the paths and deriving their distribution for each game class. Almost all the distributions are fat–tailed [10]. These distributions present a lot of data points in the tail, showing that the performance of an algorithm may vary dramatically from run to run. Formally, a distribution is fat–tailed if its kurtosis (\(\mu_4/\mu_2^2\), where \(\mu_j\) is the \(j\)–th moment) is larger than 3 (i.e., the kurtosis of a standard normal). All the game classes have a kurtosis larger than 3, except for DispersionGame, MinimumEffortGame (the kurtosis is not defined since \(\mu_2 = 0\) and \(\mu_4 = 0\), all the paths having the same length), SGC (1.0), TravelersDilemma (1.8), and WarOfAttrition (2.39). As suggested in [10], with fat–tailed distributions, random restarts may drastically improve performance. Our experiments, discussed below, confirm this.

Although almost all the classes present fat–tailed distributions, the performance of LH varies greatly across them. We ran LH with instances of different sizes and bucketed the game classes into five groups:

1. (DispersionGame, MinimumEffortGame) The length of all the paths is constant (= 2) with game size.
2. (BidirectionalLEG–CG/RG/SG, CovariantGame–Pos, LocationGame, UniformLEG–CG/RG/SG, WarOfAttrition) The average and maximum path length tends to a constant value (< 10) as game size increases.
3. (SGC, TravelersDilemma) The average path length increases linearly in game size.
4. (BertrandOligopoly, CovariantGame–Rand/Zero, GraphicalGame–RG/Road/SG/SW, PolymatrixGame–CG/RG/Road/SW, RandomGame) These games have an exponential growth of the average number of steps with the game size, but there can be some paths with polynomial length. Fig. 1 reports, for two classes, the average number of steps and the pertinent box–plot diagram: median, 1–st/3–rd quartiles with dotted lines, min/max with dashed lines of PolymatrixGame–RG and CovariantGame–Rand.
5. (HtSG) All the paths are exponentially long.

We produced the same analysis for L by randomly generating \(m\) initial solutions. All the classes present the same behavior they have with LH — except DispersionGame, which, when solved with L, belongs to Group 2. HtSG preserves, with L, the same characteristic exhibited with LH: the length of the shortest paths grows exponentially.

6.4 Finding an NE by rrLH

Groups 1–3 are easy even without resorting to random restarts (these games are easy also with other algorithms, e.g. PNS). Thus, we just briefly summarize the main results omitting details. Instances of

![Figure 1: Comparison between LH (left) and rrLH (right) in terms of average number of steps and box-plot (median, 1-st/3-rd quartiles with dotted lines, min/max with dashed lines) of PolymatrixGame–RG and CovariantGame–Rand.](image-url)