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Topic: Singapore-Malaysia Relations: A Game Theoretic Evaluation of Strained Relations

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Declaration

I declare that this assignment is my own work and does not involve plagiarism or collusion. The sources of other people's work have been appropriately referenced, failing which I am willing to accept the necessary disciplinary action(s) to be taken against me.

Student's Signature :

Two rectangular boxes containing handwritten signatures in blue ink. The first signature is 'KZ' and the second is 'E.W.'.

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Chapter 1: Introductory Chapter

1.1 General Background

States have been engaged in high-intensity conflicts in competition for water supplies. Whilst many water conflicts in the world disagree over the quality of and jurisdiction over shared water resources (most notably in the Middle East, and the Mekong River in Southeast Asia), the water conflict between Singapore and Malaysia disputes over the sanctity and legitimacy of bilateral water treaties. Disputes over water resources is high-intensity in nature, yet there are calls within the academia to “desecuritize” the conflicts over water supply (Long, 2001)¹ amidst fervent political rhetoric that any abreachment of water treaties could lead to war.

Bilateral relations between Singapore and Malaysia have also taken a toll recently as disagreements over territorial disputes, most notably the maritime issue, seem to have resurfaced. While the personal interests of each country have been embedded in the respective domestic policies drafted out over the years, diplomatic solutions have always been sought towards as a repetitive avenue for easing tensions that may arise over periods of time. The intricate choice and process of escalations or descalations of these conflicts can be analysed using Game Theory to provide a better understanding of the various rationale and decisions made behind the diplomacy between the two states, in the case of territorial disputes such as Pedra Branca.

Therefore this paper intends to use decision-making theories to explain the decisions made in Singapore-Malaysian bilateral conflicts which led to eventual cooperation in history.

1.2 Rationale

¹ Long, J. (2001). *Desecuritizing the Water Issue in Singapore—Malaysia Relations*. Contemporary Southeast Asia, 23(3), 504-532. Retrieved from <http://www.jstor.org.proxy.lib.sg/stable/25798564>

Even though tensions such as territorial, water and diplomatic disputes exist, large-scale armed conflicts have not occurred. This paper intends to examine the dynamics and conclusion of these conflicts as a means to understand the complexity of Singapore-Malaysian relations. The application of game theory in international relations is useful in analysing bilateral conflicts such as the tensions inherent in Singapore-Malaysian relations so that this paper can elucidate the decision making process of both players in the water conflict and how it came to resolution.

1.3 Research Questions

- 1) Why did Malaysia and Singapore experience strained relations over water and territory?
- 2) How far was the relationship between Singapore and Malaysia strained during these periods (Water: 1997-2003; Pedra Branca: 1979-2003)?
- 3) To what extent does the game theory explain the importance of reaching a peaceful resolution to both countries?

1.4 Thesis Statement

Tit-for-tat diplomacy employed by Singapore and better payoffs for cooperation than defection has resulted in the peaceful resolution of water and territorial conflicts between Singapore and Malaysia.

1.5 Scope of Research / Delimitation(s)

This paper will solely examine disputes over the water agreements in the past, specifically from 1997 to 2003. It will not cover the current dispute which is still ongoing (June

2018 to present). Analysis of the case study of Pedra Branca will be limited to the time frame of independence to the submission of the case to the ICJ in 2003.

This paper will only utilise the game theory to explain the process to eventual cooperation and not to predict the outcomes of the current water and territorial disputes.

1.6 Significance of Research / Usefulness

Little work exists in the academic field to explain the decision-making process which leads to the observed phenomenon of eventual cooperation in case studies of high tension. This paper would thus add on to existing literature to explain the process of escalation and eventual de-escalation in bilateral conflicts, and also illustrate the decision-making and politics in Singapore-Malaysian relations using game theory.

1.7 Limitation(s)

Game theory, when applied to international relations, de-personalises decision making. States, rather than the leaders, are viewed as players in the game while leaders are the actual ones making the decisions. Hence leaders are assumed to be rational and take the interests of the state as priority; however there may be some exceptions. Nevertheless the general policy directions of most leaders are aligned with the countries' interests in fear of falling out of favour in elections; as such leaders can be seen as similar representatives of their countries most of the time.

Chapter 2: Literature Review

2.1 Game Theory and its Application to International Relations

Game theory refers to the “the study of mathematical models of strategic interaction between rational decision makers” (Myerson, 1991, p. 1)². The “game” is a metaphor for the interactions between decision makers. Rasmusen (2006)³ identifies 4 criterion that has to be fulfilled before any analysis of the “game”: the players (the decision makers in the game), the awareness of information about the situation, the actions available to the players, and the payoffs of each outcome they make.

