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The Theory of Unintentional Collaborations

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Theory

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INTRODUCTION

In all multiplayer games with top heavy prize structures, all the players who use a high-risk high-reward strategy, unintentionally collaborate to increase their win chances over players who use a less risky and potentially less rewarding strategy.

ABOUT THE STUDY

Game example:

Winner takes all competition.

There is x of number rounds. During each round, each player is secretly given 2 options:

- They can score 100 points.

- They can flip a coin and respectively score either 0 or 120 points.

Their scores are then kept secret till the end.

The equilibrium strategy is clearly to take the 100 points on all rounds. What I am trying to show you in this paper, is that as more players opt for the high-risk high-reward strategy, the equilibrium strategy set becomes exponentially less effective.

Let's say there are only 2 rounds. If you chose option A both times, you will fulfil your role in reaching equilibrium, and will score 200.

- Against 1 opponent who opted only for the high-risk strategy, option B: Your odds of winning are 0.75.
- Against 2 opponents who opted only for option B, your odds of winning are 0.56.
- Against 4 opponents, your odds are 0.31.
- Against 8, your odds are 0.10…

The unintentional collaboration of the players opting for B, has now taken the advantage away from the equilibrium player in this game. There are 9 players in total, but the equilibrium player now has only a 1 in 10 chance of winning.

- Against 16 players, your odds are 0.01. You have a 1 in 100 chance of winning now.
- Against 100 players, your odds of winning are too small for my calculator to calculate.

It is commonly believed that the other players must deliberately collude to take the win chance away from a player who performs his role in the equilibrium strategy set. I hope I have proved that this is not true.

These unintentional collaborations happen in all multiplayer games with a top heavy prize structure. The more "top-heavy" the prize distribution, the greater the effect these unintentional collaborations will have over the results of the competition.

Familiar example: In RPS, imagine you score 1 point for each time you beat the opponent. But for this example, imagine multiple games were running at the same time between different players, and it is only the player who scores highest out of everyone that wins.

The equilibrium strategy in this game is still to use the rock, paper, and scissors randomly.

If your opponent were to risk a potentially more profitable strategy, but you remained with random choices, it can only increase your score on average. This is as you'd expect from the equilibrium strategy. However, as your opponent's strategy is potentially more profitable, the more players throughout the competition that attempt this against their own opponent, the exponentially lower your chances of achieving the highest score.

Poker example: In Poker you can play cash tables, where the value of the chips directly relates to the cash prize. In this game the prizes are distributed equally to whoever wins any amount of chips, and so these unintentional collaborations do not happen. In contrast, in a poker tournament, as they do have top heavy prize structures, these collaborations do happen.

In tournament poker you have many variables that effect the unintentional collaborative efforts of the players who opt for a higher-risk higher-reward strategy than the equilibrium strategy set; Players can get eliminated anytime their potentially more profitable strategy doesn't work, which will minimise the effects from these unintentional collaborative efforts. A contrasting effect is observable anytime a player wins these risky gambles, and so moves further from elimination. It is also true that the strength of a player during each decision is largely determined by how many of these gambles have gone their way, and how many haven't, during past decisions.

There are many variables in complex games that work both for and against the effects of these unintentional collaborations.

CONCLUSION

There are many variables in each game that effect the unintentional collaborative efforts of players. In some game formats, like large field poker tournaments, it is extremely ineffective to use the equilibrium strategy set, thanks to the huge impact from these unintentional collaborations.

Generally speaking, the more players in the game, and the more top heavy the prizes, the more riskier a strategy you should use. It's impossible to gage the exact amount of risk you should apply, as it is entirely determined by the strategies applied by the other players.

This paper essentially teaches you that the strategy you thought was optimal, is not optimal in the vast majority of multiplayer games.