

Win-to-Select Procedure: An Alternative for the Fair Allocation of Sovereignty of the Spratly Islands^{*}

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Abstract: In this paper I examine the collective action problem surrounding the Spratly Islands dispute, particularly the distributional conflict dimension. Given the relative gains issue that underlies the lack of cooperation among the claimants, I present an alternative process for the fair division of sovereignty that accounts for the claims and interests of all parties: the Win-to-Select Procedure (WSP). This two-stage method involves a point allocation process to determine each player's share of territory, and sequencing, which creates the order by which players select territory. To demonstrate WSP, I refer to a model in which the goal of each state is to maximize its geographic security. The results suggest that WSP yields envy-free and efficient gains for players. I conclude that WSP is a constructive starting point for altering the noncooperative behavior among the claimants and reaching a fair political settlement on the Spratly Islands dispute.

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Introduction

A potential security flashpoint in East Asian international relations is the dispute over the Spratly Islands in the South China Sea.¹ This archipelago, comprising over 230 islands and reefs (Denoon and Brams 1997; Brams and Taylor 1999; Joyner 1999), possesses strategic value, politically and economically, for the claimants—primarily China, Taiwan, and the four Association of Southeast Asian Nations (ASEAN) states Brunei-Darussalam, Malaysia, the Philippines, and Vietnam (Snyder 1996; Denoon and Brams 1997; Cui 2003).² Accordingly, the tension over the Spratly Island territories, manifested in mercurial diplomatic behavior, sporadic small-scale conflict, and a basic competition over resources, provides an impetus for reaching a political resolution in the near-term.

However, there is an absence of collective action toward addressing the fundamental issue of sovereignty. I posit relative gains as one explanation for the noncooperative behavior of the six claimant states and the consequent status quo, which is an inefficient and unstable outcome. The potential for mutually beneficial outcomes that could arise from cooperation is obstructed by the concern for relative gains. Overcoming such asymmetry while preserving the existing balance among the claimants is the task for any method aimed at settling the sovereignty issue of the Spratly Islands. I therefore contend that fair division could resolve the dispute over the Spratly Islands.

In this paper I tackle the distributional problem of the Spratly Islands conflict. I address the following question: Is there an alternative process for the fair allocation of sovereignty that

¹ Although this body of water is also referred to as the Philippine Sea, for the purposes of consistency with the

² Note that Indonesia, Singapore, and Thailand do not presently have any claims on the Spratly Islands.

accounts for the claims and interests of all parties? Leaving aside the theoretical analysis of the relative gains problem—as distributional conflict is assumed—I construct a procedure that alleviates the asymmetry in gains deriving from the current range of solutions. Through this research, I build on the methodology developed for the fair settlement of the dispute (Denoon and Brams 1997; Brams and Taylor 1999; Cui 2003). To further simplify the analysis, I examine only China and three of the ASEAN members: Malaysia, the Philippines, and Vietnam.

I present the Win-to-Select Procedure (WSP), a method for fair allocation, to demonstrate the envy-free and efficient gains for all parties. The process I propose seeks to resolve the distributional problem by satisfying “fair-division” criteria, whereby each state is satisfied with its share of sovereignty compared to the other parties’ shares, while accounting for the states’ divergent interests and competing claims. Alternatives for the division of the Spratly Islands have been proposed, but there are limitations to their application. In addition to those approaches, I present WSP as a methodological starting point for altering the noncooperative behavior among the claimants’ and reaching a fair political settlement on the Spratly Islands dispute.

This paper proceeds as follows. The next section outlines the states’ competing claims, discusses the effect of relative gains on efforts toward settlement, and explains the limitations of existing regimes in resolving the dispute. The third part reviews previously proposed schemes for dividing the Spratly Islands. The fourth section advances a new process for the fair allocation of sovereignty, the Win-to-Select Procedure (“WSP”), which builds from existing methodology. The final part provides concluding remarks.

Background to the dispute

The status quo of the Spratly Islands dispute represents a collective action problem among the four main claimants—China, Malaysia, the Philippines, and Vietnam. The noncooperative behavior characterizing the contemporary circumstances of the dispute is a product of the distributional conflict that would result if one state concedes to the preferences of another. None of the states desires to renounce the legitimacy over any part of its claim on the Spratly Islands' maritime space. Despite the various approaches to dividing the Spratly Islands that offer absolute gains to each party, the strategic interaction among the parties suggests that, should there be an agreement on a political settlement, a state experiencing a marginal loss on its claim expects others to suffer at least a similar decrease. I sketch the nature of the claims and discuss two bargaining issues related to the relative gains concern. I then review the limitations of existing regimes that are viewed as potential solutions to the dispute.

Since the 1970's, wherein the strategic utility of the maritime space was widely realized, East Asian countries have increased the competition over ownership of the Spratly Islands. The area possesses both political and economic value. While it is argued that the long-term utility of the Spratly Islands is in the military advantage it presents—specifically, the sea lanes—the short-term value of the maritime space is in the potential energy resources it is purported to possess.³ However, in the last four decades, there has been negligible progress toward settling the fundamental issue of sovereignty; the topic is continually deferred and, instead, discussions over joint development are pursued. Yet, even these dialogues have produced little in the form of long-term cooperation. Indeed, as this analysis implies, and following the conclusions of other

³ There are conflicting reports as to the amount of hydrocarbons within the maritime space of the Spratly Islands. Whether or not the islands have high economic value is a moot point, however, and is not discussed in this analysis. See Valencia 1995, pp. 8-11; Valencia 2009, pp. 1-3; Denoon and Brams 1997, pp. 308-13; Snyder 1996, pp. 4-5; Joyner 1999, pp. 66-9; Rosenberg 2002, pp. 243-7; Gyo Koo 2009, pp. 137-41.

