Indian Nuclear Testing and Non-testing decisions: Mapping nine cases since latency to explain dominant causal mechanisms

Abstract:
This thesis develops an original theoretical framework to explain a key aspect of India's nuclear program, its nuclear test decisions. Nuclear testing is considered to be an action in defiance of international norms, especially after the adoption of NPT[1] and Comprehensive Test ban treaty. It adversely impacts a nation's image, more so for a nation whose self professed identity is synonymous with "Gandhian" value of nonviolence. The study covers the period 1965 – 2008, broken down into nine decision periods[2]. It draws upon security centric classical realism[3] based proliferation models and Stephen Meyer's composite proliferation model[4] to explain the Indian nuclear testing puzzle. I find that extending the fifteen variable Meyer's framework to the Indian nuclear testing decisions does not explain five of the nine decision periods. Therefore, a final cut analysis is performed using additional independent variables drawn from contemporary research on proliferation models based on psychological and sociological constructivism, liberal institutionalism, domestic bureaucratic politics and neo-realism dictated by systemic bias in the global system. Correlation analysis against the facts from the cases finds that the missing elements for the India case can be explained by two additional variables - a) India's bureaucratic politics[5] and b) US diplomatic interactions with India[6]. Secondly, the causes of Indian nuclear weapons program and its trajectory of development is uncorrelated with Indian nuclear testing decisions. These conclusions have broader implications for a) CTBT b) Disarmament c) Indian posture at other multilateral negotiations d) US nonproliferation policy aimed at other break out states and e)Indo-US bilateral relations .

Nonproliferation policies are aimed at addressing both the supply and demand side challenges of proliferation. Supply side is addressed by a cobweb of export control regimes and safeguards aimed at preventing spread of technical means related to nuclear weapons. The demand side is addressed by creating international norms backed by security alliances to dissuade proliferators. However, with the rapid diffusion of technical knowhow across boundaries the supply side challenges are not as daunting as they used to be in the digital age. The demand side deterrent measures assume a known model to predict how to dissuade "would be" proliferators. However, Tanya Ogilvey-White[7] has pointed out that the field is still plagued by ambiguities and inconsistencies about the models of proliferation. According to her these models are often based on the experiences about dynamics of proliferation in the declared NWS (Nuclear Weapons States) but may not be relevant to current proliferation challenges. These doubts about the existing models have prompted this study.

Classical proliferation studies have long assumed that causes of nuclear weapons programs and nuclear testing are one and the same based on experiences of early western nuclear powers. This assumes that tests were undertaken with the singular aim of improving aspects of the nuclear weapons. Therefore, applying existing proliferation models to explain causes of nuclear testing is a logical path to pursue if one's aim is to understand the causes of nuclear testing as is the case for this paper. Nuclear testing is considered to be an action in defiance of international norms, especially after the adoption of NPT[10] and Comprehensive Test ban treaty. Therefore, studying the causes of why a state crosses the threshold and conduct tests since the adoption of NPT and CTBT is imperative in itself to validate or challenge existing proliferation models if one assumes a direct correlation between causes of proliferation and nuclear testing as this study does.

The India case is chosen for three reasons. Firstly, India is the first nuclear weapons state to test nuclear weapons since the global norms against nuclear weapons development went into force with the NPT (Nuclear Nonproliferation Treaty). Secondly, the Indian case involves testing and reversal of testing on several occasions giving us better chance to build a model. Finally, there is more public domain information about nuclear decision making for the Indian case compared to cases the other two states that have cross the threshold by conducting overt nuclear tests since the NPT went into force namely Pakistan and North Korea.

The outline of this study is as follows. First, nine decision-periods related to Indian nuclear testing decisions since achieving latency are analyzed from the lens of security centric power maximizing utility of nuclear weapons based on the classical realist framework championed by John Mearsheimer, Kenneth Waltz, Stephen Van Evera and Benjamin Frankel, among others.

Having documented the lack of fit a reanalysis is done in cut two using Stephen Meyer's composite proliferation model, augmented by constructivist concepts of identity/prestige and domestic turmoil in addition to security motivation, to explain the Indian nuclear testing decision making. Meyer model can be described as a neorealist framework borrowing additional concepts such as "identity" variables borrowed from the constructivist framework. Specifically, this model adds-regional and great power status or pretensions, pariah status, and the need to save face after loss in war, as factors in addition to classical realist framework based factors. This model shows an improved fit but not optimum.

Extending Meyer's framework to Indian nuclear testing decisions, I find that these variables do not explain five of the nine decision periods. Therefore a final attempt is made in cut three based on contemporary models of proliferation adding the domestic politics dimension as espoused by Solingen, Ways and Singh, Bleek, Muller and Schmidt coupled with neorealist assertions of power versus prudence by TV Paul in context of aspiring great power states challenging the status quo international system and the psychological constructivist addendum based on "opposition-induced fear and nationalism-induced pride" espoused by Hymans, all in the context of India.

Cut three specifically adds variables related to enduring rivalry (Ways/Sasikumar, TV Paul and Bleek), opposition-nationalism (Hymans), level of economic integration (Solingen), domestic bureaucratic politics (Ways finds this aspect of domestic politics to be dominant related to

nuclear decision making as opposed to regime type. This view is supported by Sagan) and US diplomatic interactions with India (proxy to TV Paul's measure of shift in global power system).

This study finds that only two of these five additional variables, domestic bureaucratic politics and US diplomatic interactions with India to be statistically significant when correlated with the events of the nine cases related to Indian nuclear testing decision making. In terms of Indian bureaucratic politics, at certain times, the political establishment prevailed over the scientific establishment's push for nuclear testing; at other times it was unable to resist the scientific push for testing; at still other times it resisted the scientific push for testing but allowed the scientific enclave to continue other nuclear or missile related activity. In terms of US diplomatic interactions with India, at certain times, US interaction with India was not influenced by a US nonproliferation lobby, resulting in US nuclear policy being accommodating towards India. At other times US interaction with India was more influenced by a US nonproliferation lobby, resulting in US nuclear policy towards India being confrontational. Thus, my study augments Meyer's framework with these two additional variables to fully explain India's nuclear test decisions. Another conclusion of this study is the finding that causes of nuclear testing may be decoupled and uncorrelated from the causes of a nuclear weapons program as is evident from the nine cases from India analyzed in this study. This decoupling may be a new phenomenon with the advent of computing models related to nuclear testing and global norms against testing. Therefore, there are implications of the above two findings related to the India case to the future of the comprehensive test ban treaty as applied to the hold out states in particular and defining redlines and dependent variables while applying existing proliferation models to other break out cases.

Case Selection

Nine decision periods pertaining to Indian nuclear testing covering high, medium and low likelihood of nuclear testing are described below[11] and are used to build a model. After having a analyzed the facts from each case a categorization of testing propensity is made for each case. The term testing propensity is borrowed from proliferation propensity used in Literature[12]

a. SNEPP (Study Nuclear Explosion for Peaceful Purposes): 1965-66

India faced grave security threat following the Chinese nuclear tests in November 1964 barely within two years of the 1962 Sino-Indian conflict. China continued testing at a brisk pace in the next few years enhancing the threat. Pakistani Chinese collaboration was also on the rise during this period. Moreover, technological determinants came in place following the commissioning of CIRUS in 1964 which one may argue made India a latent nuclear state at that point.

In 1964, following the Chinese tests newly appointed prime minister Lal Bahadur Shastri undertook efforts to look for security blanket from the West. He had send diplomatic missions led by LK Jha and CS Jha to Western capitals and Moscow seeking security guarantees risking non alignment while endorsing Bhabha to start calculations for SNEPP [Study of Nuclear explosion for peaceful purposes] thereby maintaining his Gandhian

distaste for the bomb but keeping pro bomb lobby within the congress party in confidence in response to the Chinese tests.

In 1965, Prime Minister Lal Bahadur Shastri authorized the chairman of the Indian Atomic Energy Commission, Homi Bhabha, to start the study for peaceful nuclear explosions. This was in response to Chinese nuclear tests in 1964, India's loss of war to China in 1962 and India's own regional power status. However, the decision was moderated by India's self image as being of "peaceful reputation".[13] Initial plans involved a test in 1968 according to some sources[14] therefore this period can be categorized as one of high nuclear testing propensity. Therefore, a score of 0.75 on a scale of 0-1 assigned to this period.

b. SNEPP Reversal: 1967

By 1966 in light of economic difficulties the mood had shifted as evidenced by 253 members of parliament signed a memorandum supporting the government's policy of using nuclear know-how only for peaceful purposes. Morarji and Indira (two major political forces) both agreed to keep nuclear issue in the back burner. Only Jan Sangh (pre cursor to the BJP) which had 9% electoral support during this time pushed for an overt nuclear weapons program at this time.

a. Scientific enclave leadership of the period

The scientific enclave in this period changed hands and moved under the control of Dr. Vikram Sarabhai from Dr. Homi Bhabha in1966 following the latter's death. Sarabhai espoused what Itty Abraham calls "nuclear developmentalism". He called for large civilian nuclear program to create a consumer society connected to the nuclear grid. He even considered tying up with the west to consider using economically viable BWR (Boiling water reactor) technology using LWR (Light water reactor) taking advantage of the large installed base of these reactors at the cost of importing enriched Uranium fuel necessary to operate these reactors. This was a shift from the strategy of using indigenously mined natural Uranium using PHWR (Pressurized Heavy Water Reactors) proposed by Bhabha. Thus both political orientation and orientation of the scientific enclave kept India in a state of nuclear ambivalence with a decision to avoid confrontation with the west on the testing issue.

b. Consensus view in New Delhi: Outcome of bureaucratic politics

In 1966 the popular view in New Delhi was a research and development strategy espoused by K.C Pant (general secretary congress parliamentary party) to enable the nuclear option but not go overtly nuclear as evident from his statements in 1966[1]. This is what Perkovich calls the Bhabha-Shastri compromise of 1964.

c. Anti bomb lobby prevails

General Som Dutt the first director of IDSA (Institute of Defense Studies and Analyses) presented a paper at IISS (International Institute for Strategic Studies) Adelphi conference in November, 1966 explaining that India did possess a" nuclear option" claiming that India could

[1] KC Pant in Perkovich's "India Nuclear Bomb" Pp 126 *"We should not, I feel, take the political decision to go in for nuclear weapons today, above all because efforts are going on to bring about a treaty of nonproliferation of nuclear weapons. However, I do feel that we cannot afford to lag behind in the growth of acquisition of technological knowledge in the nuclear field and while we do not take the political decision we should keep the option open and reduce the time from the moment of decision to the moment of implementation to the very minimum."*

explode a nuclear device within a year[2]. Dutt explained the security threat scenario in the region and argued the perils of an overt nuclear program and how it killed chances of building any chances of understanding with Pakistan. He went on to explain why the Chinese nuclear build up was not a threat and why a crude explosive is not a credible minimum deterrent without a delivery mechanism. The above sentiments led to reversal of SNEP soon after Sarabhai took office at AEC.

A political leadership change and a drop in propensity due to the passage of time led to cancellation of SNEPP in 1966. However, other reports suggest that PNE preparations started during this period. Therefore, it is fair to categorize this period as that of medium nuclear testing propensity and a score of 0.5 is assigned to this period on a 0-1 scale.

c. PNE: 1970-74

a. Ignored at NPT 1967-71

Indian representative at conference on disarmament in Geneva, Ambassador VC Trivedi's position during the NPT negotiations suggested that India wanted four things out of NPT (Nuclear Nonproliferation Treaty).

1. Ending further production of nuclear weapons and delivery systems by the NWS.
2. Securing commitments from NWS on disarmament.
3. Obtain security guarantees.
4. Reserve the right to conduct PNE (Peaceful Nuclear Explosions).

However, at the end the final format of the treaty ignored all of India's positions. The world was divided into nuclear "haves" and nuclear "have nots". All countries that tested before 1967 were granted NWS (Nuclear Weapons State) status including Indian rival China. All other states were categorized as Non Nuclear Weapons States (NNWS) ignoring any special position for latent nuclear states. This was a concern for Germany, Sweden and Japan but they all accepted the NPT terms but India along with Israel and Pakistan stayed out of the NPT. This exclusion was described as "nuclear apartheid" by Ambassador VC Trivedi[3]. This has been recurring theme since then espoused by India and some other post colonial nations. The nuclear weapons states offered little in return. Instead the global powers pushed for a regime that

1. Prohibited transfer of nuclear weapons and sensitive materials and know how to other states.
2. Prohibited receipt or production of nuclear weapons or explosive devices (including PNE) by non nuclear weapons states.
3. Expected NNWS (Non nuclear weapons states) to accept safeguards in return for civilian nuclear technology cooperation.

b. India moves to PNE 1971-74:

Complete isolation at NPT coupled with security threat from USA and China manifested by US naval fleet presence in Bay of Bengal during the 1971 war against Pakistan and Chinese statements of support denouncing Indian actions in East Pakistan are the main factors that drove India to conduct

[2] Perkovich, India and the Nuclear Bomb
[3] Anne Marks "NPT Problems and Paradoxes"

PNE (Peaceful Nuclear Explosion) in 1974 according to many Indian analysts. However, Sagan has pointed to the domestic politics model while explaining the Indian tests of 1974 while others like Viping Narang and Jacques Hymans have used the prestige argument to explain the 1974 PNE. Nevertheless, on cannot ignore the importance of the 1971 Indo-Soviet friendship treaty which may have provided the security cover to undertake such a bold move amidst improving Sino-US relations according to Jerome Conley[4].

c. Leadership change in the scientific enclave following Sarabhai's death:

According to proponents of the domestic politics model explaining the 1974 PNE felt that the political leadership of Mrs. Gandhi was feeling embattled at home and she was paranoid of western conspiracy to overthrow her thus a public opinion blip following a successful nuclear test in defiance of the west would help her image. However, preparations for the test were begun in 1971 soon after Sarabhai's death and change of leadership in AEC at a time when Indira's popularity was very high countering this view. There was a new pro bomb scientific leadership at AEC (Dr. Homi Sethna was a prodigy of Bhabha often at odds with Sarabhai) following Sarabhai's death led by a confident political leader just having tasted success in a war by defying the West.

