

# Ultimate Outcomes in Refugee Negotiations\*

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## Abstract

We explore the resolution of strategic interaction in refugee crises through a class of alternating-move games. In particular, we apply a revised Theory of Moves (ToM) by Willson (1998) to eight refugee crises, and compare it to the original version by Brams (1994). The eight crises span more than three decades and multiple regions from Southeast Asia to the Caribbean. We represent the partially conflicting interests of the key players (e.g., countries of origin and asylum and donor countries) by seven 2x2 payoff configurations and a 3x3 configuration. Our specifications rest on analyses of narrative accounts of the crises. In each case, we compare the historical outcome to the ultimate outcome of Willson and to the nonmyopic equilibrium of Brams. The ultimate outcomes offer improved explanatory power in some cases, and are in no case decidedly inferior to the nonmyopic equilibrium. Thus, the version of ToM by Willson appears to capture the structure of refugee negotiations in these cases better than the alternative formulation.

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## Introduction

The movement of people as refugees, rather than as migrants, has attracted little attention from economists, who perhaps see little in the way of choice in the movements. Yet, at a higher level of aggregation, government actions can trigger refugee movements, and these in turn stimulate strategic interaction among the state-level actors who control, or at least influence, such events. Thus, a game-theoretic formulation of the interactions would seem an appropriate analytical approach. We undertake such analyses of several refugee crises using a simple formulation that is parsimonious in terms of the technical assumptions that must be satisfied for its application – the Theory of Moves (ToM), proposed originally by Brams (1994) and revised substantially by Willson (1998).

ToM is a framework encompassing a set of extensive-form games for analyzing strategic interaction with purely ordinal payoffs and sequential moves. It is best suited for situations in which researchers have limited information about the preferences of the players – only rank orderings of the possible outcomes of the interaction – and in which choices are not inherently simultaneous. We believe these characteristics apply to many negotiations over the plight of refugees. In such situations we can often identify the main players (e.g., a first asylum country and donor country), the basic choices often reduce to a few (e.g., permit or deny first asylum; provide modest or generous assistance), and the interaction takes place over an extended period. Further, our information on the players' preferences is limited to rank orderings, not necessarily complete, over a small number of outcomes – the consequences of the strategic choices of the players.<sup>1</sup>

Indeed, versions of ToM have been applied to the Indochinese refugee crisis (Zeager, 1998), several Cuban refugee crises (Zeager, 2004), and the crises for Kosovo refugees on the Macedonian border (Williams and Zeager, 2005). In these situations we sometimes observe threats to deny asylum and even to cut assistance. The outcomes that we observe correspond to predictions by the threat power version of ToM (Brams, 1994). Yet the threat power version of ToM is not a completely satisfactory explanation, because it has an *ad hoc* flavor. For example, it justifies the rationality of threats by invoking the possibility of “repeated play,” which is not formally modeled. Indeed, such a notion would be hard to model in a consistent way using only ordinal preferences, because they make it difficult to perform the discounting required to compare payoffs across periods.

The mathematician Willson (1998) has reformulated ToM in a way that avoids such problems and is formally more rigorous. He retains the ordinal payoffs, alternating “moves” (changing strategic choices) from an initial state (a pair of prior strategies given by the history of the situation), and the opportunity to “pass” (maintain a strategy) when a player has a turn to move, but he requires two consecutive passes, instead of just one as in Brams (1994), to end the game. This rule renders the interactions more like negotiations, where each player must agree to accept the same outcome. As we will show, the rules of Willson allow a player to exercise credible threats without introducing *ad hoc* appeals to unmodeled repeated play or to special “powers.” Furthermore, ultimate outcomes (UO) in Willson (1998) need not correspond to non-myopic equilibria (NME) in Brams (1994) – or the Nash equilibria (NE) of the corresponding bi-matrix game, though they usually do.

Refugee negotiations have three classic, permanent outcomes: return to the country of origin (repatriation), asylum in the country to which the refugees have fled, and resettlement in a third country.<sup>2</sup> We will look at cases involving all three solutions in this paper. Along with protection for refugees (repatriation, asylum, or resettlement), the negotiations often involve assistance from a donor country. In cases where there is more than one donor country, the United Nations High Commissioner for Refugees (UNHCR) has often represented these countries in the negotiations.

The 1951 United Nations Refugee Convention and 1967 Protocol (Jaeger, 2005) codify the international system for refugee protection. The purpose of this international law is to eliminate the need for *ad hoc* negotiations, so the very existence of the negotiations that we examine here reveals a breakdown in this international refugee protection system. Nevertheless, such negotiations have led to durable solutions in certain cases, in spite of ominous threats of humanitarian catastrophes (e.g., boat people in the 1979 Indochinese refugee crisis and Kosovars stuck at the Macedonian border in 1999). These examples lead us to ask, “How did cooperation arise in seemingly unpromising situations?”

To answer this question, we bring game-theoretic perspectives to bear on a portion of the growing narrative literature on refugee crises. We consider eight cases of refugee negotiations,<sup>3</sup> covered by five 2x2 ordinal payoff matrices (with differing initial states or first-movers in several of the games) and one 3x3 payoff matrix. As far as we know, this is the first empirical application of Willson’s version of ToM in any setting. We find that the UO of Willson (1998) offer improved explanatory power over the NME

of Brams (1994), and are in no case decidedly inferior in predicting the outcome actually observed.

The integration of game theory with case study methods has already begun in other fields – business strategy, economic history, and political science. The standards for such projects have been set by Ghemawat (1997), Bates, *et. al.* (1998), and Dixit and Skeath (2004: 471-495). Bates, *et. al.* (1998: 10-12) use the term “analytic narratives,” and offer this description of the approach:

*[The] approach is narrative; it pays close attention to stories, accounts, and context. It is analytic in that it extracts explicit and formal lines of reasoning, which facilitate both exposition and explanation. ... By reading documents, laboring through archives, interviewing, and surveying the secondary literature, we seek to understand the actors' preferences, their perceptions, their evaluation of alternatives, the information they possess, the expectations they form, the strategies they adopt, and the constraints that limit their actions. ... By modeling the processes that produced the outcomes, we seek to capture the essence of stories. Should we possess a valid representation of the story, then the equilibrium of the model should imply the outcome we describe—and seek to explain.*

Our approach is similar, although we did not conduct any interviews, relying instead on the secondary literature that is rich in material from interviews.<sup>4</sup> We want to explore the nature of strategic interactions in refugee crises through the application of ToM, and then to evaluate how well several classes of models predict the outcomes of these interactions. Rather than statistically testing the “goodness of fit” of these models to our quite limited set of cases, we use the variation in the explanatory variables (i.e., payoff configuration, initial state, and first mover) in our cases and the deterministic nature of the predictions of ToM to evaluate the relative explanatory power of alternative versions of the theory.<sup>5</sup>

The following section of the paper summarizes the games that emerge from the interactions in our cases of refugee negotiations. We then discuss Willson’s revisions of

ToM and their implications for the outcomes of play. Next, we compare actual outcomes in each of our cases to the predicted outcomes for the NME in ToM (Brams, 1994) and the UO in the revised version by Willson (1998). Finally, we compare Willson's version to the threat and moving power versions of Brams (1994). In all these sections, we make the case that Willson offers a useful framework, and the most compelling formulation of ToM, for analyzing our cases. The final section reviews our findings and offers directions for future research.

### **Modeling the Cases**

In this section, we briefly describe eight cases of refugee negotiations. The negotiations involve protection issues (e.g., asylum, repatriation) and burden-sharing (e.g., financial assistance, third-country resettlement). The cases span more than three decades, and regions from Southeast Asia to the Caribbean. From narrative accounts of each case, we seek to ascertain ordinal preferences for the actors – either explicitly stated or implicitly revealed – over the possible outcomes and organize all the cases according to the configuration of the payoff matrix for the players. This matrix specifies for each case a 2x2 or 3x3 *ordinal* “game”.<sup>6</sup> That is, the payoffs are pure rank orderings, with the lowest ranking (1) assigned to the worst outcome in the eyes of that player, and the highest ranking (4, in the case of 2x2 games) assigned to the best outcome.

The ordinal formulation is parsimonious in its need for information, requiring only weak qualitative data – all that are available in most refugee crises, and it is more robust to enrichment of the data as a crisis unfolds, especially in 2x2 games. Of course, using ordinal payoffs limits the analytic tools available to us. In particular, it eliminates

the possibility of making marginal tradeoffs between the possible outcomes, as required for the existence and analysis of mixed-strategy equilibria. We do not believe, however, that the information available in the narrative accounts of refugee crises is sufficiently rich to justify a cardinal formulation that would allow, in modeling the negotiation process, continuous tradeoffs between the characteristics of the outcome states.

Table 1 gives information for the eight cases summarized in the form of two-player strategic games: the refugees and years covered, the row and column players in each game matrix, the strategy choices, the payoff configurations implied by the players' preferences (indicated by the corresponding "game" number),<sup>7</sup> the initial state of play, and the first player to move (switch strategies) in each case. Ericson and Zeager (2006) distill the information from the narrative accounts that justifies the payoff configurations, given in Table 1. To help the reader work through any of the cases, we present, in either Table A1 or Table A2 of the Appendix, the payoff configuration for each game from Table 1, stripped of the descriptive material.

[Place Table 1 about here]

In Table 1, we report the initial state of play and the first mover in each case,<sup>8</sup> because the outcomes in ToM can depend on this information. In Willson (1998), the first move marks the beginning of the game. The first movers are often fairly easy to discern from the narrative literature. Thailand made the first move of the 1978-79 crisis in case 1 by denying asylum to the new refugees arriving at its borders. Macedonia made the first move in case 2 by closing its border to a new, and much larger, wave of refugees fleeing a NATO bombing campaign in 1999. In cases 3-5, Cuba made the first move by opening its doors to emigration. In case 6, the U.S. made the first move by reducing its

assistance after the collapse of the Soviet Union. In case 7, Eritrea made the first move by impeding repatriation, hoping to elicit greater international assistance. Eritrea also made the first move in case 8 by relaxing its opposition to the international donors providing only modest assistance in support of repatriation.

We determine the initial states in Table 1 by examining the strategies of the players just before the first move occurred. Before closing its doors to new refugees, Thailand had already granted first asylum to about 200,000; however, the U.S. had not yet accepted any of them for resettlement. Likewise, Macedonia permitted asylum to a few thousand Kosovo refugees before closing its borders, but had no assurance of asylum assistance from NATO for the new, and much larger, wave of refugees coming toward its borders. Before opening its borders to emigration, Cuba had highly restrictive emigration policies in each of cases 3-5, while U.S. policies toward asylum for Cuban refugees were very permissive. Before the Soviet withdrawal from Afghanistan, U.S. assistance to the Afghan refugees was perhaps the most generous in the world, and Pakistan was hosting one of the largest refugee populations in the world. Eritrea did not impede the refugees who repatriated spontaneously at the end of the war of independence in case 7, and the spontaneous return makes it clear that donors provided minimal assistance. In case 8, prior to the overtures by Eritrea to the UNHCR, there had been no significant repatriation for several years, and there were rising concerns about the well-being of the refugees in exile, indicating that assistance from donors was minimal.



## Willson's Revisions of ToM

With the focus on its application in this paper, space will not allow a complete exposition of Willson's (1998) version of ToM. Instead, we feature his revisions to the rules of play and illustrate their implications in two payoff configurations that arise in our case studies of refugee negotiations.

