Game Theory and Non-Alignment: India's Position in the Russia-Ukraine War

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Following the Russian invasion of Ukraine in 2022, NATO and its allies condemned the offensive as a “brutal and unprovoked war of aggression” and called for an immediate ceasefire.[1] The attack was seen as a violation of international norms. In response, NATO imposed sanctions on the Russian economy, banned Russia from the SWIFT banking system, and provided Ukraine with arms to counter the invasion.[2] NATO also urged other countries to join in condemning Russia’s actions.[3] However, several countries in the Global South chose a ‘non-aligned’ stance. Thirty-two countries abstained from voting on the United Nations General Assembly (UNGA) resolution condemning Russia’s aggression.[4] Major economies like India and the United Arab Emirates (UAE) maintained neutrality, citing concerns of inflation, energy and food security, and disruptions to global supply chains.[5] This paper uses game theory to analyze the factors that inform India’s non-aligned position, including domestic energy needs, supply chain challenges, military dependencies, diplomatic ties, and regional security concerns.

Game theory helps study strategic scenarios where the actions of one player affect the payoffs of all others, shaping the outcome of the game itself. In this context, a Subgame Perfect Nash Equilibrium (SPNE) model is useful. An SPNE model is applicable when players make sequential moves based on the strategies and preferences of other players.[6]

A ‘Nash Equilibrium’ occurs when each player selects their ‘best’ strategy, given the strategies of others, such that no player can improve their outcome by changing their decision.[7] In an SPNE model, this logic applies at every decision point, ensuring optimal choices at each step.[8] Backward induction is used to determine the best action at each stage, tracing payoffs from the end of the game to determine the optimal starting move.[9] The game tree for this model illustrates the sequential decision points, each leading to a subgame, culminating in one unique equilibrium strategy based on the payoffs.[10]

Game Setting

Following Russia’s invasion of Ukraine on February 24, 2022, NATO imposed a series of sanctions on the Russian economy,[11] pledged military aid to Ukraine,[12] and expelled Russia from the SWIFT system.[13] By March, these sanctions had reportedly frozen about $300 billion in Russian foreign exchange reserves[14] and prompted Western corporations to cease operations in Russia.[15] Despite NATO’s actions, Russia refused to withdraw from Ukraine.[16] On March 7, 2022, the ruble plummeted to 143 against the dollar.[17] In April, Russia offered discounted oil and fertilisers to countries willing to trade with them.[18] Throughout 2022, European countries continued purchasing Russian energy to meet local demand and prepare for the upcoming winter.[19]

India’s foreign ministry issued an official press release calling for “an early cessation of violence” and offering to “contribute in any way to the peace efforts”.[20] However, India did not deliver an unequivocal condemnation of Russia.[21] In this analysis, we assume that India’s response is driven solely by its strategic interests and security priorities, with no external influences affecting its decision.

Game Model and Strategies

The three 'players' in the model are India, Russia, and NATO. India's decision matrix offers three options: support NATO, support Russia, or remain non-aligned.

India must determine its defensive strategy by evaluating the potential counter-responses from NATO and Russia should it choose to align with either side. To make the first move, India needs to assess its strategic security positions.

Bilateral trade between NATO allies and India (tNATO)

The United States is one of India's largest trading partners, with bilateral trade in goods and services reaching approximately $190 billion.[22] In the financial year 2022-2023, Indian exports to the US were valued at $71.39 billion, while US exports to India stood at $46.82 billion, resulting in a positive trade balance of $24.57 billion for India.[23]

India is also engaged in strategic partnerships with the US, Australia, and Japan through the Quad, focusing on enhancing trade, diplomatic relations, and security in the Indo-Pacific region. Additionally, the US and India collaborate on defense technology and military equipment. India and the United Kingdom are in the process of signing a bilateral free-trade agreement.[24] The Indian Air Force has commissioned thirty-six Rafale aircraft manufactured by the French defense company Dassault Aviation.[25]

Bilateral trade between India and Russia (tR)

Russia is one of the world's largest producers of oil and fertilisers.[26] In the 2022-2023 financial year, India imported crude oil, chemical fertilisers, and coal from Russia worth $46.26 billion, while exporting $3.14 billion in goods such as pharmaceuticals and biologicals, resulting in a negative trade balance of $43.12 billion for India.[27]

Russia and India share long-standing diplomatic ties, dating back to the Cold War era.[28] Both countries are members of several international groupings, such as BRICS, which promote cooperation in defense, trade, economics, and energy security.[29] Given the December 2022 border skirmishes with China along India's northeastern frontier,[30] alienating Russia would not align with India's security interests. Aligning with NATO could push Russia closer to China, which would be detrimental to India's strategic goals.