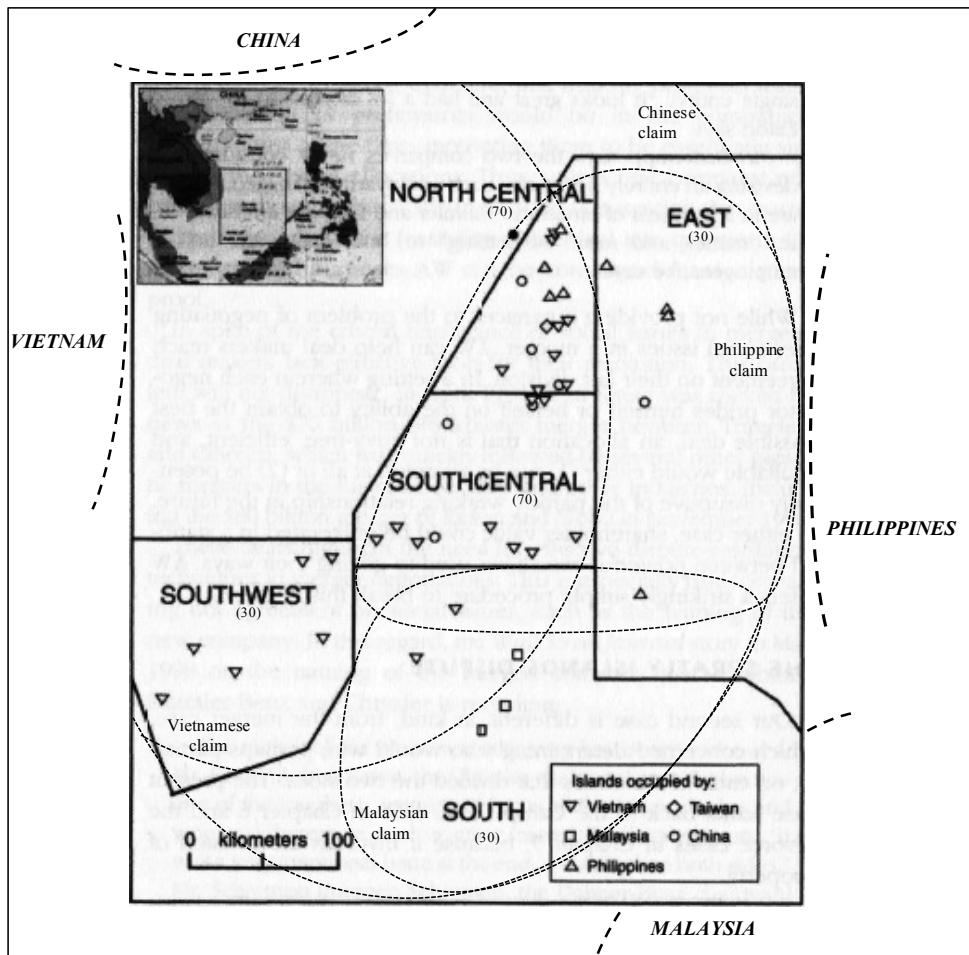
analyses, the issue of development is intricately linked to sovereignty; therefore, separating the two is highly problematical (Park 1978; Denoon and Brams 1997; Emmers 2005; Pan 2009). I accordingly discuss ownership (as related to joint-development) and sovereignty together, as both necessitate cooperation on a method of division. What explains the lack of collective action? The distributional problem underscores the divergence in state preferences over the allocation of benefits—particularly territorial gains, but ownership rights as well—resulting from any agreement concerning the division of the Spratly Islands.

The contest for the Spratly Islands predates World War II. According to the states with the largest claims—Vietnam and China—their ties to the territories originated, in the case of the former, in the period of mid-19th century colonialism, and in the case of the latter, in ancient periods of dynastic rule.⁴ Notwithstanding these declarations, across the four countries, the basis of each independent claim presents a variation in historical and legal substantiation, as well as in justification on the grounds of occupation and proximity. The purpose here, however, is not to debate the legitimacy of the claims; and as I argue later, existing measures intended to validate these maritime claims and establish boundaries are rather ineffective at resolving issues of territorial ownership and are unstable long-term solutions. Instead, my intention is to discuss the impact of the claims on the possible approaches to division.

Figure 1 presents a map of the Spratly Islands and an approximation of each state's claim. (For now, disregard the five zones within the map.) China maintains that the entirety of the Spratly Islands is part of its national territory. Vietnam declares as an extension of its sovereign space the next largest area; its claim to the east extends until just after the median of the Spratly Islands. The Philippines and Malaysia both have smaller demands. The former claims most of the archipelago's northern section as constitutive of its national space. The latter declares the

⁴ An outline of the claims is provided by Rosenberg 2002, p. 233.

Figure 1. Map of the Spratly Islands and national claims.



Source: Adapted from Denoon and Brams (1997); Brams and Taylor (1999); Valencia (1995); U.S. Department of State.

southern portion of the Spratly Islands as its territory. Evident from figure 1, the entire archipelago is an overlapping claim, with several areas to which more than two countries assert rights. National declarations pronouncing ownership over maritime space gradually aggravate the problem of competing claims; and the occupation of islands and reefs within contested areas exacerbates the issue. Overall, Vietnam maintains the most extensive presence, occupying nearly 30 islands. China and the Philippines each control approximately eight to ten territories. Malaysia sustains a smaller presence, occupying no more than six islands (Snyder 1996; Joyner 1999; Koo 2009).

A consequence of these claims and the strategic positioning across the maritime space is the short-of-force confrontations (e.g., seizing vessels or detaining fisherman) and small clashes occurring between states (Simon 1995; Denoon and Brams 1997; Joyner 1999; Rosenberg 2002). While such events are less intermittent in the contemporary period, that the dispute is politically unsettled sustains uncertainty in the South China Sea and the risk of future episodes of escalated diplomatic tensions. Concurrently, the absence of a resolution delays the opportunity for each party to capitalize on the military and industrial utility of the Spratly Islands. Given the political and economic reasons for collective action on a resolution, the status quo indicating noncooperative behavior is sub-optimal. However, cooperation among the claimants is affected by each state's distributional concerns. I raise two issues related to relative gains that prevent successful settlement of the dispute.

First, the ASEAN members are at an impasse with China. Across the dyadic interactions between China and each of the ASEAN members, there is no agreement on whether to pursue multilateral or bilateral bargaining to settle delimitation of the Spratly Islands' maritime space (Cui 2003). Although cooperation on either approach would yield an outcome in which both players benefit, the distributional problem has led the players to accept a collectively worse payoff.

China continuously advocates only for bilateral bargaining on ownership of the islands; moreover, it limits discussions to the topic of joint development (Valencia 1995; Joyner 1999; Rosenberg 2002; Cui 2003; Bercovitch and Oishi 2010).⁵ One reason for China's position on bilateral engagement, which follows from its historical conduct of diplomacy, is the state's desire to avoid being undermined by a collective ASEAN stance (Joyner 1999). In addition, China

⁵ China has participated multilaterally with the ASEAN states, but the scope of its participation has been in functional areas that are unrelated to sovereignty. See Bercovitch and Oishi 2010.

seeks to avoid further internationalization of the dispute. As Jie (1994, 896) notes, “internationalization would only enhance the positions of the smaller regional claimant countries in relation to China,” particularly with the involvement of an external power as a mediator, such as the United States. China expects that the participation of a third party would not bring impartial judgment, and thus, would not validate the totality of the state’s claim on the Spratly Islands.

