Research Statement

The primary focus of my research agenda is to explore how economic agents acquire and process new information, how the information is disseminated and aggregated in economies, and the normative effects of these dynamics in different economic structures. I explore the questions by use of both theoretical and experimental methodologies.

Social Learning

The social learning literature seeks an information-based explanation for uniform social behavior. The main argument of the literature is that, when decision-makers observe a uniform social behavior, they *rationally* tend to 'ignore' their own information and 'follow the herd'. This behavior is rational because the information inherent in aggregate behavior dominates the decision-maker's information. This behavior leads to a major problem: since the information of early decision-makers may aggregate poorly, a great number of individuals can make the same incorrect decision.

In order to understand these results, my research questions the central assumption of the literature: perfect observation of actions. A common assumption of the previous models is that all individuals are assumed to be able to observe all the decisions that have previously been made. An individual thus compares his information with that of a large (in the limit, unboundedly large) number of other individuals. In reality, individuals have access to *local information*; they observe the decisions of those who are closer to them. So the natural question arises: how robust are the results of the literature to local information?

In the paper "Observational Learning Under Incomplete Information" published in the ***Games and Economic Behavior***, 2004, **47**(1) pp. 72-86, we tackle this question by relaxing perfect observation of actions and dealing, instead, with the case in which each individual observes only his immediate predecessor's decision. We show that the results under two assumptions are drastically different. The main difference is that learning under the former assumption has the martingale property that permits establishment of convergence of beliefs and actions. Under local information, in contrast, the learning process does not have the martingale property. The important implication of this is that beliefs and actions are not convergent but cycle forever. We show that local information leads to longer and longer periods of uniform behavior, punctuated by increasingly rare switches. In other words, while under global information, social learning eventually ceases as individual behavior becomes purely imitative—hence uninformative—under local information individuals become more and more likely to imitate and, at the same time, behavior fails to converge.

These results show that the two processes, beliefs and actions, are the engines of information aggregation in large sequential economies. Indeed, the literature refers to these two processes as informational cascades and herd behavior, respectively. An informational cascade occurs when an infinite sequence of individuals ignore their private information when making a decision, whereas herd behavior occurs when an infinite sequence of individuals make an identical decision, not necessarily ignoring their private information. The practical importance of the distinction between herds and cascades is that in a cascade social learning ceases since individual behavior becomes purely imitative. In a herd, in contrast, individuals become more and more likely to imitate but their actions still provide information. Thus, the distinction is related to the social welfare properties rather than the informational properties per se. When acting in a herd, a group settles on a single pattern of behavior and, at the same time, the behavior is fragile in the sense that the release of strong information may cause behavior to shift suddenly and dramatically. In contrast, a cascade is stable, i.e., no information can cause a change in the pattern of behavior. Hence, the distinction between herds and cascades sheds light on questions such as why mass behavior is so fragile and prone to fads.

In the paper "Distinguishing Informational Cascades from Herd Behavior in the Laboratory" appeared in the ***American Economic Review***, 2004, **94**(3), pp. 484-98, we analyze this distinction by use of experimental methods. In the laboratory, we use novel setup and an elicitation technique that enable us to distinguish informational cascades from herd behavior. We find that herd behavior occurs frequently as do cascades. However, not all observed herds are cascades. Since the theoretical result predicts that an informational cascade is impossible, we explain why cascades often arise in the laboratory as a particular type of deviation from rationality. For this purpose, we generalize the model by allowing the possibility that subjects make error and that they incorporate the possibility that others are making errors into their reasoning. Our results suggest that rational models, once properly generalized to take account of human error, successfully predict subjects' behavior in the laboratory and provide an explanation for cascade behavior.

In another paper "An Experimental Test of Observational Learning under Imperfect Information" published in the ***Economic Theory***, 2005, 26(3), pp. 677-99, we use the experimental techniques that we developed in the above discussed paper to test our theoretical findings under local information assumption. We find that in the laboratory imitation is much less frequent when subjects have access to only local information, even less frequent than the theory predicts. For a better understanding of the decision mechanism of the subjects, we focus on the data at the individual level. We find that among the subjects who follow their predecessor there is a good degree of conformity with theory, which we fail to observe in the aggregate data. At the aggregate level we observe that the subjects ignore the information available to them.