India's defense technology and energy demands (δ)

I. Defense

Russia is one of India's largest weapons suppliers, accounting for nearly 36% of all total arms imports, followed by France at around 30% and the US at 13%.[31] Figure 1 illustrates the share of Russian military equipment used by each of India's three services. While most of this equipment is utilized by the Indian Army, the Navy and Air Force have seen a decline in the usage of Russian-made equipment by approximately 10% and 15%, respectively, over the last two decades (Figure 2).

The Indian army relies heavily on Russian-made equipment, including T-72 and T-90 battle tanks, BMP-2 infantry fighting vehicles, multiple rocket launch systems, and various mobile and air defense systems,[32] with close to 90% of its equipment sourced from Russia.[33] The Indian Navy operates seven former Soviet submarines, one former Soviet aircraft carrier, guided-missile destroyers, and other vessels of Russian origin,[34] with only 40% of its equipment coming from Russia.[35] The Indian Air Force utilizes Russian MiG-21 and MiG-29 fighter aircraft, Mi attack and transport helicopters, with 70% of its equipment originating from Russia.[36]

While Russia remains one of India's most significant defense partners, India has been developing and producing military equipment through the 'Make in India' campaign. India also collaborates with Russia on various equipment deals. Notably, the two countries jointly develop the BrahMos supersonic missile.[37] The Su-30MKI fighter jet, developed by Russia's Sukhoi, is licensed for production in India.[38] Additionally, bilateral defense projects include

licensing for the T-90 tank production and the supply and upgrade of MiG-29-K aircraft, further enhancing their defense manufacturing partnership.[39]

II. Energy

India is one of the world's largest consumers of oil and natural gas, with a daily consumption of about five million barrels.[40] Russia, Iraq, and Saudi Arabia are among India's key sources of oil.[41]

Following the invasion of Ukraine, NATO sanctions made it difficult for countries to purchase Russian oil, leading to inflation and supply chain disruptions in energy markets.[42] In response, Russia offered discounted rates and accepted payments in local currencies willing to continue buying its oil.[43] For instance, India could procure Russian crude at discounted rates and establish a rupee-ruble exchange with Russia.

As of December 2021, Iraq was India's largest oil supplier, accounting for 26.4% of its total oil imports, followed by Saudi Arabia at 16.6%, the UAE at 12.5%, and Russia at just 1.9%.[44] By December 2022, Iraq's share had decreased to 16.9%, Saudi Arabia's to 14.8% and the UAE's to 6%, while Russia's share surged to 21%, peaking at 44% in 2023.[45] In December 2022, Russian crude oil was priced at $79 per barrel, compared to the Saudi oil at $92 per barrel.[46] This trend continued through 2023, with Russian oil being offered at $78 per barrel.[47]

Given these figures, increasing India's consumption of Russian oil provided significant financial benefits. A simple calculation shows that if India purchased 1 million barrels of Russian oil per day at $78 per barrel, it would save over $14 million per day compared to the Saudi price of $92 per barrel. Over the course of a year, this would amount to approximately $5 billion in savings, helping to mitigate inflation in oil prices for the average Indian consumer. On the other hand, if India chose not to pursue this arrangement, it risked facing major inflation in its energy markets, which would negatively impact consumers.