The many theoretic models that fall under the umbrella of the game theory share a common assumption, outlined by the key terms of Myerson’s definition: that the players of the game are rational. Rationality in game theory refers to selecting the option that gives the maximum payoff (Shor, 2005)⁴, and in a Realist world of International Relations, often means the pursuit of one’s national interests in the anarchic international environment. Simplistic understandings of rationality would presume interactions between states to be zero-sum games and that the pursuing of interests can occur without the consideration of the interests of other nation states. Tena (2014)⁵ disputes the usefulness of game theory in the analysis of modern day conflicts as she supposes that the Realist view of international politics disregards the Liberalist observation of the rise of bureaucratic international regulatory bodies such as the United Nations after the Cold War, hence limiting the autonomy of the individual nation states. However,

² Myerson, R. (1991). *Game Theory: Analysis of Conflict*. Cumberland: Harvard University Press.

³ Rasmusen, E. (2007). *Games and Information* (4th ed.). Malden: Blackwell.

⁴ Shor, M. (2005). *Rationality in Game Theory*. Retrieved 14 February 2019, from <http://www.gametheory.net/dictionary/Rationality.html>

⁵ Tena, M (2014). Basic Assumptions in Game Theory and International Relations. *International Relations Quarterly*, 5(1), pp. 1-4. Retrieved from: http://www.southeast-europe.org/pdf/17/dke_17_a_e_Malvina-Tema_Game-Theory-and-IR.pdf

Von-Neumann and Morgenstern (1944)⁶ specify that rationality in game theory is part of a long-term strategy to protect or pursue one's interests, and that players already decide on their responses based on the other party's possible actions. Since the actions of the other party are being considered, the concept of "strategic rationality" admits that the pursuit of personal national interests is not unconditional and will not attain the best outcome independent of the decisions of external actors (Snidal, 1985)⁷. The game theory therefore helps to reconcile individual rationality and can reflect the reality of the interdependence of states, and provides two possible varieties of cooperative and non-cooperative games. Singapore and Malaysia can be considered rational players given that they pursue their respective strategies that yield the greatest payoffs for their own countries in consideration of possible actions taken by the adversary. For Malaysia, the action of yielding to negotiations in 1997 was strategic and rational to avoid a build-up in military across the Causeway. For Singapore, the continuous effort to ensure Malaysia's adherence to the Water Agreements is rational to preserve the continuity and security of its water supplies. These examples show that the two players I examine in the paper are rational.

Critics of game theory such as Northcott and Alexandrova (2015)⁸ also argue that the conditions of certain games (such as the Prisoners' Dilemma) are hard to fulfill in reality, hence the idealism of this model makes it difficult to apply to real-life situations. I contend with the fact that the payoffs of each solution are hard to quantify especially for qualitative analyses (like this

⁶ Von Neumann, J., Morgenstern, O., Kuhn, H., & Rubinstein, A. (1944). *Theory of Games and Economic Behavior (60th Anniversary Commemorative Edition)*. Princeton University Press. Retrieved from <http://www.jstor.org/stable/j.ctt1r2gkx>

⁷ Snidal, D. (1985). The Game Theory of International Politics. *World Politics*, 38(1), 25-57. Retrieved from: <https://www.jstor.org/stable/2010350>

⁸ Northcott, R. & Alexandrova, A. (2015). *Prisoner's dilemma doesn't explain much*. In Peterson, M. (2019). *The Prisoner's Dilemma: Classic philosophical arguments* (pp. 64-84). Cambridge: Cambridge University Press.

paper), and thus it is hard for scholars to ensure that a situation fits particularly into the ideal game model. The fact that there are so many theoretic models that exist in the field of game theory further complicates the problem of finding the right model. However, Snidal (1985) defends the nature of the conditions of the game models. He argues that applications of the game theory should not emphasise on the description of the games but instead the analysis of the game. It is therefore acceptable to be less stringent in terms of describing the conditions of the game, but more important to explain the reasons behind the decisions made by the players to maximise the value of using game theory.

2.2 Non-Cooperative Games

Analyses of non-cooperative games focus on the prediction of individual payoffs and the investigation of Nash Equilibrium.

The concept of Nash Equilibrium, named after mathematician John Forbes Nash Jr., is a proposed solution of a non-cooperative game. Nash Equilibrium is achieved when each player takes into consideration the most possible decision the other would make and makes the best decision for himself.

