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How Physics Can Help Social Sciences in Prediction of Complex Collective Phenomena?

The impact of physics on broadly defined social sciences, including also economics, management and finance has been one of decisive factors of development of the latter. What is less known, as Philip Mirowski showed, the influence was sometimes mutual. In the recent years thanks to econophysics, the links between physics and finance have achieved a new level. Econophysics shows that the transfer of concepts from physics to finance is explicitly and implicitly aiming at improvement of prediction (forecasting) by supplementing "classical" methods of economics/finance with concepts associated with non-linear systems, or broadly defined complex systems. The expectations of enhancing predictive capability concern not only economics and finance. In management expectations towards enhancing predictive capability of behavior of complex social structures also can be found. Although this new symbiosis of physics and social sciences have brought about a rank of interesting results, e.g. deepened understanding of uncertainty and risk in finance or applications of scale-free networks in modeling dynamics of social systems, it may be stated that a deepened understanding of limitations and possibilities of enhancing predictive capability of social sciences with methods drawn from physics has not been developed yet. The aim of the paper is to show what are the limitations and possibilities of applying models of collective phenomena from physics in prediction/forecasting in social sciences. Firstly, a survey of interpretations of prediction in collective phenomena in physics will be presented, with an exception of quantum mechanics, as not relevant to application in modeling of social phenomena. Subsequently the examples of barriers of prediction of collective phenomena in social systems will be presented. Thirdly, explanations how models taken from physics could enhance prediction in collective phenomena in social sciences or how they could help in better understanding limitations of prediction of those phenomena will be developed. The examples from social sciences will include cases of prediction of functioning of organizations at various levels of societal hierarchy – slow and disruptive change, growth, risk analysis and risk management, etc.