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**Complementary variety: when can cooperation in uncertain environments outperform competitive selection?** (English) [Zbl 1373.92090](#)  
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Summary: Evolving biological and socioeconomic populations can sometimes increase their growth rate by cooperatively redistributing resources among their members. In unchanging environments, this simply comes down to reallocating resources to fitter types. In uncertain and fluctuating environments, cooperation cannot always outperform blind competitive selection. When can it? The conditions depend on the particular shape of the fitness landscape. The article derives a single measure that quantifies by how much an intervention in stochastic environments can possibly outperform the blind forces of natural selection. It is a multivariate and multilevel measure that essentially quantifies the amount of complementary variety between different population types and environmental states. The more complementary the fitness of types in different environmental states, the proportionally larger the potential benefit of strategic cooperation over competitive selection. With complementary variety, holding population shares constant will always outperform natural and market selection (including bet-hedging, portfolio management, and stochastic switching). The result can be used both to determine the acceptable cost of learning the details of a fitness landscape and to design multilevel classification systems of population types and environmental states that maximize population growth. Two empirical cases are explored, one from the evolving economy and the other one from migrating birds.

**MSC:**

[92D15](#) Problems related to evolution  
[92D25](#) Population dynamics (general)  
[91D10](#) Models of societies, social and urban evolution

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biological and socioeconomic populations; uncertain environments; stochastic environments; complementary variety

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