India illustrates global power pretentions during this period after India obtains security umbrella from Soviet Union amidst East Pakistan crisis in 1971. During this period the US sends USS Enterprise in the Bay of Bengal leading to high nuclear testing propensity[16]. Therefore, a score of 1 on a scale of 0-1 assigned to this period based on the fact that an actual test happened in 1974 albeit termed as a Peaceful Nuclear Explosion (PNE).

d. Morarji Desai's reversal of PNE: 1977-79

a. Western Response to 1974 PNE: Symington Act, NNPA and London Club:

The U.S. reaction to the PNE was the most severe of all western nations. In 1976, US Congress introduced the Symington amendment to the foreign aid bill, thereby cutting off certain forms of economic and military assistance to countries that received enrichment or reprocessing equipment, materials, or technology without full scope International Atomic Energy Agency safeguards.[87]This resulted in the onset of what Itty Abraham calls the discourse of control.

Subsequently, the US Congress passes Nuclear Non-Proliferation Act (NNPA). This long and complicated legislation was the culmination of several years of intergovernmental debate informed by numerous official and non governmental studies. Much of this was prompted by India's 1974 nuclear explosion. Proponents of this legislation such as Senator Percy put it, India had been able to explode a nuclear device *"without any concern that they would have any sanctions imposed against them…But if we had just had a clear-cut policy from the outset that [an explosion] would be an action so contrary to our policy that we would sever our supply if technologies and materials were used for explosives, then I do not think they would have taken the action*." [88] The United States also undertook significant efforts to limit proliferation at the multilateral level, taking the lead in the formation of the London Suppliers Group, which sought to coordinate and limit the sales of sensitive and dual-use technologies to countries outside the ambit of the NPT formalized later as the Nuclear Suppliers Group (NSG).

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[4] Conley Jerome, "Indo Russian Millitary and nuclear cooperation: Lessons and Options for US Policy in South Asia" Pp 30-31

b. *Initial Indian Response- Go indigenous but no defiance by further testing*:

In the early 1960's as part of nuclear cooperation agreement under Atoms for Peace the United States helped India build the Tarapur reactor in Western India prior to the NPTregime. This reactor designed by GE ran on enriched uranium providing half the electricity for the state of Maharashtra. However, following the passage of the NNPA, US was forced to cut off enriched Uranium fuel supplies to the Tarapur nuclear reactor. The Indian scientific enclave resented this piece of legislation and the whole concept of sanctions backed export controls setting the stage for numerous future conflicts on this issue. This body of restrictive legislation also had a perverse and unintended consequence- it made the Indian program increasingly indigenous[89] in response to the export controls. The political leadership viewed it as an assault on India's sovereignty. Prime Minister Morarji Desai's team did reciprocate with a decision to expel Coca Cola and IBM out of India, probably in retaliation to the Symington act and the ensuing Tarapur fuel supply related controversy.

c. *New anti bomb political leadership*:

However, the newly elected Indian Prime Minister Morarji Desai was trying to move India to genuine non alignment away from the Soviets thus he was willing to compromise on the nuclear program and stall it because of US concerns. Moreover, this position fits well with Morarji Desai's own personal abhorrence to nuclear weapons stemming from his adherence to Gandhian principles of non violence. Thus political leadership orientation triumphed over the scientific enclave orientation in this case. Had Indira Gandhi still been in power in 1977 and Carter administration continued its pressure on Tarapur the Indian response may have been different post 1974.

Morarji Desai was a Gandhian leader with abhorrence to nuclear weapons. He abrogates PNE at UN therefore nuclear testing propensity drops to a lower level due to change in political leadership. However, there is no actuall dismantling of the Trombay nuclear weapons infrastructure although Raja Ramanna is transferred out to Delhi. Therefore, a score of 0.25 on a scale of 0-1 assigned to this period.

e. Reversal of test decision under Indira Gandhi: 1981-83

a. Indira back in power. Ramanna back in the helm

Indira Gandhi came back to power in 1980 with the Tarapur dispute still unresolved. Her defiant and anti-US stance in the 1970's would have expected one to assume a tougher nuclear line this time around. Therefore, not surprisingly soon after coming back to power pro bomb scientist Raja Ramanna was back in an important role and all preparations were underway for round of tests to complete the unfinished task from 1974 under pressure from the scientific enclave. However, this time three things were different. Indira had the taste of being out of power since 1977; she had just lost her son Sanjay; and there was change of administration in US.

b. US non proliferation policy under Reagan and Indian response

The republican administration had a more pragmatic view on non proliferation policies. Under Reagan a deal was found for Tarapur fuel supplies where by France was allowed to supply fuel (France was still a non signatory to the NPT) and the power plant kept running. In return the Indian's kept their end of the bargain by not conducting any new nuclear tests continuing a period of what Itty Abraham calls nuclear ambiguity post 1974. It is reported during this period that Prime Minister

Indira Gandhi had ordered a nuclear test in 1982-83 but reversed the decision within within twenty four hours[5] [6] while negotiations on Tarapur nuclear fuel was ongoing with US.

Nuclear testing propensity remains high during this period due to return of pro nuclear leadership coupled with increasing security tensions amidst growing Pakistani nuclear capability. However, during this period there are reports of one (possibly two[17]) instance where a nuclear test decision is made and reversed within twenty four hours in 1981. Therefore, a score of 0.25 on a scale of 0-1 assigned to this period.

f. No testing but IGMP and weaponisation amidst Brasstacks: 1983-90

a. Softening of pro test stand in India but US-Pakistan alliance an irritant

US efforts to find a way around the "long arm" of the non proliferation regime was viewed as a sign of compromise by the Indian elites and resulted in series of successful visits to US by Indira Gandhi and Rajiv Gandhi in the 1980's. While US support for Pakistan to enable Mujahedeen success against the Soviets was still an irritant to India but the political leadership was able to keep the pro bomb lobby of the scientific enclave in check.

b. Indian focus on technical cooperation with US, France and USSR:

This was a period when neo liberal economic policies were starting to get a foot hold in India under the new leadership of Rajiv Gandhi. This was also the period where KC Pant's 1964 vision of technological readiness was at the forefront thru the Integrated Missile Development program and greater collaboration between research wings such as DRDO and the defense forces under the leadership of General Sundarji at the helm of affairs in the Indian army. AEC also modernized during this period with the launch of the fast breeder program at Kalpakkam albeit with assistance from the Soviet Union and France. During this period, US and India negotiated the GE 404 jet engines for India's light combat aircraft program and the state of the art CRAY XMP-24 supercomputers. However, in the end, India had to settle for XMP-14 supercomputers due to pressure from the US nonproliferation interest group.

There is further worsening of security position as Pakistani enhances her nuclear capability with increasing help from China and immunity from US nonproliferation controls during the Afghan war. There is growing internal insurgency within India fueled by alleged Pakistani support leading India to organize military exercise termed as Operation Brasstacks escalating tension with Pakistan. Despite the high security threat during this period there are no reports of tests. Therefore, a score of 0.125 on a scale of 0-1 assigned to this period.

g. CTBT → Nuclear test:1994-96: *Build up to 1998 tests*

a. Rao-Clinton Summit:

Prime minister Rao had just implemented neo liberal economic reforms with his finance minister Manmohan Singh and was eager to open relationship with the US. He had been elected in 1992

[5] Perkovich "India builds the bomb"
[6] Chengappa"Weapons of Peace" They will break our skulls

to office after the untimely death of Rajiv Gandhi on the 1991 election campaign trail. In the meantime a democratic government had assumed office in Washington after twelve years of Republican administration. The Clinton administration was serious about nonproliferation and had just completed the nuclear posture review after a long gap. The nonproliferation regime had just had major victories in rolling back nuclear programs in many post Soviet republics and South Africa in a post cold war world. The 1995 NPT review conference made the NPT permanent. Cap, roll back and elimination of nuclear programs became the mantra of the Clinton administration nonproliferation czars. This group was now eager to take the case of India pushing for a regional arms control agreement with India on missiles and nuclear weapons. Rao understood these US sensitivities and gave assurance to Clinton privately that he would look into rolling back the missile program while expressing Indian support for ban on nuclear weapons testing and fissile materials control along with an implicit "no first use" policy. In the early CTBT negotiations the Indian representative played a constructive role. All of this alarmed the pro bomb scientific enclave back home in India.

b. Rise of the BJP and a nexus with the scientific enclave:

During the same period the BJP had started to gain politically in elections all over India amidst a renewed insurgency in Kashmir. The BJP under its charismatic leader Atal Behari Vajpayee espoused a hard-line position on the nuclear issue. It stated in its electoral manifesto that it would test if elected. By the now the BJP had over 150 seats in parliament compared to 2 in 1988. The scientific enclave was alarmed at Rao's commitments to Clinton and decided to use the media to tacitly support the BJP's position on nuclear testing. In this backdrop the state assembly elections of 1995 provided big victory to the BJP in many states.

c. Rao authorizes preparations for tests:

Under pressure at home from political opponents helped by cross border nuclear saber rattling by Pakistani politician Nawaz Sharif Rao started to consider a nuclear test but he had not authorized one. He gave okay to the enclave to start preparations only according to Perkovich. The timing of the test was impressed upon him by the scientific enclave who feared that the CTBT negotiations may lead to an agreement where non signatories to the treaty would be under sanctions. Thus Rao started playing a fine line whereby he considers a policy that will keep the enclave and hard line opposition at bay but ultimately would lead him to sign CTBT later. The following statement in parliament supporting this position is illustrated below.[7] All of this was happening in the same year the NPT became permanent treaty without India. Rao considered the gains to be had from nuclear test ahead of the 1996 elections to outflank the BJP now that India was isolated by the global nonproliferation regime at NPT and CTBT negotiations. He finally authorized tests in December 1995 without going through proper strategic calculations according to Perkovich's sources.[8]

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[7] Perkovich, India's Nuclear Bomb Pg 360 "On February 19, 1995 the Agni missile took its third test flight –the second successful one. News of the test provoked thundering applause in the parliament, as President Dr. S.D. Sharma proclaimed that efforts to restrict India's access to foreign technology required India "to rely even more on [its] talents."7

[8] Perkovich, India's Nuclear Bomb Pg 365

d. US finds out about Indian Tests:

Ambassador Frank Wisner shows satellite images showing India preparing for nuclear tests and hands them to the Prime Ministers secretary to impress upon India the difficulties such an event would pose. In parallel, the New York Times reported on December 15, 1995 about India plans to test. Roiling debates pursued in the media and parliament. Several newspapers suggested the government should test in defiance of US pressure and argued it may help Rao in the subsequent elections. Many in India pointed fingers at US arguing such a leak was aimed at coercing India into signing the test ban treaty. Ultimately K Subrahmanyam put up the first argument against a test. He stated that the 1974 PNE had already proved India's nuclear capability and there was no need for a new test. Foreign minister Pranab Mukherjee issued a statement subsequently denying India's intention to test. Some say private economic calculations proved sanctions would damage the Indian economy hence the decision was taken not to test while others point to US pressure. President Clinton reportedly called Prime Minister Rao[9] seeking an assurance against testing after US satellites had picked up Indian test preparations. Yet others have stated that Rao never had the intention to test and the whole thing was a BPM based game he was playing against the nuclear hardliners.

During this period India lose the Soviet security umbrella with the end of the cold war. Simultaneously, the US pressurizes India to join a nuclear free zone in South Asia and curtail missile testing. Globally, the Clinton administration moves ahead to make the NPT permanent in 1995 and the CTBT negotiations are underway in 1996. India realizes that her nuclear ambiguity may no longer be tenable. Ultimately these factors lead the Rao government in India to prepare for testing in 1995/96 cancelled only after detection by the west .[18] Therefore, a score of 0.75 on a scale of 0-1 assigned to this period

h. Pokhran II: 1998

Sumit Ganguly has analyzed the 1998 tests in the following way as described below.

"A number of seemingly compelling possibilities have been offered to explain India's dramatic departure from its policy of nuclear restraint. None, however, constitutes a complete explanation. Yet each offers useful insights into the forces that led to the Indian nuclear tests. One explanation holds that the chauvinistic BJP-led government conducted the tests to demonstrate both its own virility to the Indian populace and India's military prowess to the rest of the world. A second argument suggests that the BJP conducted the tests to cement its links with contentious parliamentary allies.

A third argument con-tends that these tests were designed to bolster India's prestige in the international system. A fourth argument focuses on the role of key Indian scientists in endowing nuclear weapons with mythical significance. My analysis draws upon components of the various proffered explanations and seeks to develop them in a historically contextualized fashion. I argue in this article that three factors impelled India toward its 1998 nuclear tests: fifty years of critical political choices, influenced by ideology and the imperatives of statecraft; fitful scientific

[9] http://www.indianexpress.com/oldStory/40557/

advances in India's nuclear infrastructure; and an increased perception of threat from China and Pakistan since the end of the Cold War"[10]*. (Sumit Ganguly)*

Kanti Bajpai have put the reasons for the 1998 solely on the political orientation of the BJP supported by a pro bomb scientific enclave lead by Dr. R Chidambaram, According to him the enclave was emboldened by the Bharat Ratna award given to missile scientist Dr. A.P.J Abdul Kalam (later selected as Indian president from 2002-07). Joytika Saksena[11], on the other hand argues that it was the flawed design of the Comprehensive Test Ban Treaty (CTBT) rather than the conventionally ascribed reasons of security, international status, or domestic imperatives that provided the necessary incentive for India to conduct nuclear tests in 1998 before the treaty foreclosed such an option altogether. The mandatory nature of the entry-into-force (EIF) clause of the CTBT was a departure from other international agreements in that membership was not voluntary. This suggests that any regime that impinges on a state's sovereign right to make security decisions on behalf of its people is likely to meet failure by formal or informal defections[12]. Thus, the pressures of CTBT and NPT cannot be ignored. It was only a couple of years back in 1996 Indian ambassador Arundhati Ghose made a fiery speech at the Conference on Disarmament in Geneva raising the nuclear apartheid issue while the CTBT was being discussed reiterating the importance of the nonproliferation regime on Indian decision making on nuclear matters.

