A Theory of Like-Biased Expertise
Cheap Talk With Two Senders Biased in One Direction

Wolf Gick*†

August 2011

Abstract

The paper studies the options of a decision maker (receiver) to design a game form that extracts information from two experts that are biased in the same direction. I characterize and discuss a game under simultaneous disclosure in which the receiver can combine the messages of multiple senders. The paper offers a concept different from Krishna and Morgan, (QJE, 2001), who argue that adding a second, more biased sender would not improve the information structure. Their results are entirely driven by the concept of sequential disclosure. The equilibrium concept offered here permits to combine messages simultaneously. I show that with such an equilibrium concept, it is strictly better to combine two senders instead of one. Our equilibrium is furthermore monotonic: higher types send higher messages, and R best responds by higher actions when receiving higher signals.[1]

JEL classification: C72, D23, D72, D74, D82.

Keywords: Strategic information transmission, partitional equilibria, simultaneous disclosure, message rules, noisy observation.

*Center for European Studies, Harvard University, 27 Kirkland St., Cambridge MA 02138, phone (617) 495 4303 x244, email: gick@fas.harvard.edu.

†Department of Economics, Tufts University, email: wolf.gick@tufts.edu.

[1]This paper supersedes earlier versions that circulated under the title "Two Experts Are Better Than One", "Like-Biased Experts and Noisy Signals", and "Why Consulting Two Experts?" I am indebted to Attila Ambrus, Marco Battaglini, Pierpaolo Battigalli, Oliver Board, Ying Chen, Sidartha Gordon, Rick Harbaugh, Navin Kartik, Frederic Koessler, Ming Li, Karl Schlag, Joel Sobel, Phil Stocken, Derek Tittle and Jean Tirole for comments on earlier drafts and versions presented to the 2008 World Congress on Game Theory, the Fall 2008 Midwest Economic Theory Meetings, the 20^{th} International Conference on Game Theory in Stony Brook in 2009, and the December 2010 Workshop on Information Transmission and Persuasion in Games at the Paris School of Economics. Research support from the Center for European Studies at Harvard University is gratefully acknowledged. All errors are mine.

1 Introduction

Managers need good advice to make sound decisions. In general, they hear out more than one staff member before deciding what action to take and how much budget to allocate to a specific project. Still, asking two experts instead of one does not necessarily lead to more information. More generally, how an uninformed decision maker (DM) will be able to best combine experts' opinions will depend on a series of criteria. Wilson Mizner was quoted as saying that "to profit from good advice requires more wisdom than to give it."[2]

Research in Organization Science, Operations Research, Decision Theory, and Psychology has focused on the issue how a DM may, in such a situation, benefit from advice that comes from more than one expert. Within business firms, managers tend to rely on specific modes of communication to make use of what Budescu et al. (2006) call the "asymmetry among experts." Experts may "coordinate" to some extent as Faraj and Sproull (2000) found out about the coordination of expertise in software development teams. Broomell and Budescu (2009) show by decomposing the correlation between disclosures that experts, while observing the same *cues*, may still put specific weight on each piece of information received. But even in cases where cues differ, expertise often does not. On one hand, they show evidence that specialists differ too little in their advice, which might limit the value of multisender expertise.

On the other, and unnoted by these contributions, the problem of combining experts' opinions has a fundamentally strategic aspect to it. Depending on what an expert observes in the presence of another expert, she will typically act strategically and withhold information in some states, to possibly reach a more favorable outcome for herself. As this paper argues, this fact is fundamental for an understanding of expertise. Keeping the DM less informed may actually be a general result of multiexpert settings, as Krishna and Morgan (2001a) (KM hereafter) have pointed out. Their result for "like biased" senders is of particular importance for business firms - where staff experts will generally prefer higher states compared to the DM. Still, KM's result that the best a DM can do is to only take advice from the less biased expert seems questionable in practice. While it may hold for the particular equilibrium construction in KM, it still bears the flavor of a negative result. I show that there are other equilibria that become feasible for practical forms of expertise in which the DM is able to structure disclosure and messages through rules before hearing out his staff experts.[3]

[2]See www.quotationsbook.com

[3]Li (2008) in an interesting note has shown that "partisan bickering" may in fact reduce informativeness of two-sender expertise. His paper is however based on discrete biases and discrete states and messages, without touching the case discussed

Evidence reveals that managers make use of their option to structure communication in many ways when consulting their staff members. Krishna and Morgan (2004) have already shown that requesting *two* sequential disclosure stages from the same single expert may improve information transmission. The recent literature on argumentation and persuasion in games with one expert has focused on such settings.[4] To receive advice requires that the DM understands how to communicate with experts when their disclosure is strategic.