Non-cooperative games occur when two players compete with each other. Even if in a coalition, it is self-enforcing (i.e. can only be maintained by threats). The state of the Singapore-Malaysian relationship in 1997 was a non-cooperative coalition because both countries came to a consensus to negotiate their differences (including their different interpretations of the Water Agreements), yet in conflicts such as disputes over the Water Agreements, Singapore and Malaysia are players which compete against each other to vvy for the legitimacy of the right to renew water prices. A non-cooperative game model hence can be used

to describe scenarios of conflict or competition between the two countries, such as in the negotiations from 1997 to 2003.

The distinctive feature of non-cooperative games is the absence of an external authority which enforces cooperative behaviour (Dombrowsky, 2007)⁹. The reason why such a condition is set for non-cooperative games is that the focus of the analysis is on the interactions between the two players when they are in conflict. The typical behaviour of a rational player would be to pursue its interests in consideration of the possible actions taken by the other player only, and not other rules restricting the pursuit of its own interests. However, in reality, especially after WW2, the regulatory power of bureaucratic bodies like the United Nations have grown such that it may suffice as a factor deterrence for a drastic decision to, for example, go to war with another country. Hence when applying non-cooperative game theory to Singapore-Malaysia relations, the impact of international organisations such as the UN or ASEAN cannot be taken into consideration, and instead will be proposed as a limitation when evaluating the effectiveness of game theoretic analysis of Singapore-Malaysia relations.

An example of a non-cooperative game is the Prisoner's Dilemma. It is a hypothetical situation when two people are held prisoners and are presented with the deal by the authorities.

If A and B both betray each other they receive a sentence of two years.

If A and B both remain silent they receive a sentence of three years.

If one cheats on another, the one who cheats will be set free while the other will be imprisoned for three years.

⁹Dombrowsky, I. (2007). *Conflict, Cooperation and Institutions in International Water Management: An Economic Analysis*. Cheltenham: Edward Elgar Publishing Limited.

Prisoner's dilemma payoff matrix

	B	B stays silent	B betrays
A			
A stays silent		-1	0
A betrays		-3	-2

Figure 2.1: A sample payoff matrix of the Prisoner's Dilemma

Assuming the rationality of the players, that the players will always seek their individual choice, the Prisoner's Dilemma asserts that both players will choose to betray each other as it guarantees the maximum payoff regardless of the actions taken by the other party. This is also the Nash Equilibrium for the Prisoner's Dilemma.

The Prisoner's Dilemma has been applied to explain the arms race between the USA and the USSR during the Cold War. Snyder (1971)¹⁰ explains it as such: though both states do not arm themselves at status quo, the act of betrayal will grant it more power which can be used as a tool to gain leverage over the other. Bearing in mind that the other party is also rational to think of this strategy, it is imperative to arm to safeguard one's security. The result is being trapped in a double-defection box of the Prisoner's Dilemma.

A conceptual flaw of the Prisoner's Dilemma is its view of the game as a zero-sum game. In the Prisoner's Dilemma, a situation in which each party chooses the best decision for himself is known as the Nash equilibrium, in which "one person's gain is another's loss, so the payoffs

¹⁰ Snyder, G. (1971). "Prisoner's Dilemma" and "Chicken" Models in International Politics. *International Studies Quarterly*, 15(1), 66-103. doi:10.2307/3013593

always sum to zero” (Holt & Roth, 2004, p. 3999)¹¹. This results in no net gain by either sides and outcomes return to their status quo. Holt’s explanation of the dynamics of the Prisoner’s Dilemma as “one person’s gain is another’s loss” shows the game as a zero-sum game, when the payoff of the choice to cooperate is worse than the payoff of the choice to betray. However, there is a possibility of the condition of the Prisoner’s Dilemma being untrue - when the payoffs for cooperation is better than betrayal. This can be used to explain how non-cooperative games sometimes transition into cooperative ones.

2.3 Transitioning into Cooperative Game: The Tit-For-Tat Strategy

Another way non-cooperative games transition into cooperative games is through the strategy of tit-for-tat. Tit-for-tat was a solution by Anatol Rapoport in 1980 to resolve iterated (i.e. repeated) Prisoner’s Dilemmas. If both players are aware of the N number of prisoner’s dilemma to be played, the Nash Equilibrium of iterated Prisoner’s Dilemmas is still mutual defection. However, players would choose the last of the N number of games to defect, fearful of retaliation of the party in the future.

