Investigating Social Influence Through Large-Scale Field Experimentation

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The recent emergence of computational social science research methods has enabled us to conduct large-scale, population level experimentation that allow us to estimate causal effects of different policy alternatives. This new experimental paradigm is particularly suited to study patterns of social influence over real-world networks in which social embeddedness and tie strength are often correlated with each other and with homophily. Networks of interaction among individuals provide the primary pathways along which viral contagion spread. This viral information and behavior spreading is relevant to understand fundamental aspects of social influence in the adoption of behavior like smoking or exercising, and economic product adoption. Given limited resources, policy makers and marketers confront a strategic choice: who to initially target with information? Traditional models of contagion suggest that targeting neighboring nodes would be inefficient, because there is the possibility that one node would infect the other virally. More recent work on complex contagion suggests that behavioral confirmation by alters will increase probability of adoption. Here we report on a marketing experiment in which the clustering of targeting is varied, and we find support that clustered targeting is more effective than non-clustered targeting.

Theory. This is the core reasoning behind the "strength of weak ties"—weak ties connect nodes that provide non-redundant information (Granovetter, 1973; Onnela et al., 2007). However, more recent work (Centola & Macy, 2007; Centola, 2010) suggests that the probability of behavioral contagion increases more than linearly with marginal adoption. That is, having two friends that adopt X more than doubles ego's odds of adopting X. This has direct implications for mass efforts for mass behavior change, either by marketers or policymakers: that efforts to change behavior should NOT be randomly disseminated through the population but aimed at clusters of connected individuals.

Methods. Here we report the results of two country-level experiments in which we exposed 19,352 and 27,420 users, through mobile phone text messages, to unique voucher codes that offered them 100MB of free traffic for their data plans. Each user exposed to a code could (a) adopt the code themselves (i.e., redeem the voucher) and (b) pass the code on to their friends. In the experiments we manipulated the number of users within a dyad and closed triangle of "friends" that were exposed to the market offering. That is, in some randomly selected dyads, one randomly selected user was exposed, while in other dyads both were exposed (N=9,318 dyads with one code; N=5,017 dyads with two codes). Conversely, in some randomly selected closed triangles, one randomly selected user, two randomly selected users, or all three users were exposed to the product offering (triangles with one, two, or three codes: 8,408, 4,697, 3,206). We then tracked adoption of voucher codes over two weeks.

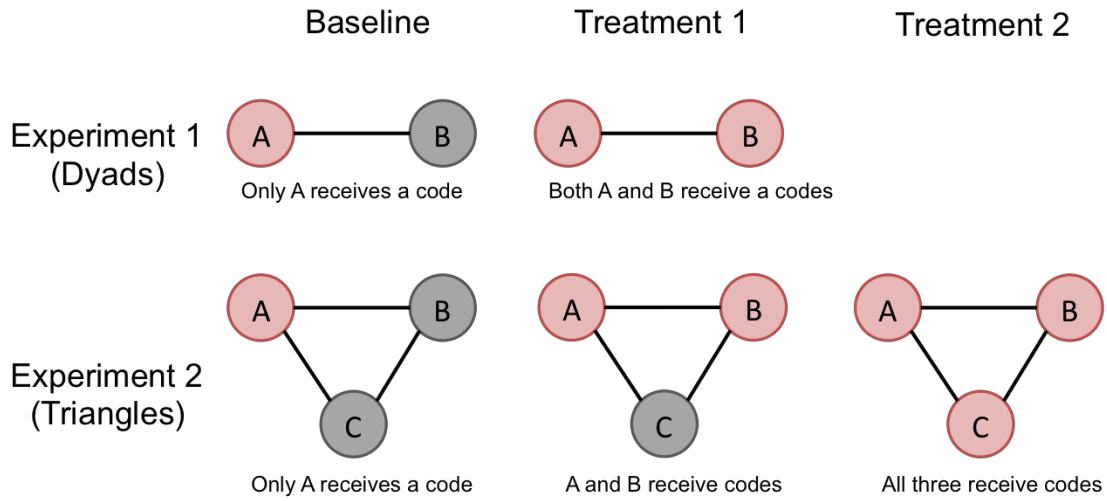

Figure 1. What is the probability of adoption by the focal node (in red)? In the experiment we had two dyad level treatments, and three triad level treatments, varying the number of nodes that received the offer. In experiment 1 probability of focal node adopting was 4.56% in the baseline condition and 4.68% in the treatment condition where both nodes received a code—i.e., employing clustered targeting (not significantly different). In the triangles experiment, the probability of adoption in the baseline condition was 6.28%. In the treatment condition in which two of the three nodes received a code it was 7.18% and in the second treatment condition where all nodes received a code it was 7.08% (3-sample test for equality significant at $p < 0.5$). This represents an increase in adoption probability of 13%-15% from being exposed to clustered treatments.

Results. We find strong causal evidence that increased exposure to the offering through friends significantly increases adoption probability by the focal node in the triad experiment. In dyads, the baseline probability of code adoption remains largely unchanged if a "friend" is equally exposed to a code (adoption probabilities of 4.56% and 4.68%, respectively; not significantly different). However, in the triad experiment, we find that the baseline adoption rate of 6.28% increases to 7.18% and 7.08% if one or two "friends", respectively, have also been exposed to a code (3-sample test for equality significant at $p < 0.5$).

Conclusion. Our results suggest that there is a marginal benefit of exploiting existing ties between individuals to increase behavioral contagion. We show that not only may peer's adopted behavior affect own adoption rates, but simply peer's exposure may already be enough. This has direct implications for efforts to affect mass behavior change and suggests that efforts to change behavior can be more effective if they are aimed at clusters of connected individuals rather than disseminated randomly.

References

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