

Simulating the Effects of Social Context on Economic Decision Making

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Abstract

A dynamic model of social and economic change will be presented. In this model we propose a framework, based on principles of social influence, for modeling local interactions in economic and social processes. We show the interplay between building simulation models and empirical research testing model assumptions and predictions. We use empirical findings concerning social influence to construct cellular automata model of coordinating individual opinions and decisions. The results of computer simulations developed to test the assumptions and predictions of this model will be presented, in combination with economic data from Poland during the transition period from centrally governed to market economy. The central notion is that social change sometimes occurs rapidly in an abrupt and nonlinear manner. Social influence processes play a pivotal role in promoting such societal and economic phase transitions. These processes and their group- and societal-level consequences are modeled within a cellular automata framework. Both a qualitative and a quantitative model accounting for empirical results will be presented. The validity of the model is tested against empirical data collected during the societal transitions that occurred in Poland in the late 1980s and early 1990s. Changes in the shape of the spatial correlation function suggest that this change followed a scenario of phase transition, in which local domains of economic growth develop. In addition to capturing the dynamics of social change, the model has important implications for designing programs to facilitate economic growth, as well as new attitudes and behaviors in society. The model also provides a framework for understanding cross-cultural differences in the dynamics of social influence and societal transition.

To model the fact that individual opinions depend on their social context, we assume that individuals communicate with a certain number of others to find out how much support each of the possible opinions has. Opinions of others located nearby and of those who are most influential are given the most consideration. In these processes, individuals also give considerable weight to their own opinion. As the simulation progresses, individuals adopt the opinions that they find most influential in the process of interacting. In the course of simulations, the number of individuals holding the minority opinion declines. In the end of simulations, people holding the minority opinion are also grouped in clusters or “bubbles.” The phenomenon of clustering is frequently observed in social groups. The clusters or bubbles will form in any formal model that incorporates local interactions in which an individual is likely to adopt the prevailing opinion in his or her local environment. Note that in clustered society, particular individuals may be unaware or even mistaken as to whether their opinion is consistent with a global majority or minority. To weight different opinions existing in the society, individuals use in fact a very limited sample, composed mostly of people in their neighborhood.

A minority can survive in three general types of configurations. The simplest configuration consists of a single strong individual surrounded by a ring of weaker minority members. Notice that the weaker members, although they would not be able to maintain their opinion without the leader, provide him or her also some support and isolate him or her from the majority. A second configuration consists of a group of stronger minority members located close to each other and may be termed a "stronghold." The whole group is usually surrounded by a ring of weaker members. In the third scenario, strong individuals are located on the borders of the cluster; they form a "wall," shielding the weaker individuals located inside the cluster.

A number of empirical studies were conducted to test the assumptions of the model and the model's predictions. The results confirm the viability of the model's assumptions and confirmed the model's predictions. The data have also indicated to what types of situations this model can be applied. These results are also informative in more general sense: how to construct psychologically realistic simulation models of social interactions.

The model was generalized to social transitions. A social transition may occur when the opinion that initially has been in the minority becomes more attractive than the opinion of the majority. As a result of bias and social interaction, the minority of the followers of the new starts to grow. Clusters start to form around those individuals who can be interpreted as seeds of the transition. These bubbles of new continue to grow in the course of time and eventually connect to each other. Eventually the new equilibrium is reached. Interestingly, despite the fact the bias is still

present, there are bubbles of old well-entrenched in the sea of new, in the final state of the transition. The reason is that the original majority had time to self-organize and to find the most convenient niche to survive. The major conclusion of the scenario presented above is that the transition occurs through the growing bubbles of new within the sea of "old." Clustering is the necessary first step toward the "new." The success of the transition depends on how effectively clusters of minority can grow and connect to each other.

The predictions of the model were tested using the economical and voting data from Poland in the 1989-1982, the period of transition from centrally governed to market economy. Data analyses have shown that characteristic patterns of economic transformation can be characterized as growing clusters of entrepreneurship and economic growth. Qualitative prediction of the model were fully confirmed by the analysis of economic and voting data. To be able to generate quantitative predictions, however, it was necessary to build a new, aggregate level model in which an agent correspond to a local community, rather than to an individual. The correlations of predictions from this model with empirical concerning spatio-temporal pattern of privately owned businesses in Poland are highly reliable.