Although we find that localized information causes substantial differences in the behavior, both theoretically and experimentally, the question of how individuals choose their local environment remains an open question. To address this question, in the paper "Social Learning through Endogenous Information Acquisition: An Experiment" we study the effect of social learning on the formation of local networks. Precisely, we analyze a model in which a decision-maker is allowed to choose a set of agents he can observe. In this setting, although a variety of social networks is expected, diversity of actions is impossible in the long run. The process of network formation has a significant effect on the social learning dynamics since the network itself provides valuable information to decision-makers. Since, an agent forms a link only if the information he can acquire is potentially valuable, the decision to form a link partially reveals his private information. Also, an interesting prediction of the model is that the existence of a small cost enhances average welfare. The existence of a small cost separates those decision-makers who have an informative signal from those who do not because the former ones do not form a link while the latter ones do. Clearly, this provides valuable information to succeeding decision-makers who will decide whom to form a link. This is why the existence of cost increases average welfare.

Our experimental results support this prediction. Also, when the informativeness of signals change across treatments, behavior changes in accordance with the theory. However, within treatments, there are important deviations from rationality such as a tendency to conform and excessive link formation. Given these biases, our results indicate that subjects would, except when faced with a small cost, have been better off not forming any links.

The standard social learning models have several special features that are quite restrictive and deserve further examination. Perhaps most importantly, the odd aspect of the social learning literature is that it does not really accurately reflect social behavior. In the real world, although people learn by observing the actions of others, they also learn from their advice. For example, people choose restaurants not only by noting which of them are popular but also by receiving advice about them. Similarly, people choose doctors not only by seeing how crowded their waiting rooms are but also by asking recommendations about which physician is more qualified. Thus social learning tends to be far more social than we, economists, describe it. In the paper "An Experimental Test of

Advice and Social Learning," which appeared in ***Management Science***, 2010, 56(10), pp. 1687-1701, we tackle this question by introducing advice giving into the standard social learning model. We design the experiment so that both pieces of information—action and advice—are equally informative (in fact, identical) in equilibrium. Despite the informational equivalence of advice and actions, we find that subjects in a laboratory social-learning situation appear to be more willing to follow the advice given to them by their predecessor than to copy their action. Moreover, we find that the presence of advice increases subjects' welfare.

A common characteristic of the papers that are mentioned above is that there is no strategic interaction between decision-makers. Precisely, they focus on the effects of information externalities and assume away any possible payoff complementarities among decision-makers. Clearly, there are many economic activities that are characterized by strategic complementarities where individuals can achieve a desirable outcome if they coordinate their strategies. Such activities include agglomeration of businesses, technology adoption, bank runs and currency attacks, among many others. These activities often involves asymmetric information and timing problem. In other words, decision-makers possess different information regarding the underlying uncertainty and the timing of which decision-maker makes the first move is a strategic decision. In the paper "The Effect of Endogenous Timing on Coordination Under Asymmetric Information: An Experimental Study," we study the intertwined effect of strategic timing and information asymmetry on coordination. We show that, in the equilibrium, a player who has sufficiently high beliefs about the state of the economy moves first without resort to any delay. This decision triggers an action by the other player whose beliefs would have led to inaction otherwise. Endogenous timing has two distinct effects on coordination: a learning effect (early decisions reveal information) and a complementarity effect (early decisions eliminate strategic uncertainty). We also show that endogenous timing enhances ex ante welfare compared to the simultaneous case. The experiments we conduct to test these results show that the learning effect of timing has more impact on the subjects' behavior than the complementarity effect. We also observe that subjects' welfare improves significantly under endogenous timing.

Diversification of Contractual Risk

The goal of this project is to analyze incentive implications of executive hedge markets. In the paper "Implications of Executive Hedge Markets for Firm Value Maximization" published in the ***Journal of Economics and Management Strategy***, 2007, 16(2), pp. 319-49, we demonstrate both positive and negative effects of hedge markets on the contractual agreements. We show that when a manager can promise the return from his shares to third parties in exchange for a fixed payment (swap contracts) and/or he can trade a customized financial security whose payoff is correlated with his firm-specific risk, the equilibrium effort improves. However, unless they are exclusive, swap contracts lead to a complete unraveling of incentives when the firm-specific risk, or the manager's risk aversion, is sufficiently high. Accordingly, the concern that the manager's hedge market access will lead him to undo his performance incentives is valid only when the hedge market can provide low security customization, and it cannot enforce exclusivity in swap contracts.

In the paper "Acquisition of Information to Diversify Contractual Risk" forthcoming in the ***International Economic Review***, we analyze a principal-agent problem whereby the agent can trade financial assets in order to diversify his compensation risk. Prior to making the portfolio decision, the agent acquires information on how the financial assets available in the market will fit his diversification purposes. We model this information-acquisition activity as a costly search process. The amount of risk that the agent diversifies decreases in information-acquisition cost and increasing in the asset market's sophistication, as measured by the variety of financial assets available. As the agent gains access to an asset market with lower information acquisition costs and higher sophistication, the optimal compensation contract involves more performance-sensitive pay and elicits a higher level of effort.