Will a rational player ever play R?

**Dominated Strategy**

A strategy $s'_i \in S_i$ of player $i$ is strictly dominated if there exists another strategy $s_i$ of $i$ such that for every strategy profile $s_i \in S_i$ of the other players $U_i(s_i, s_i) > U_i(s'_i, s_i)$.

A strategy $s'_i \in S_i$ of player $i$ is weakly dominated if there exists another strategy $s_i$ of $i$ such that for every strategy profile $s_i \in S_i$ of the other players $U_i(s_i, s_i) \geq U_i(s'_i, s_i)$, and there exists some $\tilde{s}_i \in S_i$ such that $U_i(s_i, \tilde{s}_i) > U_i(s'_i, \tilde{s}_i)$.

**Example:** R is strictly dominated, D is weakly dominated.
Dominant Strategy

A strategy $s_i$ is strictly (weakly) dominant strategy for player $i$ if $s_i$ strictly (weakly) dominates all other $s_i' \in S_i \setminus \{s_i\}$.

Examples:

1. Neighboring Kingdoms' dilemma

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<tr>
<th></th>
<th>Agri</th>
<th>Defence</th>
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<tbody>
<tr>
<td>Agri</td>
<td>5,5</td>
<td>0,6</td>
</tr>
<tr>
<td>Defence</td>
<td>6,0</td>
<td>1,1</td>
</tr>
</tbody>
</table>

Dominant strategy?
Which kind?

2. One indivisible item for sale

Two players having values $v_1$ and $v_2$ respectively.

Each player can choose a number in $[0, M]$, $(M > v_1, v_2)$

Player quoting the largest number “wins” the object (tie broken in favor of 1), and “pays” the losing player’s chosen number.

Utility of winning player = her value − her payment
Utility of losing player = 0

NFG representation: $N = \{1, 2\}$, $S_1 = S_2 = [0, M]$

$$u_1(s_1, s_2) = \begin{cases} v_1 - s_2, & \text{if } s_1 > s_2 \\ 0 & \text{otherwise} \end{cases}$$

$$u_2(s_1, s_2) = \begin{cases} v_2 - s_1, & \text{if } s_1 < s_2 \\ 0 & \text{otherwise} \end{cases}$$

Dominant strategy? Which kind?
**Dominant Strategy Equilibrium**

A strategy profile \((s_i^*, s_j^*, \ldots, s_n^*)\) is a strictly (weakly) dominant strategy equilibrium (SDSE/WDSE) if \(s_i^*\) is a strictly (weakly) dominant strategy for \(i\), \(\forall i \in N\).

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<th>D</th>
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<tbody>
<tr>
<td>A</td>
<td>5, 5</td>
<td>0, 5</td>
</tr>
<tr>
<td>B</td>
<td>5, 0</td>
<td>1, 1</td>
</tr>
<tr>
<td>C</td>
<td>4, 0</td>
<td>1, 1</td>
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</tbody>
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Question: What kind of equilibrium in this game?