The pariah status of India in CTBT coupled with regional security concerns leads India to test amidst changing domestic politics due to pro bomb BJP coming to power. Therefore, a score of 1 on a scale of 0-1 assigned to this period based on the fact that an actual test happened in 1998.

i. Talbot- Singh talks leading to Indo-US Nuclear deal: 1998-2008

The US imposed immediate sanctions on India following the tests of 1998 as required by US law. All forms of trade with defense related organizations closed down suspended contacts with senior level members of the Indian defense establishment. However, unlike 1974 the US decided to engage in diplomacy with India after the sanctions were put in place. In contrast to 1974 the Indian economy was a lot stronger in 1998 and connected to the global economy thus it warranted a fresh look albeit against the wishes of the US nonproliferation interest group.

a. Singh-Talbott Diplomacy:

According to Teresita Schaffer, the ensuing Strobe Talbott - Jaswant Singh diplomacy was the first attempt in strategic dialogue between the two countries. "The two men entered the discussions with different objectives: in Talbott's case, to persuade India to agree to some form of restraints on its nuclear program; in Singh's, to gain acceptance for India as a country with nuclear weapons. The United States explored a number of proxies for nuclear limitations, referred to as "benchmarks."" The four benchmarks under discussion included CTBT, FMCT,

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[10] Sumit Ganguly *International Security 23:4 / 161*

[11] Joytika Saksena, Regime Design Matters: The CTBT and India's Nuclear Dilemma Comparative Strategy Volume 25, Issue 3, 2006, Pages 209 - 229

[12] Joytika Saksena, Regime Design Matters: The CTBT and India's Nuclear Dilemma Comparative Strategy Volume 25, Issue 3, 2006, Pages 209 - 229

export controls and "strategic restraint". This fourth benchmark of "strategic restraint" proved most difficult as Indians viewed this as an attack on their strategic autonomy while US hoped India would embrace an arms control deal as was discussed earlier in the Rao-Clinton talks. The US was looking for a concrete definition of India's "minimum credible deterrence." None of these benchmarks were met from US point of view. India did not want to discuss its strategic posture with an outside power claiming "no first use" should be assurance to rest of the world. In the end Talbott recognized that India came closer to its goals than US but pillars were set for strong Indo-US ties for the near future.

b. Indo –US Nuclear Deal negotiations 2005-08

Nothing embodies the promise of better US-India ties predicted above as the Indo-US nuclear deal shaped by Ambassador Blackwill and his deputy Ashley Tellis during the early years of the George W Bush administration as a follow up to the Talbott Singh talks. US legislation amended Section 123 of the Atomic Energy Act of 1954. It let the US make a one-time exception for India to keep its nuclear weapons without signing the Nuclear Non-Proliferation Treaty (NPT). The amendment overturns a 30-year-old US ban on supplying India with nuclear fuel and technology, implemented after India's first nuclear test in 1974.Under the amendment, India must separate its civilian and military, nuclear facilities, and submit civilian facilities to inspections by the International Atomic Energy Agency (IAEA). India says 14 of its 22 nuclear facilities are civilian.

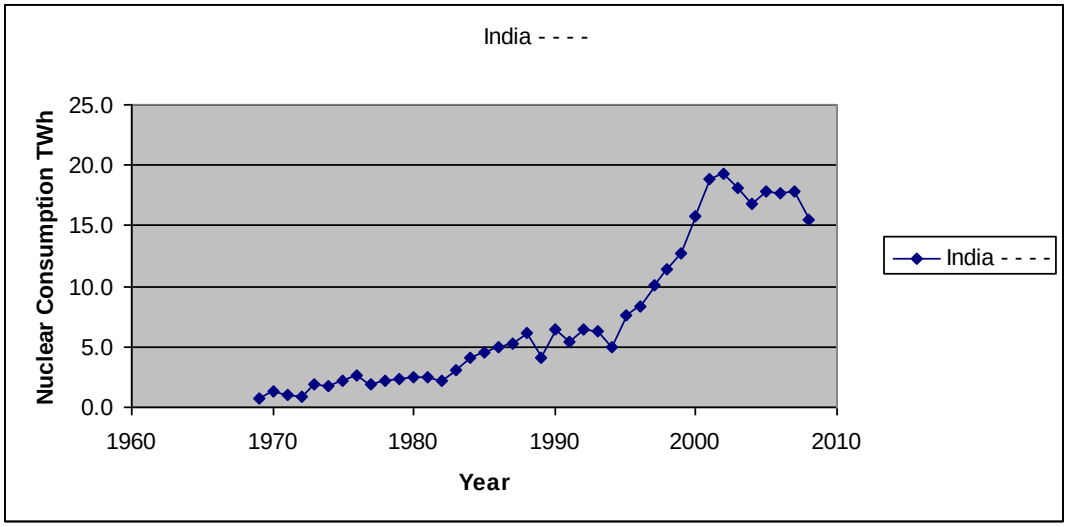


Figure 10: Beleaguered status of Domestic nuclear power production since 1998

At each stage India struck a hard bargain. The touchstone of each negotiation was whether the agreement allowed India full equality with the recognized nuclear weapons states. Teresita Schaffer states "Among the thorny issues were whether the United States would allow India to reprocess fuel supplied by the Unites States; whether the United States would sell reprocessing equipment; whether the United States would guarantee India against interruptions of fuel supply; what was meant by safeguards "in perpetuity" on India's civilian nuclear facilities; and, especially, what would be the consequence if India chose to abandon its unilateral, voluntary pledge not to test a nuclear device. Each of these issues was seen in India as a test of whether the

United States really meant to allow India equality."[13] The "Hyde Act" based on which this agreement was being negotiated states end of nuclear cooperation if India tests. However, in deference to Indian sensitivities on "atomic apartheid" this clause was left ambiguous in the agreement demonstrating US flexibility as famously stated by US negotiator under secretary Nick Burns, "India retains the right to test, and the United States retains the right to respond."[14] This deal was viewed by many in India as a triumph of her diplomacy. Details about the Indian negotiating tactics and the diplomatic team are chronicled by Harsh Pant[15] in his book on the US India Nuclear deal.

The tests of 1998 resulted in first serious strategic dialog (Talbot/Singh) between the US and India following the 1998 tests amidst an unilateral test moratorium by India leading to a period of low nuclear propensity and no tests. Indo-US nuclear relations improve in the civilian sphere due to the nuclear deal between the two nations[19] . The Indo-US nuclear deal was shaped by Ambassador Blackwill and his deputy Ashley Tellis during the early years of the George W Bush administration as a follow up to the Talbot Singh talks. US legislation amended Section 123 of the Atomic Energy Act of 1954. It let the US make a one-time exception for India to keep its nuclear weapons without signing the Nuclear Non-Proliferation Treaty (NPT). The amendment overturns a 30-year-old US ban on supplying India with nuclear fuel and technology, implemented after India's first nuclear test in 1974[20].

Amitabh Matoo[16] while acknowledging security based factors such as "Managing the Dragon" and "Stabilizing the crescent" as rationale's for the Indian nuclear program but as a pragmatist wants a way out of the global nonproliferation regime imposed sanctions by describing the "futility of sticks" and calls for "hard-headed bargain, may serve the interests of both the US and India" out of the nuclear conundrum. K Subrahmanyam and Jasjit Singh made the transition from security focus (when they justified 1998 tests) to neo liberal economic gains argument while supporting the Indo-US nuclear deal in deference to the wishes of the existing ruling party of the day and the prevailing economic mood in India. Therefore, a score of 0 on a scale of 0-1 assigned to this period.

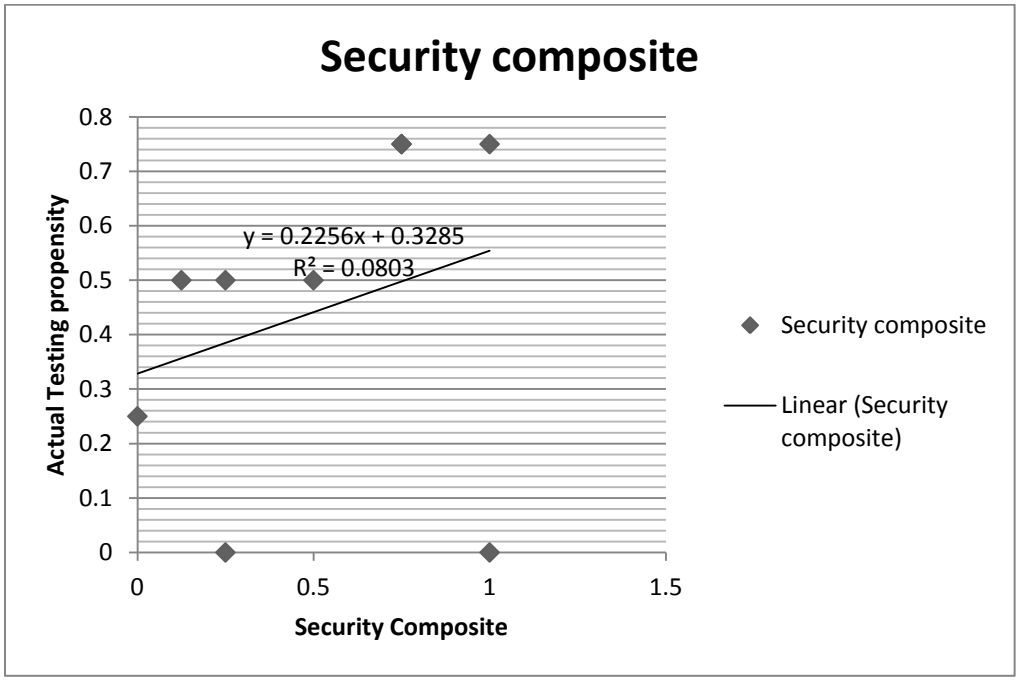
India Case Cut One - Proliferation models Classical Realism

According to Ogilvey-White, realist explanations of nuclear proliferation have dominated the academic and policy discourse since the advent of nuclear weapons. This is due to two reasons. Firstly, realist theory provides a convincing security driven justification for the acquisition of nuclear weapons. Secondly, "realism provided a framework for analysis which could side-step, or "black box" domestic issues, and still provide a persuasive explanation for nuclear proliferation."[21] The ease of this explanation has influenced a plethora of nonproliferation

[13] India and the United States in the 21 st Century, Teresita Schaffer Pg 97
[14] "PM's N-Energy Argument fails to silence critics" Times of India June 17, 2008
[15] PANT Harsh V (2011) US India Nuclear Pact Policy, Process and Great Power Politics (Oxford: Oxford University Press)
[16] Matoo, "India's nuclear deterrent: Pokhran II and beyond"

policies aimed at enhancing power and security of states in the international system through security alliances. A security composite is compiled based on the additive effects of conventional threat, nuclear threat, regional nuclear proliferation and subtracting the effect of a nuclear ally during each of the nine cases for the study. This is correlated against testing propensity based on the facts gathered for the nine cases using open source and archives. The concept of testing propensity is borrowed from Stephen Meyer's definition of nuclear propensity. Loosely defined it will mean the probability of a nuclear test being carried out a given time based on case facts.

	Nuclear threat	Conventional threat	Regional nuclear proliferation	Nuclear /technical ally	Actual Testing Propensity	Security composite
1965	1	1	1	0	0.75	0.75
1967-69	1	1	0	0	0.5	0.5
1970-74	1	0	0	1	1	0
1977	1	0	0	1	0.25	0
1980-83	1	1	1	1	0.25	0.5
1983-90	1	1	1	1	0.125	0.5
1994-96	1	1	1	0	0.75	0.75
1998	1	1	1	0	1	0.75
1998-2008	1	1	0	1	0	0.25



With a low R-squared of 0.08 one can safely conclude there is little correlation between testing propensity and security threats for the India case.

India Case Cut Two- Composite Proliferation Model: Realism + Constructivism-Meyer Model

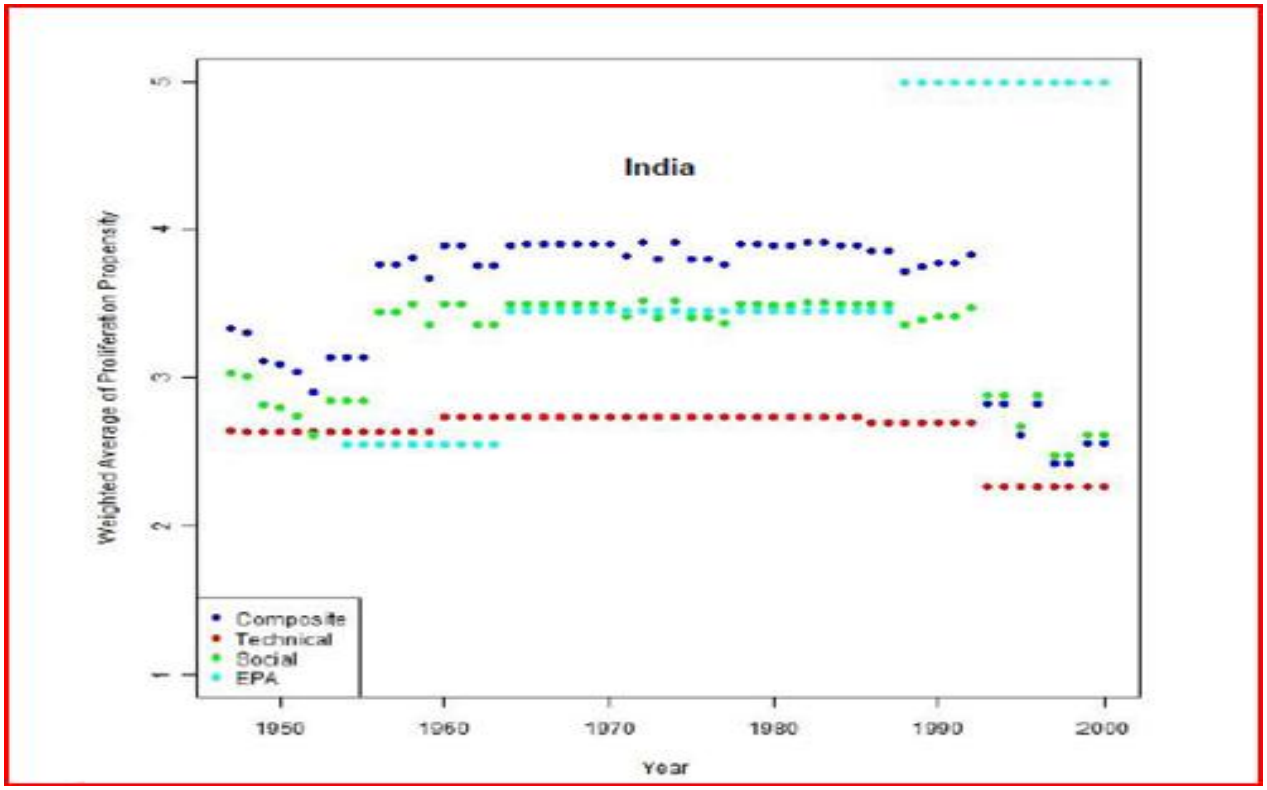
Stephen Meyer[22] describes the details of a comprehensive quantitative model which includes fifteen motivational factors affecting the proliferation propensity of a nation described in the table below. These variables are a conglomeration of the security, domestic politics and prestige related variables covering classical realism, neo liberal institutionalism and constructivism. Some of these are motivating factors while others are dissuading.

