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Edgeworth and the Travelling Salesman: Bounded Rationality and the Complexity of Economic Organization

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This paper seeks to understand the complexity of economic organizations. I use the concept of a stable coalition structure to characterize an economic organization and explore ways to measure its complexity. This is accomplished by using Shannon and Kolmogorov measures to estimate the information contained in a description of consistent coalitions relative to a completely disordered state. Both measures are proportional to the size of the object and the length of a contract that describes it. I find there is constant average complexity with respect to scale by the Shannon measure and decreasing average complexity by the Kolmogorov measure; both measures converge in the limit. I also estimate the complexity of an optimal coalition structure by estimating the time complexity of computing it. This problem is intractable; the number of coalition structures grows as an exponential of the number of agents and the value landscape is flat and granular. Optimal organizations are not unique, they are rare, and forming them is intractably difficult. It may be possible to form large organizations only if they are boundedly rational or if they are formed by random or evolutionary processes.