Though the nomenclature of tit-for-tat may sound aggressive, it is in fact a cooperative strategy to persuade the adversary into cooperation. The core of the tit-for-tat strategy is imitation. The player cooperates during the first iteration of the game and then simply imitates the action taken by the other player subsequently.

Axelrod (1984)¹² sets 4 criterion for the strategy to be successful:

1. Nice: do not defect before your opponent
2. Retaliation: to prevent exploitation of kindness

¹¹ Holt, C. & Roth, A. (2004). *Proceedings of the National Academy of Sciences of the United States of America*. 101(12): 3999–4002. doi: 10.1073/pnas.0308738101

¹² Axelrod, R. (1984). *The Evolution of Cooperation*. New York: Basic Books, inc. Publishers.

3. Forgiving: though the other player may retaliate, it is important to continue cooperating such that the other player goes back to cooperation in the subsequent games. This reduces chances of long-run revenge, helping both parties.
4. Non-envious: not attempting to benefit more than the other player.

By investigating traces of the four requirements set by Axelrod (1984) in the interactions between Singapore and Malaysia, we can argue whether the tit-for-tat strategy is a contributing factor to the eventual resolution of water conflicts.

2.3 Two-Level Games: Relating Domestic and International Politics

Apart from the game played on the international stage between Singapore and Malaysia, there may be domestic games within the respective countries between different stakeholders, such as opposition parties and public opinion. Robert Putnam's "Diplomacy and Domestic Politics: The Logic of Two-Level Games" (1988)¹³ attempts to theorise the relationship between domestic and international games. The three stakeholders involved in the two-level game are the domestic player (who puts pressure on the central player), the foreign player (who is either already in a cooperative or non-cooperative game with the central player), and the central player (who has to balance the needs of both the domestic and foreign players). Interpreting the government of a country as the central player would allow for further analysis of the decision making process into one that takes domestic and foreign conditions into account.

In the case of disputes over the Water Agreement, this paper will only apply Putnam's Two-Level Model to Malaysia, given that Malaysia's opposition was of a larger strength than

¹³ Putnam, R. (1988). Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization*, 42(3), 427-460. Retrieved from <http://www.jstor.org.proxy.lib.sg/stable/2706785>

Singapore's in 1997 (15.62% and 2.41% of seats in government respectively). A domestic player of considerable strength is needed for the Level I game to be played.

2.4 Conclusion

This literature review has justified the application of game theory in the area of international relations, and has explained the nature of non-cooperative games and cooperative games and why the period of dispute over Water Agreements can be modelled as these two games.

The following game model integrating the features of non-cooperative game theory, cooperative game theory and two-level games (Putnam, 1988) will be tested on my case study of the disputes over the Water Agreements between Singapore and Malaysia.

<h3>Characterisation of Situation as</h3>	
<p>Non-cooperative Game</p>	<p>Cooperative Game</p>
<p>Is there a domestic game simultaneously? (For Malaysia)</p>	
<p>(Iterated) Prisoner's Dilemma</p>	<p>How did cooperation come about? Either 1) Tit-for-tat (Rapoport, 1980) - Conditions: Nice, retaliating, forgiving, non-envious or 2) Payoffs for cooperation > defection</p>
<p>Find out the: -Possible choices by players - Resulting payoffs of each choice -Nash Equilibrium</p>	
<p>Evaluating usefulness of the game model</p>	
<p>What can it explain? What can it not explain?</p>	

Chapter 3: Methodology

This paper will refer to a variety of primary and secondary sources for analysis.

For analysis of the disputes over the Water Agreements, the publication named “Water Talks - if only it could” by the Ministry of Foreign Affairs of Singapore will be extensively used. This is because of the chronology of events provided that allows ease for historical analysis. There are also records of official conversations such as transcripts of speeches and letters by both leaders and ministries of Singapore and Malaysia. Consultations of Malaysian news reports will also be considered to fact-check and nuance the opinions of the MFA publication.

For analysis on the territorial disputes, the extensive use of media outlets and government sites (Ministry of Foreign Affairs) from both Singapore and Malaysia will provide a clearer perspective of the historical nature of territorial disputes that have arisen between the two nations over the course of years. In seek of attaining and forging a better understanding of evidence-based research for policy makers and stakeholders seeking measurable outcomes between the two nations, international websites such as the Economist Intelligence Unit and Times Defence News will be monitored consistently.

To quantify the impacts and costs of conflict in the Prisoner’s Dilemma matrix, the report will also refer to databases and reports which reflect an increase in military spending or any suspension of economic cooperation.