Contrarily, the ASEAN members endorse multilateralism in discussing with China the issue of Spratly Island ownership. The greatest fear among the ASEAN states is that the outcome of any initial bilateral negotiation with China would establish a precedent that negatively affects the positions of small countries in subsequent rounds (Snyder 1996; Tønnesson 2003). Vietnam and the Philippines engaged independently with China on maritime delimitation in the early 1990s, and the result in both cases was a stalemate (Marlay 1997).

The second issue is the inability for any subset of the disputants to settle on a plan for joint-economic development of overlapping territory. The relative gains issue here revolves around the benefits from joint-development. The basic problem in establishing economic cooperation in contested maritime space is deciding the parameters of joint-ownership. There has been some success with bilateral and multilateral cooperation in the form of granting oil exploration contracts.⁶ Although determining the economic value is a vital step, the main issue is in sharing the hydrocarbon resources and their returns—that is, the apportionment of benefits (Rosenberg 2002; Acharya 2009).

It should be noted that the development of energy resources has yet to occur in the areas contested by more than two parties. Nonetheless, it is not unreasonable to assume that each of the parties has a different vision of how “joint” ought to be considered, which presumably involves

⁶ See Valencia, *China and the South China Sea disputes*; Denoon and Brams, 1997, pp. 314-5.

an asymmetry in the gains from the arrangement. It can be expected that China and Vietnam would demand a greater share because of the extent of their respective claims. Consistent with this, Valencia (1995) explicates that China is unlikely to agree to a development scheme in which the distribution of goods is equal among the parties. Indeed, Bercovitch and Oishi (2010) note that China rebuffed a doughnut-hole proposal for joint-development because its claims would be compromised.⁷

Similarly, the ASEAN members will not independently concede to the Chinese conditions of a bilateral agreement. Bercovitch and Oishi (2010) describe that the consequence of any bilateral agreement with China is the implicit renouncement of an ASEAN member's claim on the contested area in exchange for a share of China's economic benefits from the area's extracted resources. More broadly, Emmers (2005) explicates that, enhanced by the lack of a settlement on sovereignty, the present power asymmetries among the parties, including intra-ASEAN relations, undermine the negotiating positions of the states with smaller claims. Following on this, as Koo (2009) clarifies, cooperative ventures with China are impeded by the inability for ASEAN members to harmonize their preferences.

The distributional problem, intensified by each state's preferences, has rendered the stalemate outcome more attractive than cooperation. The persistence of the status quo, which is unstable in the long-term, has practical implications. First, none of the countries, independently or collectively, can fully exploit the economic resources residing within the maritime space, especially in the areas characterized by competing claims. Second, while the parties are not prepared to militarily escalate the dispute, high diplomatic tensions remain probable as the nature of government responses to encroachments on "claimed" territory is historically unpredictable.

⁷ See Bercovitch and Oishi 2010, p. 108. See Valencia (*China and the South China Sea disputes*) for more on the doughnut hole. A discussion of Valencia's proposals is in section III of this paper.

Existing regimes have attempted to settle the dispute; but as Simon (2008) asserts, most of these arrangements work toward conflict avoidance rather than resolution. On the one hand, mechanisms such as the Declaration on the Conduct in the South China Sea can be viewed as confidence building measures (CBMs).⁸ Notwithstanding their general importance for preventing the emergence and settlement of confrontational situations involving the use of force, contrary to Joyner (1999), current CBMs have been ineffective at providing an assurance of self-restraint.⁹ Despite agreement to certain measures, several parties have taken provocative actions by increasing their physical presence on controlled territories and enhancing military capabilities (Emmers 2005; Simon 2007; Simon 2008; Bercovitch and Oishi 2010). Thus, CBMs are unstable stopgaps.

On the other hand, international law, through such institutions as the International Court of Justice (ICJ) and the United Nations Convention on the Law of Seas (UNCLOS), also cannot provide a stable outcome. Denoon and Brams (1997) and Valencia (2003) emphasize the biased and unpredictable nature of ICJ rulings, as the criteria for what constitutes a legitimate claim is ambiguous. Moreover, the parties are not bound to the verdicts of the ICJ. Central to the status quo of the dispute, Dutton (2007) explains that UNCLOS leaves unresolved the areas to which there are competing claims.

Accordingly, to engender a more stable outcome, the resolution of the dispute resides in a method that incentivizes cooperation by providing a distribution of gains such that all parties receive a share it values highest. A system of fair division is the best alternative to bring about such a set of payoffs. Why a *fair* division? Because cooperation is hindered by the distributional problem in which there are asymmetric payoffs and strongly divergent preferences, logically,

⁸ This declaration is the foundation for a Code of Conduct for the South China Sea.

⁹ For his proposal of CBMs, see pp. 89-98.

only gains wherein each player perceives the value of its returns to be greater or equal to those of other participants could engender collective action.

How is fairness measured? Brams and Taylor (1999) assess the “fairness” of a procedure using three criteria.¹⁰ *Envy-freeness* indicates that each participant, according to her valuation, perceives her allocation to be at least equivalent to the shares of other participants; when this condition is satisfied, no player would want to trade his allotment for that of another. *Equitability* is demonstrated when every player’s portion is precisely equal to all others; that is, each player in a two-person bidding process, for instance, is awarded 54.3% of its perceived total value of the items. *Efficiency* reveals that no other distribution of goods could achieve greater satisfaction for all players without negatively affecting the share of at least one player. Employing these criteria, I assess a few of the proposed methods of division that provide longer-term solutions to the sovereignty issue.

Methods of allocation

Contrary to the existing regimes that work to avoid conflict, several solutions addressing the sovereignty issue have been proposed. In aggregate, these designs include variation in the extent of independent and joint ownership. Although these schemes are a significant improvement to the current regimes, the distributive implications limit their application.

Valencia (1995) devises four scenarios.¹¹ The first arrangement is a division of the South China Sea based on current claims; contended areas are dissolved and equidistance lines establish boundaries. This method, while simplistic, provides a disproportionate allocation of maritime space; the states with the largest claims, China and Vietnam, receive significantly

¹⁰ See pp. 13-6.