The way in which the original version of ToM by Brams (1994) analyzes the strategic- or normal-form games in Table A1 is captured nicely by Gilboa (1995: 368):

*[C]onsider a normal-form game—let us call it the “state game”—and imagine that it is played over time, where at each stage each player has a selected strategy. Assuming an initial state and a certain order of moves, ToM analyzes the extensive-form game generated by “unilateral deviations” from the current state. Let us refer to this extensive-form game as the “moves game.” ...The moves game is assumed to terminate by certain rules that make it finite. Thus one may apply the backward-induction solution to the moves game, and this is the basis for ToM's analysis of the state game.*

In the standard version of ToM, play begins at one of the four states defined by the decision pairs in the 2x2 ordinal bi-matrix under consideration. A move by the row player changes the state to the other row, but within the same column. A move by the column player changes the state to the other column, but within the same row. All moves in the game occur by strict alternation between the players. The game ends when: (1) a player passes instead of making a move – except at the first move,<sup>9</sup> or (2) play returns to a state encountered previously in the game. The latter ending requires exactly four moves, because one cycle of moves in a 2x2 payoff matrix (in either the clockwise or counterclockwise direction) returns the game to its initial state.

Unlike Brams (1994), Willson (1998) initiates play by having one player make the first move; however, he also revises the way the game ends by replacing the single-pass rule of Brams, and instead requiring two consecutive passes (i.e., a double-pass rule)

to end the game. The double-pass rule reflects a negotiated agreement (both sides agree to stay at the same state).<sup>10</sup> Furthermore, Willson (1998) considers any arbitrary limit,  $\mathbf{n}$ , on the number of moves – excluding passes – in place of the specific case of  $\mathbf{n} = 4$  imposed by Brams (1994, 27-29). These alterations permit a wider range of strategies in ToM. For example, the new rules allow players to switch between clockwise and counterclockwise cycling within the payoff matrix in search of agreement.<sup>11</sup> The expansion of possibilities makes the game somewhat more complicated to analyze, but in the cases we examine,  $\mathbf{n}$  need not be much larger than in Brams (1994), due to the small size of the state space.<sup>12</sup>

Willson’s strategy for the analysis is to show that for  $\mathbf{n}$  sufficiently large, the outcomes of the negotiations are “ultimately periodic” in  $\mathbf{n}$ . To make this notion more precise, let  $\mathbf{S}$  be the initial state of play,  $\mathbf{i} = \mathbf{R}$  or  $\mathbf{i} = \mathbf{C}$  represent the first mover (Row or Column), and  $\mathbf{O}(\mathbf{n}, \mathbf{i}, \mathbf{S})$  denote the final outcome (the state in which optimal play ends) when player  $\mathbf{i}$  moves from state  $\mathbf{S}$  with  $\mathbf{n}$  moves, excluding passes, remaining.<sup>13</sup> Willson (1998, 215) defines a game as *ultimately periodic*, “if there exists [a non-negative] integer  $m$  and a positive integer  $p$  such that for all  $\mathbf{n} \geq m$  and for all states  $\mathbf{S}$  we have  $\mathbf{O}(\mathbf{n}, \mathbf{R}, \mathbf{S}) = \mathbf{O}(\mathbf{n} + p, \mathbf{R}, \mathbf{S})$  and  $\mathbf{O}(\mathbf{n}, \mathbf{C}, \mathbf{S}) = \mathbf{O}(\mathbf{n} + p, \mathbf{C}, \mathbf{S})$ .” He defines the smallest such positive integer  $p$  as the *ultimate period* and the smallest such nonnegative integer  $m$  as the *transiency*. An *ultimate outcome* (UO) is any  $\mathbf{O}(\mathbf{n}, \mathbf{R}, \mathbf{S})$  or  $\mathbf{O}(\mathbf{n}, \mathbf{C}, \mathbf{S})$  for  $\mathbf{n} \geq m$ . For many 2x2 games, the UO are independent of the number of moves ( $\mathbf{n}$ ), the first mover (R or C), and the initial state ( $\mathbf{S}$ ). If no player can improve on an initial state  $\mathbf{S}$  given the value of  $\mathbf{n} \geq m$  and the periodicity  $p$ , considering all possible sequences of

optimal moves and countermoves from  $\mathbf{S}$ , then  $\mathbf{S}$  is a “stable point” of this dynamic interaction – an analog of a NE in conventional game theory.

To illustrate the interactions under alternative rules of play, consider game 33 with initial state (4,3), our specification of case 4 in Table 1 – the Cuban boatlift to the United States in 1965. Figure A1 in the Appendix illustrates the extensive-form moves game under the standard rules of ToM in Brams (1994). We show payoffs in the current state in parentheses at the nodes in the game tree. We also indicate in square brackets the payoffs the players would reach by rational play from the current state.

Using backwards induction – highlighted in Figure A1, we find that the nonmyopic equilibrium (NME) is the pair of strategies associated with the payoffs (4,3). On the left-hand side of Figure A1, the row player would not make the first move from the initial state. On the right-hand side, the column player could remain at the initial state or the players could make a complete cycle back to the initial state, leading to the payoffs (4,3) either way. This prediction clearly differs from the bi-matrix game with simultaneous moves (game 33 in Table A1), in which the dominant-strategy and Nash equilibrium (NE) is the pair of strategies associated with the payoffs (3,4).<sup>14</sup>

Figures A2 to A6 show the analysis under the revised rules of Willson (1998). These figures are drawn for  $\mathbf{n} = 4$ , the same number of moves used in Figure A1. The double-pass rule creates many new possibilities for the players to consider. Following their optimal choices (highlighted in bold), we find ourselves led (by different paths) to the ultimate outcome (UO), the pair of strategies associated with the payoffs (3,4). The route to this outcome could involve one or three moves, and there are two routes of the

latter kind. Unlike the NME, the UO corresponds to the NE (and dominant strategy equilibrium) of the bi-matrix game with simultaneous moves.

We can gain additional insights into Willson's (1998) version of ToM by considering the situation represented by game 47 in Table A1 of the Appendix. In Willson's analysis, game 47 differs fundamentally from game 33 in that the UO (from any initial state) depends on whether the number of moves in the game is even or odd. We illustrate game 47 by the game trees in Figures A7 to A11 (four moves) and Figures A12 to A15 (three moves), where the initial state has the payoffs (2,1) in each case.<sup>15</sup> The optimal choices of players, using backwards induction (highlighted in bold), yield the UO with payoffs (4,2) when the number of moves  $n = 4$ . When  $n = 3$ , we obtain a different UO with payoffs (3,3). Willson (1998) shows that the UO alternates between these two states in game 47 as the parameter  $n$  increases, hence the ultimate period for this game is  $p = 2$ . In Brams (1994), the same two states are NME (as shown in Table A1), but emerge from different the initial states, rather than first movers. As Table 1 indicates, game 47 has no pure-strategy NE in the simultaneous-move game.

Other differences between the two formulations of ToM are that Willson's version allows ties in the players' rankings of states and the introduction of more than two strategies for a player. For an application with ties, consider case 6 in Table 1, where we cannot ascertain the next-best and next-worst rankings for one of the players from the information contained in the narrative accounts. Here we could treat the rankings as ties, thereby generating a new game.<sup>16</sup> Below, we also consider a game (Table 2, case 8) in which the actors have more than two strategies.

The next section offers an empirical evaluation of Willson's (1998) version of ToM. We compare his UO to the NME of Brams (1984) and the NE of the bi-matrix game. We also compare the predicted outcomes with the historical outcomes in each case.

### **Predicted vs. Actual Outcomes**

Table 2 presents, for each of our eight cases, the predictions of the NE in the normal-form game, together with the UO of Willson (1998) and the NME of Brams (1994) in the extensive-form (or moves) game.<sup>17</sup> We give the minimum number of bargaining steps required to reach the UO from any initial state in each game (i.e., the transiency parameter,  $m$ ).<sup>18</sup> Finally, Table 2 shows the historical outcomes for each case in the sample, expressed in terms of the evident strategy choices of the players.<sup>19</sup>

[Insert Table 2 about here]

The NE emerges from the dominant strategies in each game (except game 47), which can be obtained by inspection of the payoff configurations in Appendix Table A1. Neither player has a dominant strategy in game 47, and as already noted, game 47 has no NE in pure strategies. Of course, it would have a NE in mixed strategies, but computing a mixed-strategy equilibrium would force us to treat the payoffs to the players as cardinal rather than ordinal, which strains credulity and violates the spirit of ToM. Furthermore, any mixed-strategy equilibrium would place a positive probability on each of the states occurring, which makes it difficult to explain the historical state(s) that we observe as the outcome.<sup>20</sup>

Unlike the NE, the NME and the UO depend on the initial state of the game, which we give in Table 1. The UO can also depend on the first mover, again given in Table 1. The NME for the games in Table 2 are taken from Brams (1994: 215-19); the UO are taken from Willson (1998: 233-39). We compare the predicted outcomes with the historical outcomes in each case to determine which game-theoretic approach appears to have the greatest explanatory power in these cases.

Inspection of Table 2 shows that the NME and UO give the same predictions in cases 1 through 3 and 6, and the NE and UO give the same predictions in cases 4 through 6. The three approaches generate rather different predictions in case 7. In case 8, the NE and UO again yield the same predictions, but the NME does not apply, because Brams (1994) does not consider 3x3 games in the standard version of ToM.

From the last column in Table 2, we see that the actual outcomes in cases 1 through 6 and in case 8 correspond in every way to the strategies of the players in the UO. In case 7, this correspondence holds only when the number of moves in the game is odd.<sup>21</sup> In contrast, the actual outcomes differ from the players' strategies in the NME of cases 4 and 5, and from the players' strategies in the NE of cases 1 through 3. It appears from Table 2, therefore, that the UO has greater explanatory power in these cases than either the NME or the NE.<sup>22</sup>

In the discussion in this section, we did not consider the notions of "moving power" and "threat power" in Brams (1994) that might correct some of the erroneous predictions of the NME in Table 2. In the next section, we consider these concepts and their relation to Willson's revised version of ToM.

### **Threat and Moving Power in Willson's Version of ToM**

The standard version of ToM has been enhanced by Brams through the introduction of auxiliary strategic factors called “threat power” (Brams, 1994, 138-148) and “moving power” (Brams, 1994, 85-102). These concepts allow him to provide explanations of many strategic situations.<sup>23</sup> Indeed, in prior applications to refugee negotiations [(Zeager (2002, 2005), Williams and Zeager (2004), and Zeager and Williams (2006)], threat power often plays a key role. An application of moving power also appears in Zeager and Bascom (1996). These forms of “power” involve revisions to the rules of play, and the revisions give the rules a more *ad hoc* flavor than the standard version of ToM.<sup>24</sup> This issue is far beyond the scope of our paper, but we can compare the predicted outcomes under threat and moving power, also called NME in Brams (1994), with the UO of Willson (1998) and with the historical outcomes for our eight cases.

Unlike the standard version of ToM, threat power analysis assumes that players communicate prior to making any moves. It inquires whether a player can implement a proposed outcome by threatening to force play to a mutually disadvantageous state if the other player rejects the proposed outcome. Without loss of generality, let the row player issue the threat, let its payoff in state  $ij$  be written  $x_{ij}$ , and let  $y_{ij}$  denote the payoff for the column player. Suppose further that the outcome the row player desires has payoffs  $(x_{kl}, y_{kl})$  and that the mutually disadvantageous state has payoffs  $(x_{mn}, y_{mn})$ . By construction,  $x_{kl} > x_{mn}$ . We call a threat *real* only if  $y_{kl} > y_{mn}$  (Brams 1994: 144). As Brams (1994) points out, these conditions are necessary, but not sufficient, for a credible threat.

