Information, stability and dynamics in networks under institutional constraints

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Extended 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 (2000a) study Nash stability and provide a dynamic model) 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 to 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 the seminal models networks provide information through the links, but the current network is assumed to be common knowledge to all players. If this is an unrealistic assumption (the greater the number of nodes the more unrealistic), it seems more realistic to assume that because of belonging to a same group (family, club, professional association, department, etc.) individuals may have a clear idea of the connections within such smaller groups. Moreover, an individual may belong to more than one of these groups, sharing common knowledge of the links connecting members of each group.

Based on this idea, in this paper we focus on the effects of institutional and/or informational constraints on the stability, efficiency and network formation. More precisely, an exogenous "societal cover" specifies the social organization in different groups or "societies". A societal cover is a collection of possibly overlapping subsets of the set of players or "societies" 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 another. It is assumed that a player may initiate links only with players that belong to a society s/he belongs to, thus restricting his/her feasible strategies and also the feasible networks. We consider two scenarios concerning information and knowledge. In the first scenario the current network is assumed to be partially common knowledge to all players in each "componnent" of the cover ("partially" means only the part within that componnent of the cover), so that the societal cover imposes a double "physical" and informational constraint. Note that this setting extends Bala and Goyal's setup, which corresponds to the simplest societal cover, consisting of a single "society" including all players. While in our setting only players in the possibly empty "social core", i.e., those belonging to all societies, have common knowledge of the whole network. In this more general setting we characterize Nash networks and strict Nash networks, and also extend Bala and Goyal dynamic model.

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In the second scenario we only assume that all players belonging to each society have common knowledge of the part of the current network connecting nodes that belong to that society, which means an additional informational constraint.

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