¹¹ See pp. 54-67.

greater shares of the Spratly Islands territory than the other parties. The second and third plans revolve around the creation of a “doughnut hole,” each scheme delineating a central area of different size. Using equidistance lines to mark boundaries with adjacent neighbors, national territory expands only 200 nautical miles (nm) into the South China Sea, thus consistent with the UNCLOS provisions for an exclusive economic zone (EEZ) and a continental shelf. The remaining central portion, formed by the edges of each 200nm national extension, is the doughnut hole. This area is designated as a zone of shared-ownership among all the states, creating what Valencia (1995, 62) refers to as a “multilateral cooperative regime.” The fourth arrangement develops on this multilateralism through the design of a “regional common heritage area.”¹² In this scheme, countries are entitled to their original claims; however, areas of overlapping contention operate under a multinational ownership that includes only the states with competing claims.

These last three scenarios are problematic because they engender additional collective action problems, while also not satisfying the fairness criteria. Determining the parameters of joint-ownership, and the arrangement itself, especially among more than two states, would be highly complex for both governments and firms. Two main challenges arise. First, there is the fundamental issue of establishing the share of each co-owner. Second, effective shared-ownership would likely necessitate a central authority to ensure compliance with the supporting regimes. Yet, institution building is costly, and more practically, deeper institutionalism conflicts with the norms of East Asian international politics. As Joyner (1999) asserts, a shared development scheme, while seemingly logical, is neither a permanent nor optimal solution to the sovereignty issue. These three scenarios also encounter difficulty meeting the criteria of fairness.

¹² This idea eventually develops into a scenario through which “joint-development companies,” representing the areas claimed by multiple countries, are created for the purposes of organizing collaborative economic ventures. See pp. 64-6.

The joint-ownership arrangement does provide for an efficient allotment. But shortcomings in Valencia's (1995) proposals demonstrate a lack of envy-freeness and equitability. Notably, because the status quo is used as a basis for determining initial boundaries, participants, particularly the Philippines and Malaysia, are *ex ante* at a disadvantage. Additionally, the size of the shared area affects the reduction in each state's allotment. Moreover, while Valencia offers an equal distribution of resources and profit among the parties, in his organizational design of the management scheme, China retains a preponderance of rights.

Divergently, Denoon and Brams (1997), and Brams and Taylor (1999), advance Adjusted Winner (AW) as a procedure for the fair division of the Spratly Islands. AW is a bidding process, involving two parties, that yields an equal allocation for each party in terms of their respective valuation of the items in contention. Applied to the South China Sea, AW organizes the Spratly Islands into five zones, and the bidding between the two players ASEAN and China determines which areas are designated to either participant. The mathematical model ultimately produces an outcome in which there are zones of independent ownership for each party and a zone of joint management to be shared between both participants; AW establishes the fractional ownership of this zone.

The main shortcoming of AW is the two-player format. This limitation has implications for the reality of an ASEAN collective and the fairness of the procedure. Substantively, aggregating Malaysia, the Philippines, and Vietnam under ASEAN in a bargaining process suggests homogeneity among these members. However as Acharya (2009) and Cui (2003) emphasize, intra-ASEAN tension and divergent domestic interests would impede the capacity for the members to harmonize on a unified bid. On the theoretical fairness of the AW division, the procedure may not in fact produce an envy-free or efficient outcome. It is true that the shares the

ASEAN collective and China receive are initially envy-free. However, because the Southeast Asian countries have different independent valuations for each zone, further division of ASEAN's allotment would yield shares that are not proportional vis-à-vis China; each member is allocated a personal share that is significantly less than the 50 percent China possesses, and perhaps lower than the 20 percent minimum portion each should perceive to have been awarded. Therefore, an alternative process should account for more than two parties while satisfying conditions of fairness. I present such a procedure in the following section.

Win-to-Select Procedure

The collective action problem of the Spratly Islands dispute is derived, in part, from distributional conflict. Based on the potential outcomes of the existing maritime regimes or other proposed division methods, the expected asymmetric gains from cooperation obstruct progress toward reaching a political settlement. The task, therefore, is to develop a mechanism through which the payoffs from cooperation meet fair-division criteria. Specifically, the outcome must be such that the share of the Spratly Islands that each player receives should include the territory it values highest.

A process of fair allocation could thus provide the conditions sufficient for cooperation. I propose an alternative fair-division system to engender a more balanced distribution of gains: the Win-to-Select Procedure ("WSP"). It is a two-stage process, wherein the first phase involves the apportionment of the territory among the players, and the second phase determines the sequence in which territory is chosen. This method builds on two previous models, AW (Denoon and Brams 1997; Brams and Taylor 1999), the Gap Procedure (Brams and Kilgour 2001). Moreover, it incorporates the Hamilton method of apportionment and the Webster procedure of sequencing

(Brams 1989; Brams and Kaplan 2004). I present the procedure in the following. I first introduce its methodological basis. I then expound its application utilizing a model based on geographic security. Subsequently, I discuss the utility and limitations of WSP.

As previously discussed, Denoon and Brams (1997) and Brams and Taylor (1999), propose AW to arrive at a fair division of the Spratly Islands. WSP adopts the general point-assignment feature of AW. The employment of finite points rather than unlimited monetary tenders provides for equality in voting, since the latter would automatically place the Southeast Asian countries at a severe financial disadvantage vis-à-vis China. WSP also integrates the five-zone organization of the Spratly Islands within AW. But WSP is embedded in an alternative format because of AW's two-player limitation; aggregating the Southeast Asian countries' preferences into the single actor ASEAN provides an obstacle to the method's practical application.

The Gap Procedure advanced by Brams and Kilgour (2001) affords a more functional format for developing a division procedure. It is presented as an alternative bidding process for dividing a set of goods or items that entail costs among n players (where $n \geq 2$). Brams and Kilgour apply this to the problem of assigning rooms and rent to individuals in a living space. In the housemate example, players bid on the rent they are willing to pay for each room that is available. Each room is assigned to the highest bidder, assuming that the winning bids meet or exceed the total rent for the living space—referred to as finding the *maxsum*. For the Gap Procedure to function, there is a minimum value for the total set of goods that the aggregate bids must reach; otherwise, the situation is infeasible for the method (i.e., the rule of *feasibility*). The final room prices are determined by a modified process of proportional reduction. The winning bid—representing rent—is decreased by an amount that accounts for the competitiveness in the

valuations of an item, represented by the “gap” between the highest and next-highest bids for that item. Essentially, the final cost each participant incurs for the item it wins is ultimately lower than its valuation, allowing each participant to sustain a savings in the price it pays for the item.