Brams (1994: 145) refers to the mutually disadvantageous (or Pareto-inferior) state as the “breakdown state,” and makes a distinction between “compellent” ( $m = k$ ) and “deterrent” ( $m \neq k$ ) threats.<sup>25</sup> In the former case, the breakdown state is in the same row (or column, if the threat comes from the column player) as the desired state. Thus, carrying out the threat involves no change of strategy. It also follows that a compellent threat is unconditional. With a deterrent threat, the breakdown state is in a different row (or column, if the threat comes from the column player) than the desired state. Therefore, implementation of a deterrent threat involves a change of strategies. Whether the change of strategy occurs in the case of a deterrent threat depends on the strategy chosen by the other player.<sup>26</sup> Hence, a deterrent threat is conditional, unlike a compellent threat.<sup>27</sup>

To illustrate these concepts, we consider two games. In Table A1 of the Appendix, the best outcome for the column player in game 5 has the payoffs (2,4); however, it is also next-worst outcome for the row player. Fortunately for the column player, the other outcome in the first column is worse for both players than (i.e., Pareto inferior to) the outcome it wants to implement. If the column player remains in the first column of game 5 (its dominant strategy), regardless of the row player’s choice, then the row player faces a choice between its worst and next-worst states. The best response for the row player would lead to the outcome desired by the column player. In this case, the column player has a compellent threat and row player has no counter-threat.<sup>28</sup>

We see a different situation in Game 35 in Table A2. The column player has a compellent threat, like game 5, but Brams (1994) identifies a deterrent threat for the row player. The row player wishes to induce the outcome in the first row with payoffs (4,3), but the column player prefers the other state in this row (its best state), so no compellent



threat is possible. Still, the second row contains a Pareto-inferior state with the payoffs (1,2), which is also consistent with the column player's best response to the row player's strategy. Reasoning along these lines, Brams (1994: 218) identifies the outcome in game 35 with payoffs (4,3) as an NME that the row player can implement by using its deterrent threat. One could object that to carry out this threat, the row player must use a dominated strategy – and even move to its worst state, making the threat appear “incredible.”<sup>29</sup> As Brams (1994: 140) acknowledges, such strategic moves can be rational only in a context of repeated interaction where the players can recoup a loss incurred to establish a reputation for future play.

Repeated interaction allows rational players to carry out threats, but it raises another problem. Using only ordinal payoffs, the usual way to weight payoffs across plays of the game is not available, making it difficult to model the decisions the players would be required to make. Even if we found a way to resolve this problem, there is yet another problem. For the games in which both players have threats, Brams (1994) makes the outcome depend on which player can endure the breakdown state the longest. Such a notion would be difficult to specify rigorously without resorting to a discount rate, which is problematic with ordinal rankings of outcomes.<sup>30</sup> Moreover, in applications it might be difficult to ascertain which player has the advantage in such situations. As we see below, Willson (1998) avoids many of these problems by his reformulation of ToM.

Table A1 in the Appendix shows the outcomes each player can implement by threat power for the five 2x2 games that arise in our cases.<sup>31</sup> In game 5, only one player has threat power. In all other games in Table A1, both players can use threats. In two of the games (32 and 47), the threats lead to the same outcome. In other games (33 and 35),

the threats lead to different outcomes. Obviously, predictions are more difficult to make in the last group of games, for the researcher must ascertain which player has greater threat power.<sup>32</sup>

Inspection of Table A1 reveals a close association between the UO in Willson (1998) and the outcomes players can induce with threat power in Brams (1994). All the threat-power outcomes in Table A1 correspond to a UO while only one possible UO in Table A1 falls outside the set of threat-induced outcomes (one of two UO in game 47). What accounts for the correspondence? Consider Figures A8 and A10 through A13 in the Appendix, which all contain threats (shown in the figures) that influence the choices made by the players. Notice that the threats in Willson (1998) do not require “repeated play” or discounting over time, but can be implemented due to the “double-pass” rule. Therefore, his version of ToM generates threats in a clearer and more credible way, providing an improvement on “threat power” analysis.

The double-pass rule, in effect, makes “threat power” endogenous. In Figure A12, for example, play could not move through states with payoffs like (1,4) or (4,2) – where the column and row players have the next move, respectively – with a one-pass rule for ending a game. Yet, with a double-pass rule, the row player chooses not to pass at (4,2) because the column player has a credible threat to move to (1,4). Thus, elements of threat power can emerge in strategies pursued by players in the revised version of ToM by Willson (1998). This revision also does not require *ad hoc* changes to the rules to explain certain cases in Table 2. Further, it does not require repeated play, which would lead us to treat payoff values as cardinal (rather than ordinal) in a rigorous analysis. Finally, unlike threat power analysis (Table A1), Willson’s UO identify the actual

outcome in all but one case in Table 2, and the threat power emerges naturally *within* the analysis rather than being imposed by the analyst exogenously.

*Moving power* in Brams (1994) is the ability by one player to endure cycling longer than the other player, thus forcing the other player to stop at one of the cells in which it has a turn to move. It, however, also involves changes to the rules of play. Instead of a fixed number of moves ( $n = 4$ ),  $n$  is indefinite. Suppose further that the game is *cyclic*, so that a move in a clockwise or a counterclockwise direction, “never give[s] a player its best payoff when it has the next move” (Brams 1994: 221). As Brams (1994: 90) shows, cycling in such games cannot occur in both directions, because in either one direction or the other, at least one player will pass at its best state. The placements of the best states will block cycling in both directions in certain games. All the games in Table A1 are cyclic, except for game 32 (Brams, 1994: 92-95).

Game 47, for example, is cyclic in the counterclockwise direction. In fact, the player with the next move does immediately better by moving at each step in the cycle, making game 47 *strongly cyclic*.<sup>33</sup> In each cycle the row player moves from (3,3) to (4,2) and (1,4) to (2,1), whereas the column player moves from (4,2) to (1,4) and (2,1) to (3,3). If the row player were to terminate the cycling (by remaining in the state achieved by the other player’s last move), it would stop where it received the higher payoff, (3,3) instead of (1,4). By similar reasoning, the column player would stop at (4,2) instead of (2,1). It is also important to note that in game 47, each player obtains a better payoff by forcing the other player to stop. Therefore, “moving power” – the capacity to force the other player stop cycling – is *effective* in game 47.

In case 7 in Table 2, in which game 47 arises, introducing moving power yields two NME, with the payoffs (3,3) and (4,2), making the predictions of the NME and the UO the same. To understand these predictions, consider Figures A7 to A11 that show Willson's version of game 47 from initial state (2,1) with  $n = 4$  moves remaining. As in game 33 above, game 47 has multiple paths to the equilibrium outcome, yielding payoffs (4,2), and at least one of these paths moves in the counterclockwise direction. Moreover, if the column player makes the first move and  $n = 4$ , the row player makes the last move to a UO with payoffs (4,2), as in the moving power analysis. For the case where  $n = 3$  (Figures 12 to 15), the column player makes the last move to a UO with payoffs (3,3). Therefore, one can see how moving power analysis can give predictions similar to Willson's UO in this case.

Yet, inspection of Table A1 in the Appendix reveals that the UO (and actual outcomes) in our sample are more loosely related to the outcomes induced by moving power than to those induced by threat power. In game 5, the outcomes made possible by moving power correspond to no UO and miss the historical outcome, and they correspond to only one of the two UO in game 35, where they also miss the historical outcome. Therefore, moving power analysis makes correct predictions in some situations (e.g., game 33), but it is hardly a reliable approach to making predictions, at least in our small sample of cases.

## **Conclusions**

One objective of this paper is to enhance the analytic toolbox available to scholars, observers, and policymakers concerned with refugee crises and associated

negotiations. We believe that this analysis shows the power of thinking clearly about how (state-level) agents' preferences and objectives affect outcomes for refugees, their achievability, and the stability of negotiated (compromise) solutions. Assuming the rational pursuit of national interests by these state-level actors, we can show how they were able to achieve a stable compromise – a negotiated solution – in most cases. In the case where the actor preferences ruled out an acceptable compromise (case 7), a formal analysis demonstrated an instability in outcomes that was only resolved when one of the sides “rethought” the acceptability of some alternatives. This rethinking changed the structure of the strategic interaction by opening a richer set of alternatives for consideration (case 8), and thereby allowed a stable outcome (negotiated compromise) to emerge.

All of these historical compromises, it is worth emphasizing, arose outside the formal international framework for managing refugee crises; the situations we analyze arose from the breakdown of those formal international resolution mechanisms. We are able to analyze them formally, using the analytic tools of ToM, by taking advantage of an understanding of the state-level actors' motivations and preferences, as these are revealed in the narrative literature on the crises. Taking those motivations and preferences as the driving factors behind outcomes, we are able to more clearly understand what the ultimate resolution would be, and reasonably explain its appearance.

In the pursuit of this objective, we have considered eight cases of refugee negotiations in which the countries involved sought to reach agreement on refugee protection (repatriation to the country of origin, settlement in the country of asylum, or resettlement in a third country) with some assistance from donor countries. These

situations involve strategic interaction, with common and conflicting interests for the players, making them amenable to a game-theoretic analysis. We compare three approaches to such an analysis: NE for the normal-form state game, NME for extensive-form moves game of Brams (1994), and UO for the alternative extensive-form moves game of Willson (1998). We then compare the historical outcomes from the eight cases to the predictions of the alternative approaches to refugee negotiation situations.

We find that the UO of Willson have the greatest explanatory power in our sample of cases. For example, in prisoners' dilemma matrices, the NE of the matrix game and the UO of Willson (1998) give different predictions, because the NE predicts noncooperation by both players while the UO predict cooperation. Each of our cases of prisoners' dilemmas shows cooperation by both players, which is consistent with the UO of Willson (1998), but not the NE of the standard normal-form game. The versions of ToM by Willson and Brams give the same predictions in each "prisoners' dilemma" case, but they differ in two Cuban refugee crises (captured by games 33 and 35). In both cases, the historical outcome matches the prediction of Willson's version. Our interpretation of the findings is that in our sample of refugee negotiations, the players act as if they were using the rules of Willson, rather than those of Brams, or of simultaneous Nash play. These findings encourage further investigation of the Willson's version of ToM.

The results of our examination of these cases suggest some avenues for future research, both empirical and theoretical. An obvious extension would be to include other cases in which the players evidently have more than two strategies and are thus amenable to the analysis of Willson (1998) – if not Brams (1994). Also, as in other applications of game-theoretic analysis, we could dramatically increase the sample sizes by testing ToM

in an experimental setting. We might explore whether players could converge to the UO of Willson (1998) using a tâtonnement (groping) method instead of backwards induction. Finally, there are fascinating issues of equilibrium refinement when the UO stable set is not unique and the UO depend on the parity of the length of the negotiating period. We intend to explore several of these extensions in subsequent research.