The analysis of the case studies will be divided into 4 sections reflecting 4 stages of the management of the disputes for coherent discussion. The disputes are observed to have progressed from a state of disagreement to a temporary cooling down of tensions. Tensions then

reemerge and then a resolution to the conflict in the set time period closes the case study.

Analysis will hence be structured according to stage rather than individual case studies.

Chapter 4: Discussion and Analysis

4.1 Factors for Initial Disagreement

This paper observes that for both case studies, it was Malaysia that initiated the conflict by directing threats at entities important to Singapore's sovereignty and security, namely the sanctity of the Water Agreements and the ownership of Pedra Branca. However, this does not mean that the responsibility of bilateral tensions rests solely on the shoulders of the Malaysian government.

Especially for the water disputes, it was the Singapore government that caused an internal domestic game in Malaysia. As Kwek and Liow (2015)¹⁴ note, in 1996, Lee Kuan Yew had raised the possibility of a re-merger with Malaysia and commented that Johor was unsafe. This enraged activists in the UMNO Youth Wing and many opposition politicians in Malaysia, who threatened to cut off the water supply. Such a situation creates a domestic game in Malaysia involving the reacting parties (UMNO Youth Wing politicians and opposition) and the federal government. According to Putnam (1998), the federal government of Malaysia would have to absorb to an extent the demands of the domestic players. This could be an explanation of why Malaysia did not denounce or suppress the fervent political rhetoric by its domestic players which did threaten its bilateral relationship with Singapore.

Though seemingly a small incident of just an exchange of heated rhetoric, Singapore authorities treated the unofficial threat of cutting the water supply seriously. It is important to note that the issue of water is only one of the many underlying tensions seeded in the relationship of Singapore and Malaysia. It has often been alleged that water could be used as a political

¹⁴ Kwek, T. & Liow, J. (2015). Singapore's Relations with Malaysia and Indonesia. In Ang, C.G. & Barry, D. (2015). *Perspectives on the Security of Singapore*. Singapore: World Scientific.

leverage by Malaysia whenever Singapore's policies are seen to have the possibility to harm Malaysian interests (Tan, 1997)¹⁵, and has been one of Singapore's greatest fears after independence since the late Tunkun Abdul Rahman suggested the possibility himself. The Singaporean government hence would speak against the Malaysian government to remind them about the legally binding Water Agreements so as to ensure the security of water supply.

As for the Pedra Branca incident, it can be asserted that it was the growing ambition of Malaysia and its politicians given the context of a young growing nation that was heading in the direction of attaining prosperity at that point of time in the 1960s to 1970s. From 1971 to 1991, the implementation of New Economic Policy (NEP) spearheaded the advancement of Malaysia's economy, leading to ruling party politicians calling for Malaysia to expand its influence around its areas (Milne, 1976)¹⁶. A domestic game is seen here, with domestic pressure being piled on the central government to enact out policies and measures in favour of expanding Malaysia's national interests.

This supports the notion that territorial disputes emerge as a result of rational strategic and economic interests and changing power relations (Forsberg, 1996). To Malaysia, expanding territorial control was seen as a necessary component to securing key maritime trade routes that could increase trade activity, which could help "accelerate the process of restructuring Malaysian society in order to correct economic imbalance" (Milne, 1976). Resultantly, we see a more aggressive approach utilised by the Malaysian government to increase its economic trade power.

As Associate Professor Eugene Tan of Singapore Management University has put it, territorial

¹⁵ Tan, A. (1997) Problems and Issues in Malaysia-Singapore Relations. *Working Paper*, (314)

¹⁶ Milne, R. (1976). The Politics of Malaysia's New Economic Policy. *Pacific Affairs*, 49(2), 235-262. doi:10.2307/2756067

Forsberg, T. (1996). Explaining Territorial Disputes: From Power Politics to Normative Reasons. *Journal of Peace Research*, 33(4), 433-449. Retrieved from <http://www.jstor.org/stable/424568>

claims are effective tools to “assert state sovereignty”, and increase state influence over the region. Likewise, this was met with fervent opposition from Singapore. Pedra Branca, too, had an important role in protecting Singapore’s maritime trade routes. In 1979, Malaysia published a map claiming sovereignty over Pedra Branca, only to receive stark protest from the Singapore side. This led to mutual disagreement arising between both sides, as neither could come to a common consensus on Pedra Branca’s sovereignty.