Essentially, WSP utilizes the point allocation bidding and item organization of AW, and the n -player format and proportional reduction framework of the Gap Procedure. WSP improves on the limitations of the original division methods to account for the constraints of the Spratly Islands dispute, outlined earlier. The independent claims, however, present an obstacle. As other analyses of the conflict maintain, each state’s objectives are ambiguous; consequently, it is difficult to determine the weight of the various influences on decision-making processes (Brams and Taylor 1999; Cui 2003). Concerns include geographic security and economic value. To illustrate WSP, I apply the procedure to a model in which the players are concerned with geographic security. Although a simplification, this single-goal scenario demonstrates the possibility of fair division among more than two parties, and therefore, cooperation on a political settlement of the Spratly Islands. As will be revealed, given the context of the dispute, WSP yields gains that are efficient and envy-free, two fairness criteria used by Brams and Taylor (1999) to assess the fairness of allocation methods.

Structure

WSP is composed of two stages: division and selection. The first phase is the point allocation process wherein players bid on territories that are clustered across five zones. This point assignment procedure results in the territorial share for each player. The second phase is the selection of the territories according to an order determined by the point allocation results. I elaborate on the procedure in the following.

In WSP, the set of players $n = 4$, which consists of China, Malaysia, the Philippines, and Vietnam.¹³ Each participant i is endowed with a fixed number of points P , wherein $P = 230$. This quantity corresponds to the approximate number of territories comprising the Spratly Islands (Denoon and Brams 1997; Brams and Taylor 1999; Joyner 1999).¹⁴ Define *territory* as an island or islet and the accompanying features (e.g., reefs and shoals) and surrounding maritime space, over which jurisdiction would be given by boundaries marked using equidistance lines. Organizationally, the 230 territories are divided into five *zones*, according to those in the AW application¹⁵: East, North Central, South Central, South, and Southwest. These areas are illustrated in figure 1. Due to a lack of official estimates, for the purposes of explaining the procedure, I assume the following *ex ante* distribution of territory across the five zones, which is depicted in table 1.¹⁶ Players allocate their 230 points across all, or only some, of the five zones; thus, a player can choose not to distribute points to a zone. WSP then transforms players' point assignments into the shares of territory to which they are entitled. The size of each participant's territorial share in a given zone is utilized to determine the sequence by which territory is selected by the claimants. To demonstrate the procedure, I refer to a model under which players are concerned with maximizing their geographic security. WSP proceeds as follows.

Table 1: Distribution of territory.

Zone 1 = 30 (East)	Zone 2 = 70 (No. Central)	Zone 3 = 70 (So. Central)	Zone 4 = 30 (South)	Zone 5 = 30 (Southwest)
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¹³ In any application of this method, $n \geq 2$. Thus, the procedure could include more than the four East Asian claimants discussed here.

¹⁴ Any number, such as 100 in AW, could be the fixed-point scheme; here, the quantity of 230 provides for a simple calculation of each state's territorial share resulting from WSP.

¹⁵ See Denoon and Brams 1997; Brams and Taylor 1999.

¹⁶ This *ex ante* distribution of territory is also noted in parentheses in figure 1 (p. 5).

Point allocation. A state $i \in \{1, 2, 3, 4\}$ allocates p_i points, from its endowment P_i of 230 points, to a zone $j \in \{1, 2, 3, 4, 5\}$. Thus, for each zone, state i 's allotment of points is p_{ij} , wherein $0 \leq p_{ij} \leq 230$. In aggregate, the bids for state i across all five zones cannot exceed 230 points; that is,

$$(1) \quad 230 \geq \sum_{j=1}^5 p_{ij}.$$

The sum of all players' point allocations to a zone j is given by $\sum_{i=1}^n (p_{ij})$.

To illustrate WSP, consider the following model. Suppose that the goal of each player is to maximize its geographic security. The states thus allocate points according to the following assumption:

- i) *Each state values highest the territory in zones corresponding to its claims and occupancy, and that is closest to its national borders.*

Given this condition, an example of the bidding process is displayed in table 2 (p. 18). The first column presents the n players in the procedure. As in table 1, the first row displays the five zones and the distribution of territory. Rows 2 through 5 represent the point allocation for every participant across all the zones. Consistent with inequality (1), the summation of a player i 's points over all zones returns a value of 230 points, as indicated in the last column of table 2.

Since the states are functionally similar, each places a higher utility on the zones in which it presently maintains a physical presence. This information is provided by the maps of Valencia (1995), Denoon and Brams (1997), and Brams and Taylor (1999).¹⁷ China, the Philippines and Vietnam assign more points to North Central; this is the area in which each of the three countries has a high concentration of occupied territories. In addition, China allocates an equivalently large share of points to South Central, where it also possesses a substantial physical presence. Vietnam

¹⁷ Valencia 1995, p. 5, p. 65; Denoon and Brams, 1997, p. 311; Brams and Taylor 1999, p. 134.

Table 2: Players' point allocations under a scenario of geographic security.

	Zone 1 = 30 (East)	Zone 2 = 70 (No. Central)	Zone 3 = 70 (So. Central)	Zone 4 = 30 (South)	Zone 5 = 30 (Southwest)	Total
China	20	100	100	—	10	230
Malaysia	10	—	80	140	—	230
The Philippines	110	110	10	—	—	230
Vietnam	—	70	60	10	90	230
<i>Total</i>	140	280	250	150	100	
<i>Surplus</i>	110	210	180	120	70	

places high bids on both South Central and Southwest, across which the preponderance of its occupied territories are spread. The Philippines places greater value on the East mainly because of proximity, but it also maintains a small physical presence on the territories. Likewise, Malaysia assigns the majority of its points to South Central and the South, where, in the latter, it occupies a few territories. Based on this distribution of points, the “winner” of zones 1 and 2 is the Philippines; China, Malaysia, and Vietnam are the winners of zones 3, 4 and 5, respectively. The significance of winning a zone is the first-mover advantage reward in the sequencing stage of WSP, which I elaborate on later. I now turn to the calculation of the players' territorial shares of the Spratly Islands.

Surplus. Define the surplus s_j as the number of points bid from all states in a zone j exceeding the maximum number of territories that can be allocated in that zone m_j . The maximum quantity m_j for each zone is derived from the distribution of territory described above and illustrated in table 1 (p. 16). The surplus is thus determined by subtracting the maximum quantity of territory that can be distributed in a zone, m_j , from the total number of points assigned to the zone by all players; that is,

$$(2) \quad s_j = \sum_{i=1}^n p_{ij} - m_j.$$

Referring to table 2 (p. 18), the last row provides the surplus of allocated points for each zone. For example, using equation (2), the surplus in Zone 1, s_1 , is $140 - 30 = 110$. The value of the surplus is used to calculate the territorial shares of all players for a given zone.