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## Endnotes

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- <sup>1</sup> The early versions of ToM focused on 2x2 payoff matrices (with four possible outcomes), but Willson (1998) permits any number of strategies for the players. In this paper, we include a 3x3 payoff matrix.
- <sup>2</sup> The location of the refugees naturally favors repatriation to the country of origin or settlement in the first asylum country. The preferred solution is to return home (i.e., repatriation) if it is reasonably safe to do so. Resettlement in a third country is usually the last resort.
- <sup>3</sup> These and other cases of refugee negotiations have been developed by Zeager and his coauthors over the last 12 years. They are detailed in Ericson and Zeager (2006).
- <sup>4</sup> Our reading of the literature was enhanced by two visits to the archives of the library of the Refugee Studies Centre, affiliated with the University of Oxford.
- <sup>5</sup> A mixed-strategy equilibrium would be an example of a probabilistic prediction from game theory. Even in such cases, statistical tests with “real-world” data are rare, and tend to come from athletic contests rather than economic settings [e.g., Walker and Wooders (2001) and Chiappori, Levitt, and Goseclose (2002)].
- <sup>6</sup> We use the term “game” as a convenient descriptor. We do not, however, treat the ordinal payoff matrices as a “matrix” (i.e., normal-form) game, but rather as a tableau summarizing the states in a ToM extensive-form game. See the game trees in the Appendix for the actual games that we analyze.
- <sup>7</sup> The numbers associated with the games in Table 1, and later in Table A1 in the Appendix, are taken from Brams (1994: 217-219), and are also used in Willson (1998).
- <sup>8</sup> Ericson and Zeager (2006) provide additional discussion and documentation of the first movers and the initial states in these cases.
- <sup>9</sup> In the case of the first move, Brams applies a “two-sidedness rule” (Brams, 1994, 28) that gives precedence to the player who moves over the player who passes. Therefore, at the first move, a single pass by one player may not end the game.
- <sup>10</sup> Willson’s (1998) approach can be interpreted as generating conditional predictions. That is, if the row player moves first, the ultimate outcome will be X. If the column player moves first, the ultimate outcome will be Y. From many initial states in many games, X=Y. Note that the double-pass rule allows the player who moves first to take back the move if the other player passes, in effect, handing the first move to the other player.
- <sup>11</sup> In the standard version of ToM, Brams (1994) allows only one cycle, but it may be in either direction, depending on who moves first. The “moving power” version, which we consider later in the paper, allows for more cycling.
- <sup>12</sup> Willson (1998: 216) provides a very loose upper bound on the required number of moves, which increases with the number of possible states in the game. For the specific games that we consider in this paper (given their initial states and first movers), the maximum number of moves (**n**) needed to find the ultimate outcome of the game is **n** = 4.
- <sup>13</sup> Opportunities to move are strictly alternating between the two players. Of course, with passes allowed, the same player could make two (or more) consecutive moves between states.
- <sup>14</sup> Later in the paper, we will explore what happens in game 33 when we relax the assumption that n=4, which leads us to the notion of “moving power” in Brams (1994).

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<sup>15</sup> Both cases,  $n = 4$  and  $n = 3$ , exceed the transiency for game 47 ( $m = 2$ , given in Table 2 below).

<sup>16</sup> We can explore this game using a Gauss program adapted from the original Pascal program of Willson. If we assign a “2” to the intermediate outcomes for the U.S. (i.e., treat the rankings as a tie), the equilibrium outcome of the new game has the same structure as game 35. For the initial state and first mover specified in Table 1, the UO is the same in game 5, game 35, and the new game. The Gauss (version 6.0 or higher) program is available from the authors upon request.

<sup>17</sup> We use the NE for the matrix game, rather than analyzing an extensive form, because there is a unique structure for the former case, but not the latter.

<sup>18</sup> Note that, even though UO in all these games generally depend on the parity of the number of moves, in all our cases but the 7<sup>th</sup> there is a unique UO solution due to the particular, historically given, initial state and first mover.

<sup>19</sup> For most of the cases in Table 2, the events leading to the actual outcome are covered elsewhere, from the perspective of one of the versions of ToM by Brams (1994): case 1 (Zeager, 2002), case 2 (Williams and Zeager (2004), cases 3 through 5 (Zeager, 2005), and case 6 (Zeager and Williams, 2006). For cases 7 and 8, see the sources given in Ericson and Zeager (2006).

<sup>20</sup> One might be tempted to think in terms of correlated equilibrium, but that would involve more institutional structure – and more explicit cooperation – than we observe in these cases.

<sup>21</sup> It is not clear how we should interpret an odd or even number of moves in the actual negotiations. If we treated  $n$  as an issue for negotiations, the players might have considerable difficulty reaching an agreement, since their interests are diametrically opposed. Later in the paper, we find clues to interpreting alternating outcomes in game 47 when we compare Willson’s ultimate outcomes to the notion of “moving power” in Brams (1994). Thus, we postpone further discussion of the matter until those clues emerge.

<sup>22</sup> Space limitations will not allow us to compare the unfolding events of each crisis to the various paths through the corresponding game tree that the players could take to reach the UO, but we intend to provide these comparisons in a more extensive treatment of the subject. In the next section of the paper, where we compare the Willson (1998) version of ToM with the threat-power version of Brams (1994), one can get a feel for such an analysis.

<sup>23</sup> The original threat power analysis was by Brams and Hessel (1984).

<sup>24</sup> Using alternative sets of rules allows one to explain a wider range of cases, but substitutes the special insight of the analyst (regarding which set of rules to apply) for the machinery of the theory. The exercise of special insight thus renders the analysis more *ad hoc*, which has been a source of criticism of Brams (1994). Gilboa (1995), though generally supportive of ToM, acknowledges this criticism.

<sup>25</sup> Brams (1994) borrows these terms from the analysis of Schelling (1960).

<sup>26</sup> In effect, a compellent threat says to the other player, “I am committed to strategy X, so choose your strategy accordingly.” A deterrent threat says, “If you choose strategy Y, my response will make us both worse off.”

<sup>27</sup> As Brams (1994: 140) notes, threats “presume continuing, if not repeated play.” A conditional threat, in particular, requires a relaxation of the “single-pass” stopping rule, because the threat can be meaningful only if the player issuing it has a chance to respond to the strategy chosen by the other player.

<sup>28</sup> One might conjecture that compellent threats, as here, necessarily involve dominant strategies. But, as inspection of games 36-41 in Brams (1994: 218) shows, that is not the case.

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<sup>29</sup> Dixit (2006: 7-8), in reviewing the pioneering contributions of Schelling (1960) to “strategic moves” (commitments, threats, and promises) in game theory, points out that, “The modern notion of credibility is subgame perfectness; the outcome that the player making the strategic move wishes to achieve must be the result of a subgame perfect equilibrium in the enlarged game ... Subgame perfectness is best understood in the extensive or tree form of the game, but in the 1950s game theory generally only used the strategic or normal form.” Similarly, conducting a threat power analysis in terms of payoff matrices makes the credibility of threats more difficult to evaluate.

<sup>30</sup> Skeris (2006), in considering the closely related concept of “holding power,” also addresses these issues. He treats payoffs as cardinal and introduces discounting.

<sup>31</sup> We take these outcomes from Brams (1994: 217-218).

<sup>32</sup> The introduction of “powers” and other notions such as “magnanimity” and the “two-sidedness convention” in Brams (1994) also introduces a form of “collective rationality” into models built on ideas of individual rationality, which often conflict with collective rationality. The problems emerge most clearly in situations captured by the prisoners’ dilemma game, where a fundamental conflict between individual and collective rationality is inherent in the logic of the situation. See Woerdman (2000) on these issues.

<sup>33</sup> In strongly cyclic games, each player benefits immediately by moving (in either the clockwise or counterclockwise direction) when it has a turn to move (Brams, 1994, 92).

**Table 1: Case Studies in Refugee Negotiations**

<b>ID</b>	<b>Refugees (Years)</b>	<b>Row Player Column Player</b>	<b>Strategy Choices</b>	<b>Game*</b>	<b>Initial State of Play**</b>	<b>First Mover</b>
1	Indochinese (1978-79)	Thailand United States	Permit or Deny First Asylum Permit or Deny Resettlement	32 (PD)	Permit First Asylum (1, 4) Deny Resettlement	Thailand
2	Kosovars (1999)	Macedonia NATO	Permit or Withhold Asylum Resettlement or No Resettlement	32 (PD)	Withhold Asylum (1, 4) No Resettlement	Macedonia
3	Cubans (1994)	Cuba United States	Permissive or Restrictive Emigration Permissive or Restrictive Asylum	32 (PD)	Restrictive Emigration (3, 3) Permissive Asylum	Cuba
4	Cubans (1965)	United States Cuba	Permissive or Restrictive Asylum Permissive or Restrictive Emigration	33	Permissive Asylum (4, 3) Restrictive Emigration	Cuba
5	Cubans (1980)	United States Cuba	Permissive or Restrictive Asylum Permissive or Restrictive Emigration	35	Permissive Asylum (4, 3) Restrictive Emigration	Cuba
6	Afghans (1991-96)	Pakistan United States	Restrictive or Permissive Asylum Modest or Generous Assistance	5 or 35	Permissive Asylum (4, 2) or (4, 3) Generous Assistance	United States
7	Eritreans (1991-96)	Eritrea Donors	Permit or Impede Repatriation Generous or Minimal Assistance	47	Permit Repatriation (1, 4) Minimal Assistance	Eritrea
8	Eritreans (2000-03)	Eritrea Donors	Full, Partial, or Minimal Repatriation Generous, Modest, or Minimal Assistance	3x3	Minimal Repatriation (2, 1) or (3, 1) Minimal Assistance	Eritrea

\* See Appendix Table A1 or A2 for configurations    \*\* Ordinal Payoffs for (Row, Column)  
 PD: payoff configuration for the Prisoners' Dilemma

**Table 2: Predicted vs. Actual Outcomes in Refugee Case Studies**

<b>ID</b>	<b>Row Player (Years) Col Player</b>	<b>Game</b>	<b>Nash Equilibrium (with payoffs)</b>	<b>Nonmyopic Equilibrium (with payoffs)</b>	<b>Ultimate Outcome (with payoffs)</b>	<b>Minimum Bargaining Steps (m)</b>	<b>Historical Outcome (with payoffs)</b>
1	Thailand (1978-79) United States	32 (PD)	Deny First Asylum (2,2) Deny Resettlement	Permit First Asylum (3,3) Permit Resettlement	Permit First Asylum (3,3) Permit Resettlement	6	Permit First Asylum (3,3) Perm Resettlement
2	Macedonia (1999) NATO	32 (PD)	Withhold Asylum (2,2) No Resettlement	Permit Asylum (3,3) Resettlement	Permit Asylum (3,3) Resettlement	6	Permit Asylum (3,3) Resettlement
3	Cuba (1994) United States	32 (PD)	Permissive Emigration (2,2) Permissive Asylum	Restrictive Emigration (3,3) Permissive Asylum	Restrictive Emigration (3,3) Permissive Asylum	6	Restrictive Emigration (3,3) Permissive Asylum
4	United States (1965) Cuba	33	Permissive Asylum (3,4) Permissive Emigration	Permissive Asylum (4,3) Restrictive Emigration	Permissive Asylum (3,4) Permissive Emigration	4	Permissive Asylum (3,4) Permissive Emigration
5	United States (1980) Cuba	35	Permissive Asylum (2,4) Permissive Emigration	Permissive Asylum (4,3) Restrictive Emigration	Permissive Asylum (2,4) Permissive Emigration	3	Permissive Asylum (2,4) Permissive Emigration
6	Pakistan (1991-96) United States	5 or 35	Permissive Asylum (2,4) Modest Assistance	Permissive Asylum (2,4) Modest Assistance	Permissive Asylum (2,4) Modest Assistance	2 3	Permissive Asylum (2,4) Modest Assistance
7	Eritrea (1991-95) Donors	47	Mixed- Strategy Payoffs	Permit Repatriation (4,2) Generous Assistance	Even or Odd (4,2) or (3,3) Number of Moves	2	Impede Repatriation (3,3) Minimal Assistance
8	Eritrea (1996-2000) Donors	3x3	Partial Repatriation (7,7) Modest Assistance	NA	Partial Repatriation (7,7) Modest Assistance	3	Partial Repatriation (7,7) Modest Assistance

NA (Not applicable): Brams (1994) does not consider 3x3 games in the standard version of TOM.