Payoffs and Expected Utility (EU)

India makes the first move, followed by Russia and NATO moving simultaneously with perfect knowledge of India's choices, payoffs, and actions. The key variables in the model are defined as follows:

tIndia | R represents Russia's valuation of its diplomatic relations and energy trade with India. When positive, it indicates that Russia benefits from maintaining strong ties with India, such as revenue from energy exports and diplomatic cooperation. Conversely, a negative value suggests that strained relations with India would result in losses for Russia, such as reduced trade and diplomatic isolation.

tIndia | NATO denotes NATO's valuation of its relationship with India. A positive value implies that NATO benefits from cooperation with India, such as strategic alignment and trade partnerships. A negative value indicates that strained relations with India would be detrimental to NATO's interests, leading to weakened security cooperation and diplomatic tensions.

tR reflects India's payoff from its relationship with Russia. A positive value indicates that India benefits from strong ties with Russia, such as access to military equipment and discounted oil prices. A negative value suggests that strained relations with Russia would result in drawbacks for India, such as reduced access to defense technology and increased energy costs.

tNATO represents India's payoff given its relationship with NATO. A positive value indicates that India benefits from cooperation with NATO, such as security partnerships and trade opportunities. Conversely, a negative value suggests that strained relations would lead to disadvantages such as reduced security cooperation and trade barriers.

δ denotes the cost associated with India's defense technology and energy demands. A positive value indicates that India benefits from fulfilling its domestic defense and energy needs through trade. A negative value suggests a

reduction in these areas, leading to increased costs.

The Expected Utility (**EU**) in this model represents the payoff for each player across the various game scenarios, expressed in a (Player 1 – India, Player 2 – Russia, Player 3 – NATO) format.

Given these considerations, the following scenarios can be derived (see Figure 3 for the extended game form)

If India chooses to support NATO, Russia can:

Retaliate: EU = (- tR – δ + tNATO, – tIndia | R, + tIndia | NATO).

1. India risks straining its relationship with Russia, which affects its access to Russian defense technology and cheaper oil. It faces domestic inflation and higher energy costs due to losing access to Russian oil (- tR – δ). However, relations with NATO improve, bringing trade and security benefits (+ tNATO).

2. Russia strains relations with India, leading to a loss of revenue from energy exports and reduced diplomatic cooperation (- tIndia | R). it also faces further diplomatic isolation as its relationship with India deteriorates.

3. NATO strengthens its relations with India, gaining strategic and diplomatic advantages (+ tIndia | NATO) while continuing to escalate sanctions against Russia.

Or not retaliate: EU = (+ tR – δ + tNATO, – tIndia | R, + tIndia | NATO).

1. India avoids severely straining its relationship with Russia but still loses access to cheaper Russian oil, resulting in domestic inflation and higher energy costs (- δ + tR). However, India improves relations with NATO, gaining trade and security benefits (+ tNATO).

2. Russia continues to lose revenue from energy exports and experiences diplomatic isolation, although to a lesser extent without full retaliation (- tIndia | R).

3. NATO strengthens its relations with India, while maintaining its sanctions regime against Russia (+ tIndia | NATO).

If India chooses to Support Russia, NATO can:

Retaliate: EU = (+ tR + δ – tNATO , + tIndia | R, – tIndia | NATO).

1. India strains relations with NATO, risking cooperation and trade with NATO and its allies (- tNATO). However, relations with Russia improves, along with a significant reduction in energy costs (+ tR + δ).

2. Russia improves relations with India, increases revenue from energy exports, and gains diplomatic support for its actions in Ukraine (+ tIndia | R).

3. NATO strains relations with India, which reduces security cooperation and trade (- tIndia | NATO).

Or not retaliate: EU = (+ tR + δ + tNATO, + tIndia | R, – tIndia | NATO).

1. India avoids straining the relationship with NATO while supporting Russia. This allows India to buy cheaper Russian oil to counter rising domestic inflation and procure military equipment from Russia (+ tR + δ). India maintains some diplomatic ties with NATO but sacrifices some security cooperation (+ tIndia | NATO).

2. Russia improves relations with India, gains revenue from energy exports, and receives diplomatic support for actions in Ukraine (+ tIndia | R).

3. NATO experiences weakened sanctions against Russia and maintains limited diplomatic ties with India (- tIndia | NATO).

If India chooses non-alignment, Russia and NATO can:

Retaliate: EU = (- tR – δ – tNATO, – tIndia | R, – tIndia | NATO).

1. India risks straining relationships with both Russia and NATO. This could lead to domestic inflation due to higher fuel prices and reduced defense cooperation with Russia (- tR – δ). India may also experience decreased security and trade cooperation with NATO (- tNATO).

2. Russia strains relations with India, loses revenue from energy exports, and faces further diplomatic isolation (- tIndia | R).