Proportional reduction and apportionment. WSP transforms players' point allocations into the shares of territory to be awarded. Let t_{ij} be the initial territorial share t of a state i for a zone j . This value is the result of a proportional reduction procedure.

Since the sum of the points assigned by all players to a zone j may be greater than the quantity of territory that can be distributed m_j , the surplus of points allocated to that zone, s_j , must first be expunged. Through proportional reduction, a player i 's point assignment to a zone p_{ij} is converted to a value that represents its initial territorial share t_{ij} . Subtracting from p_{ij} the product from multiplying the surplus s_j , acquired through equation (2), by the proportion of its point allocation to the total points bid to the zone, i.e., $p_{ij}/\sum_{i=1}^n (p_{ij})$, returns a participant's t_{ij} . This is expressed as

$$(3) \quad t_{ij} = p_{ij} - s_j \left(\frac{p_{ij}}{\sum_{i=1}^n p_{ij}} \right)$$

To demonstrate the proportional reduction scheme, consider Malaysia's point assignment for zone 3 in table 2 (p. 18). Applying equation (3), the state's $t_{ij} = 22.4 = 80 - 180(80/250)$. The effect of the proportional reduction method is that the sum of the players' initial territorial shares in zone j is equal to the maximum quantity of territory in that zone; i.e., $\sum_{i=1}^n (t_{ij}) = m_j$. Because t_{ij} is any real nonnegative number, some values will have fractional parts. Although a single

Table 3: Initial territorial share t_{ij} for all players.

	Zone 1 = 30 (East)	Zone 2 = 70 (No. Central)	Zone 3 = 70 (So. Central)	Zone 4 = 30 (South)	Zone 5 = 30 (Southwest)	Total
China	4.29	25	28	—	3	60.29
Malaysia	2.14	—	22.4	28	—	52.4
The Philippines	23.57	27.5	2.8	—	—	53.87
Vietnam	—	17.5	16.8	2	27	63.3
<i>Total</i>	30	70	70	30	30	

territory could be divided among two or more parties, this presents an additional challenge.

Instead, WSP employs the Hamilton method of apportionment to determine integer shares of territory.¹⁸

Define t_{ij}^* as the true territorial share of a player i for a zone j . The apportionment process transforms t_{ij} , the value of which may consist of a fractional part, to t_{ij}^* , an integer. The Hamilton method is a simple rounding scheme in which quotas are increased to the nearest integer starting with the value possessing the largest fractional part; the pattern continues in descending order until all legislative seats have been assigned. As applied by WSP, every player in a given zone is awarded the integer part of its initial territorial share. This will leave extra territories to be distributed. The t_{ij} possessing the greatest fractional part is rounded-up to the closest integer; the t_{ij} with the next-highest fractional part is then rounded, and the process persists until the sum of all integers is equal to m_j . Therefore, a player i 's resulting integer value of territorial share is t_{ij}^* .

The Hamilton method is demonstrated in table 4, which illustrates the division of territory in zone 3. The first column provides t_{ij} for every participant based on the point allocations derived from table 2 (p. 18); as indicated in the last row of the first column, $\sum_{i=1}^n (t_{ij}) = m_j = 70$.

¹⁸ See Brams (1989), pp. 79-82, for an illustration of the Hamilton method of apportionment.

Following the Hamilton scheme, the second column displays the integer apportionment each player receives based on the integer part of its t_{ij} . The sum of the awarded integer values is two units less than the maximum quantity of territory in the zone. The next step, then, is to round t_{ij} such that the resulting sum of integers is equal to the total number of territories in the zone.

In the case of zone 3, the rounding procedure begins with Vietnam, whose fractional part of its territorial share is tied with the Philippines but whose integer is larger. Under these circumstances, the participant with the greater integer shall have priority in the rounding scheme. Vietnam's territorial award is increased from 16 to 17. Since the maximum quantity of territory in the zone is not yet reached, the Philippines' share is then improved from 2 to 3. The integer value resulting from the Hamilton method, whether or not it was manipulated by rounding, is a player i 's true territorial share t_{ij}^* . As indicated in the final column in table 4, after rounding t_{ij} for Vietnam and the Philippines, $\sum_{i=1}^n (t_{ij}^*) = m_j = 70$.

Having demonstrated the derivation of a player i 's awarded territorial share, table 5 reveals t_{ij}^* for all players in the model, which is based on the point assignments in table 3 (p. 20). The figures in the last column are each participant's total territorial share across all zones; this represents the aggregate portion of Spratly Island sovereignty won by each state. There is an

Table 4: Apportionment of territory for zone 3 using the Hamilton method.

	Initial Share (t_{ij})	Integer apportionment	True Share (t_{ij}^*)
China	28	28	28
Malaysia	22.4	22	22
The Philippines	2.8	2	3
Vietnam	16.8	16	17
<i>Total</i>	70	68	70

Table 5: True territorial share t_{ij}^* for all players.

	Zone 1 = 30 (East)	Zone 2 = 70 (No. Central)	Zone 3 = 70 (So. Central)	Zone 4 = 30 (South)	Zone 5 = 30 (Southwest)	Total
China	4	25	28	—	3	60
Malaysia	2	—	22	28	—	52
The Philippines	24	28	3	—	—	55
Vietnam	—	17	17	2	27	63
<i>Total</i>	30	70	70	30	30	

important case to note. In the model presented here, the point assignments for every zone are such that the sum of all bids exceeds the maximum quantity of territory to be distributed; i.e., $\sum_{i=1}^n (p_{ij}) > m_j$. However, there may be a case in which $\sum_{i=1}^n (p_{ij}) < m_j$. In such a scenario, a “proportional increase” calculation is utilized to award larger territorial shares to those players who assigned points in that zone. The method for this can be found in the appendix.

As the results in table 5 convey, each of the states gains a share of the territory in the zones to which they allocate points. One general finding is that a player i ’s territorial share in a given zone j increases as it allocates more points to that zone. Focusing on the pure goal of maximizing geographic security, the distributed territorial shares enable the claimants to establish, or sustain, a physical presence in the areas of the Spratly Islands perceived to be most important to their respective geo-strategic interests. Furthermore, overlapping claims are settled by permitting multiple ownership in those areas, which is achieved through the control of a single territory.

4) Selection. The second stage of WSP is the selection of the territory in each zone by the players. The order in which players choose territory is determined by the Webster method of

sequencing (Brams and Kaplan 2004). Succinctly, the “winner” of each zone—i.e., the player who allocated the most points and thus received the greatest share of territory—gains first-mover advantage in selecting territory; the Webster method of sequencing consistently provides such a result. While the first choice is not a problem, the order of subsequent turns must be determined.