Category	Meyer's factors
Security	Nuclear threat
Security	Latent Capacity Threat
Security	Conventional threat
Prestige	Regional Power Status
Prestige	Global Power
Prestige	Pariah status
Domestic Politics	Domestic turmoil
Prestige	Loss in a war
Security	Regional nuclear proliferation
Security	Defense expenditure burden
Security	Nuclear /technical ally
Prestige	Legal treaties (Sanctions)
Security	Risk of unauthorized seizure
Security	Possible nuclear intervention'
Prestige	Peaceful reputation

Table 1: Meyer variables explaining nuclear proliferation

The next step in the analysis involves overlaying with Indian nuclear testing and non testing decisions on top of the Meyer predicted nuclear propensity. For the purpose of this study composite propensity score greater than four is categorized as high, below four as medium and below three as low. We introduce a new metric-Actual Testing Propensity which is coded on a scale of 0-1 based on facts gathered from the above nine cases.

Once test decisions are overlaid on the above described propensity data for India one finds that there is a lack of fit in five of the nine cases based on the categorization described above. This is illustrated in the table below via color coding where green is a no testing and red is testing with yellow being a posture in between. Same color coding used for nuclear propensity. Red being high (>4), medium (<4 but >3) being yellow and green (< 3) for low propensity. Lack of fit is categorized by cased where the Meyer color code does not match the actual test decision color code.



[23]*Fig 1: Nuclear Propensity of India based on the BN Composite Model from PNNL*

	Nuclear threat	Latent Capacity Threat	Conventional threat	Regional Power Status	Global Power	Pariah status	Domestic turmoil	Loss in a war	Regional nuclear proliferation	Defense expenditure burden	Nuclear /technical ally	Legal treaties (Sanctions)	Risk of unauthorized seizure	Possible nuclear intervention'	Peaceful reputation	Technological capability	Composite Propensity	Meyer Propensity
1965	1	0	1	1	0	0	0	1	1	0	0	0	0	0	1	2.75	4	0.8
1967-69	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	2.75	3.5	0.7
1970-74	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1	2.75	4	0.8
1977	1	1	0	1	0	0	1	0	0	0	1	1	0	0	1	2.75	3.5	0.7
1980-83	1	1	1	1	0	0	0	0	1	0	1	1	0	0	1	2.75	4	0.8
1983-90	1	1	1	1	0	0	0	0	1	0	1	1	0	0	1	2.75	4	0.8
1994-96	1	1	1	1	0	1	1	0	1	0	0	1	0	0	1	2.25	4	0.8
1998	1	1	1	1	1	1	0	0	1	0	0	1	0	0	1	2.25	4	0.8
1998-2008	1	0	1	1	1	0	0	0	0	0	1	1	0	0	1	2.25	2.75	0.55

For the purpose of analysis a composite of predicted nuclear propensity as defined by Meyer (based on motivational profile defined above) is correlated against the actual testing propensity gathered from the nine cases. The output is summarized below.

Year	Media reports of nuclear test related events	Dominant Meyer factor	Meyer Nuclear Propensity	Test Decision
1965	SNEPP-→ SNEPP Reversal	Chinese nuclear threat Loss in a war	High	Reversal
1967-69	SNEPP Reversal-→ PNE	Change in Domestic Politics	Medium	Prepare for Test
1970-74	PNE	Regional Power Status	High	Decision to Test
1977	Morarji Desai's reversal of PNE	Peaceful reputation Sanctions	Medium	No Testing but no Safeguards either
1980-83	Reversal of test decision under Indira Gandhi	Pariah Status Regional Power Status Regional nuclear proliferation	High	Reversal of Testing but launch of IGMP (Missile Program)
1983-90	No testing but IGMP and weaponisation amidst Brasstacks and Zarb Moen	Regional nuclear proliferation/threat -Pakistan	High	No Testing but continued IGMP
1994-96	CTBT → Nuclear test	Pariah Status	High	Momentum to Test but no test in the end.
1998	Pokhran II	Pariah Status at CTBT Domestic Politics	High	Test
1998-2008	Talbot- Singh talks leading to Indo-US Nuclear deal	Legal treaties Nuclear/technical ally	Low	Nuclear deal – India defacto signing CTBT

Table 2: Meyer model Prediction vs actual Indian testing decisions

	Technological capability	Composite Propensity	Normalized Composite Propensity(Meyer)	Actual Testing Propensity
1965	2.75	4	0.8	0.75
1967-69	2.75	3.5	0.7	0.5
1970-74	2.75	4	0.8	1
1977	2.75	3.5	0.7	0.25
1980-83	2.75	4	0.8	0.25
1983-90	2.75	4	0.8	0.125
1994-96	2.25	4	0.8	0.75
1998	2.25	4	0.8	1
1998-2008	2.25	2.75	0.55	0

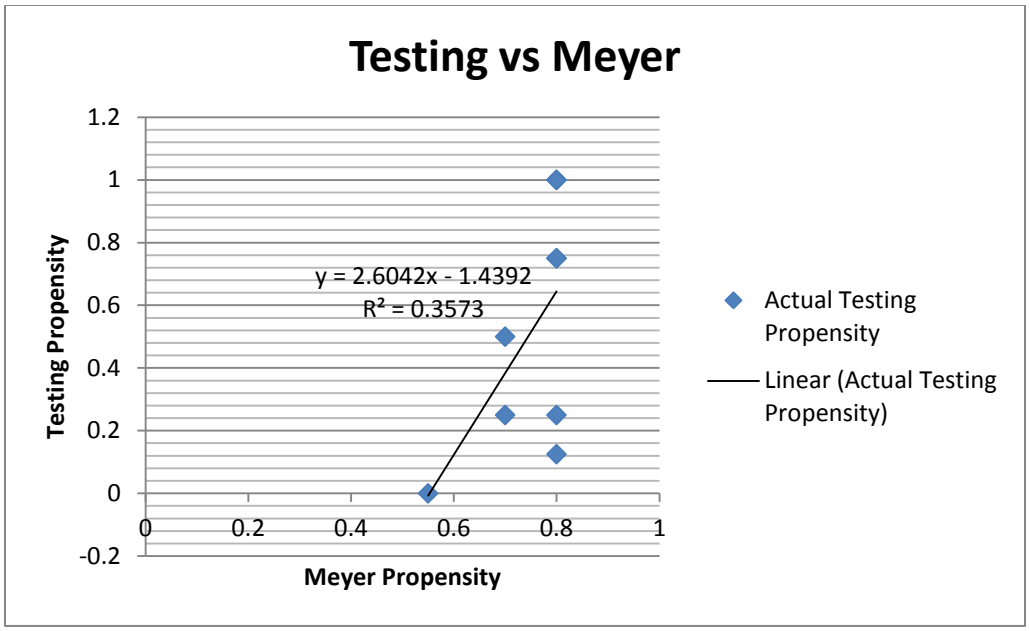


Figure 2: Testing Propensity vs Meyer Propensity

As can be seen from the above chart the actual nuclear testing propensity does not fit well with the Meyer predicted nuclear propensity with an R-squared of 0.3573 (R^2=1 implies a perfect fit). While an R-squared of 0.3573 is better than the 0.08 obtained for the security model it still implies certain other major variables are still missing from the proliferation model. Meyer, himself has alluded to the lack of applicability of his model to newer nuclear weapons states from the third world where he predicts domestic politics to have a greater role but is not clear in identifying what those domestic politics related variables are. The Indian data set vindicates the fears he had with his own model published in the early eighties.

Survey of Contemporary Proliferation Frameworks

Recent literature by Potter and Mukhatzhanova has highlighted the shortcomings of the classical realist framework (security centric) to explain nuclear proliferation and nonproliferation, particularly for cases that happened after the NPT (the India case under consideration here falls in this category) went into effect in 1968. In response to the shortcoming they have devoted the first volume of their edited two volume book on this topic towards newer models of proliferation based on neorealism (TV Paul) neoclassical realism (Natasha Bajema) , neoliberal institutionalism (Etel Solingen, Muller and Schmidtt) and psychological constructivism (Hymans). Therefore, it may be a worthwhile to exercise to distill the key points of each of these models and test if any of them fit the India case.

a. Structural Factors

TV Paul[24] has asserted that countries aspiring for great power status weigh the cost and benefit of nuclear abstinence and then decide which way to go. He has tempered the traditional classical realist assertion justifying nuclear weapons for the sake of enhanced power by contending that

the other cardinal realist value of prudence[25] calls for nuclear abstinence for the sake of promoting stable relations with a state's neighbor. His second assertion is that non great powers engaged in enduring rivalries but not protected by a superpower gurantee will go for the bomb. Natasha Bajema introduces us to the concept of strong state and weak state and explain proliferation based on state capacity to mobilize resources for nuclear weapons program or opt for alliance.

In the Indian context, nuclear testing as an illustration of challenge to the status quo is a dominant theme proposed by TV Paul[17]. He articulates this position explicitly in his essay; "The systemic bases of India's challenge to the world nuclear order" He asserts, "The tests should be seen in the larger context of global power politics involving the great powers and India, especially the fact that former remain unwilling to accept the latter to their ranks."[18] The looming deadline on the CTBT in 1996 following the extension of the NPT in 1995 explains the 1998 tests according to TV Paul. The two tier NPT has been termed as "nuclear apartheid" in the Indian narrative dating back to VC Trivedi's statements in Geneva in 1968 and further amplified in later years by K Subramanyam and Arundhati Ghose during the CTBT negotiations.

Anti bomb leaders such as Indian Prime Minister Morarji Desai also used this argument while opposing full scope safeguards and articulating India's refusal to sign the NPT in response to US threats to halt fuel shipments for Tarapur. Others Indian scholars such as Bhabani Sen Gupta, Raja Menon and TT Poulose highlight the same factor as one of the dominant reasons for India undertaking nuclear tests. Scientists like PV Iyengar and Abdul Kalam has stressed this position with regards to export controls and the regime of denial imposed on India ever since the 1974 tests. The unfairness of unabated vertical proliferation by nuclear weapon states while trying to limit miniscule horizontal proliferation has been a theme articulated by this group. Proponents of this theme have included TT Poulose[19] and Siddharth Vardarajan[20]. Vice Admiral Raja Menon summarizes the view held by a large group of strategic elites in India who argue that "India was reluctantly pushed into making a nuclear bomb by the cynicism and indifference of the international order which ignored India's cry for a "moral approach to nuclear weapons and disarmament". He states that the Indian posturing post the1974 test was based on the fact that, "there were still two lobbies, pro- and anti-bomb, but there was only one anti-NPT lobby which included even the anti-bomb lobby". Even anti bomb analyst Bhabani Sen Gupta concedes this point in his book "Nuclear Weapons? Policy Options for India[21] He concedes that the 1974 PNE

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[17] "The systemic bases of India's challenge to the world nuclear order" , TV Paul Nonproliferation Review, vol.no.5(1) Fall 1998

[18] TV Paul, "India, the International System, and Nuclear Weapons" pp 84 in "Nuclear India in the 21 st Century" edited by Raju Thomas and D.R Sardesai

[19] TT Poulose, Nuclear Proliferation and the Third World (New Delhi: ABC Publishers, 1982)

[20] Siddharth Vardarajan, The International Dynamics of a nuclear India" in Sardesai and Thomas' edited book, "Nuclear India in the twenty-first century".