3. NATO weakens its sanctions against Russia but also strains diplomatic relations with India (- tIndia | NATO).

Or not retaliate: EU = (+tR + δ + tNATO, + tIndia | R, + tIndia | NATO).

1. India avoids straining relationships with both Russia and NATO. India can continue to buy cheaper Russian oil, mitigating domestic inflation, and procure military equipment from Russia (+ δ + tR). At the same time, India can also maintain good diplomatic ties with NATO and benefits from ongoing cooperation on security and trade (+ tNATO). By advocating for a ceasefire and peace in Ukraine, India balances its relations with both sides.

2. Russia maintains diplomatic relations with India and continues to receive revenue from energy exports to India (+ tIndia | R).

3. NATO weakens its sanctions but continues cooperation with India on humanitarian and peace efforts in Ukraine (+ tIndia | NATO). NATO also maintains collaboration with India on security, trade, and defense in strategically important regions like the Indo-Pacific.

The payoffs for the following scenarios are similar to the first two sub-games where India supports either Russia or NATO.

If Russia retaliates and NATO does not: EU = (- tR – δ + tNATO, – tIndia | R, + tIndia | NATO).

If Russia does not retaliate and NATO does: EU = (+ tR + δ – tNATO, +tIndia | R, – tIndia | NATO).

Equilibrium Evaluation

Russia values maintaining good diplomatic relations with India and continuing to export military equipment, especially as its economy suffers from NATO sanctions. It benefits from having a large energy consumer base that can still purchase crude oil despite the sanctions, ensuring continued revenue from oil trade. Moreover, being banned from the SWIFT system, Russia stands to gain from trading with countries with stable currencies like the Indian rupee, which can provide stability to its declining ruble. Additionally, Russia seeks continued engagement with major economic powers amidst global diplomatic isolation. Therefore, it is in Russia's interest not to strain relations with India. Russia prefers to either improve relations with India (positive payoff, + tIndia | R) or maintain the status quo (payoff of 0) rather than straining relations (negative payoff, – tIndia | R).

→ [+ tIndia | R > 0 > – tIndia | R]

NATO also values maintaining good diplomatic relations with India. If India chooses not to join the sanctions against Russia, it could weaken the effectiveness of NATO sanctions. The success of sanctions against the Russian economy relies on a total boycott of Russian crude oil. If countries with large consumer bases like India circumvent

the sanctions, they may not achieve their intended impact. A non-aligned India presents this challenge.

However, many NATO countries have strong and mutually beneficial bilateral trade and security agreements with India. in 2021, approximately 20-25% of India's total exports went to NATO countries, with 18% going to the US, 3% to the UK, and 2.3% to Germany.[48] These exports spanned sectors such as consumer goods, electronics and software, and crude oil and petroleum.[49] India is also a significant partner in the Indo-Pacific region and is emerging as one of the major economic powers in Asia, with a large consumer base and growing manufacturing and services capabilities. Moreover, India serves as an alternative investment destination for major corporations. Additionally, India and NATO share a common interest in countering Chinese military aggression in the Indo-Pacific region.

Therefore, despite India not aligning with NATO, it would be beneficial for NATO to continue maintaining good ties with India (positive payoff, + tIndia | NATO) or maintain the status quo (payoff of 0) as opposed to retaliating (negative payoff, − tIndia | NATO).

→ [+ tIndia | NATO > 0 > − tIndia | NATO]

Since Russia and NATO make their moves simultaneously, both would prefer to either improve relations with India (if India aligns with either player) or maintain the status quo (if India aligns with neither player). Retaliation would be the least preferred option for both.

Considering India's position, it aims to maintain diplomatic ties, continue defense cooperation, and purchase Russian oil at a lower price to shield consumers from high energy prices. Therefore, India's interest lies in maintaining good ties with Russia (positive payoff, + tR) or maintaining the status quo (payoff of 0) as opposed to retaliation (negative payoff, − tR).

Similarly, given the defense and security cooperation in the Indo-Pacific region and trade relations, NATO countries are also important to India. India would choose to continue maintaining good ties with NATO countries (positive payoff, + tNATO) or maintaining the status quo (payoff of 0) as opposed to retaliation (negative payoff, − tNATO).