In its original form, the Webster procedure uses a formula (whose inputs are derived from the associated Webster method of apportionment) to arrive at a sequence for allocating ministries to parliamentary parties. The order of selecting ministries is based on the values returned from the formula. I modify this equation to include the relevant variables of WSP. Applying the Webster sequencing procedure to WSP, the order for selecting territories in each zone is given by

$$(4) \quad W_{ij} = t_{ij}^*/(a_{ij} + 1/2).^{19}$$

As Brams and Kaplan (2004) explicate, participant turns are determined by the highest values of W . In equation (4), W_{ij} therefore functions as a ranking value for a player i in zone j , t_{ij}^* is the true territorial share, and a represents the *current* number of selected territories (for a player i) at a given turn in the order; thus, a ’s value is updated by the integer 1 after every instance that player i selects a territory.

To demonstrate this sequencing method, I refer to the states’ true territorial shares t_{ij}^* of zone 3 in table 4 (p. 21); China—the winner of the zone—receives 28, Malaysia acquires 22, the Philippines obtains 3, and Vietnam gains 17. Effectively, the number of territories to which each player is entitled is also the number of turns that player will have in the sequence.

Table 6 displays the first few instances of each player’s W_{ij} . As the winner, China selects first; and equation (4) returns a W_{ij} that is highest for China. At the start of the ranking, China

¹⁹ The value of 1/2 in the latter term is related to the Webster rounding method. Indeed, any value greater than 0 could be inserted; however, for the purposes of simplicity and consistency I maintain the 1/2 value in the divisor. See Brams and Kaplan (2004).

has not yet selected a territory, so $a = 0$. Consequently, $t_{ij}^*/(a_{ij} + 1/2) = t_{ij}^*/(1/2) = W_{ij}$. Inserting values for the variables, $28/(1/2) = 56 = W_{ij}$. Likewise, the other players also have not selected territory at the commencement of the sequencing method; therefore for each participant, $a = 0$. For Malaysia, $22/(1/2) = 44 = W_{ij}$. As the sequencing method continues, a_i for each player i increases by a value of 1 until the $a_i = t_{ij}^* - 1$. Therefore, in calculating W_{ij} for China in the second instance, $a = 1$, and $28/(3/2) = 18.667 = W_{ij}$. In the final calculation for China, $a_i = t_{ij}^* - 1 = 27$, which results in $W_{ij} = 1.018$.

The values of all W_{ij} for every player are ranked, forming a sequence. Referring to table 6, China's value of 56 is the highest; it therefore chooses territory first. The second choice belongs to Malaysia, whose value of 44 is the next-highest. The subsequent selection is made by Vietnam, whose value of 34 ranks third. Unfortunately, for the Philippines, its initial turn to choose territory does not occur until much later in the sequence because its highest value of 6 is lower than the successive values of W_{ij} , which are associated with those players who allocate greater shares of points to the zone in the bidding stage.

This process of ranking W_{ij} persists until the sum of the players' turns is equal to the quantity of territory to be awarded in that zone; i.e., $\sum_{i=1}^n(t_{ij}^*) = m_j$. In the case of zone 3 of the model, a sequence of 70 turns is developed. This selection order is as follows, wherein the

Table 6: Results of the Webster sequencing method.

	$a_{ij} = 0$	$a_{ij} = 1$	$a_{ij} = 2$
China, W_{ij}	56	18.667	11.2
Malaysia, W_{ij}	44	14.667	8.8
The Philippines, W_{ij}	6	2	1.2
Vietnam, W_{ij}	34	11.333	6.8

abbreviations C, M, V, and P refer to China, Malaysia, Vietnam, and the Philippines, respectively:

CMVCMVCMCVMCP CMVCMVCMCMVCMCP/VCMCVMCMVCMCMVCMCP CMVCMCVMCP
VCMCVMCMCVMC.

Winners will *always* select first. The results from the point allocation process indicate that higher point allocations by a player i are increasing in i 's territorial share, and consequently, the number of turns in the selection order. As the 70-turn sequence of zone 3 suggests, players who have greater (true) territorial shares are awarded with more turns before those participants with the smaller shares have the opportunity to choose. For example, the Philippines' first selection is not until thirteenth turn in the overall sequence; by this point in the selection, the other three states have each had at least three opportunities to select territory. These observations about the allocation and sequencing outcomes of WSP are the result of each player's private valuation of a zone and the competition over winning the zones, both of which are indicated by a participant's initial point allocations.

Discussion

The fundamental purpose of WSP is an outcome of fair division. In reviewing the model of geographic security, how fair is the distribution? The results reveal that the allocations are envy-free and efficient. Assuming sincere bidding in players' point allocations, the resulting territorial shares are envy-free²⁰; that is, none of the countries should be willing to exchange its territorial share for another state's share, since this would result in a loss on the zones each values highest. A corollary is that the outcome is also Pareto-optimal, as the shares of territory cannot be reorganized without incurring a cost—i.e., a territorial loss—to another state.

²⁰ See Brams and Taylor 1999, pp. 13-4, for additional clarification on envy-freeness.

One limitation to WSP is that it does not provide an equitable division of the Spratly Islands. Assessed on the allocated territorial shares, the countries are not guaranteed equal quantities of territory. In the outcome of the model in table 5 (p. 22), there is variance in participant gains, albeit small; each state receives some share in the range of 50 and 60 territories.

The results in table 5 (p. 22), however, are hypothetical and are intended only to illustrate WSP. I note two caveats about the preceding analysis. First, the territorial allocations from WSP are based on limited information about the utility of the Spratly Islands. Especially vague is the available analysis on the economic potential of the territories. Second, the model referred to throughout provides a distribution of gains based on the concern for geographic security. In reality, the calculus of political leaders includes a mix of motives—and the extent to which political and economic motives, *inter alia*, affect the decision-making process cannot be known with certainty.

Reviewing its methods, WSP integrates features of several fair settlement procedures. In terms of its structure, it utilizes the Gap Procedure's n -player design, which is conducive for the number of parties to the dispute—in this analysis, $n = 4$. Most important, WSP employs a proportional reduction formula (to determine the share that a state wins), which is common among fair settlement mechanisms (Brams and Kilgour 2001) and which is modified in the Gap Procedure. Akin to the Gap Procedure, the outcomes of WSP provide for winners and territorial shares that are affected by competitive point allocations. WSP also functions in scenarios that are otherwise “infeasible” in the Gap Procedure. These cases occur when $\sum_{i=1}^n (p_{ij}) < m_j$; this is explained in the appendix. Accounting for the problems posed by the context of the dispute, particularly the large but finite number of islands and reefs, WSP deviates from the Gap

Procedure by grouping territories into zones, corresponding to AW’s format; this avoids allocating points across an extensive set of items, some of which no player may want, thereby rendering the procedure inefficient.