[21] Bhabani Sen Gupta, "Nuclear Weapons? Policy options for India refer to Lewis Dunn and Herman Kahn's fourteen reasons or pressures encouraging a country to go nuclear. He even lists the eight such "triggers" a) involvement in foreign crisis b) reduction in alliance credibility c) nuclearisation of other countries d) weakening or breakdown of international constraints e) domestic crises f) government of leadership change g) increased availability of necessary resources and inputs and h) changed perception and utility of nuclear weapons. While analyzing the 1974 Indian PNE he concludes that most of the eight triggers did not apply to this case except for the

was partially justified from the "unjust nuclear order perspective". Jasjit Singh[22] makes a rebuttal to the moral argument against nuclear weapons is made by pointing out that the lack of disarmament on the part of the nuclear weapons states made the Indian tests justifiable. Ashok Kapur[23] in his piece Nuclear weapons and India's national security" welcome the 1998 tests as a projection of power. He argues that these tests as got India out of unilateral self restraint instead of relying on futile diplomatic talk about international non discriminatory arms control arrangements.

b. Domestic Factors

Neo liberal institutionalists have added the dimension of domestic politics and interest groups to the literature on proliferation. Etel Solingen[26] asserts that "democratic states pursuing liberal economic policies may decide that it is not in their interests to develop an overt arsenal, due to their extensive reliance on the global economy and the international community. As a result, they decide to keep their options open". Scott Sagan has added organizational theory to explain proliferation as he explains, government leaders intend to behave rationally, but are influenced by powerful domestic organizations whose decisions often conflict with the decisions taken by political leaders.[27] Itty Abraham and Scott Sagan have introduced us to domestic bureaucracies and their effect on nuclear decision making. Itty Abraham used the term "strategic enclave"28 to categorize the group of scientists and bureaucrats with stake in the nuclear weapons program. The Bureaucratic Politics Model (BPM)29, introduced into political science scholarship by Graham Allison (1969) while analyzing decision making during the Cuban missile crisis. The focus here is on the workings inside the state unlike structural theories which argue that factors outside the state determine behavior in the international system. BPM argue that international affair is simply the unintended consequence of national actions often dominated by narrow self-interest. This model assumes there are a) separated institutions sharing power b) each have power to persuade c) there is bargaining according to the process d) power equals impact on outcome and e) this model can be extended to intra-national and international relations particularly among allies and/or non combatants with similar regime types. The Principal-agent aspect of this model makes two assumptions: that goal conflict exists between principals and agents and that agents have more information than their principals, which results in an information asymmetry between them.

Sagan[24] attributes the domestic politics model to explain the Indian tests of 1974. This explanation can be categorized as neoliberal explanation driven by absolute gain seeking by an interest group-namely Indira Gandhi's congress party in response to political challenge from the Jayprakash Narayan led opposition protests in the mid 1970's.

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gradual breakdown of international constraints on non-proliferation with regard to "the unjust and exploitative NPT regime".

[22] Jasjit Singh, Why Nuclear Weapons" in Jasjit Singh's edited book "Nuclear India"

[23] Ashok Kapur, ""India's nuclear weapons capability: convincing or confusing?" in the book edited by M.L Sondhi "

[24] Sagan"Three models in search of the Bomb"

c. Individual Factors

Cognitive and psychological explanations based on the constructivist school are used to explain "myth maker" and "fetish "model leading to proliferation even though the results are disastrous to the state as illustrated by Peter Lavoy[30] and Anna Harrington[31].Hymans[25] introduces us to the concept "oppositional nationalist" identity of some leaders vs "sportsman like" of others and concludes those with oppositional nationalist orientation is most likely to go for nuclear weapons based on case studies from France, India, Australia, Brazil and Argentina and others.Sociological Constructivism: Itty Abraham has been the prime proponent of this model looking at the Indian nuclear program from the lens of a post colonial desire to demonstrate indigenously driven progress in the newly independent states of which India was a key member in the immediate post war period.

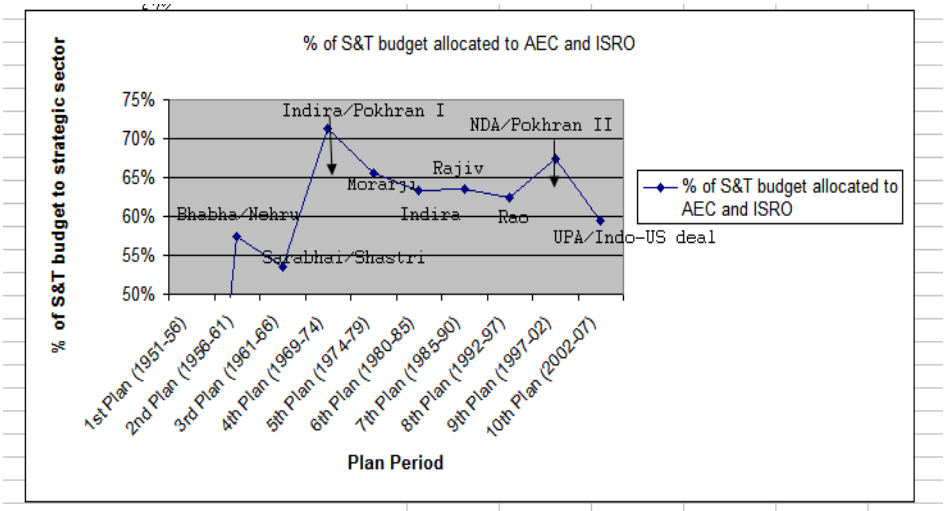
In the South Asian context this theme is studied by Kanti Bajpai[26] while analyzing the dominant role played by the BJP in shaping the Indian nuclear program in Chapter 1 of "Inside Nuclear South Asia". He argues that India would not have tested nuclear weapons in May 1998 had the BJP not come to power. He illustrates his argument by highlighting the ideology of the BJP. Vipin Narang[27] undertakes a quantitative analysis in in concluding opposition nationalism promoted by the right wing BJP (Bharatiya Janata Party) as the dominant factor in nuclear and missile testing decisions in line with Hyman's and Bajpai's explanation of the 1998 Indian tests.

Analyzing Indian Nuclear Test Decisions - Cut Three

Meyer model continues to regard the state as a rational actor, and evidence suggests that states do not always behave rationally where nuclear weapons are concerned. Ogilvey-White has suggested several directions to pursue while looking for an enhanced model to explain the proliferation puzzle. In this study strategic culture and security challenge based explanations are not included because they do not change overnight hence they cannot explain testing reversal decisions as seen in the India case. However, domestic politics and players do change therefore the bureaucratic politics model is chosen to explain the Indian nuclear testing puzzle. The following data shows budgetary allocation to explain changing bureaucratic power over time.

A coded representation of each of the variables during each of the nine cases analyzed in this study as illustrated in the table below. The number of seats of the BJP (and it predecessor Jan Sangh) is used to code opposition nationalism as defined by Hymans and supported by Narang and Bajpai (see Appendix C). Level of economic integration proposed by Solingen is coded based on exports as total percentage of the Indian GDP (see Appendix D). The explanation for BPM in Delhi and diplomatic exchanges with US is explained in Table 3 and a composite of the two variables is used in Table 4.

[25] Jacques Hymans, "The psychology of nuclear proliferation: identity, emotions, and foreign policy"
[26] Bajpai, "Inside nuclear south asia" edited by Scot Sagan
[27] Vipin Narang, in Sagan's "Inside Nuclear South Asia"



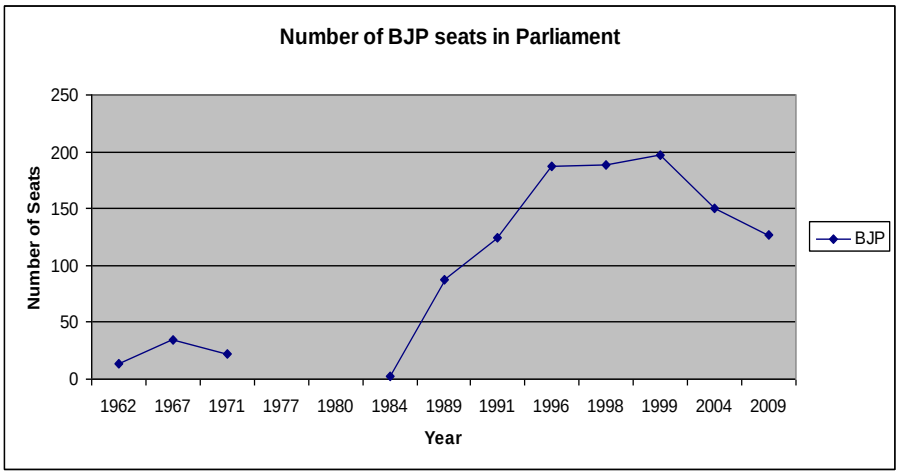


Table 2 Indian exports, export growth, and share of gross domestic product (GDP)

	Exports (Rs crores)	Annual change (%)	GDP (Rs thousand crores)	Exports as percentage of GDP
1950–1951	606		9.7	6.2
1960–1961	642	0.5	16.4	3.9
1970–1971	1 535	9.7	42.7	3.6
1980–1981	6 711	16.3	132.9	5.0
1990–1991	32 553	17.5	507.5	6.4
1991–1992	44 041	35.3	584.1	7.5
1992–1993	53 688	21.9	669.9	7.5
1993–1994	69 751	29.9	780.1	8.9
1994–1995	82 674	18.5	912.2	9.1
1995–1996	106 353	28.6	1 069.8	9.9
1996–1997	118 817	11.7	1 247.6	9.5
1997–1998	130 100	9.5	1 388.7	10.4
1998–1999	139 752	7.4	1 601.1	8.7
1999–2000	159 561	14.2	1 771.1	9.0
2000–2001	203 571	27.6	1 902.2	10.7
2001–2002	209 018	2.7	2 077.6	10.1
2002–2003	255 137	22.1	2 244.7	11.4
2003–2004	293 367	15.0	2 520.0	11.6
2004–2005	375 340	27.9	2 855.3	13.1
2005–2006	456 418	21.6	3 249.6	14.0
2006–2007	571 779	25.3	3 760.3	15.3
2007–2008†	448 337	7.7	na	

†April–December.
Source: Ministry of Finance (2008). 1 crore = 10 million.

Year	Media reports of nuclear test related events	Meyer Nuclear Propensity	BPM in New Delhi	Diplomatic Interactions	Test Decision
1965	SNEPP-→ SNEPP Reversal	High	Bhabha (Scientific enclave) vs LK Jha (Economic Development concerns adjudicated by Shastri With Bhaba's death Sarabhai is first leader of scientific enclave publicly against the bomb.	Shastri looks to Wilson for Nuclear umbrella under advise from LK Jha.	Reversal
1967-69	SNEPP Reversal-→ PNE	Medium	NPT interactions strengthen VC Trivedi's hand in New Delhi on PNE leading to Sarabhai and Indira changing position under pressure from BARC.	Zero-Sum interaction on NWS Disarmament. US/USSR isolates India in NPT on PNE	Prepare for Test
1970-74	PNE	High	Pro bomb Ramanna in charge of scientific enclave with Sarabhai's death overpowering Haskar/PN Dhar in PMO on test	India stays out of NPT. USS Enterprise Incident	Decision to Test
1977	Morarji Desai's reversal of PNE	Medium	Anti Bomb Morarji overpowers Scientific enclave on Testing but safeguards viewed as discriminatory by the Gandhian	NNPA legislated by Nonproliferation interest group→ Tarapur fuel threat	No Testing but no Safeguards either
1980-83	Reversal of test decision under Indira Gandhi	High	PC Alexander(PMO) & Rasgotra (MEA) overpower Scientific enclave (Ramanna) calls for testing	Tarapur fuel alternative negotiated by Rasgotra and Reagan team	Reversal of Testing but launch of IGMP
1983-90	No testing but IGMP and weaponisation amidst Brasstacks and Zarb Moen	High	Rajiv/Arun Singh/KC Pant (PMO) overpowers scientific enclave calls for testing. Arunachalam (scientific enclave) accepts compromise allowing capability building	High Technology cooperation agreements with US on Cray and GE engines for LCA.	No Testing but continued IGMP and capability build up.
1994-96	CTBT → Nuclear test	High	Narashima Rao under attack from BJP and Scientific enclave. Amb Arundhati Ghose takes charge at CTBT stating principled opposition to CTBT while Gujral in power but both Gujral and Rao favor economics lobby over scientific enclave.	Clinton team pushes for South Asia NWFZ influenced by Nonproliferation interest group. Zero-Sum dialog. Isolated at CTBT on annexure B	Momentum to Test but reversal in the end.
1998	Pokhran II	High	Scientific enclave led by Kalam finds pro bomb BJP in power in New Delhi amidst CTBT talks	Zero Sum interaction at CTBT leading to isolation	Test
1998-2008	Talbot- Singh talks leading to Indo-US Nuclear deal	Low	Manmohan Singh from Economic enclave now PM in New Delhi. He overpowers scientific enclave opposition to nuclear deal	Two level game framework used in Indo-US strategic dialogues →Indo-US civil nuclear deal	Nuclear deal –India defacto signing CTBT

Table 3: Re analyzing using BPM framework

Year	Composite of BPM+Diplomacy	Opposition Nationalism	Enduring Rivalry	Level of Economic integration	Testing Propensity
1965	0.75	0	0.5	0.25	0.75
1967-69	0.5	0.25	0.5	0.175	0.5
1970-74	1	0	0.75	0.125	1
1977	0.375	0.75	0.5	0.375	0.25
1980-83	0.125	0.125	0.5	0.5	0.25
1983-90	0.125	0.125	0.9	0.675	0.125
1994-96	0.75	0.75	0.5	0.75	0.75
1998	1	1	0.5	0.75	1
1998-2008	0	0.5	0.5	0.9	0

Table 4: Using 4 new variables from current proliferation models research

A standard least square fit model is build with the above data showing that only BPM+ Diplomacy is significant based on the parameter estimates illustrated below (JMP software package developed by SAS Inc. is used for the analysis).

