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Persuasion and receiver's news

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HIGHLIGHTS

- In a persuasion game the receiver is endowed with independent access to information.
- The receiver may be better off when she does not observe the content of the news.
- The value of ignorance deteriorates when communication is two-sided.

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ABSTRACT

In a persuasion game with possibly missing evidence a receiver with access to news may make better decisions when she does not observe its content. The value of ignorance deteriorates when communication is two-sided.

The model I study in this paper departs from the typical persuasion game with possibly missing evidence (Dye, 1985; Jung and Kwon, 1988; Shin, 1994) in that the receiver is endowed with some independent access to information. I compare the receiver's equilibrium payoff when she may only know that evidence exists (*indirect news*) and when she may also discover its content (*direct news*). Due to strategic information retention considerations by the sender, the receiver is sometimes better off in the case of indirect news. Her equilibrium payoff always improves compared to when she has no access to information and it is maximal in one of these two polar cases even when her signal about the state can be more flexible than perfectly revealing or completely uninformative. The value of indirect news may however deteriorate when the receiver also has an opportunity to disclose.

These results on the countervailing effect of direct news in a persuasion game echo findings from the recent literature on cheap-talk communication with an informed receiver (de Barreda, 2010; Chen, 2012; Lai, 2014; Ishida and Shimizu, forthcoming). Besides, this effect is akin to that of repeated communication when information is soft but lies detectable (Dziuda, 2012). In hard information settings, instead, it is the quantity rather than the quality of news that has been shown to generate similar effects when biased experts compete to influence (Bhattacharya and Mukherjee, 2013).[1] Also, exact grading may cause comparable effects in the case of voluntary costly certification (Harbaugh and Rasmusen, 2013). Finally, in the literature on principal–agent relations the use of ignorance as incentive device is a recurrent theme that dates back since Cremer (1995).

1. The model

The game has two players: a sender (S) and a receiver (R). S aims at maximizing the action (a) that R takes, while R wants her action

[1] Bhattacharya and Mukherjee (2013) construct examples in which the receiver's payoff decreases with the experts' likelihood of obtaining information. If we consider the receiver as an expert, in this paper the configuration of preferences of the two players is such that this effect never arises.

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Fig. 1. Disclosure(—) and nondisclosure(—) regions.

to match the true state (ω). Nature draws $\omega \in \Omega = \{0, v, 1\}$ from a common prior distribution that assigns equal probability to each outcome, where $v \in (0, 1)$. With probability $p \in (0, 1)$ there exists hard evidence certifying the state. In this case, S automatically observes it, while R obtains information only with probability $q \in (0, 1)$. I will consider two alternative scenarios about R's information: *direct* news reveals to R the content of the evidence; *indirect* news reveals to R only that evidence exists. When evidence does not exist, an event that has probability $1 - p$, both S and R receive no information. S's payoff is a, R's payoff is $-(a - \omega)^2$ and the timing of the game is the following:

0. nature draws ω and the information status of S and R;
1. S sends a message m to R, who chooses her action a;
2. ω becomes public and payoffs realize.

Because evidence is hard, when S is uninformed she must remain silent ($m = \emptyset$). When she is informed, instead, she can either remain silent or disclose ($m = \omega$). The relevant solution concept is sequential equilibrium (Kreps and Wilson, 1982). For ease of exposition, in the main body I neglect mixed strategy equilibria that exist for non-generic parameters by adopting the convention that in such cases S elects to disclose. The appendix contains all proofs.

2. Results

Because type 0 will always conceal the evidence and type 1 will always reveal it,[2] we can restrict our attention to the behavior of the middle type.

Proposition 1 (*Equilibrium Disclosure*)**.** *There exist three cutoffs such that* $0 < \underline{v}_i < \bar{v}_i < \hat{v}_d < 1/2$ *and: in the case of direct news the middle type discloses if and only if* $v \geq \hat{v}_d$*; in the case of indirect news the middle type discloses when* $v \geq \bar{v}_i$*, does not disclose when* $v < \underline{v}_i$ *and discloses, does not disclose or randomizes depending on the prevailing equilibrium when* $v \in [\underline{v}_i, \bar{v}_i)$.

