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## **Effects of noise gene expression on background and cooperator-defector fitness**

The models of evolutionary dynamics are usually based in a fixed background fitness and, when they include cooperation, they include a fixed level of cooperation, which means that it is deterministic. However, in a biological system each individual is going to have different fitness and cooperate in different degrees due to phenotypic variability, even in isogenic populations. This is an effect of the gene expression noise. Expression noise affects the fitness of an organism when its fitness depends on the advantage of some phenotype that is generated by a gene or group of genes, and an increase in gene noise expression can lead to a decrement of the total fitness. Our stochastic simulations show that the fixation time is altered if the background fitness is a non-linear function of the gene expression. Including phenotypic variability in Moran processes allows a more realistic approach to the evolution of cooperation. Detailed simulations of competition populations of cooperators and defectors would allow characterization of the importance of phenotypic variability and its utility as an evolutionary strategy.