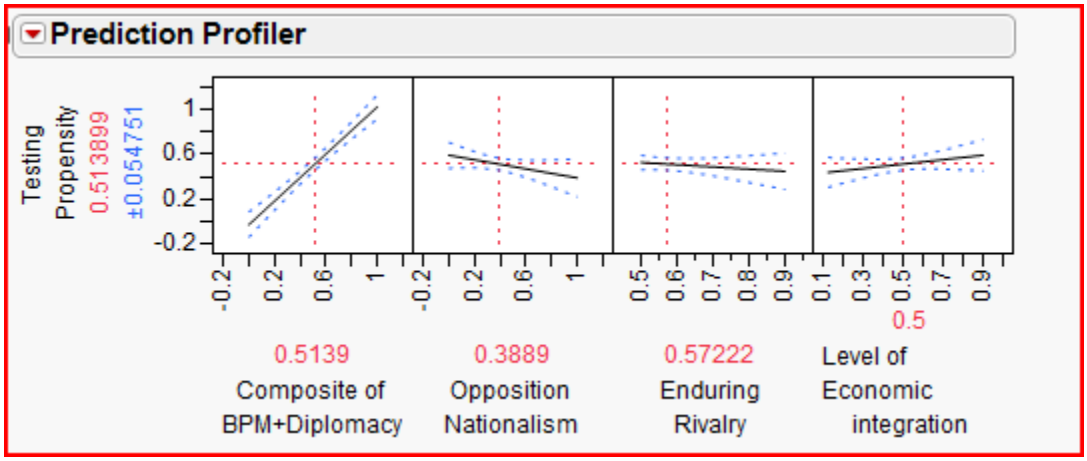
Summary of Fit

RSquare Adj	0.975416
Root Mean Square Error	0.05916
Mean of Response	0.513889
Observations (or Sum Wgts)	9

Analysis of Variance

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.0644792	0.111137	0.58	0.5929
Composite of BPM+Diplomacy	1.0554585	0.069367	15.22	0.0001*
Opposition Nationalism	-0.203373	0.094181	-2.16	0.0970
Enduring Rivalry	-0.19736	0.168505	-1.17	0.3065
Level of Economic integration	0.1980893	0.117102	1.69	0.1660



Re analyzing the cases in terms of Indian bureaucratic politics, at certain times, the political establishment prevailed over the scientific establishment's push for nuclear testing; at other times it was unable to resist the scientific push for testing; at still other times it resisted the scientific push for testing but allowed the scientific enclave to continue other nuclear or missile related activity. In terms of US diplomatic interactions with India, at certain times, US interaction with India was not influenced by a US nonproliferation lobby, resulting in US nuclear policy being accommodating towards India. At other times US interaction with India was more influenced by a US nonproliferation lobby, resulting in US nuclear policy towards India being confrontational. Therefore, the difference between the predicted and observed outcomes regarding Indian testing decisions based on the Meyer model can be explained by adding two new variables, namely a) India's bureaucratic politics and b) Indo-US diplomatic interactions in light of the bureaucratic politics model. These two new BPM related variables in Washington and Delhi are coded in a scale of 0-1 based on the outcome for each variable during the time period.

	BPM Delhi	Washington Nuclear Diplomacy	Composite of BPM +Diplomacy	Actual Testing Propensity
1965	1	0.5	0.75	0.75
1967-69	0	1	0.5	0.5
1970-74	1	1	1	1
1977	0	0.75	0.375	0.25
1980-83	0.25	0	0.125	0.25
1983-90	0.25	0	0.125	0.125
1994-96	0.5	1	0.75	0.75
1998	1	1	1	1
1998-2008	0	0	0	0

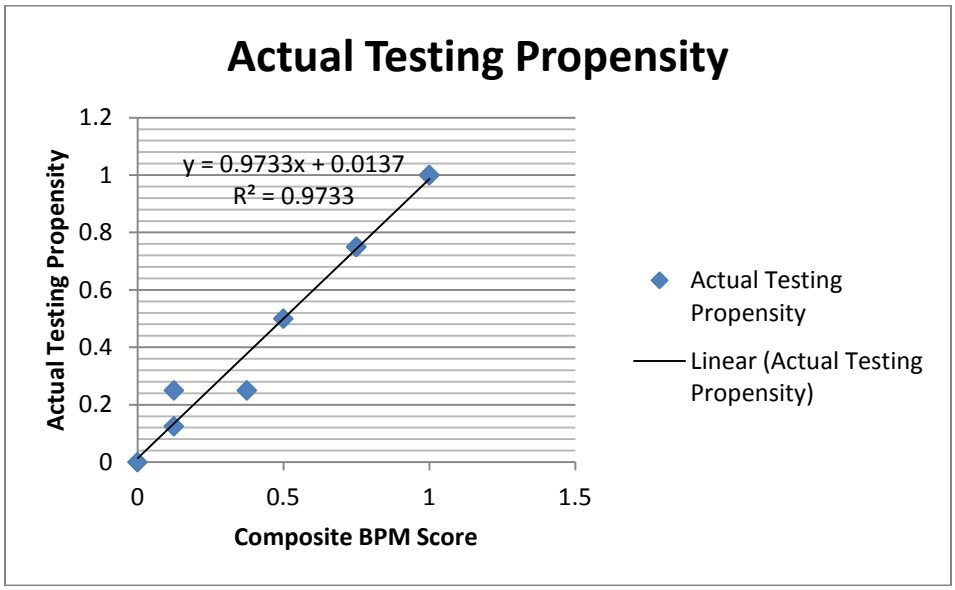
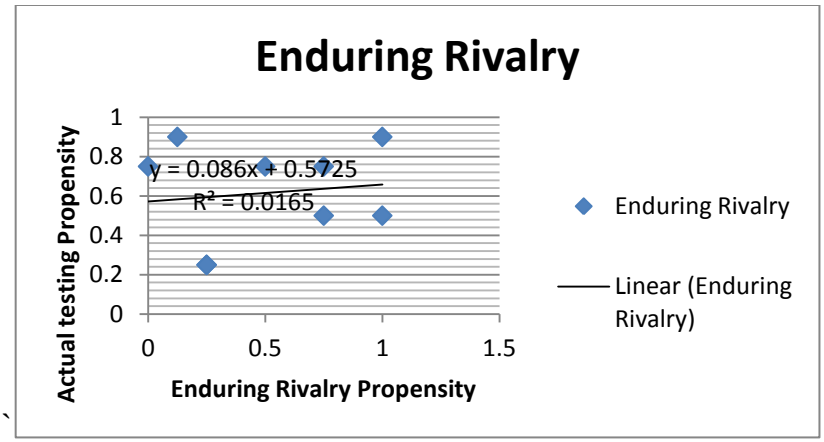
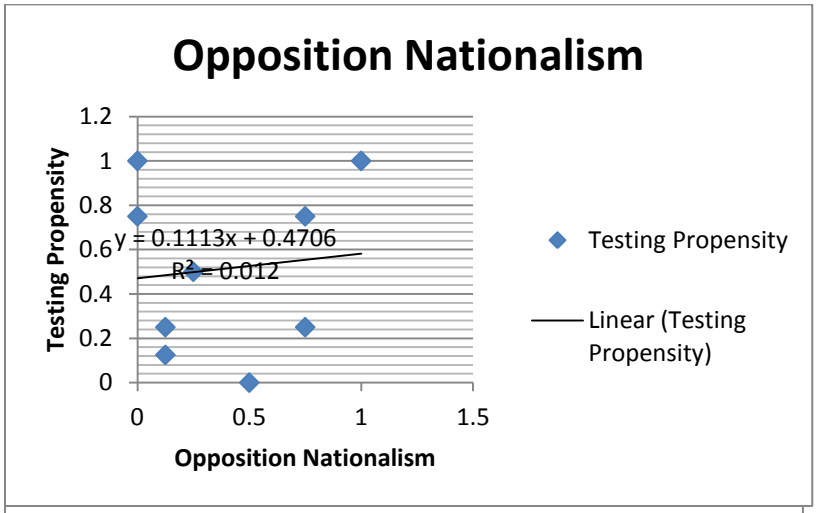


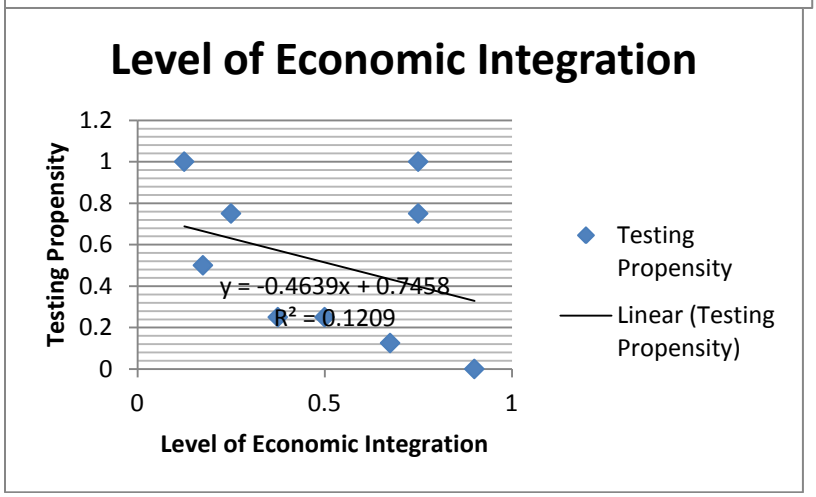
Figure 7: Testing Propensity vs BPM Variables

Thereafter, plotting the actual testing propensity during the time period vs. a composite of the two new BPM related variables one gets a R^2 of 0.973 (R^2=1 implies perfect fit) signaling an almost perfect fit illustrating the validity of the hypothesis tested in this study. Other variables such as opposition nationalism, enduring rivalry and level of economic integration do not show a good fit with the data making them secondary order effects for the post colonial proliferation cases.

On the other hand testing propensity vs enduring rivalry (w/ Pakistan-Ways model), opposition nationalism (Hymans, Narang, Bajpai) and level of economic integration (Solingen model) shows little correlation with the Indian testing propensity data as evident from the low R^2 for each of these cases. (See the three graphs below).

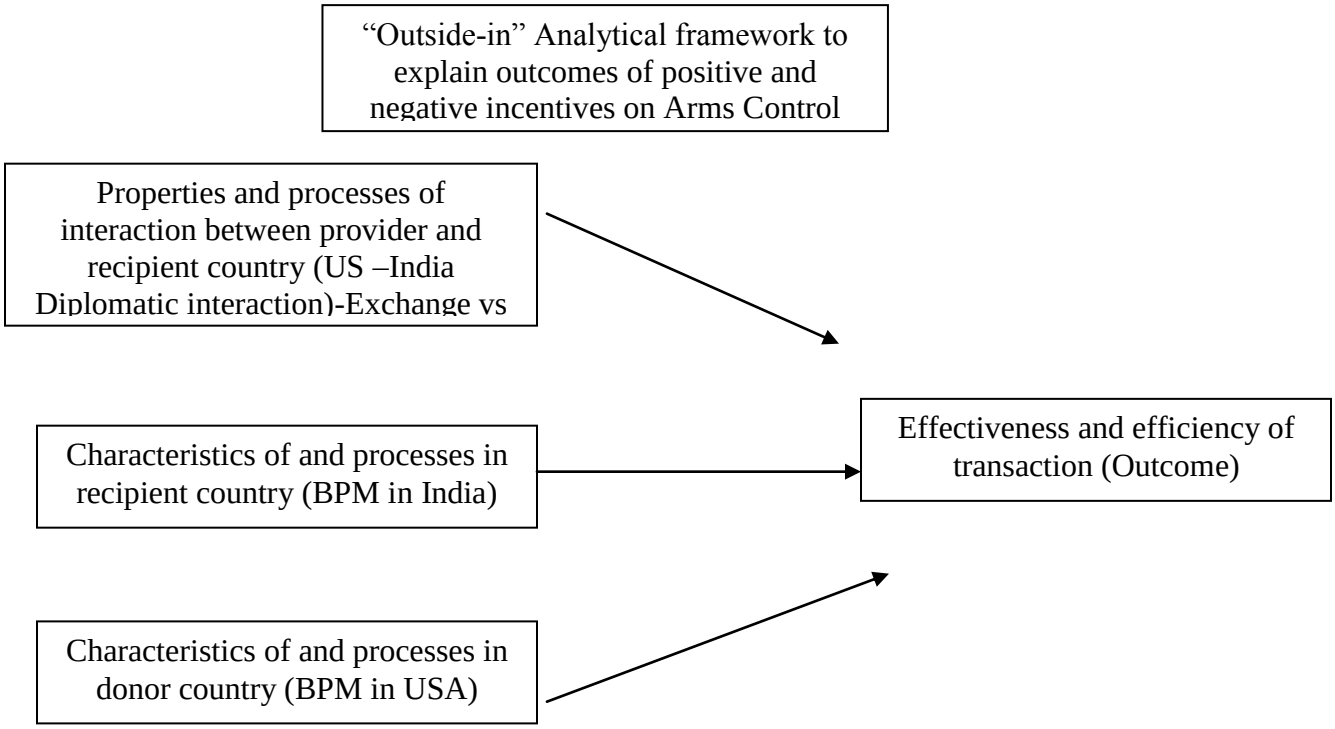






While further Study is required to recalculate nuclear propensities using Bayesian statistics in light of the two additional variables but a preliminary correlation between these additional factors and actual events related to Indian testing decisions point out to fit for all the nine cases when we look at them using the BPM framework.

Explaining Causal Mechanisms



I. Boundary Conditions - Indian Nuclear testing decision making

Amidst shifting allegiances there are three fundamental constrains under which nuclear testing decisions are undertaken in New Delhi. Firstly, all sides of the nuclear testing debate in India believe in a non aligned foreign policy although the boundaries may shift depending on the political vantage point. This is often termed as Indian desire for Strategic Autonomy[46]. Secondly, all sides in India view the intrusive nonproliferation regime with suspicion[47] on grounds of systemic bias in the global system.[48] Finally, there is a large constituency in India that likes to believe that India has a moral role to play in the community of nations upholding the rights of the disenfranchised. The illustration below graphically describes the rules of the game in New Delhi as played out in the last forty five years since achieving latency.

