



Opinion dynamics and wisdom under conformity



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ABSTRACT

We study a dynamic model of opinion formation in social networks. In our model, boundedly rational agents update opinions by averaging over their neighbors' expressed opinions, but may misrepresent their own opinion by conforming or counter-conforming with their neighbors. We show that an agent's social influence on the long-run group opinion is increasing in network centrality and decreasing in conformity. Concerning efficiency of information aggregation or "wisdom" of the society, it turns out that misrepresentation of opinions need not undermine wisdom, but may even enhance it. Given the network, we provide the optimal distribution of conformity levels in the society and show which agents should be more conforming in order to increase wisdom.

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1. Introduction

Opinions crucially shape individual behavior and affect economic decisions and outcomes.¹ For instance, opinions on political issues set the political course, opinions about a product's quality and the integrity of its producer influence demand, and opinions about an economy's growth determine investment decisions. The formation and evolution of opinions are often carried by day-to-day interactions of individuals, i.e. the opinions are determined by exchange in a social network.

We model the formation of opinions through communication in a given social network such that individuals are influenced by the opinions stated by others: individuals update their opinion in a naïve way by taking a weighted average of others' stated opinions (as in the literature on naïve learning, see e.g. DeGroot, 1974; DeMarzo et al., 2003; Golub and Jackson, 2010; Acemoglu et al., 2010). However, influence often goes beyond this simple updating of opinions. When asked for a personal opinion, people usually do not straightforwardly state what they truly think, *rather they are tempted to*

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¹ Under the term *opinions* we subsume also beliefs, judgments, and estimations – depending on the application.

misrepresent their opinion to conform to their friends since disagreement entails uncomfortable feelings (see Zafar, 2011, for empirical evidence). In this paper, we consequently allow that not only the own opinion is influenced by what others say, but also the statement itself. In other words, some individuals tweak their stated opinions to conform to what their social contacts say.

In such a framework, we study the long-run dynamics of opinions and particularly focus on *how conformity affects opinion leadership* and *how it affects the quality of information aggregation* (“wisdom”). Concerning opinion leadership, we obtain a closed-form solution for the influence of an agent on the long-run consensus opinion (i.e. her power). It is determined not only by each individual's position in the network, given by eigenvector centrality (Bonacich, 1972; Friedkin, 1991; DeMarzo et al., 2003), but also by the distribution of conformity in the society. Comparative statics reveal that an agent's power is increasing in own network centrality, increasing in other agents' level of conformity, but decreasing in own level of conformity. The last result, hence, explains the empirical finding that opinion leaders are often characterized by low conformity.²

Concerning quality of information aggregation, we interpret initial opinions as unbiased noisy signals about some true state of nature, and study the precision of the consensus beliefs. First, in a finite population setup, we are able to exactly determine the quality of information aggregation depending on network position, initial signal quality and the distribution of conformity. It turns out that heterogeneous levels of conformity foster precision of the consensus beliefs if conformity is distributed such that it balances the power of agents with their signal quality. Agents who are connected to multiple groups and, thereby, have access to multiple sources of information, end up being well informed although their initial information is lost completely. In large populations, we similarly obtain that agents learn the true state with probability one (i.e. wise crowds emerge, cf. Golub and Jackson, 2010) if too central agents are very conform.

We allow for conformity in an opinion formation framework since there is substantial empirical evidence that individuals conform to the actions of others when these actions are observable (as stated opinions are). For instance in the famous study by Asch (1955), subjects wrongly judged the length of a line after other participants of the experiment (conceived as neutral by the subjects, but being collaborators) had placed the same wrong judgment. Follow-up studies revealed that this effect is weaker if the subjects do not have to report their judgments publicly (Deutsch and Gerard, 1955). In the study by Asch (1955), subjects were asked for the reasons of their wrong judgment. Some said they were convinced of the wrong answer by the collaborators; others said that they knew that their answer was wrong, but felt uncomfortable by not conforming to what the collaborators said (see Asch, 1955, p. 21). Deutsch and Gerard (1955), hence, distinguish two forms of social influence that can be observed in this study. While *informational social influence* describes the updating of (true) opinions according to what others have said, *normative social influence* describes the behavior of stating an opinion that fits the group norm.³

Normative social influence is also documented with respect to other publicly observable behavior. In an experiment on charitable giving, Zafar (2011) shows that individuals adjust more to the contributions of their neighbors (and hence conform more by reducing respectively increasing their contribution), the more their donations are observable, supporting the findings by Asch (1955) and Deutsch and Gerard (1955). Moreover, subjects in Zafar's experiment mainly conform to the actions of participants who are their friends outside the lab. Hence, normative social influence is determined by the social network itself. Zafar (2011) concludes that individuals experience “a utility gain by simply making the same choice as [their] reference group” (Zafar, 2011, p. 774). Incentives to conform can be derived from desires for social status (Bernheim, 1994) and are embodied in a utility component that depends on the difference of the behavior of the focal actor and the behavior of some peer group (Jones, 1984).

While normative social influence affects the choice of stated opinions, informational social influence embodies the updating of the true opinions. We assume that individuals update their true opinions naïvely rather than sophisticatedly since empirical evidence strongly suggests that individuals in these settings behave boundedly rational (Corazzini et al., 2012; Grimm and Mengel, 2013; Battiston and Stanca, 2014). If individuals were fully rational, they would perfectly account for repetition of information (for some references on Bayesian learning in opinion formation, see Gale and Kariv, 2003; Acemoglu et al., 2011; Sethi and Yildiz, 2012; Mueller-Frank, 2013; Sethi and Yildiz, 2013). In fact, evidence from laboratory experiments shows that even in small social networks (of only four people) where the network is made common knowledge, people fail to properly account for repetitions of information (Corazzini et al., 2012; Battiston and Stanca, 2014). In more complex networks, other studies (Chandrasekhar et al., 2012; Grimm and Mengel, 2013) also confirm that learning in the lab is very well approximated by the naïve learning approach.

Hence, we model informational social influence by assuming that individuals learn naïvely from what others say (see also DeMarzo et al., 2003; Golub and Jackson, 2010; Acemoglu et al., 2010). In view of the substantial empirical evidence, we enrich the naïve learning model by studying the effects of individuals who have a desire to adjust their behavior (i.e. their stated opinion) to the behavior of their friends (i.e. their friends' stated opinions). In the words of psychology, this corresponds to modeling normative social influence. Remarkably, this type of influence has not been studied in a theoretical

² A personality trait that has been found to discriminate opinion leaders from followers is called ‘public individuation’ (Chan and Misra, 1990). It measures by a list of questions the extent to which “people choose to act differently than others” (Maslach et al., 1985).

³ Deutsch and Gerard (1955, p. 629) further explain: “Commonly these two types of influence are found together. However, it is possible to conform behaviorally with the expectations of others and say things which one disbelieves but which agree with the beliefs of others. Also, it is possible that one will accept an opponent's beliefs as evidence about reality even though one has no motivation to agree with him, per se.”

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