Fig. 1 represents the equilibrium strategy of the middle type in the case of direct and indirect news, where the dashed line indicates that disclosure is not the unique outcome.[3] When v is relatively low the middle type has a strong incentive to attempt to pass for an uninformed high type and she conceals the evidence regardless of the nature of R's news. Similarly, when v is relatively high the middle type has a strong incentive to separate from the low type and she always discloses. For intermediate values of v, instead, the nature of R's news determines the extent of voluntary disclosure. In the case of indirect news R's threat of choosing the lowest action upon discovering that S is informed induces the middle type to disclose, which in turn makes such a threat credible. In the case of direct news, instead, such a threat is not credible, so that the endogenous punishment for withholding information is lower and the middle type elects to remain silent.

When indirect news induces the middle type to disclose, any additional information about ω is redundant. R's payoff is therefore higher than in the case of direct news whenever the latter discourages disclosure. When even under indirect news the middle type remains silent, instead, direct news is more valuable to R because it allows separating the low and the intermediate state.

Corollary 1 (*Value of Direct and Indirect News*)**.** *The receiver's equilibrium payoff is higher in the case of indirect news when* $v \in [\bar{v}_i, \hat{v}_d)$ *and in the case of direct news when* $v < \underline{v}_i$*. When selecting her favorite equilibrium, indirect news is more valuable in the whole* $[\underline{v}_i, \hat{v}_d)$ *region.*

I will derive the following comparative statics by focusing on R's favorite equilibrium.[4] The region in which indirect news is more valuable decreases with the likelihood that evidence exists and increases with R's likelihood of obtaining it. In short, this occurs because if p is low or q is high, whenever R is uninformed S's ignorance is plausible. Nondisclosure is then relatively attractive and the disincentive effect of direct news on voluntary revelation is strong.[5]

Corollary 2 (*Comparative Statics*)**.** *The region in which indirect news is more valuable decreases with p and increases with q. The region in which direct news is more valuable decreases with p and q. The two regions vanish as p converges to* 1 *or as q converges to* 0.

No matter the nature of R's news, her equilibrium payoff increases with p and q and it is hence higher than when R obtains no information unless S discloses ($q = 0$).

Corollary 3 (*Value of Information*)**.** *Both in the case of direct and indirect news the receiver's equilibrium payoff is increasing in p and q and it is therefore higher than when she has no access to information.*

Arbitrary precision. Suppose R's news consists of a realization $\sigma_\omega \in \{0, v, 1\}$ of a signal σ such that, when the state is ω, $\sigma_\omega = \omega$ has probability $s \in (\frac{1}{3}, 1)$ and the two other realizations have probability $\frac{1-s}{2}$ each. Direct and indirect news correspond to $s = 1$ and $s = \frac{1}{3}$ respectively and R's equilibrium payoff is necessarily maximal in one of these two cases.

Proposition 2 (*Optimal Precision*)**.** *When the precision of the receiver's signal can be arbitrary, her equilibrium payoff cannot be higher than in the case of either direct or indirect news.*

Two-sided communication. Suppose now that in between time 0 and 1 R can send a verifiable message to S about her information status.[6] In the case of direct news, the disclosure decisions of S and R are essentially independent and this additional communication stage has no impact. In the case of indirect news, instead, by interpreting R's silence as ignorance S may induce R to reveal her information status and tailor her own disclosure decision accordingly. As a result, the equilibrium set enlarges and the region in which indirect news is more valuable no matter the selection vanishes.

[2] Indeed, in any equilibrium $0 < \mathbb{E}[a^*(\emptyset)] < 1$, where $\mathbb{E}[a^*(\emptyset)]$ denotes the expected action R takes when $m = \emptyset$.

[3] In that region, R's beliefs are self-fulfilling in that both disclosing and withholding information can be rational for the middle type depending on the behavior R expects.

[4] As its proof shows, Corollary 2 equally applies to the region in which indirect news is more valuable no matter the selection. Corollary 3 also holds no matter the selection except that in the mixed strategy equilibrium R's payoff is constant in q.

[5] As p increases R takes a lower action in the absence of any information. While remaining silent becomes less attractive both in the case of direct and indirect news, the downward updating is stronger in the former. As q increases, instead, so does R's action in the absence of any information. Due to this change, in the case of direct news the marginal type now elects to conceal information. On the contrary, in the case of indirect news she elects to disclose because this payoff increase is more than offset by a decrease in its likelihood.

[6] There is no loss of generality in assuming that R's message does not contain information about the state.