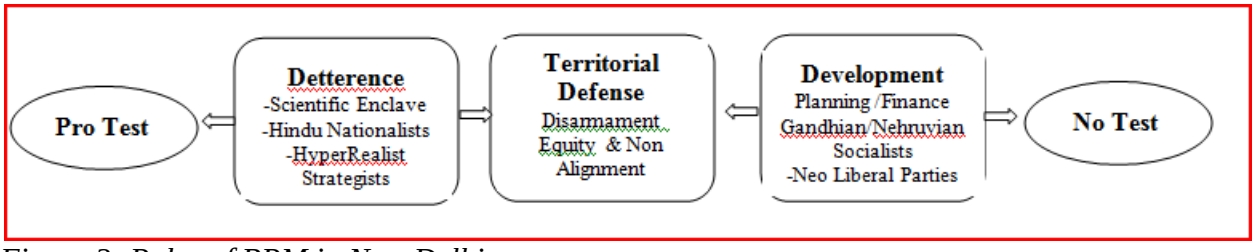


Figure 3: Rules of BPM in New Delhi

II. Primary Actors in India

a. The Principal Decision maker: Cabinet committee on Political affairs

The cabinet committee on political affairs has functioned as the highest decision making group in India on all critical policy issues including nuclear testing. In addition to the Prime Minister, the cabinet committee consists of ministers for external affairs, defense, home and finance in addition to the cabinet secretary (not a member of the committee). Ashok Kapur has illustrated the key nuclear decision makers in the graphic below.

However, historical accounts have shown that the ministry of external affairs has not been involved in nuclear and missile testing and development decisions. The ministry of Defense has had limited influence on nuclear policy decisions other than its oversight of the DRDO (Defense Research and Development Organization). The Finance ministry manages the state budget and evaluates the affordability of programs. Thus this leaves the Prime minister in his or her capacity as minister of the Department of Atomic Energy to work closely with the department's senior scientist/technologist to formulate nuclear policy including testing decisions-"Dominant Scientist-Politician coalition".

Figure 4: *Indian nuclear decision makers*[49]

The orientation of the PMO (Prime Minister's office) can be traced to the three strands of strategic culture prevailing in India[50] namely Hyperrealists, Neo Liberal and Nehruvian

Socialists. The pro bomb support is the strongest among the hyperrealists closely associated with the Hindu nationalists while weakest among Nehruvian socialists who support universal disarmament on moral grounds. Neo liberals are primarily driven by a bomb strategy that does not hamper economic growth.

b. The Indian Scientific Enclave: An agent with Pro bomb interest

India's civilian nuclear energy program morphed into the weapons program unlike the west. One of the consequences of this background is the unique position of influence exerted by the guardians of the civilian nuclear program-the nuclear scientists on nuclear policy matter. In my study the group of DAE (Department of Atomic Energy), DoS (Department of Space) and DRDO (Defense Research and Development Organization) scientists with influence on the nuclear program is being termed as the scientific enclave. Self reliance has been one of the key guiding principle of the scientific enclave. This has led to the creation of a scientific body that has been trained indigenously at international standards upholding nationalist goals and objectives. Some of the tactics used by the scientific enclave have included the use of civilian research programs as nursery to develop strategic technology systems, the use of media outlets[51] during critical nuclear testing debates within India and nurturing political contacts with senior ministers[52]. Some scientists themselves have gone on to hold executive positions in the government such as former DAE chairman Raja Ramanna as Defense minister in 1991 and DRDO head APJ Abdul Kalam as President in 2002.

c. Planning Commission: An agent with Anti bomb interest

Central planning has been an integral feature of Independent India ever since Nehru introduced the concept to the Indian lexicon and shaped its structure just like he had done in the scientific arena described above. Ever since then Economists have used this platform to influence the policy direction of India. The Guns vs. Butter argument has been central at various junctures and the nuclear program became a lightning rod at junctures especially when famine, poverty and economic aid defined the headlines in India for the majority of the last forty years[53].

III. Boundary conditions- US nuclear diplomacy towards India

All sides in Washington have viewed relations with India critical considering the size, economic potential and democratic structure of government in India however prevailing policy and political environment in Washington at a given time has resulting in certain boundary conditions while dealing with nonproliferation pressures and India. Firstly, all sides in the US are constrained by the overall US nonproliferation strategy present since the 1970's with the passage of the NPT. International Atomic Energy Agency (IAEA) safeguards coupled with diplomacy were the prevailing nonproliferation strategies until the Indian nuclear test in 1974, which triggered much more intensive efforts on international export control and the formation of the Nuclear Suppliers Group and passage of the Nuclear Nonproliferation Act (NNPA) in 1978 which limit US nuclear exports exclusively to NPT signatory countries. Secondly, US geostrategic interests in the region act as another firm anchor often in conflict with the first constrain. Finally, US economic interests in India act as another anchor. The rules of the game in

Washington related to US-India nuclear diplomacy based on the above boundary conditions is illustrated by the graphic below.

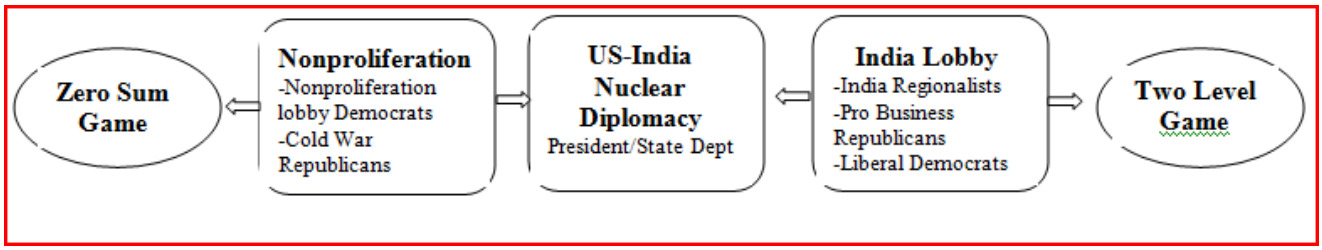


Figure 5: Rules of BPM in Washington

IV. Primary Actors in the US

a. The Principal US Decision makers: Executive and Legislative Branch

Nuclear diplomacy related to India is managed by the executive branch under influence from the legislative branch in the US. Regionalists in support of India have long included liberal democrats. The roster has included Chester Bowles, John Galbraith, Ed Kennedy, Hubert Humphrey[54], Moynihan, Stephen Solarz and Senator Hillary Clinton. Functionalists with strong nonproliferation track record have included many prominent lawmakers such John Glenn, Percy, Bingham, Pressler, Symington and Ed Markey. This group has championed the passage of NNPA in 1978[55] and opposed the Indo-US civil nuclear deal of 2008. Geo strategists in the administration have aligned with India based on the prevailing international scenario. Recently, this group has championed nuclear cooperation with India by proposing the Indo-US civil nuclear deal of 2006 in light of alignment post cold war and 9/11 where a democratic India is seen a counterbalance to rising China. Similarly, in the 1980's Reagan administration compromised on Tarapur fuel in deference to US interests in Afghanistan and Pakistan[5657]. The dynamics are illustrated below

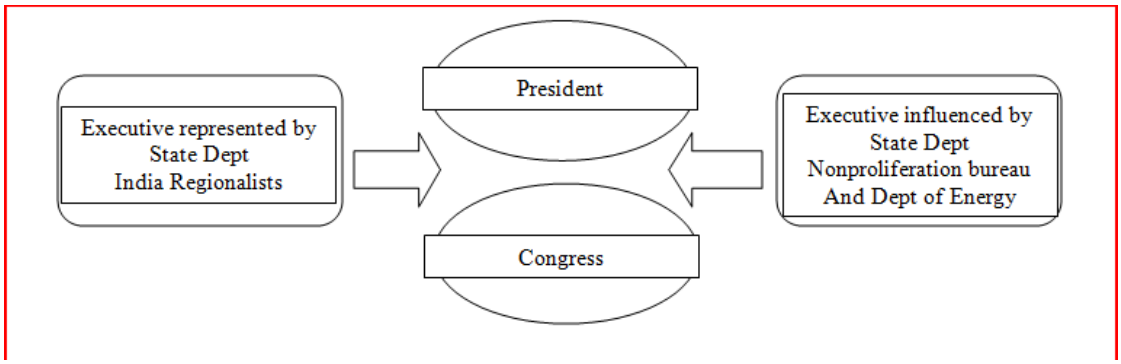


Figure 6: Indo-US nuclear diplomacy Decision makers in Washington

b. US Nonproliferation interest group: An agent with anti bomb interest

The arms control community (think tanks, academics and scientists) in the US has been categorized as an "epistemic community" that went onto create a new organization, the ACDA (Arms Control and Disarmament Agency) to ensure that their perspective was regularly

represented in national security policy deliberations. This group has had influence on Indian nuclear testing decisions as torch bearer of the global nonproliferation regime and associated sanctions on would be violators of this regime. During the Carter administration this group fought and succeeded in creating the NRC (Nuclear Regulatory Commission) and passing the NNPA (Nuclear nonproliferation act) in 1978. During Clinton administration this group was active with the Comprehensive Test Ban Treaty (CTBT). This group has steadfastly pressurized the executive branch to uphold nonproliferation initiatives often using the US congress as an instrument to fight battles within Washington but an unintended consequence of this posture has resulted in this group being being unfairly branded anti India in New Delhi[58].

c. US India Business Council and the Indian Diaspora: An agent

With the rising US economic interests in the high technology sector and with the advent of globalization in the 1990's has resulted in the creation of the US India business council which has supported a large India caucus in congress. This phenomenon was absent in the 1970's and 1980's during the passage of NNPA. The rising clout of the ever increasing Indian diaspora in the US since the 1990's has been another source of influence over US policy as a counterbalance to the nonproliferation interest group described above.

Conclusions

This study finds that only two of these five additional variables, domestic bureaucratic politics and US diplomatic interactions with India to be statistically significant when correlated with the events of the nine cases related to Indian nuclear testing decision making. In terms of Indian bureaucratic politics, at certain times, the political establishment prevailed over the scientific establishment's push for nuclear testing; at other times it was unable to resist the scientific push for testing; at still other times it resisted the scientific push for testing but allowed the scientific enclave to continue other nuclear or missile related activity. In terms of US diplomatic interactions with India, at certain times, US interaction with India was not influenced by a US nonproliferation lobby, resulting in US nuclear policy being accommodating towards India. At other times US interaction with India was more influenced by a US nonproliferation lobby, resulting in US nuclear policy towards India being confrontational. Thus, my study augments Meyer's framework with these two additional variables to fully explain India's nuclear test decisions. Another conclusion of this study is the finding that causes of nuclear testing may be decoupled and uncorrelated from the causes of a nuclear weapons program as is evident from the nine cases from India analyzed in this study. While efforts to plan nuclear tests coincided with marginalization at the NPT as a non nuclear weapons state and fearing the permanent codification of that status in the CTBT immediately following the 1995 NPT Review conference. On the other hand, the trajectory of the nuclear weapons program seem to be dictated by progress of nuclear weapons programs of China and Pakistan as demonstrated by timing of the launch of SNEPP in 1965 in response to Chinese tests and weaponization drive in late 1980's after having received credible intelligence information confirming the Pakistani nuclear weapons program. This decoupling between causes of nuclear testing and development of nuclear weapons may be a new phenomenon with the advent of computing models related to nuclear testing and global norms against testing.

There are implications of the above two findings related to the India case to the future of the comprehensive test ban treaty as applied to the hold out states in particular and defining redlines

and dependent variables while applying existing proliferation models to other break out cases. The section below highlights five areas where the outcome of the above study may be useful in explaining outcomes.

a. CTBT Ratification and "Entry into Force"

The Comprehensive test ban treaty negotiated in the 1990's require ratification by all nuclear weapons technology capable member states as defined in annexure A. However, entry into force has been delayed by nine states out of the forty five in Annexure A still holding out including India. Therefore, understanding the motivations that lead a country to test may help proponents of CTBT to put conditions in place that address the motivating causes head on. The conclusions from the India case shows that this may become easier than thought in some cases if policymakers at multilateral organizations react to the fact that the causes of nuclear testing can be decoupled from the causes of nuclear weapons. While security threat perceptions and actual ground realities of geopolitics may dictate nuclear weapons programs for a independent minded break out state like India making it difficult to address those concerns in the short term there may easier solutions to dissuade nuclear testing motivations which may have been motivated by other factors such as perceived systemic bias in an international system. Therefore, solutions aimed at India such as expanding membership to international organizations such as NSG and permanent seat in the Security Council may enable India closer to signing the CTBT under certain domestic political bureaucratic power scenario although dismantling nuclear existing nuclear weapons program may be a different issue.

b. Disarmament

While test ban treaty may be a necessary condition towards disarmament it is not sufficient in a world where testing models can be computer generated without actual tests and the deterrence threat still credible without a test as demonstrated by Israel and Iran. As observed from the analysis of the India case we find that security threat perceptions and actual ground realities of geopolitics still dictate nuclear weapons program. Therefore, efforts such as Weapons free zone initiatives in areas such as the middle east leading to global zero beyond the adoption of CTBT should still continue in the spirit of universal global disarmament.

c. Future US Nonproliferation Policy

It is hoped that US nonproliferation policy prescription efforts need to be focused on finding solutions that move the negotiations towards the ZOPA based on engineering the optimum balance between incentives and coercion depending on the category of the recipient state.
A specific observation from the Indian case is the fact that we may be able to replace the currency of power from weapons to scientific collaboration to scientists in these post colonial states as seen in the recently concluded US-India civil nuclear deal. However, attention to sensitivities of not converting these relationships into donor-acceptor kind needs to be kept in mind. Often these national scientific institutions have greater internal bureaucratic power when subjected to "pariah" status and may decide to forgo cooperation if above described sensitivities

of "equal partnership" [59]are not adhered to[60] considering indigenous scientific progress in these nations[61].

d. Indian Posture at Future Multilateral negotiations

Therefore, a similar quest for global recognition consumerate with Indian perception of her rightful place in the global seat may dicate her posture on other ongoing multilateral negotiations such as Climate Change, Trade and Tariff reduction negotiations as part of the Doha round of GATT and Intellectual Property rights as part of TRIPS. This inflexible posture may prove frustrating for western nations ready to embrace India as a strategic partner. Therefore, analyzing each of those negotiations after having internalized the reduced boundary available for a democracy aspring great power status may reduce misunderstanding on all sides. For example, in the nuclear arena multilateral cooperation may be extended to include nuclear energy related projects such as Gen IV reactors, plasma fusion and accelerators driven systems using thorium in a multilateral setting such as ITER and CERN.