The method also differs from AW and the Gap Procedure in that a zone “won” is not the exclusive territory of the highest bidder. This has implications for the distribution of territory. Whereas the competing claims dimension is settled by AW and the Gap Procedure through sole sovereignty, and thus excludability, WSP permits multiple parties to maintain a stake in contested maritime space.²¹ In this way, WSP allows for the possibility of states gaining sovereignty over territories in each of the five zones, while ensuring that the total number of allocated territories does not exceed the population of islands.

Despite the shortcoming concerning equitability, WSP appears to satisfy the fair-division criteria of envy-freeness and efficiency. The procedure is intended to respond to the distributional implications of other proposed alternatives, such as Valencia’s (1995) joint-development schemes and AW (Denoon and Brams 1997; Brams and Taylor 1999). In achieving fairness, WSP excludes the significance of claims prior to the process; instead, the claims are a private baseline for each state’s independent valuation. Accordingly, every party is fundamentally entitled to an equal claim to the islands. An additional consideration, however, is that smaller point assignments, for example where $p_{ij} = 1$ for some player i , may have a return such that $t_{ij}^* = 0$. This is one consequence of the Hamilton method of apportionment.²²

Furthermore, WSP’s format enables the inclusion of more than two participants. This is a critical dimension to the bargaining circumstances among the Spratly Island claimants; specifically, the heterogeneity in the valuation processes among ASEAN countries implies that

²¹ There is the exception of possible shared-ownership over a zone in AW; nevertheless, the distributions from both AW and the Gap Procedure exclude “losers” from the “winner’s” set of items.

²² See Brams (1989), p. 80, table 4.4 for an illustration of a seat apportionment of zero despite a nonzero quota.

the Southeast Asian countries cannot be treated as a collective unit. Indeed, the n -player condition will continue to pose problems for any division process applied to the Spratly Islands.

Conclusion

In this analysis, I examine the collective action problem embedded in the Spratly Islands dispute. I contend that the lack of cooperation among the claimants toward resolving the fundamental issue of sovereignty, or even the matter of joint-development, is in part a consequence of the distributional problem. The effect of relative gains on collective action is the enduring acceptance, by the disputants, of the sub-optimal status quo. Therefore, a sufficient condition for cooperation in this dispute is a distribution of benefits such that each state's share of the Spratly Islands includes the territory it values highest.

Accordingly, this logic prompts the main research inquiry: is there an alternative method of fair division through which sovereignty can be allocated among more than two parties? I develop WSP as a method for mitigating the distributional problem. As the model of geographic security demonstrates, the procedure yields envy-free and efficient shares of territory, which should incentivize cooperation. Although the model presented abstracts from the complexity of the distributional conflict, WSP reveals the possibility of overcoming the asymmetry in gains that result in other alternatives. Ultimately, this research is intended to build on the existing methodology of fair settlement (Brams and Taylor 1999; Brams and Kilgour 2001).

Of the two fundamental obstacles to collective action, I have addressed the relative gains issue that underlies the unsuccessful approaches to dividing the Spratly Islands. Provided that the players are bidding sincerely, then WSP results are envy-free, as each state would receive a share of territory that it values highest and would therefore not desire to trade its gains for those of

another state. The other impediment to collective action is compliance, which ought to be the focus of future research, as this component is critical to achieve lock-in on an outcome among the claimants. Akin to the literature on the commitment to international agreements, one challenge with the practical application of fair-division methods, such as WSP and AW, is that their utility relies on the assumption that all parties have the political will to agree and bind themselves to the process and outcome. Thus, enhancing the prospects for multilateralism—the format for bargaining and negotiations that has not yet prevailed with regard to the sovereignty of the Spratly Islands—is a topic that should be addressed further.

A final dimension, which also requires attention, is the regime or ad-hoc conflict mediation mechanism through which bargaining or negotiations will occur. The implication here is that the construction of a new regime may be required to commence the division process, and this may be a costly alternative. Another option is a mediator, a role Indonesia has assumed in the past (Simon 1995; Acharya 2009); yet, the involvement of a state outside of the dispute or an extra-regional state will be met with resistance, particularly from China.

Since competition over the strategic Spratly Islands intensified in the 1970's, there has been marginal progress toward a political settlement. The political and economic potential of this maritime space continues to be untapped as stalemates persist over the manner in which to approach the division of the islands. This analysis has endeavored to explain the noncooperative behavior among the claimants and develop an alternative method for allocating sovereignty. Although the Spratly Islands issue is not regarded as an inciting incident for future interstate war, the mercurial behavior from governments in response to "infringements" on national territory has escalated to low-level militarized interstate disputes. This underscores the need for a political settlement in the near future. Moreover, the status quo affects the opportunity for the parties to

collectively benefit from the value of the maritime space—either politically or economically. Therefore, the Win-to-Select Procedure should be considered a methodological starting point for overcoming the relative gains issue of that obstructs progress toward a fair resolution to the Spratly Islands dispute.

Appendix

In the case where the total points allocated to a zone j do not meet the maximum quantity of territory that can be distributed m_j —that is,

$$(i) \quad \sum_{i=1}^n p_{ij} < m_j$$

—the participants bidding for that territory receive “proportionally increased” shares. Consider the following point assignments in example 1.

Example 1. Sum of point allocations is less than zone maximum.

Zone 3 = 70 (So. Central)	
China	30
Malaysia	10
The Philippines	—
Vietnam	10
<i>Total</i>	50

Because the sum of allocated points for zone 3 is less than the maximum quantity of territory in the zone, reflecting inequality (i), the distribution of territory is based on a formula that increases each player’s final share compared to their original point assignments. A player i ’s initial territorial share t_{ij} is calculated by multiplying the total number of territories in zone j by the proportion of state- i ’s point assignment to the total points bid. Formally, this is expressed as

$$(ii) \quad t_{ij} = m_j \left(\frac{p_{ij}}{\sum_{i=1}^n p_{ij}} \right).$$

Applying equation (ii) to example 1 yields the following t_{ij}^* for each participant in table 7.

Table 7: True territorial share t_{ij}^* for players after “proportional increase.”

	Point allocation	Initial Share (t_{ij})	True Share (t_{ij}^*)
China	30	42	42
Malaysia	10	14	14
The Philippines	—	—	—
Vietnam	10	14	14
<i>Total</i>	50	70	70

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