazilian Navy nuclear engineer and ex-president of Electrobras Othon Luiz da Silva strikingly described the workings of the NPT as having the effect of a 20th century version of the Treaty of Tordesillas, in the way the US and the Soviet Union effectively divided the world into nuclear spheres of influence, as the papal accord that carved up South America in the fifteenth century had done upon the discovery of the New World.[[62]](#footnote-62) The paradigm which came from this development was that of nuclear development being fundamentally out of the question for a participative member of the international community. The paradigm which came from this development was that of nuclear development being fundamentally out of the question for a participative member of the international community.

## Conclusion

In conclusion, it can be said that norms-based factors comprehensively influenced Brazilian decision-making on the Brazilian nuclear programme. It has become clear that norms have influenced both the Brazilian decision to initiate its nuclear programme and also the decision to discontinue developing nuclear weapons. The norms of the 1960s encouraged nuclear development by emerging states and provided an outlet for Brazilian aspirations of greatness on the international stage. The institution of the NPT in 1971 changed the norms governing nuclear proliferation in the international community, promising international condemnation and isolation for emerging states seeking to attain nuclear capabilities. Consequently, the Brazilian programme to develop nuclear weapons went underground with the institution of the *Programa Paralelo*, and was steadily shut down when the new, democratically elected Brazilian government was not prepared to run the risk of becoming tarred as a rogue nuclear state, and absent any geopolitical threat, held off building a nuclear weapon.[[63]](#footnote-63) It so becomes clear that norms have influenced both the Brazilian decision to initiate its nuclear programme and also the decision to discontinue developing nuclear weapons. Because norms are contested and ever-changing, they can both contribute to nuclear proliferation and non-proliferation. In 1990, the newly elected president Fernando Collor de Mello threw two shovels into the old shaft at Itaorna Beach, which was used for nuclear testing at Angra I, symbolically denouncing the *Programa Paralelo*:the project that had existed for the previous ten years with the goal of developing nuclear weapons without international oversight or safeguards.[[64]](#footnote-64) The norms of the 1960s had been replaced by the post-NPT norms on nuclear proliferation, thus dooming the Brazilian nuclear programme.

# Conclusion

## Main conclusion

In this thesis, I have aimed to shine a light on the motivations for nuclear proliferation in Brazil from 1970 to 1990. In answering the thesis main question, it becomes apparent that the three theoretical frameworks, explicated by Sagan’s ‘Why do states build nuclear weapons?’ as the security, domestic and norms-based models, offer a fitting structure in which to analyse Brazilian nuclear proliferation. Dozens of hours researching and writing about Brazilian nuclear proliferation have resulted in valuable insights on the subject, within the security, domestic and norms-based models respectively. The following conclusions of this thesis can be used to aid policymakers in to review their decision-making, as well as scholars seeking to position themselves in the neorealist versus organisational theory debate alluded to in the first chapter.

## Chapter conclusions

Firstly, the academic debate regarding nuclear proliferation is dominated by neorealist theory. Propagated by scholars such as Shultz, Epstein and Paul, this academic school of thinking considers military-strategic considerations as governing the decision-making of nuclear states alone. However, representing opposing organisational theory, Sagan makes the argument that the neorealist approach is too narrow and inadequate to serve as a theory explaining the nuclear decision-making of states. In Sagan’s ‘Why do states build nuclear weapons? Three models in search of a bomb’, he sets out an alternative approach, in which military-strategic factors constitute but one model in a total of three models. The other models are the domestic and norms-based model, respectively. These three models set out the academic framework of the next three chapters, each applying one of Sagan’s models to the case study of Brazil’s nuclear programme.

In the second chapter, it was established that using neorealist theory of ‘proliferation begets proliferation’, the decision by Argentina to initiate its nuclear development programme would mean that Brazil would automatically have to follow by pursuing nuclear capability itself, in order to cancel out Argentina’s nuclear power and return to the status quo. However, when one views the interconnectedness of these decisions, it becomes apparent that Argentina would be foolish to continue to pursue nuclear capabilities, thus leading Argentina to cease its nuclear programme in the mid-1970s. With its prime (nuclear) military threat having left the scene, neorealist theory would entail the termination of the Brazilian nuclear programme as well. This did not happen, however, with the *Programa Paralelo* being escalated into the 1980s, even as ties with Argentina became ever closer. Thus it becomes clear that the neorealist theory does not adequately explain nuclear proliferation in Brazil.

Consequently, in the third chapter, the issue of Brazilian nuclear proliferation has been discussed on the domestic level, using Sagan’s domestic model as guide. It is established that in order for the nuclear programme to be even remotely possible, economic and technological factors played an important role. After the 1964 military coup, the Brazilian economy boomed, bringing enough cash into state coffers in order for the military regime to be able to pursue its nuclear dream. Also, it took ten long years of (failed) foreign investment and research to get to the point where Brazil was capable of mastering the fuel cycle. Another important domestic factor in the decision-making regarding Brazil’s nuclear programme was the decision-makers themselves, and their parochial interests. The way president Geisel used the nuclear programme to couch his liberalising agenda of *abertura* and *distensão*, saved the costly project from the scrapheap in a period when the state was forced to cut costs. The nuclear programme became a third-rail issue for military hardliners, forcing Geisel’s successor, João Figueredo to maintain the programme even as he carried out deep spending cuts, leading to his defeat for re-election in 1985. José Sarney was unwilling to terminate the *Programa Paralelo*, but was forced by popular opinion to withdraw funding, until Fernando Collor de Mello finally killed the project in 1990. It can be concluded from this summary (and the deeper analysis in Chapter Three) that domestic issues such as economic, technological and political factors deeply impacted decision-making on the Brazilian nuclear programme.

The final model of Sagan that this thesis has dealt with, is the norms-based model. Since its independence in 1822, Brazil has had aspirations for the world stage. In the 20th century, the country has made three expedited efforts to attain a seat at the table on the world stage. The first two instances entailed involvement in the two world wars, seeking post-war and prestige. These efforts were rebuffed, and Brazil’s ambitious military leaders hoped to claim its rightful place as a world power by attaining nuclear capabilities in the 1960s. However, the institution of the NPT started a shift in the norms governing international affairs. Whereas the 1960s had been a time when nuclear exploration was encouraged, the NPT consensus brought different responsibilities for emerging nations, prohibiting them from pursuing nuclear capabilities on penalty of international condemnation and even isolation. Brazil responded by initiating the secret *Programa Paralelo*, and subsequently shutting the programme down when nuclear development could no longer be reconciled with norms governing Brazil as an emerging state.

## Further research

I have thoroughly enjoyed the countless hours of reading, writing and watching documentaries with the goal of comprehending both the subject of nuclear proliferation, as well as Brazil’s nuclear programme, both of which were relatively new to me. I like to think I have attained a passing knowledge of the two subjects and would very much like to delve deeper into the nuclear proliferation debate. Further research into the subject of Brazilian nuclear proliferation is still eminently valuable, as my research has turned up enough source material to write a 200-page book, and it was difficult at times to restrain myself in ambition and scope. It would also be an excellent idea, from an academic point of view, to conduct a similar kind of study for another case, such as Argentina’s nuclear programme. It would be interesting to analyse whether my conclusions about the validity of Sagan’s theoretical framework still holds upon trial by a different case study and this comparative study would enable scholars to draw more comprehensive conclusions about the universality of Sagan’s three models. For Brazil, the models were more than sufficient.

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