e. Indian Posture at Future bilateral negotiations with US

One of the political fallout of the Indo-US nuclear deal has been the view that the current Manmohan Singh administration may jeopardize strategic autonomy by moving too close to the US ambit in the name of neo liberal economic interdependence. This will go counter to years of non alignment. This charge was most vociferously raised by the communist coalition partners of the first UPA government headed by Singh. The communists went to the extent of withdrawing support to the government in opposition to the Indo-US nuclear deal. This resulted in a scenario where the government of Mr. Singh was about to fall. However, timely support from some other smaller parties saved the day for the UPA. Subsequently, in the 2009 elections the Singh led UPA came to power with a larger majority without the need for support from the communists. This would free up their ability work closely with the US. However, since the global financial crisis of 2008 there has been doubt's raised on the US styled neo liberal economic policies. The new Singh administration has focused more on income equality issues and tried to stay away from any new strategic partnerships with the USA. It is viewed in New Delhi that the Singh government has expended all its political capital on strategic relationship with the USA on the Indo US nuclear deal and now is the time for it to play cautiously. India's intransigence on the nuclear liability bill against US wishes and her recent decision not to choose US suppliers for a large fighter jet purchase, the delay in approving FDI for multi-brand retail and insurance or the inflexibility on sanctions against trade with Iran illustrates this line of thinking[28] in accordance

[28] Nuclear liability bill:The following article by Times of India on August 2010 summarizes the bill well."Ending months of wrangling between treasury benches and the opposition, the Lok Sabha on Wednesday passed the civil nuclear liability bill after government dropped the contentious provision of "intent" in the case of accident adopting a BJP amendment, paving the way for nuclear commerce with the world. The Civil Liability for the Nuclear Damages Bill, 2010 was adopted by the House by a voice vote after it rejected a CPM (Communists) amendment that sought to fix the liability cap on suppliers in case of accidents at Rs.10,000 crore instead of the Rs.1,500 crore proposed in the measure.The House nod came not before Prime Minister Manmohan Singh made a spirited

with the limited zone of possible agreement dependent on the bureaucratic and domestic political mood in the country at the timeframe in question. However, game changers such as US support for Indian permanent membership of UNSC and NSG may move those boundaries.

ACKNOWLEDGEMENTS

The author thanks Dinshaw Mistry, Harsh Pant, Wyn Bowen, Mark Hilborne and Scott Sagan for their comments and critiques while setting the direction of research.

NOTES

[1] NPT (Nuclear Nonproliferation Treaty)

[2] PERKOVICH George (1999) India and the Nuclear Bomb: The impact on global proliferation (Berkeley and Los Angeles: University of California Press)

[3] GANGULY S (1999) India's pathway to Pokhran II: The prospects and sources of New Delhi's Nuclear Weapons Program. International SecurityVol. 23, No. 4 (Spring, 1999), pp. 148-177

[4] MEYER Steven (1984) The Dynamics of Nuclear Proliferation (Chicago: Univ. Chicago Press) . Meyer model augments classical realist model of proliferation by adding constructivist concepts of identity/prestige and domestic turmoil.

[5] In terms of Indian bureaucratic politics, at certain times, the political establishment prevailed over the scientific establishment's push for nuclear testing; at other times it was unable to resist the scientific push for testing; at still other times it resisted the scientific push for testing but allowed the scientific enclave to continue other nuclear or missile related activity.

6 In terms of US diplomatic interactions with India, at certain times, US interaction with India was not influenced by a US nonproliferation lobby, resulting in US nuclear policy being accommodating towards India. At other times US interaction with India was more influenced by a US nonproliferation lobby, resulting in US nuclear policy towards India being confrontational.

[7] Tanya Ogilvey-White, "Is there a theory of nuclear proliferation? An analysis of the contemporary debate," Nonproliferation Review, Fall 1996, pp 44-53

[10] NPT (Nuclear Nonproliferation Treaty)

[11] India acquired latent capabilities to manufacture nuclear weapons in 1958[11] with the commissioning of the Apsara reactor. Within the next seven years India moved to the advanced nuclear infrastructure club[11] with the commissioning of the CIRUS Pressurized Heavy Water reactor and the Trombay plutonium separation plant.

[12] MEYER Steven (1984) The Dynamics of Nuclear Proliferation (Chicago: Univ. Chicago Press)

[13] MEYER Steven (1984) The Dynamics of Nuclear Proliferation (Chicago: Univ. Chicago Press) Pg 122

[14] MEYER Steven (1984) The Dynamics of Nuclear Proliferation (Chicago: Univ. Chicago Press)

[16] GANGULY S (1999) India's pathway to Pokhran II: The prospects and sources of New Delhi's Nuclear Weapons Program. International SecurityVol. 23, No. 4 (Spring, 1999), pp. 148-177

[17] Christina Hansell

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intervention in the four-hour long debate rejecting allegations that the bill was brought to advance the interests of the United States and its corporations".28

Fighter jet purchase decision:"It's the biggest fighter aircraft deal since the early 1990s," said Boeing's Mark Kronenberg, who runs the company's Asia/Pacific business. India's planned multi-billion dollar, 126+ plane jet fighter buy became a contest between Dassault, Saab, MiG, American competitors and EADS' Eurofighter in the recent defense industry daily article of April 28, 2011. To huge US disappointment the Indians have now shortlisted only the European options ahead of the US and Russian competitors.28

[18] PERKOVICH George (1999) India and the Nuclear Bomb: The impact on global proliferation (Berkeley and Los Angeles: University of California Press)

[19] SCHAFFER Teresita (2009) India and US in the 21 st century: Reinventing Partnership (Washington DC: Center for Strategic and International Studies)

[20] SCHAFFER Teresita (2009) India and US in the 21 st century: Reinventing Partnership (Washington DC: Center for Strategic and International Studies)

Under the amendment, India must separate its civilian and military, nuclear facilities, and submit civilian facilities to inspections by the International Atomic Energy Agency (IAEA). India says 14 of its 22 nuclear facilities are civilian. At each stage India struck a hard bargain. The touchstone of each negotiation was whether the agreement allowed India full equality with the recognized nuclear weapons states. Teresita Schaffer states "Among the thorny issues were whether the United States would allow India to reprocess fuel supplied by the Unites States; whether the United States would sell reprocessing equipment; whether the United States would guarantee India against interruptions of fuel supply; what was meant by safeguards "in perpetuity" on India's civilian nuclear facilities; and, especially, what would be the consequence if India chose to abandon its unilateral, voluntary pledge not to test a nuclear device. Each of these issues was seen in India as a test of whether the United States really meant to allow India equality." The "Hyde Act" based on which this agreement was being negotiated states end of nuclear cooperation if India tests. However, in deference to Indian sensitivities on "atomic apartheid" this clause was left ambiguous in the agreement demonstrating US flexibility as famously stated by US negotiator under secretary Nick Burns, "India retains the right to test, and the United States retains the right to respond.

[21] Tanya Ogilvey-White, "Is there a theory of nuclear proliferation? An analysis of the contemporary debate," Nonproliferation Review, Fall 1996, pp 44-53

[22] MEYER Steven (1984) The Dynamics of Nuclear Proliferation (Chicago: Univ. Chicago Press)"Options and Choice: The motivational aspect of nuclear proliferation"

[23] http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20492.pdf

[24] PAUL TV (1998) The systemic bases of India's challenge to the world nuclear order , Nonproliferation Review, vol.no.5(1) Fall 1998

[25] Hymans

[26] Etel Solingen, The Domestic Sources of Nuclear Postures: Influencing Fence-sitters in the Post-Cold War Era, IGCC Policy Paper Number 8, University of California, October 1994

[27] Scott Sagan, "The Spread of Nuclear Weapons: A Debate (New York: W. W. Norton and Company, 1995), pp 49-53

[28] ABRAHAM Itty, India's "Strategic Enclave": Civilian Scientists and Military Technologies, Itty Abraham, *Armed Forces & Society* Winter 1992 vol. 18 no. 2 231-252

[29] ALLISON Graham (1999) Essence of Decision: Explaining the Cuban missile crisis 2nd edition (New York: Longman)

[30] Peter R. Lavoy, "Nuclear Myths and the Causes of Nuclear Proliferation," Security Studies 2 (Spring/Summer1993).

[31] HARRINGTON Anne (2009) Nuclear Weapons as the currency of Power: Deconstructing the Fetishism of Force Nonproliferation Review, vol.no.16 (3) Nov 2009

[46] SCHAFFER Teresita (2009) India and US in the 21 st century: Reinventing Partnership (Washington DC: Center for Strategic and International Studies)

[47] MENON Raja (2000) A nuclear strategy for India (New Delhi: Sage Publications). He states that the Indian posturing post the1974 test was based on the fact that, "there were still two lobbies, pro- and anti-bomb, but there was only one anti-NPT lobby which included even the anti-bomb lobby.

[48] PAUL TV (1998) The systemic bases of India's challenge to the world nuclear order , Nonproliferation Review, vol.no.5(1) Fall 1998

[49] Kapur in Solingen's Scientist and the State Pp 211

[50] BAJPAI Kanti (2002) SOUTH ASIA IN 2020: FUTURE STRATEGIC BALANCES AND ALLIANCES: (Strategic Studies Institute: US Army War College) Indian Strategic Culture Chapter 11 pp 243-45

[51] SUBRAHMANYAM K (1982) Indian security perspectives (New Delhi: ABC Publication House)

K Subrahmanyam has been a noted voice in support of the community as has been the Hindu newspaper. He narrates Indian nuclear history from his vantage point in SINGH Jasjit (1998) Nuclear India (New Delhi:

Knowledge World) describing his tactics of questioning Krishan Kant in Parliament with planted questions in advance to influence the debate.

[52] R Venkatraman in the 1980's and Krishan Kant in the 1970's have been supportive of the enclave as evident in Chengappa and Subrahmanyam's recollection of events.

[53] CHENGAPPA Raj (2000) Weapons of Peace: The secret story of India's Quest to be a Nuclear Power (New Delhi: Harper Collins Publishers India) . In Pg 390 Raj Chengappa has described the animosity between BARC scientist and current Prime Minister Manmohan Singh regarding budget allocation process in light of poor performance of the civilian energy aspect of the scientific enclave. The detailed description of the tussle between the economists and the scientists regarding testing are presented in pp 387-395.

[54] PARANJPE Shrikant (1987) US Nonproliferation Policy in Action: South Asia (London: Oriental University Press) pp 37

[55] PARANJPE Shrikant (1987) US Nonproliferation Policy in Action: South Asia (London: Oriental University Press) pp 44

[56] PARANJPE Shrikant (1987) US Nonproliferation Policy in Action: South Asia (London: Oriental University Press) Pg 63

[57] US Department of State S/S8532787. Memo to Robert MacFarlane from Nicholas Platt at State urging NSC intervention to overrule ACDA opposition and DOE non commitment to Indian request for rewording of nuclear assurance in return for CDC Computer Contract (Supercomputers). The memo notes State, Defense and Commerce department support to the Indian proposal.

[58] Stoler Alex (2006) US and South Asia Articles # 2062 (IPCS : New Delhi) Non-Proliferation Ayatollahs or Thoughtful Scholars: Understanding the American Non-Proliferation Lobby. Authors interview with former NRC commissioner Victor Gilinsky on September 11, 2012

[59]Grover Ravi, Scientific advisor Department of Atomic Energy-Government of India, e-mail correspondence with author, January 10, 2013 Cooperation in the area of discovery science never stopped. In case of atomic energy, reservation about cooperation was not by scientists from India, it was by scientists from the west. India has now reached a stage where "donor-recipient" model of cooperation has been replaced by a model based on "equal partnership" as in case of ITER

[60] Grover Ravi, Scientific advisor Department of Atomic Energy-Government of India, e-mail correspondence with author, January 10, 2013.Scientific pariah status need not be a handicap, if one follows a scientific approach. Such an approach is laborious. It involves starting from basic research, recognising industrial capabilities available in the country and coming up with solutions to all issues by taking into consideration limitations. Scientific pariah status can lead to innovative solutions. This is what happened in case of India. In support of this, I am enclosing two quotes in enclosure 2. The first is from Sig Hecker, who visited some of DAE establishments and then gave testimony in the US. Second is a quote from Canadian researchers

Siegfried S. Hecker, Hearing of the US Senate Committee on Appropriations, Subcommittee on Energy and Water Development, April 30, 2008

> "I found that whereas sanctions slowed progress in nuclear energy, they made India self-sufficient in nuclear technologies and world leaders in fast reactor technologies, while much of the world's approach to India has been to limit its access to nuclear technology, it may well be that today we limit ourselves by not having full access to India's nuclear technology developments. Such technical views should help to advise the diplomatic efforts with India."

AV Popov, G Marleau and A Olekhnovitch, Ecole Polytechnique de Montreal, Quebec, Canada, "The Third generation of Heavy-Water Moderated Reactors", 16th Pacific basin Nuclear Conference, Aomori, Japan, Oct 13-18, 2008.

> "Nuclear technology transfers for power reactors between India and Canada were fairly unidirectional some 40 years ago when they started. Today, however, it is clear that both the Indian and the Canadian designers teams may profit from the other Party's experience and innovations"

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[61]Grover Ravi, Scientific advisor Department of Atomic Energy-Government of India, e-mail correspondence with author, January 10, 2013. I agree that science diplomacy is useful and can be used to bring together people from different nations. But, this conclusion doesn't flow from what I said. India can continue with indigenous technology. That will limit growth rate of nuclear installed capacity as industrial infrastructure can meet only part of the demand. India has to use indigenous technology and also set up reactor in technical cooperation with interested vendors. As I have said in my interview, NPCIL is moving ahead with setting up indigenous reactors and negotiating for light water reactors with various vendors.