Networks: Information, Stability and Dynamics

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Abstract

Several seminal papers study the stability and efficiency of networks where links are formed either unilaterally (in this setting Goyal (1993) and Bala and Goyal (2000), who also provide a dynamic model, study Nash stability) or based on bilateral agreements (in this setting Jackson and Wolinsky (1996) introduce pairwise stability). In these seminal papers it is assumed homogeneity across players and also that the current network is common knowledge of all node-players. Galeotti et al. (2006) consider heterogeneous players, while Bloch and Dutta (2009) consider endogenous link strength. The common knowledge assumption may be unrealistic in many cases and is dropped by McBride (2006), who studies the effects of a limited perception, namely, assuming that each node-player perceives the current network only up to a certain distance from the node.

In this paper we focus on information but adopt a different approach: we study the effects of introducing some sort of "bounded common knowledge" on stability, efficiency and network formation. Namely, we assume that the current network is only partially common knowledge, that is, different groups of players share different partial common knowledge about the current network. More precisely, an exogenous "information cover" specifies the information status of different groups. An information cover is a collection of subsets of the set of players that covers the whole set (i.e., each player belongs to at least one set in this collection) and such that no set in this collection is contained in other. It is assumed that the players belonging to a given set have common knowledge of the part of the current network connecting nodes that belong to this set.

In the seminal models networks provide information through the links, but even if no link exists the current network is supposed to be common knowledge of all players. If this is an unrealistic assumption (the greater the number of nodes the more unrealistic), it seems more realistic that because of belonging to a same group (club, professional association, department, etc.) individuals may have a clear idea of the connections in such smaller groups. Moreover, an individual may belong to more than one of these groups, sharing common knowledge of the links within each group. Based on this two-ingredient model, network and information cover, we examine the impact of the information on the stable/efficient architectures as well as on dynamics for different information configurations.

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