Aligning with either player risks straining one of the two important relationships. Therefore, choosing one would jeopardize vital security and trade cooperation. Thus, the Subgame Perfect Nash Equilibrium (SPNE) for this game is

SPNE = {(Non-Aligned, (Don't Retaliate, Don't Retaliate)}.

The magnitude of these variables could vary significantly with changes in trade relations or security policies. For instance, if India were insulated from energy inflation by another energy source, eliminating δ, or if military dependencies were reduced, India might lean towards aligning with NATO. Conversely, if cooperation with Russia becomes more advantageous than the relationship with NATO, India might prefer to align with Russia. Such changes could alter the equilibrium of the game.

Limitations

This model considers only three players—India, Russia, and NATO—and their respective actions, preferences, and payoffs in the conflict. However, the real-world scenario is far more complex and dynamic. It involves numerous nations, each with its interests and payoffs, which are intertwined with the primary players in the model.

Additionally, this model does not account for the signaling that occurs during conflicts. For instance, Russia's troop buildup on the Ukrainian border prompted NATO to reposition its troops, signaling support to Ukraine in the event of an invasion.[50] Such signals convey strategic messages and provide insights into players' potential moves.

Furthermore, the model has limited scope as it primarily focuses on energy and security aspects of cooperation between India-Russia and India-NATO. It does not explore other factors such as trade and historical ties in detail.

While the payoffs are defined for mathematical simplicity, accurately assessing the size and significance of these variables, as well as their relative importance to each player, is challenging. For example, although India's trade with Russia is approximately half the size of India's trade with the US, it does not necessarily mean the US is more important to India than Russia. The importance of these variables can fluctuate based on evolving trade relationships and mutual dependencies.

Extensions

Several extensions to this model can enhance its conclusions significantly. Firstly, improving the estimation of each player's preferences based on the payoffs would provide valuable insights into their strategies and priorities. Accurately estimating the values of variables would shed light on players' motivations.

Secondly, incorporating signals into the model by designing a Bayesian game would be beneficial. A Bayesian game is a game theoretic model that accounts for players having incomplete information.[51] Each player has beliefs about the strategies of the other players, and as the game progresses, these players update their beliefs and positions in the game.[52] Introducing communication into the model would allow for the exploration of different outcomes based on the established states of the world.

Additionally, the model allows for changes in players and the inclusion of other countries to perform similar payoff and equilibrium analyses. Evaluating whether these countries should align or remain non-aligned in such scenarios can provide valuable insights. For example, if a player shares a land border with Russia, altering their geographical positioning could significantly impact the outcome. By implementing these changes, the model can more effectively evaluate strategic decision-making by different countries within the given game setting.