Singapore	Singapore Cooperates	Singapore Defects
Malaysia		
Malaysia Cooperates	2	3
Malaysia Defects	-1	1
Nash Equilibrium: Mutual Defection		

Fig 4.1 Prisoner’s Dilemma Matrix

For Malaysia, cooperation is being defined as withdrawing the threats of cutting water supply and the claim over Pedra Branca, while defection is being defined as simply living with the status quo, i.e. the threats and claims are not withdrawn.

For Singapore, cooperation is being defined as living with the status quo, while defection is being defined as actions attempting to reverse the assertions of the Malaysian government, such as demanding for an apology.

Since the payoffs for defection outweigh the payoffs of cooperation, the result is a Nash Equilibrium of mutual defection. Singapore formally protests against Malaysia's claim of Pedra Branca in 1980 and had also rebutted the rhetoric of Malaysian politicians in 1997.

4.2 Entrance into Negotiations

This paper asserts that the successful tit-for-tat strategy employed by Singapore for both case studies encouraged an agreement to cooperate between Malaysia and Singapore.

The period of time when the disputes over the Water Agreements were triggered coincided with the Asian Financial Crisis which lasted from 1997 to 1999. Statistics show that the Malaysian economy was more severely hit than Singapore's economy, and this paper asserts that the state of the Malaysian economy had forced the Malaysian government to seek external help from a more economically stable regional player such as Singapore.

	Exchange Rate to US Dollar		Total Rate of Change (percent)
	Local currency unit/US dollar		
	1 July 1997	24 January 1998	
Malaysian ringgit	2.52	4.58	44.9 %
Singaporean dollar	1.43	1.76	18.8 %

*Fig 4.2: Rates of Depreciation of Malaysia's and Singapore's Currencies from July 1997 to January 1998 (Ryu, 2008)¹⁷
(Source: Institute of Southeast Asian Studies, Singapore, p. xv)*

In 1998, Mahathir had requested for financial aid which Goh Chok Tong responded with a financial aid package. The action of agreeing to Malaysia's request of financial aid fulfills the 3 out of 4 of Axelrod's (1984) criterion for a successful tit-for-tat strategy.

The economic strategy employed is "nice" because it attempts to cooperate rather than defect, hence there is no betrayal of the opponent. It is also "forgiving" because it offers Malaysia cooperation despite the previous instance of defection by the Malaysian government which officially triggered the water disputes. The financial aid package is also "non-envious" because it does not attempt to benefit more than Malaysia; in fact financial aid would distribute some share of Singapore's interests to Malaysia.

The only absent condition was retaliation, which Axelrod deemed was essential for the employer of the strategy to avoid being taken advantage of. However, this was only the start of the tit-for-tat strategy and immediate retaliation would be a display of a lack of sincerity by the Singapore government. It can be argued that the absence of retaliation was and was a diplomatic

¹⁷ Ryu, Y.W. (2007). The Asian Financial Crisis and ASEAN Concept of Security. *Working Paper Series* (148).

demonstration of willingness to cooperate. The success of Singapore's tit-for-tat strategy explains Mahathir's initiated proposal to resolve bilateral issues as a package.

For Pedra Branca, intergovernmental talks were held from 1993 to 1994, and that can be attributed to the tit-for-tat strategy employed by Singapore, helping to allay tensions in the bilateral relationship. Most notably, efforts towards establishing partnerships were seen being taken place. While previous tensions had both countries interlocked in national interests as portrayed in previous disagreements, either side was "forgiving" of each others' actions subsequently. Attempted actions and amendments were made to soothe tensions, providing greater opportunities for more cooperative negotiations to take place. In 1989, the Growth Triangle partnership was established between Singapore, Malaysia and Indonesia, which sought to strengthen economic links in the region and optimise the complementarity between the three countries through combining the competitive strengths of the three areas to make the subregion more attractive to regional and international investors. This paved the way for greater cooperation and trust between the two nations, allowing for the easier facilitation of conferences between senior officials.

4.3 Failure of Negotiations

The dissolution of negotiations on the package of bilateral issues and Pedra Branca failed ultimately. The result is predictable by the theory of iterated prisoners' dilemma as described in Chapter 2.

The negotiations can still be considered a non-cooperative game though both parties are working towards a goal of eventual cooperation because they have competing interests which

requires a compromise from the other party. The eventual breakdown of negotiations happens as the Nash Equilibrium of the set of iterated Prisoner's Dilemmas is still mutual defection.

Negotiations for the water package broke down when Malaysia called off the negotiation package in 2002 and a unilateral declaration by Malaysia to raise the water price to RM 6.25 per gallon, higher than what was promised previously. The failure of negotiations could be attributed to a weak tit-for-tat strategy by Singapore which involved no retaliation for 4 years till 2002.