These considerations are particularly relevant for decisions in business-relevant environments, but so far only a few authors have directly focused on managerial decision making. Fischer and Stocken (2001) analyze the quality of information disclosed in such games with the expert observing a random variable and explore the limits of credible communication. Morgan and Stocken (2003), who focus on an analysis of stock recommendations, find two general ways of structuring communication with an analyst in an asymmetric setting. Analysts can give advice to buy, sell or hold stock, and this expertise arises endogenously as equilibrium message in a game between a biased sender and an uninformed receiver, as laid out in the seminal paper by Crawford and Sobel (1982), (CS hereafter). When there is uncertainty about the degree of preference divergence, Morgan and Stocken (2003) find that there is a class of *ranking system equilibria* in which the sender will generally tend to issue too many favorable reports, while in other equilibria, less favorable information will also be transmitted. Dimitrakis and Sarafidis (2005) find that in a similar setting with unknown biases, the emerging equilibria are partitional, like in the case of CS.

This paper has a specific goal. It focuses on viable and typical ways of disclosure in organizations in which experts are hired and form a staff. A manager asking his experts will typically know their preferences. This paper assumes that the preferences of experts are formed by the institutional and organizational setting. Specialists hired as staff will have similar biases. Political scientists, in particular Shepsle (1978) as well as Gilligan and Krehbiel (1997) have pointed out the importance of focusing on an "implicit theory"[5] of expertise preference formation associated with specialization. In fact, to understand

in my paper.

[4]On argumentation see in particular Dziuda (2010) who describes a setting in which the Sender has the option to disclose or suppress positive and negative information. Since the sender is unable to prove how many arguments exist, she may sometimes prefer to disclose information against her favor. Glazer and Rubinstein (2004) in a one-sender setting different from CS and with with limited verifiability show that the Sender may want to disclose some information to convince the Receiver to pick one out of two actions. The amount of possible messages helps the Receiver to infer the state. Glazer and Rubinstein (2006) in a stochastic setting find that there always exists are non-random persuasion rules. For an overview see Sobel (2010).

[5]Gilligan and Krehbiel (1997, p. 371).

like-biased expertise as a concept it will be helpful to follow and to extend Shepsle's "pattern of selective participation"[6] and its influence on bias formation. The focus of this paper is on business firms, and it differs by nature from the canonical setting of political expertise in which the DM's ideal point will often be between the ideal point of the "left wing" and "right wing" expert – which defines the setting with "opposing biases."

Krishna and Morgan (2001b), in following a large body of literature with 2 senders (Gilligan and Krehbiel, 1989, Austen-Smith, 1990), have shown, that under opposing biases, there exist fully revealing equilibria (FRE), in which the DM can extract full information from two opposedly interested senders. This setting is similar to a situation in which a judge has the option to play a defendant's witness against the one of the plaintiff, to ideally learn the truth.[7]

For business firms with like-biased experts the DM has no such option in practice. In particular, no DM has the power to "put a constant threat" on staff experts to render expertise more informative.[8] One may argue more generally that FRE are not applicable to firms in addition to not being practicable for political expertise, as Krehbiel (2001) has pointed out. To my knowledge, there does not exist research using FRE for developing business-relevant decisions tools. The reason can be found in the implausibility of the extreme beliefs on which they rest.[9]

Battaglini (2002), among others, has characterized FRE in one dimension, and for like biases. To illustrate, assume two like-biased experts and a DM. Both experts observe the same state. The DM can now construct punishment strategies (to implement a much lower state, closer to his own ideal point) and so "punish" both senders when deviating from truth-telling. This equilibrium exists, among others, and it has attractive welfare properties. The DM cannot do better, and from a theory perspective there is nothing to disavow the result, given the assumptions, much in the same way one cannot deny, on one side, that the canonical equilibrium in dominant strategies for the one-shot prisoners' dilemma exists, independent of its lack of applicability to expertise in business firms.

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[6]Shepsle (1978).

[7]It is worth pointing out that this literature, starting from early contributions, has continuously pointed out that by restricting possible communication through "rules," expertise will generally be improved. A typical and early paper is Gilligan and Krehbiel (1987), which, together with others, was criticized by Epstein (1998) and extended by Krishna and Morgan (2001a, b) toward continuous state and messages spaces. The present paper focuses more generally on like-biased expertise, with specific results for expertise in business firms with known biases.

[8]See Mylovanov and Zapelchelnyuk (2010) for a paper on expertise with opposing biases. My paper focuses on a clearly different setting, rejecting a view on the applicability of threat mechanisms for the situation at hand.

[9]Krehbiel's detailed critique of implausible disclosure forms with opposing biases ("heterogeneous committee") together with fully-revealing equilibria should be considered as an intuitive point in favor of an analysis of like-biased senders.

Besides of being unrealistic for the practical design of communication forms in business organizations, the fully revealing equilibrium is plagued by the following flaws. First, FREs are not monotonic. By monotonicity I mean that higher states (or "types of players") should lead to (at least weakly) higher messages, and higher messages should (at least weakly) to higher actions of the DM.[10] That is, full revelation will for most practical forms of expertise be too much to expect. If not, one would rarely consider information revelation in expertise a problem.