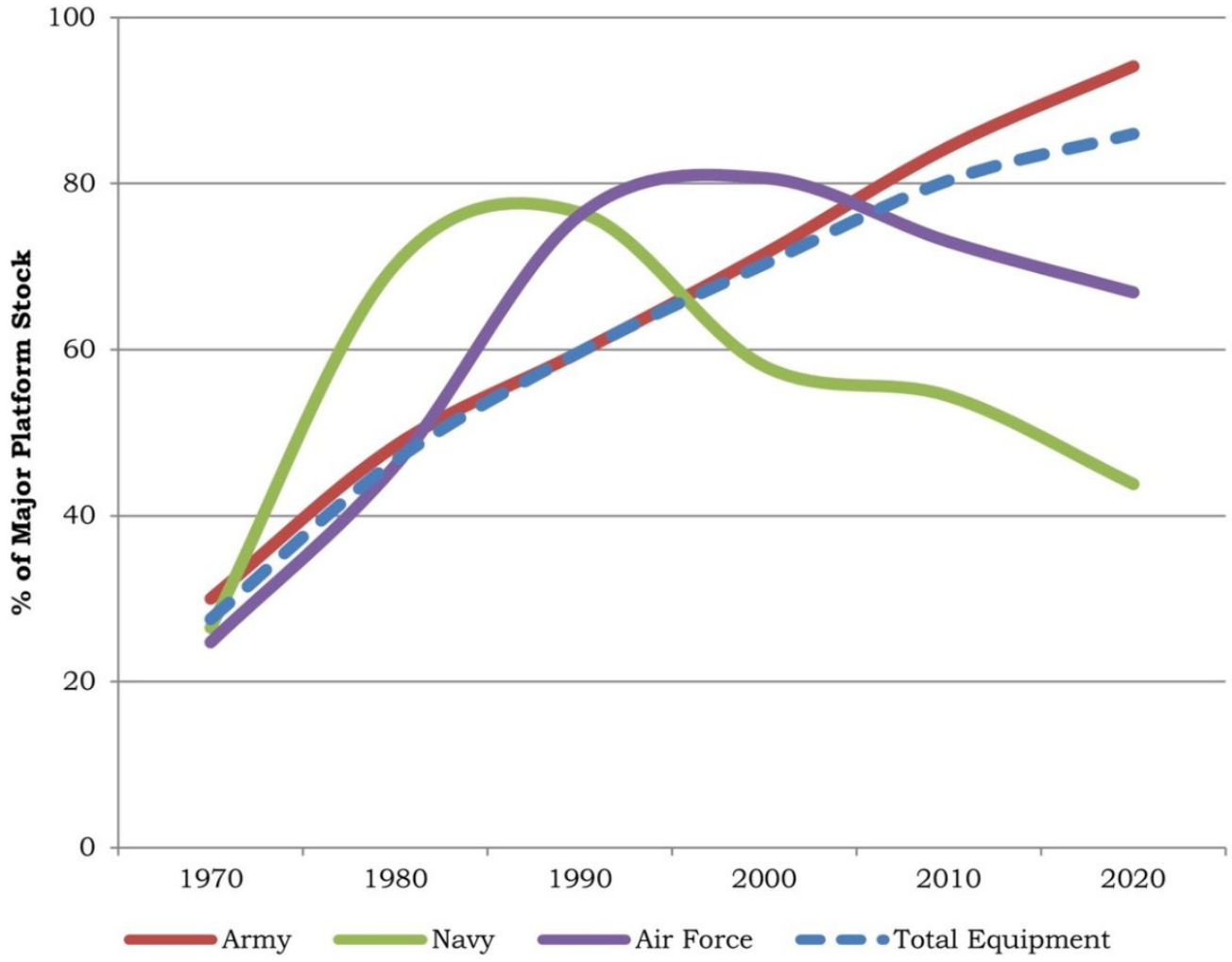
Conclusion

India adopted a 'non-aligned' foreign policy position in the Russia-Ukraine conflict. By choosing not to align with either NATO or Russia, India was able to navigate sanctions and continue purchasing Russian crude, reflecting its strategic autonomy. This approach helped India preserve its economic interests while also complicating NATO's efforts to weaken Russia's economic stability and expedite the conflict's resolution.

Using game-theoretic modeling, this paper explored whether India's neutral stance in the conflict constitutes a Nash Equilibrium within the game framework. Through an extended game form and backward induction process, we found that non-alignment followed by no retaliation represents the Subgame Perfect Nash Equilibrium. The findings underscore the geopolitical dynamics and strategic calculations that influence foreign policy decisions. For India, non-alignment serves as a pragmatic strategy to balance diverse interests in a complex geopolitical landscape.