This was evident in several instances throughout the negotiation process. Malaysia had increased the price of water it wished to sell to Singapore from 45 sen to 60 sen per gallon 6 months after an agreement had been established. Malaysia had also refused to respond to a letter sent by Senior Minister Lee Kuan Yew in 2001 seeking clarification of Malaysia's final stand on the bilateral issues already agreed upon. In 2002, PM Mahathir of Malaysia had also reportedly complained that Malaysia had been "underpaid" and compared the price of water to what China had been selling to Hong Kong.

The insincerity of Malaysia's diplomacy however did not trigger any retaliation by Singapore in the form of abandoning negotiations. The Ministry of Foreign Affairs of Singapore released a statement reminding Malaysia about the sanctity of the Water Agreements, and continued to open channels of dialogue with Malaysia to discuss about the package.

The unilateral decision by Malaysia to call off negotiations was significant as it revealed the unstable and non-cooperative nature of the negotiations. Malaysia was probably more fixated on its domestic concerns such as the reconstruction of the fractured economy after the financial crisis. The ability to use water as a leverage would be further depreciated with more agreements to legally bind it to ensure stable water supply to Singapore. It is important to note the political

nature of the issue of water despite political rhetoric of financial concerns regarding the price of water (Ganesan, 1998)¹⁸.

For Singapore, defection (i.e. leaving the talks) was the only choice as cooperating meant an acceptance of the insincerity of Malaysian diplomats and also going against exactly what it fought against: the unwillingness to accept the big-brother mentality commonly asserted by the Malaysian government. It would also be strategic to retaliate according to Axelrod's criterion for a successful tit-for-tat strategy, to avoid constantly being taken advantage of, as seen from the failure of negotiations.

With regards to the Pedra Branca Incident, two main factors played a major role in hindering negotiations during the intergovernmental talks that were held from 1993 to 1994. Firstly, the lack of progress in bilateral negotiations. Neither side wanted to concede their claim of sovereignty over Pedra Branca due to its strategic maritime importance. While initial efforts towards cooperation were edged towards, the economic benefits in line with national interests seemingly outweighed negotiations towards a compromise, leading to persisting stances. Using the Prisoner's Dilemma, it rationalises for either side to defect in order to prevent the suffering of great permanent losses. Choosing to play down negotiations was seen as another effective method to stall for time and test each side's resolution in holding on to Pedra Branca. Also, the diminishing of political clout was another detrimental aspect that could be derived from the loss of sovereignty over Pedra Branca (Malintoppi, 2013)¹⁹. Secondly, the issue was made even more complicated with additional factors being thrown into the fray. The question of the appurtenance

¹⁸ Ganesan, N. (1998). Malaysia-Singapore Relations: Some Recent Developments. *Asian Affairs*, (2).

¹⁹ Malintoppi, L. (2013). Trends and Perspectives of Settlement of Law of the Sea Disputes in Southeast Asia. *Proceedings of the Annual Meeting (American Society of International Law)*, 107, 56-60.
doi:10.5305/procanmeetasil.107.0056

of Middle Rocks and South Ledge was also raised, leading to even more indecisiveness and uncertainty among the negotiators, as sovereignty over two additional territories had to be decided too.

	Singapore	Singapore Cooperates	Singapore Defects
Malaysia			
Malaysia Cooperates		2	3
Malaysia Defects		-1	1
		2	-1
		3	1
Nash Equilibrium: Mutual Defection			

Fig 4.3 Prisoner's Dilemma Matrix

For Malaysia, cooperation is being defined as resuming negotiations and the claim over Pedra Branca. Defection is being defined as calling off the negotiation package and resuming disputation over the contested islet.

For Singapore, cooperation is being defined as living with the status quo. Defection is being defined as actions attempting to reverse the assertions of the Malaysian government.

Eventually, the Nash equilibrium achieved involved mutual defection. As Malaysia continued to press on for its claims, Singapore continued its attempts to renegotiate, leading to an inconclusive solution.

The chain of negotiations over the package ended in 2003 inconclusively and defection by Singapore included an additional step of releasing primary documents including transcripts and letters of the official correspondence between Singapore and Malaysia in 2003, which was frowned upon by the Malaysian government thereafter.

4.4 Eventual Resolution

The failure of negotiations in 2003 was succeeded by an increase in military spending and equipment by Singapore and Malaysia. Stratfor (2002)²⁰ observes that both countries began fuelling an “aviation arms race” after recovering from the wounds of the financial crisis.

