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RESEARCH ON STRUCTURAL EVOLUTION AND PATTERN EMERGENCE OF SOCIO-ECONOMIC COMPLEX NETWORKS BASED ON INDIVIDUAL CHOICES

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Abstract. In this paper, we are concerned with the effects of individual behaviors at a microscopic level on the structures of complex networks at a macroscopic level in terms of the different micro features between socio-economic complex networks and other networks. We start with a random network and show the evolving process of topological structure of this network. A main conclusion is that agents' individually choosing behaviors lead to the dynamical evolution of a complex network, which follows the spontaneous emergence of some common structural features including small-world effect and power-law distribution of node degrees. We aim to understand how the dynamical processes taking place on a network shape the network topology from the viewpoint of socio-economic research.

Keywords. Complex network; Individual choice; Evolution; Pattern; Emergence

AMS (MOS) subject classification: 91D30, 92D15

1 Introduction

In the last few years, we have seen a burst of interest in research on complex networks. The researchers come from a wide range of academic fields including physics, biology, engineering, as well as socio-economics. There is a growing consensus among socio-economic scientists that many socio-economic phenomena display some inherent network features. Studies on these phenomena should not exclude the consideration of the role of the network structure. Related researchers' attention has been, to a large extent, focused on the significance of embeddedness of networks for understanding these socio-economic phenomena. The collection of related examples include the influences of network embedding on job-searching [6], diffusion of knowledge [4], bilateral trading [14], decision making dynamics in corporate boards [3], etc. Phenomena like these are all related to the dynamical behavior of nodes in the network. Therefore, briefly speaking, current research primarily highlights the effects of network topological structure on the dynamics of