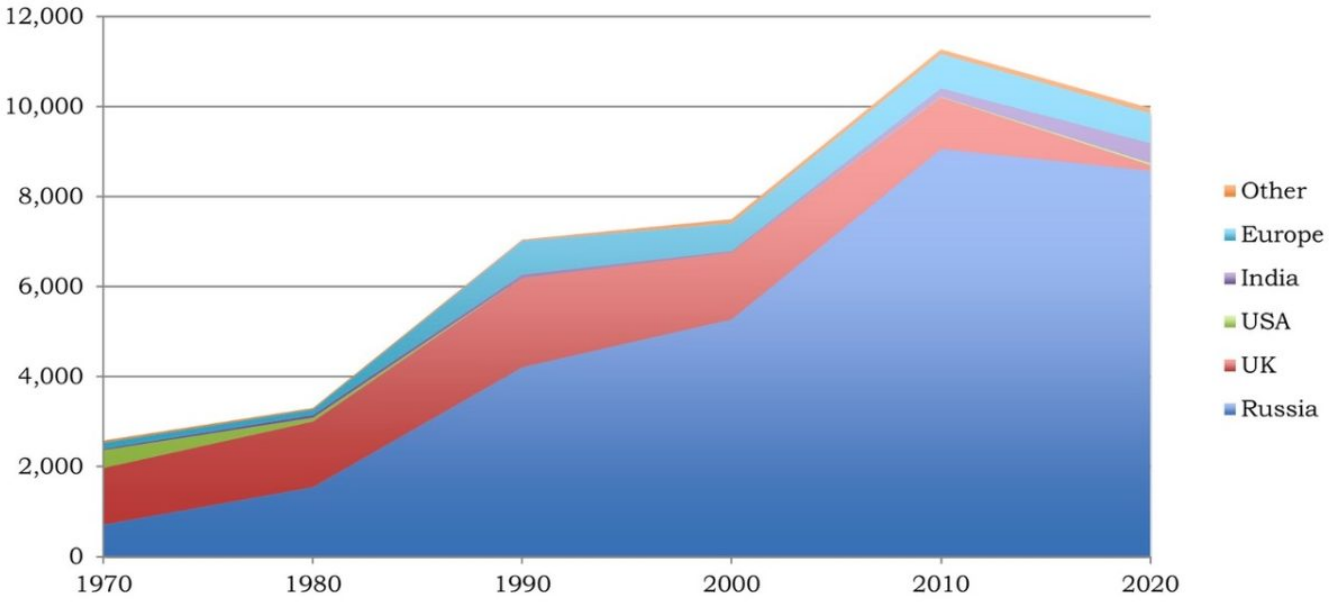
Figures

Figure 1: Military equipment of Russian origin (% per decade)



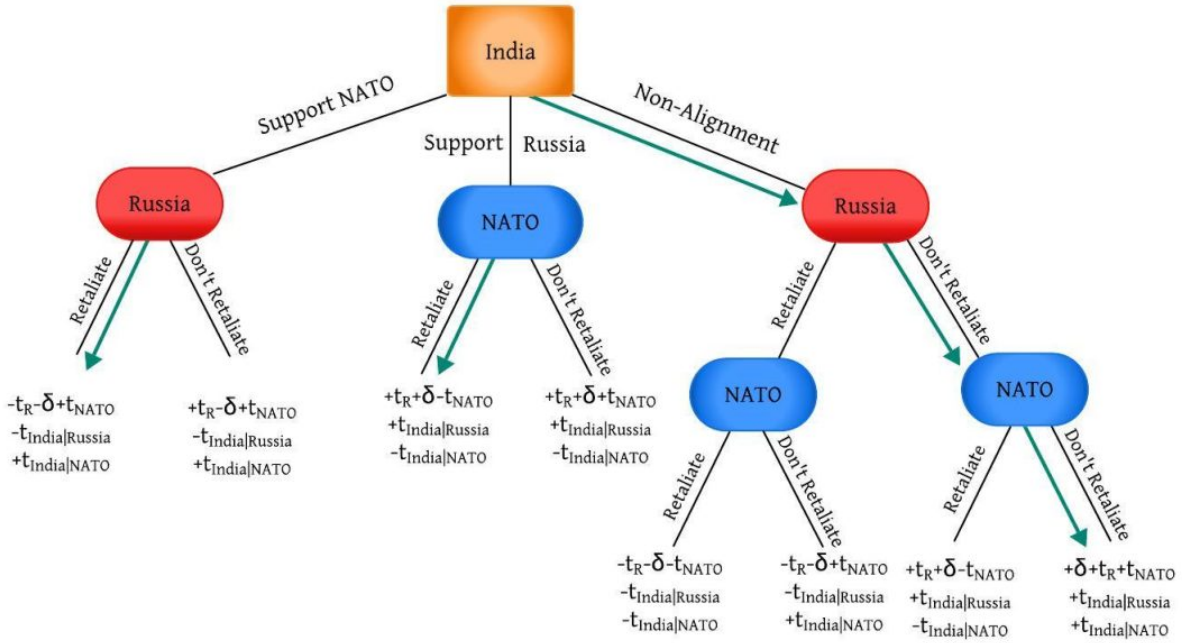
Source: The Military Balance, IISS[53]

Figure 2: Cumulative share of military equipment by national origin (pieces per decade)



Source: The Military Balance, IISS[54]

Figure 3: Extended Game Form



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