**Table A1:  
Payoff Configurations for 2x2 Games**

Game 5

<b><u>(2, 4)</u></b> <sup>T</sup>	(4, 2)
(1, 3) <sup>m</sup>	(3, 1) <sup>M</sup>

Game 35

<b><u>(2, 4)</u></b> <sup>T</sup>	<b>(4, 3)</b> <sup>mt</sup>
(1, 2)	(3, 1) <sup>M</sup>

Game 33

<b><u>(3, 4)</u></b> <sup>MT</sup>	<b>(4, 3)</b> <sup>mt</sup>
(1, 2)	(2, 1)

Game 32

<b><u>(2, 2)</u></b>	(4, 1)
(1, 4)	<b>(3, 3)</b> <sup>tT</sup>

Game 47

<b>(3, 3)</b> <sup>MtT</sup>	(2, 1)
<b>(4, 2)</b> <sup>m</sup>	(1, 4)

Ultimate outcomes of Willson (1998) in **bold**; Nash equilibria underscored

m/M equilibrium the row/column player can induce with moving power in Brams (1994)

t/T equilibrium the row/column player can induce with threat power in Brams (1994)

(x, y) x is the ordinal value of a state to the row player; y is the ordinal value to the column player

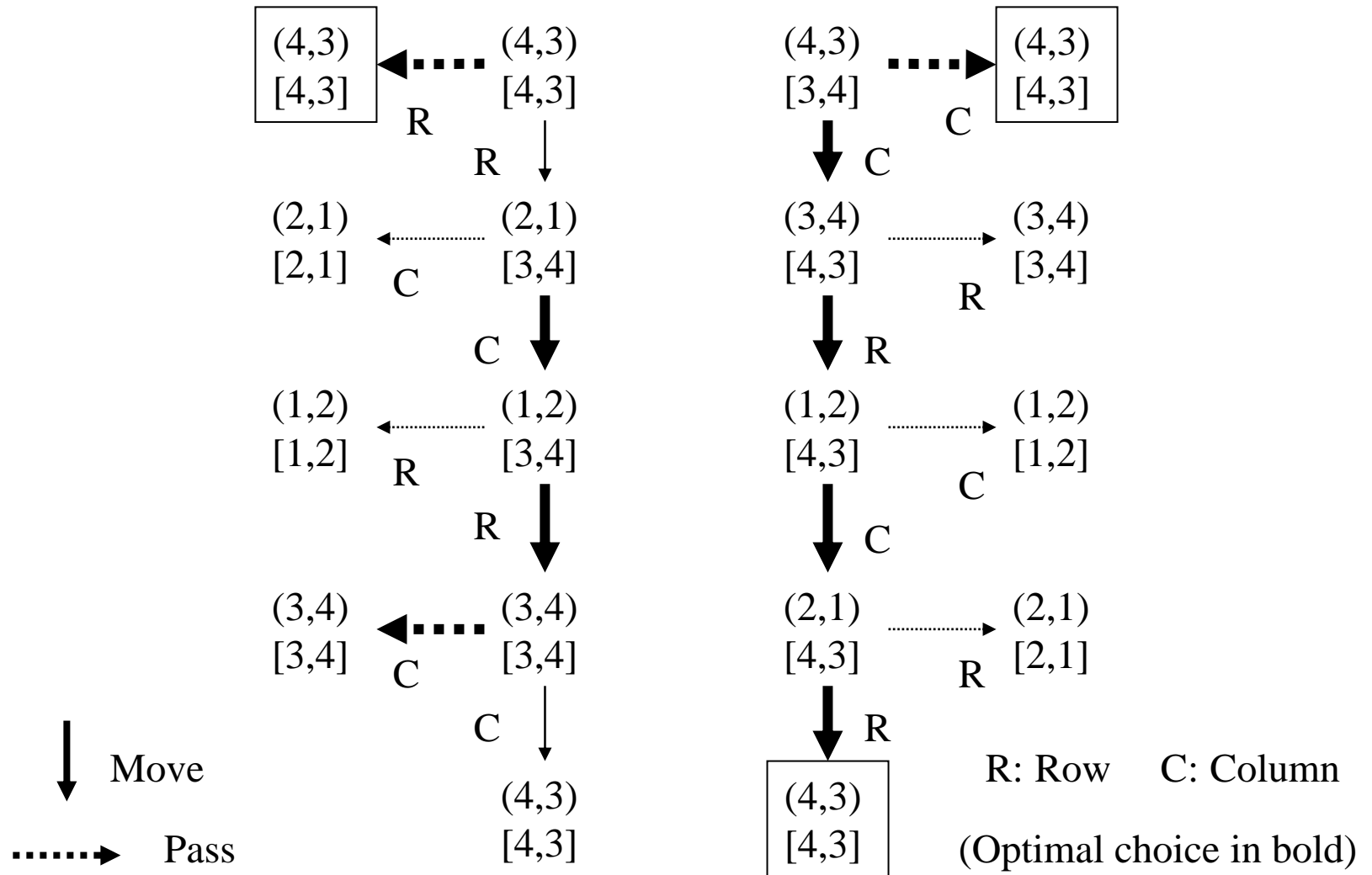
**Table A2**  
**3x3 Payoff Matrix for Eritrean Refugee Negotiations (2000–03)\***

		<b>Donors</b>		
		<b>Generous Assistance</b>	<b>Modest Assistance</b>	<b>Minimal Assistance</b>
<b>Eritrea</b>	<b>Minimal Repatriation</b>	(4, 5)	(4, 5)	(2 or 3, 1)
	<b>Partial Repatriation</b>	(7, 4)	<b><u>(6, 6)</u></b>	(2 or 3, 2)
	<b>Full Repatriation</b>	(8, 3)	(5, 7 or 8)	(1, 7 or 8)

\* The first payoff is for the row player (Eritrea) and the second payoff is for the column player (Donors). Payoffs written with an “or” (e.g., 2 or 3) indicate that we considered alternative payoffs in this state. We indicate the ultimate outcome (UO) of Willson (1998) in **bold** and the pure-strategy Nash equilibrium by an underscore.

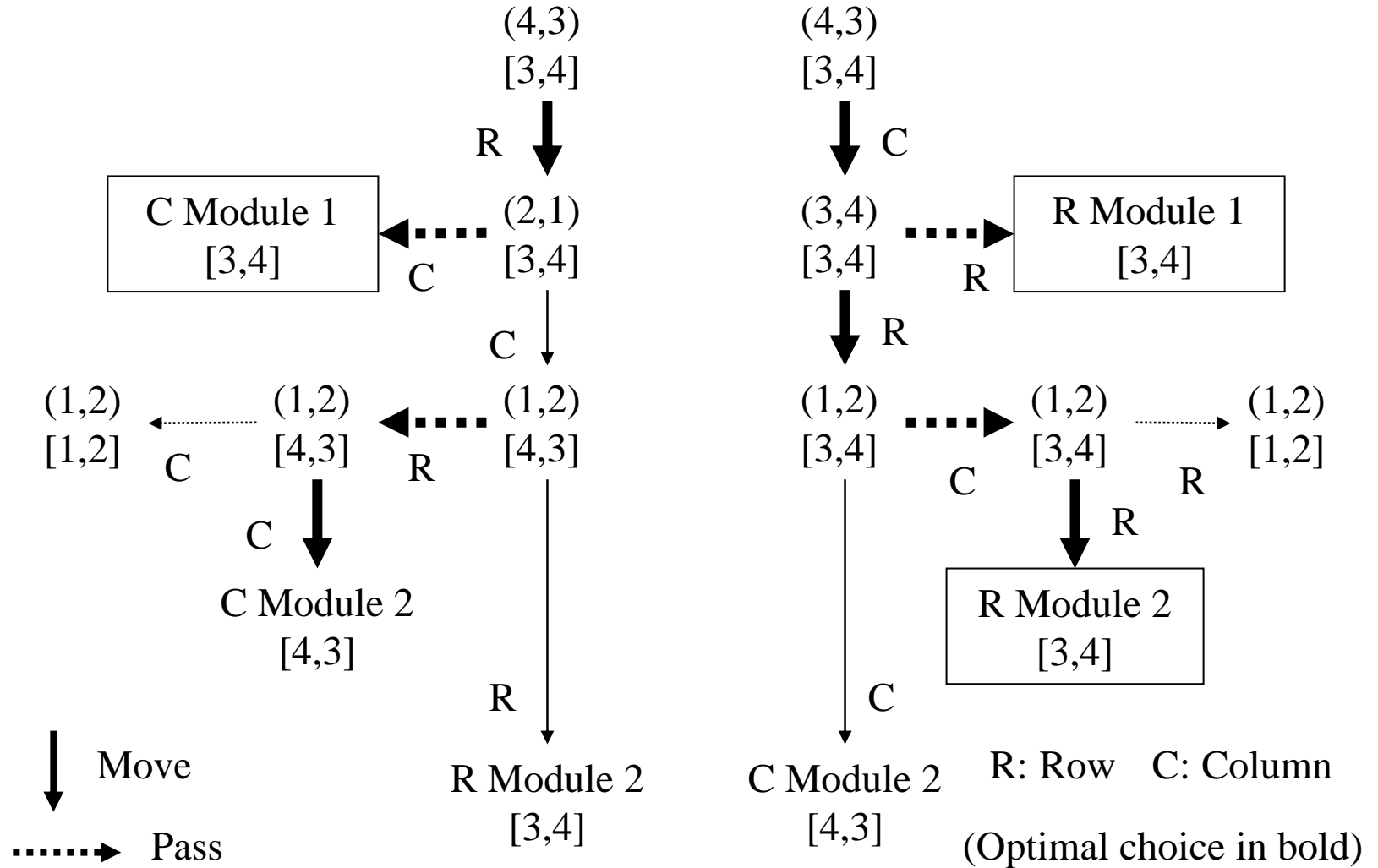


**Figure A1: Brams' Version of Game 33 from Initial State (4,3)**



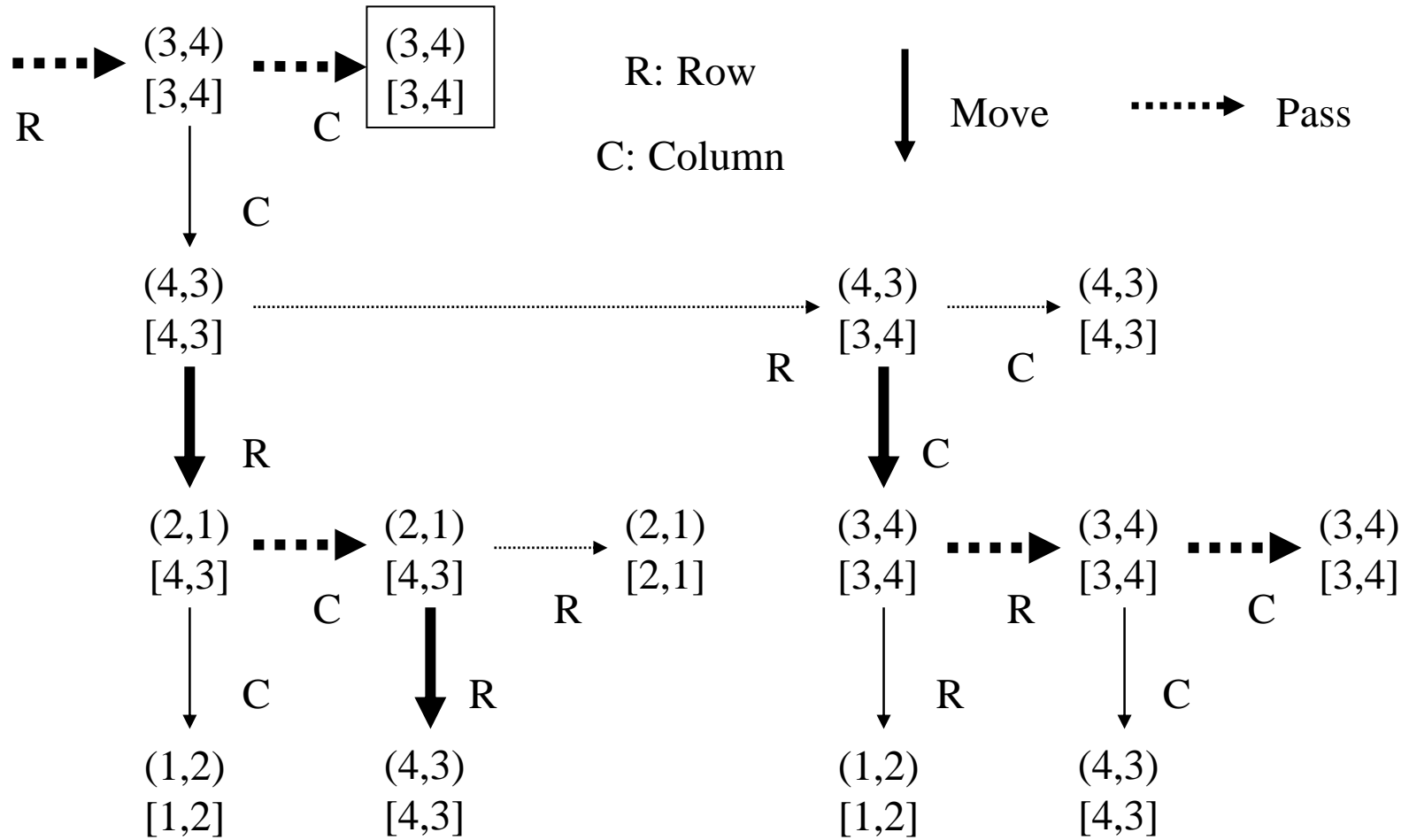
Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold

**Figure A2: Willson’s Version of Game 33 from Initial State (4,3) with Four Moves**

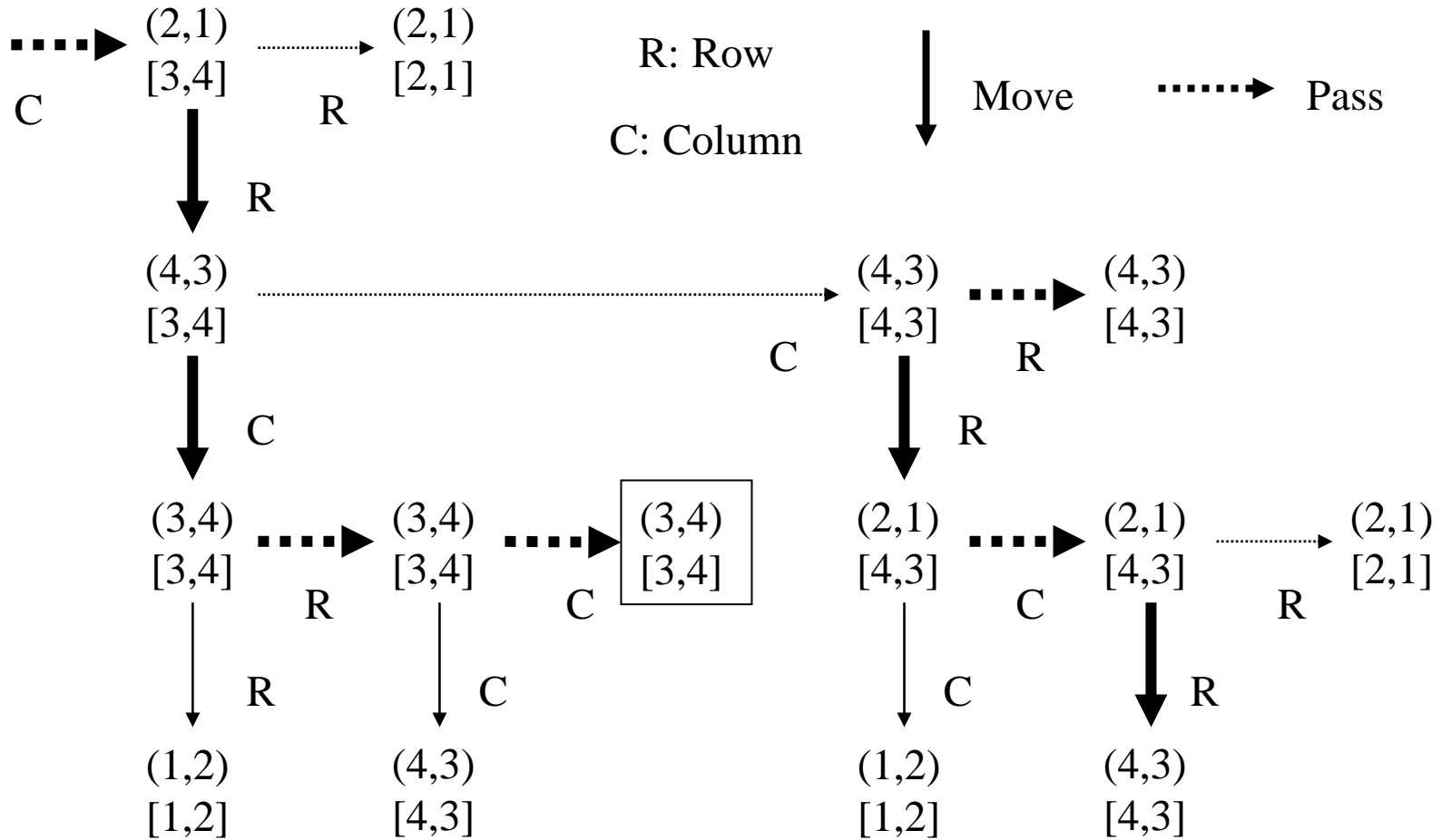


Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold

**Figure A3: R Module 1**

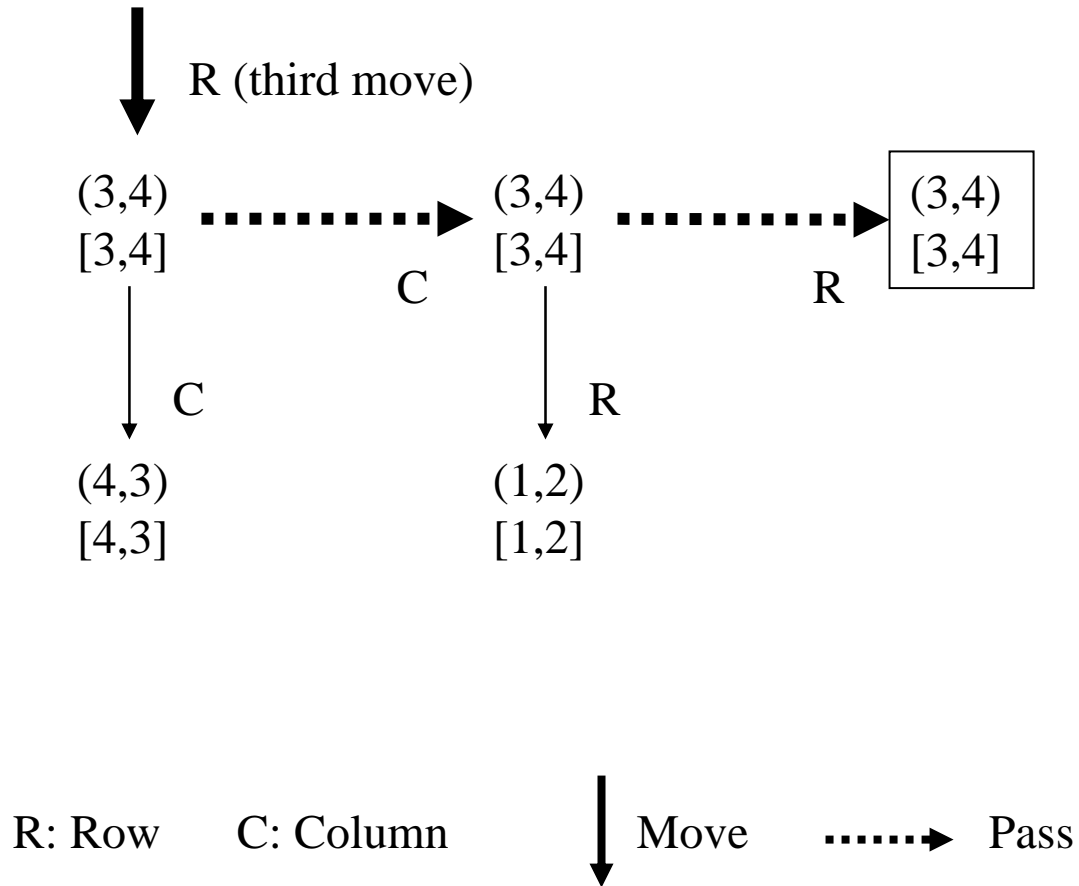


**Figure A4: C Module 1**

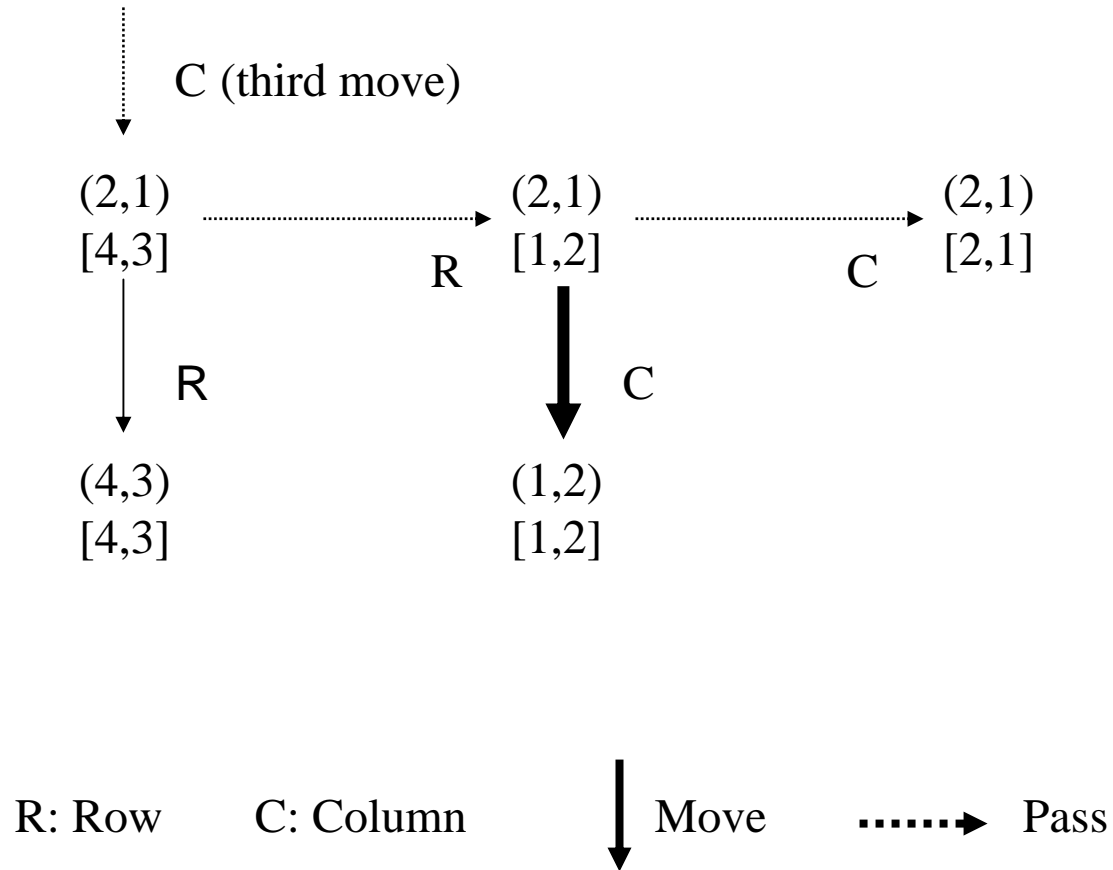


Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold

**Figure A5: R Module 2**

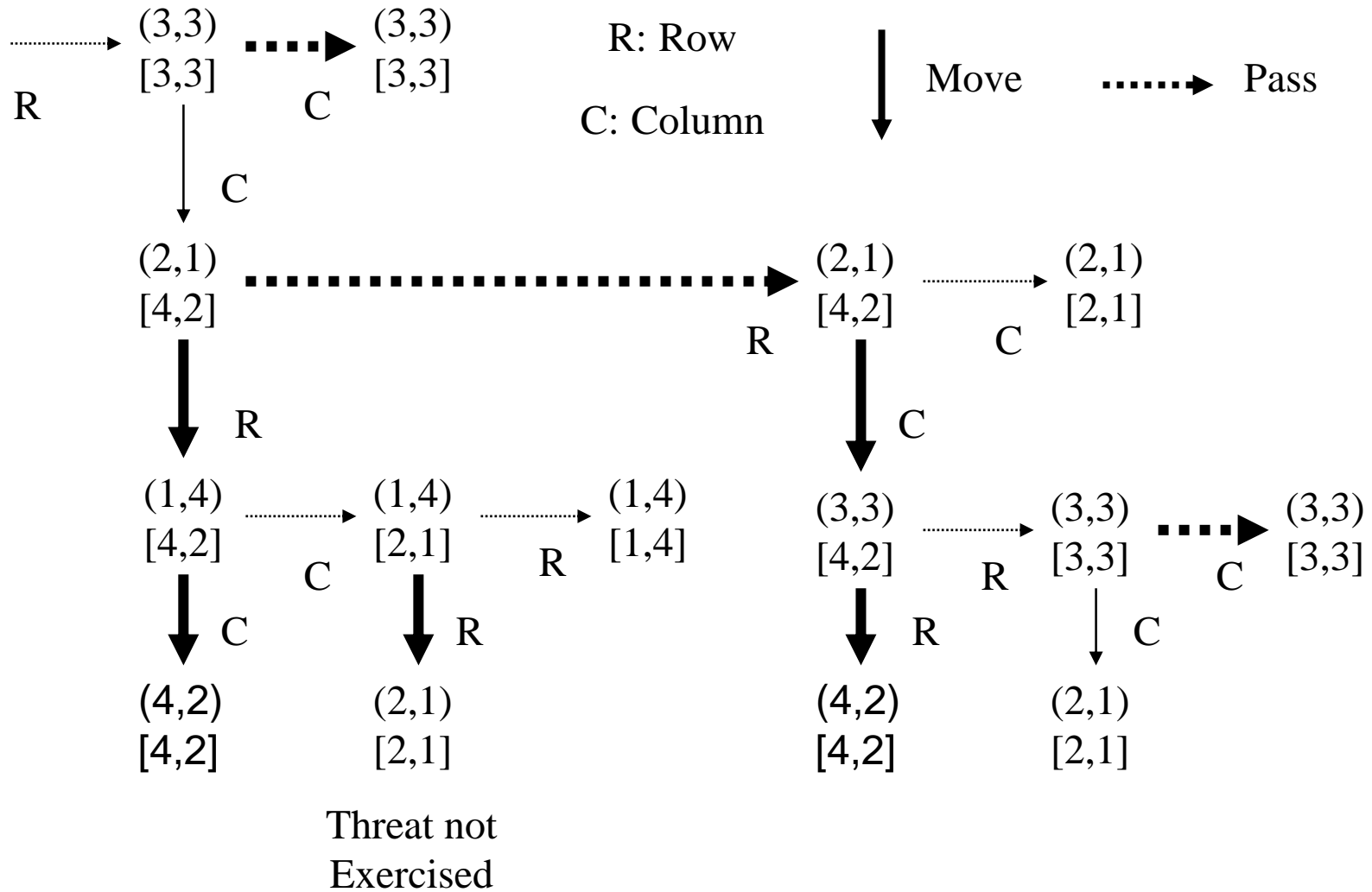


**Figure A6: C Module 2**





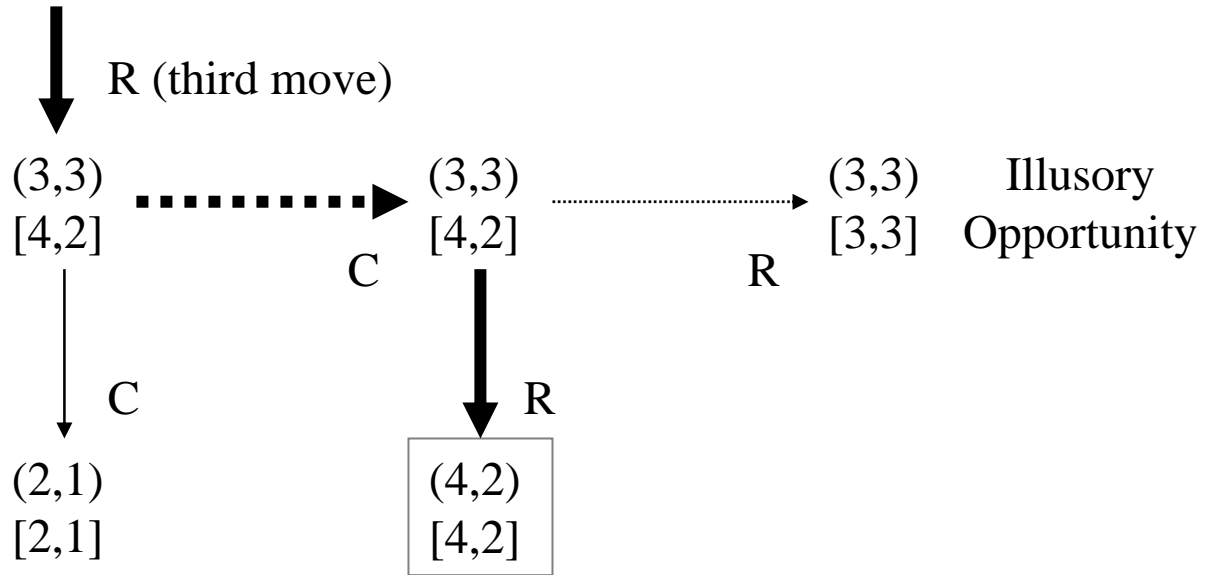
**Figure A8: “Nothing Better for R” Module**



Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold



**Figure A9: “One Possibility” Module**



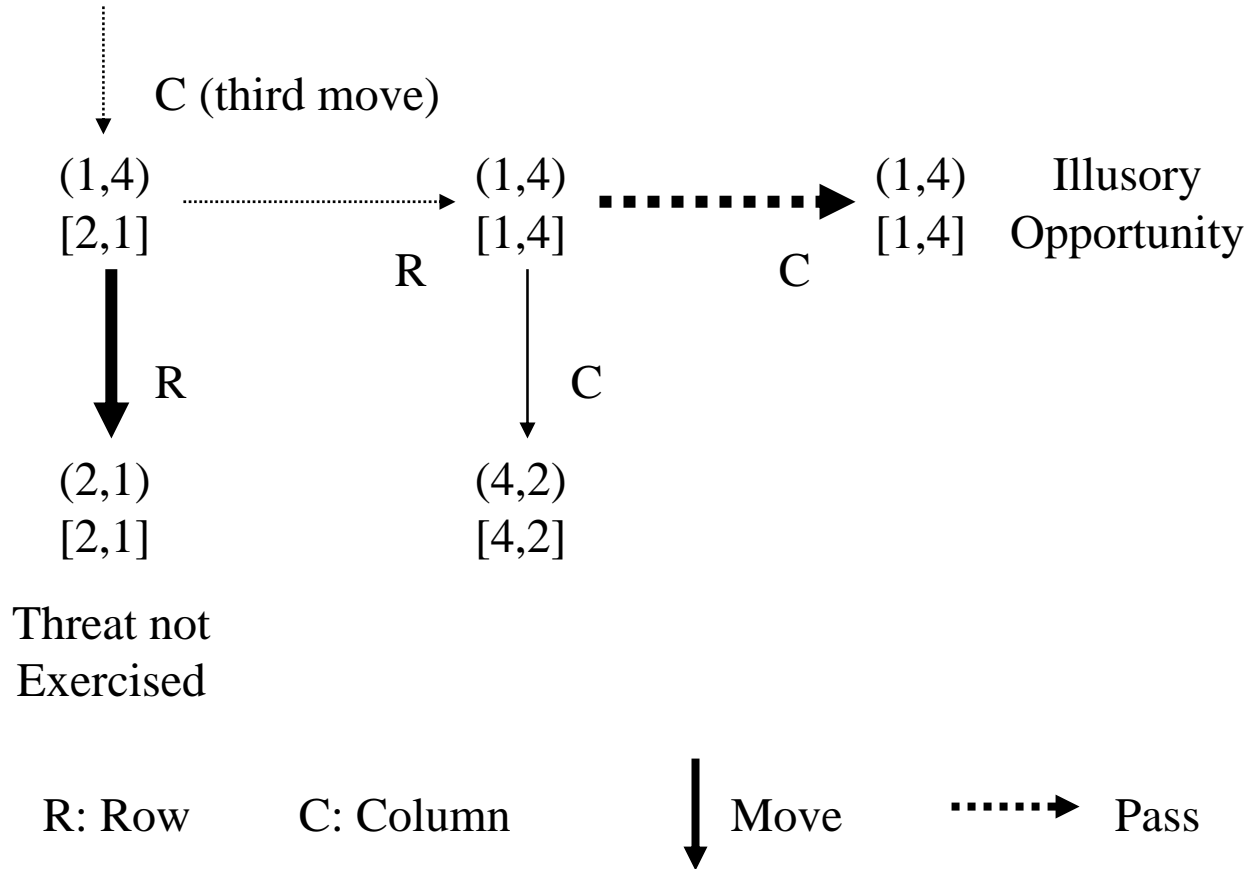
R: Row

C: Column

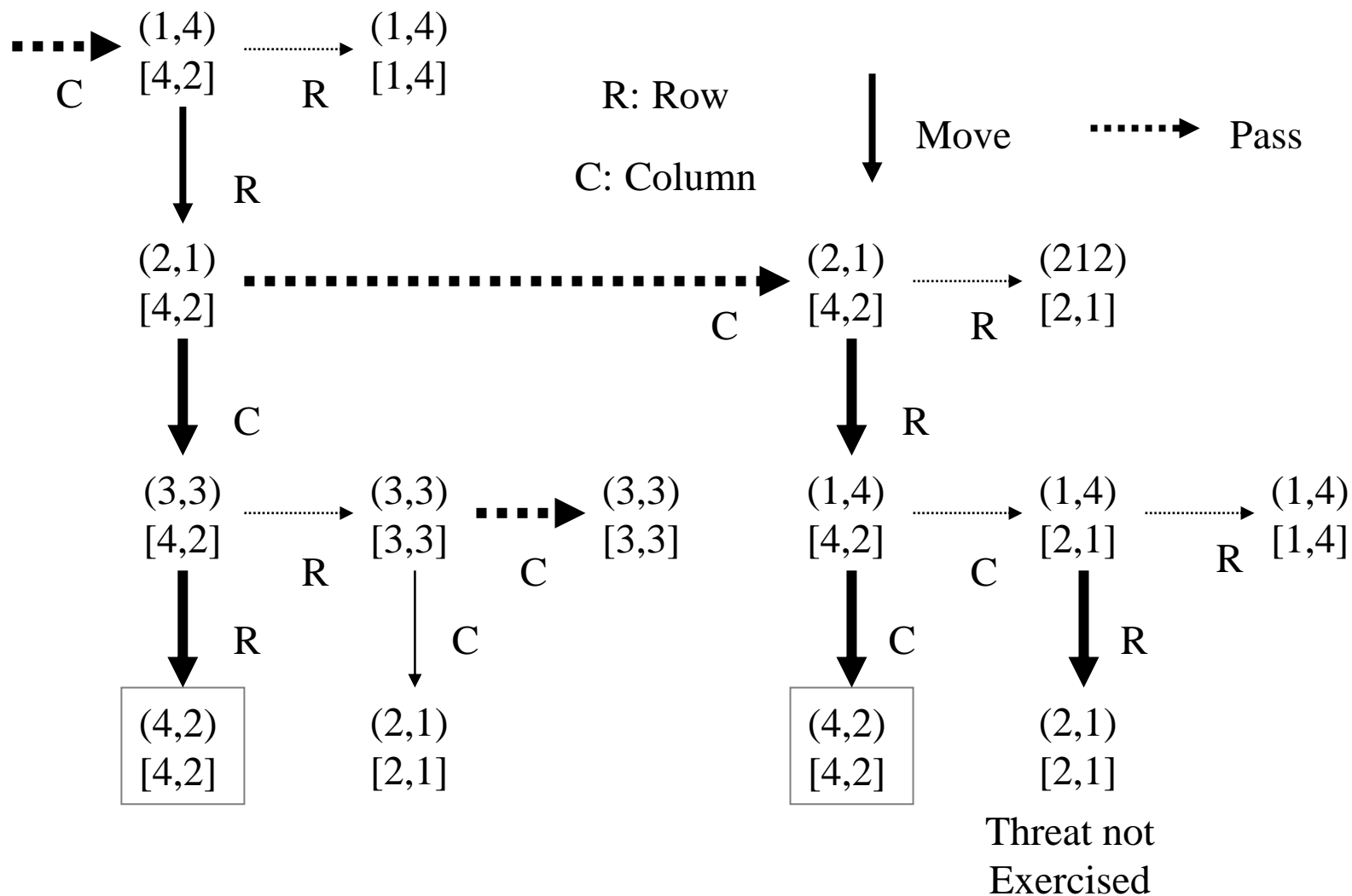
↓ Move

.....→ Pass

**Figure A10: “No Possibility” Module**

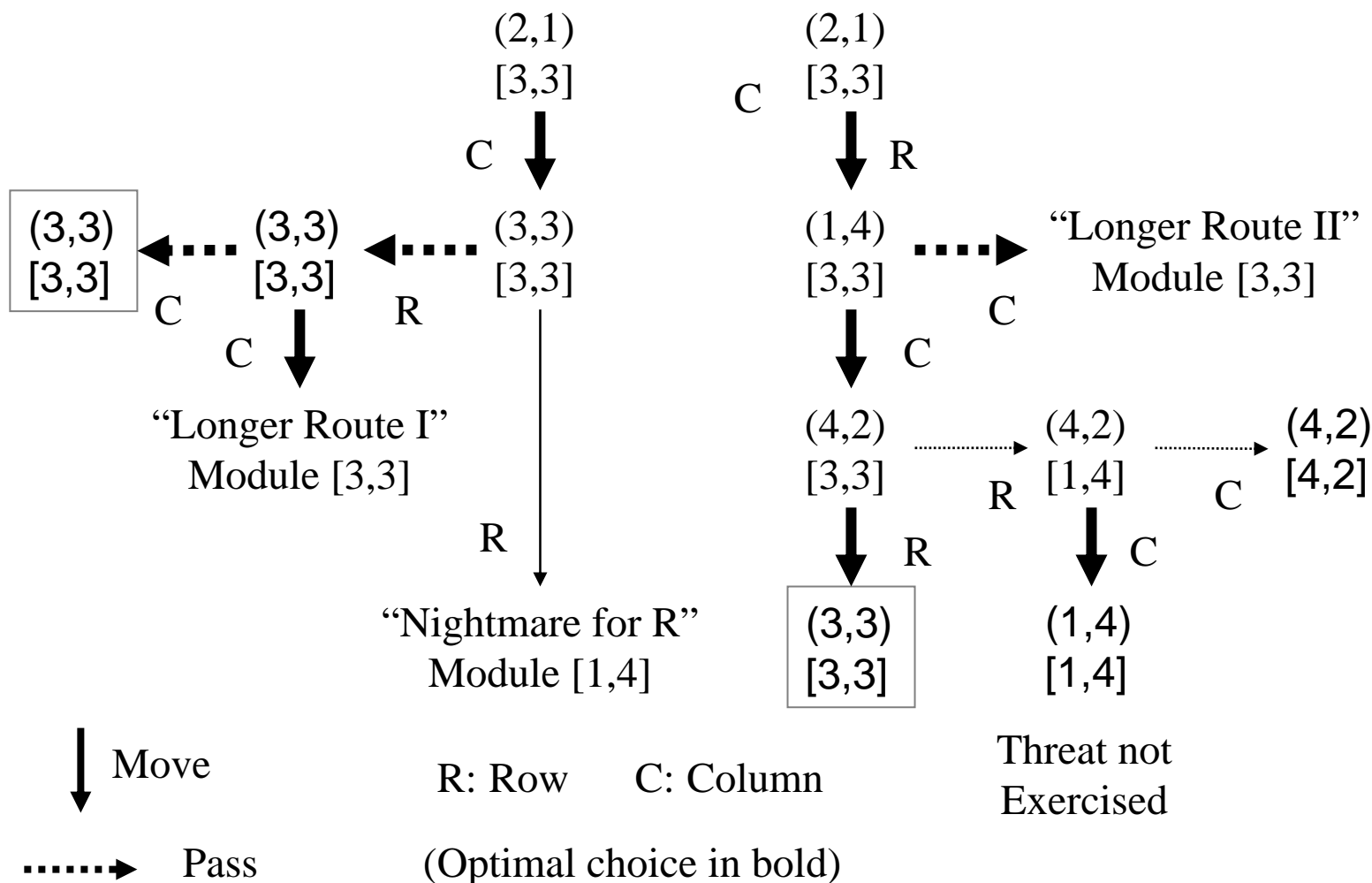


**Figure A11: “Two Possibilities” Module**



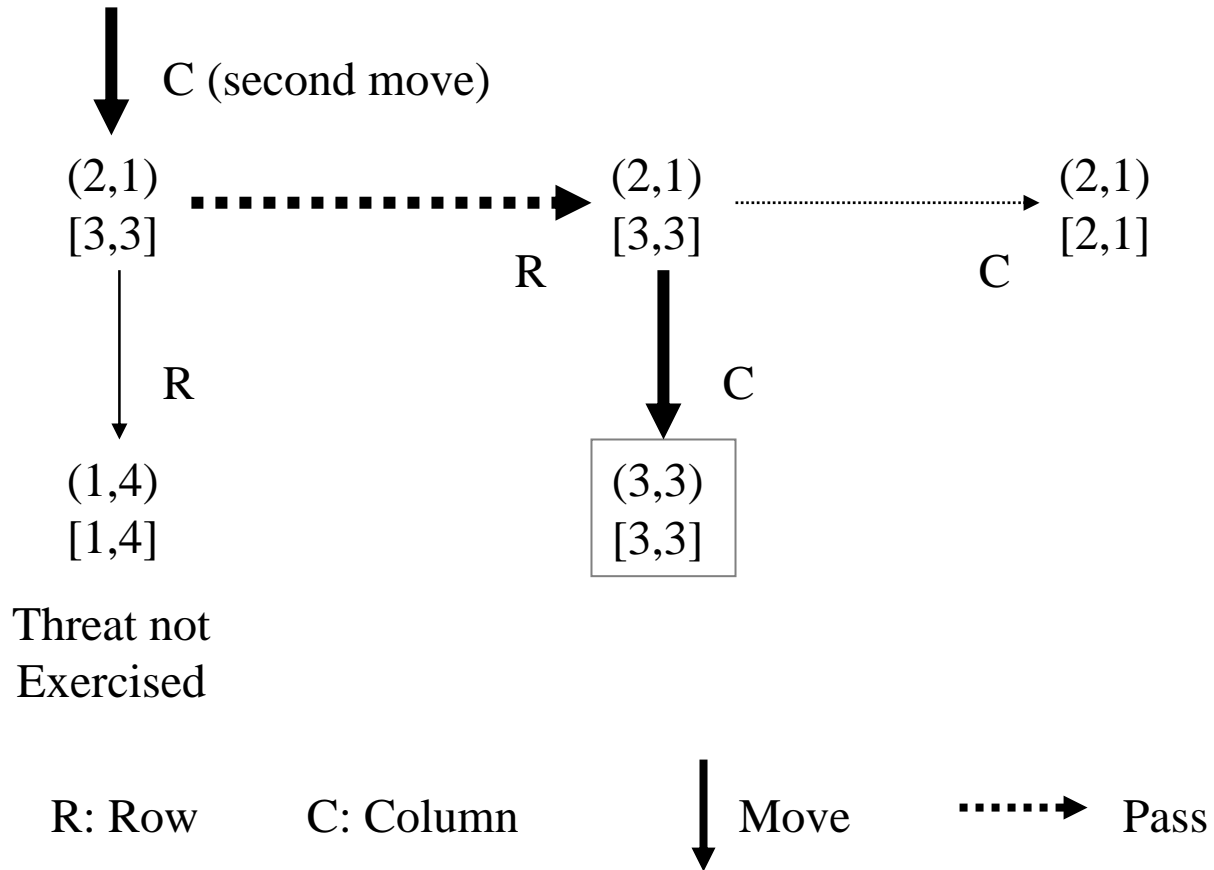
Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold

**Figure A12: Willson’s Version of Game 47 from Initial State (2,1) with Three Moves**

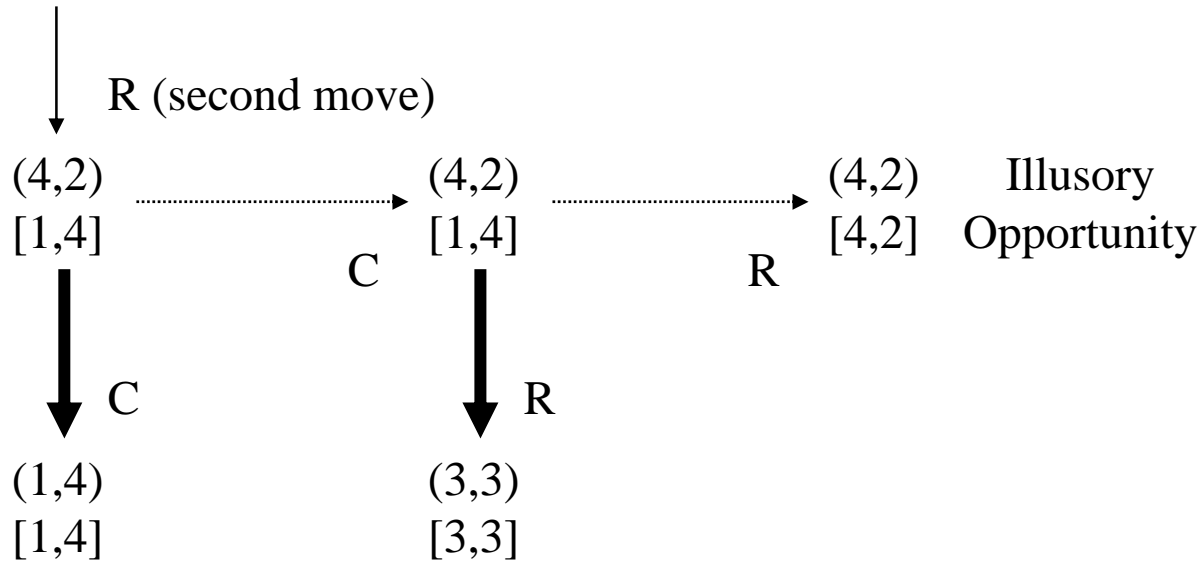


Note: If “move” and “pass” at any node lead ultimately to the same payoffs, both options are shown in bold

**Figure A13: “Longer Route I” Module**



**Figure A14: “Nightmare for R” Module**



R: Row

C: Column

$\downarrow$  Move

$\cdots \rightarrow$  Pass

**Figure A15: “Longer Route II” Module**