However, statistics seem to suggest that Singapore, though having a small number of soldiers, has a more developed weapon system than Malaysia.

Country	Number of soldiers	Light and heavy tanks	Artillery pieces	Fighter planes	Battleships	Sub-marines
Cambodia	124,300	220+	433+	5	16	0
Indonesia	395,500	390	1,110+	104	110	2
Malaysia	109,000	69	424	67	51	2
Myanmar	406,000	290+	419+	167	117	0
Philippines	125,000	7	254+	22	69	0
Singapore	72,500	446	798+	126	45	4
Thailand	360,850	487	2,622	150	111	0
Vietnam	482,000	1,890	3,040+	101	86	6

Fig 4.4 Comparison of Personnel Levels and Weapons Systems

Source: The International Institute for Strategic Studies (IISS), *The Military Balance 2016* (London, 2016).

²⁰ Regional Worries Speed Singapore-Malaysia Arms Race. (2002). Retrieved 17 June 2019, from <https://worldview.stratfor.com/article/regional-worries-speed-singapore-malaysia-arms-race>

Defection for Malaysia in this circumstance is implementing the unilateral increase in the price of water. The risks of defection for Malaysia were amplified by the threat seeded historically by former PM Lee Kuan Yew of Singapore of military retaliation. Unwilling to risk security, cooperation in the form of the pause of rhetoric to cut the water was ideal.

While neither country could come to a common agreement to one's stand, it was mutually agreed afterwards that efforts be made for the case to be submitted to the International Court of Justice (ICJ) for further handling. From 1995 to 1998, negotiations on the text of the Special Agreement were successful, and the signing of the Special Agreement was concluded by 2003. With the dispute having started in 1979, by 1994, it would have been almost 15 years since the dispute was unresolved - a long period of time. The choice of both to defect simply yields the conventional Nash Equilibrium - neither side would hold an accepted recognised claim over Pedra Branca, rendering its futility in its original usage. With the tactic of stalling not coming to any fruition either, it is notable that the intensity of the situation, though still high, had mellowed down from the earlier years due to the continuous ongoing drag of the issue. A suitable, rational resolution was to thus seek a third party opinion on the issue. This way, the notion that despite disputes, countries' willingness to cooperate and seek a fair result, would be set especially among the ASEAN committee, which was set up to foster mutual collaboration, for all to follow and act upon.

	Singapore	Singapore Cooperates	Singapore Defects
Malaysia			
Malaysia Cooperates		2	3
Malaysia Defects		-1	-1
		2	-1
		3	-1
Nash Equilibrium: Mutual Cooperation			

For Malaysia, cooperation is being defined as ceasing provocative rhetoric and handing the Pedra Branca dispute to the ICJ, while defection is being defined as continuing provocative rhetoric regarding cutting water supply or raising the price of water and claims over the territory.

For Singapore, cooperation is being defined as living on with the status quo, while defection is being defined as policies undermining bilateral cooperation such as military aggression and breaking of economic ties.

The Nash Equilibrium of mutual cooperation was attained with the payoffs of defection being lower than that of cooperation because of the military tension between the two states after the previous defection.

Chapter 5: Conclusion

This paper has used two branches of game theory, namely cooperative game theory (tit-for-tat) and non-cooperative game theory (Prisoner's Dilemma), and adopted Putnam's metaphor of two-level games to analyse the bilateral tensions between Singapore and Malaysia. The two case studies of water and territory have several common findings which explain how the two governments handle issues. Malaysia tends to prioritise domestic interests over bilateral contentions and reflect domestic concerns in international relations until a significant threat is posed to its security. Singapore, which is observed to be the more vulnerable party in especially the water disputes, resorts to cooperative economic strategies with elements of tit-for-tat to reciprocate cooperation.

The conclusion of both case studies are not concrete resolutions. Analysis with the game theory suggests that it is just a temporary cooldown in tensions to mitigate the military and economic impacts of continuous mutual defection.

This paper has therefore explained the resurfacing of issues of bilateral contention and its eventual closure between Singapore and Malaysia. However, the game theory is unable to explain the impact of the change in administration in a country, especially for politicians with a distinct style of leadership. The closure of the water disputes post-2003 could be attributed to Badawi's succession of Mahathir's leadership, marking a departure of a more anti-Singapore foreign policy. Future analysis could involve other leader-centric theories such as role theory to offer deeper insights to this issue.

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