Analysis of the causes and evolution of class solidification based on Q-learing and asymmetric repetitive eagle-pigeon game

Xuan Zhou and Yicheng Gong

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If the phenomenon of class solidification in a society intensifies, it will lead to a lack of impetus for social production. Class solidification can be understood as an equilibrium situation with low class mobility formed by various strata groups in the interaction of aggressive and concessional strategies, which can be seen as a groups' repetitive eagle-dove game. Based on the practice of continuous selection strategy of each class group and the characteristics of eagle pigeon game, this paper constructs an asymmetrical repetitive class competition game model, and theoretically analyzes the influence of class group selection on class solidification phenomenon, and establishes a class competition game model with parameters, including asymmetric factors $\mu=k_A$：k_B and the payoff per unit is $m = V/C$ when two sides of the game are in conflict, and obtains the analytical solution of the model. Take advantage of the characteristics of agents in reinforcement learning to find excellence in trial and error, the Q-learing method is considered to simulate experiments.

In this paper, experiments are simulated under the settings of constant and variable values of parameters μ to verify the strategic selection and equilibrium state of class groups in the phenomenon of class solidification and class flow. Considering the gap in strength of class groups, the μ value is divided into five cases: $\mu = 0.5: 0.5$, $\mu = 0.4: 0.6$, $\mu = 0.3: 0.7$, $\mu = 0.2: 0.8$, and $\mu = 0.1: 0.9$. Experiments with five μ values (μ values unchanged) and five μ values (μ values change) were carried out, and the stabilization strategy formed by 20,000 iterations of class groups was observed. It can be obtained that under the two μ value settings, after about 10,000 repeated games, three stabilization strategies are formed: "eagle-pigeon", "pigeon-eagle" or "pigeon-pigeon" strategy.

On the other hand, the above experiments were run independently for 100 times to observe the similarities and differences of the stable strategies of each group under different μ values: Similarly, as the m value continues to decrease, the group strategy of selecting "pigeon-pigeon" will gradually decrease, that is, the class unit The smaller the income, the easier it is for the class group to slack off. At the same time, as the value of μ continues to decrease, the group that chooses the "carrier pigeon-pioneer" strategy will gradually increase, that is, the greater the asymmetric factor of the class, the easier the class group is to slack off. The difference is that when there is a disparity in the strength of class groups ($\mu = 0.1: 0.9$), the low-class group when the μ value is unchanged will directly choose to laid-back, while about 26% of the low-class group is willing to choose a positive and enterprising strategy when the μ value changes.

It can be seen that the greater the asymmetry of class groups, the more vulnerable groups tend to be more laid-back; the higher unit income in conflict between the two sides of the higher group effectively stimulates the enthusiasm of different class groups, continuously promotes the flow between social classes, and improves the social developmental activity.