Secondly, FRE rely on the assumption that the two experts observe the exact same state of nature (a number on the real line). Battaglini (2002) showed that fully revealing equilibria are not stable under noise. Assume there is noise in the two expert's observations, leading to two distinct and different messages sent to the DM. According to his posterior beliefs, the DM will need to put a comparably high probability on the fact that one sender has deviated, but a very low one that both did. Knowing this, it becomes a dominant strategy for each sender to deviate from the fully revealing equilibrium upward in direction of the senders' ideal state – illustrating the brittleness of FRE.[11]

In extending this robustness test by Battaglini, Ambrus and Takahashi (2007) developed a concept called diagonal continuity, based on the requirement that the receivers out-of-equilibrium beliefs are continuous in the senders' reports. Essentially, these authors have created a continuous transformation of Battaglini's criterion for multidimensional expertise, which has implications for the one-dimensional case studied here. Specifically, they require continuity of beliefs at points where both senders observe the same signal: take a sequence of pairs of states such that in the limit when the number of observations go to infinity, both states approach the true state. Then, a FRE is continuous on the diagonal if for this sequence, the actions of the receiver lie on the diagonal, which is not the case.[12]

The main reason why this paper rejects such a construction is based on simple evidence. Would it ever be practical for a manager to tell to her experts before the meeting "I will punish you by implementing a much lower budget for your project if your reports are not identical"? Even if such practices would become a legal option for managers, such a disclosure form will - at best - lead to collusion between the two experts and so make sure that they jointly coordinate on misreporting the true state.

What is known today is that cheap talk with *one* sender fundamentally differs in its result from multi-sender expertise. To my knowledge, this property has not sufficiently been explored for finding

[10] I thank Joel Sobel for a discussion of this issue.
[11] I thank Marco Battaglini for a discussion.
[12] See Ambrus and Takahashi (2007), p.16, Definition 2.

practically feasible forms of advice taking between one DM and two or more senders. In the one sender setting (CS), the meaning of messages arises endogenously, forming partitional equilibrium messages. That is: depending on the bias, the sender will have specific messages indicating specific equilibria.

With two senders, an equilibrium does not need to rely on this construction. For example, different from KM's argument, there is no need to assume that for each of the two senders the set of equilibrium message strategies need to be given by their bias, as in CS. Nothing in particular would restrict the DM to put specific beliefs on senders' messages when communicating with them. In particular, the DM may want to understand a message of Sender 1 in a different way than a message of Sender 2, and adopt a message rule in which the messages will be designed in a way that the two senders together disclose more in equilibrium.[13] This insight, as I show below, permits to design forms of communications that naturally emerge in multisender expertise, and for a wide range of biases. Compared to multistage communication with one sender, multisender expertise offers an intuitive concept to structure advice taking by an uninformed DM.

The paper is is structured as follows. Section 2 presents the model with two experts and one DM, illustrating the solution concept and characterizing the equilibrium, followed by a discussion on stability under noisy observation. Section 3 discusses the findings and concludes.

2 Model

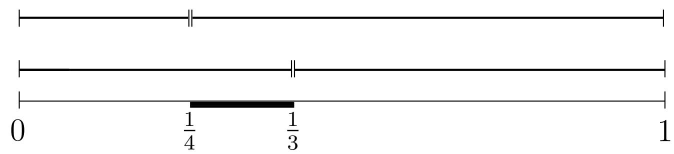
2.1 A first example

To motivate the model, I start with KM's (p.575) result, who argues that with like biases, there is no way to combine two CS equilibrium profiles to build a more informative equilibrium with two senders. Their argument concerning the impossibility to "combine" two CS profile is that, as soon as the senders are aware of each others' existence, they will deviate. This construction rests for the most general setting and is based on their equilibrium construction. In particular, KM's nonexistence of more informative equilibria neglects the fact that the DM may, under known biases, structure messages according to some disclosure rule – a procedure adopted by KM later in their paper and thoroughly explained in Krishna and Morgan (2001c). While in their paper, KM later on offer a characterization of a *sequential* equilibrium and move away from the original concept of a weakly sequential equilibrium or BNE used in CS by a

[13] This all comes without loss of generality. With two senders and known biases, the focus on "asymmetric" forms is particularly intuitive. See also Li (2009).

PBE for sequential disclosure, the present paper is closer to the general construction suggested CS and in Ambrus and Lu (2009).

I start with the following example. Assume the DM has access to two possible experts, a less biased one with $b_1 = 1/12$, and a more biased one, with $b_2 = 1/8$. When playing the CS Best Equilibrium with the less biased sender, he will be able to learn that the true state θ (a number between 0 and 1) is either below 1/4 or above, that is between 1/4 and 1. When playing the same game with the more biased sender, it will permit him to learn that the state is either below 1/3 or above. See $Fig.$1 below.



$Fig.$ 1: Combining messages under simultaneous disclosure ($b_1 = \frac{1}{40}, b_2 = \frac{1}{12}$)

The question resulting that this example raises is: is there a disclosure rule with two senders that would generally render it possible for the DM to increase information transmission with two experts? The graph suggests that one should expect that by asking two senders, the DM should gain an additional partition if such partition will form an equilibrium. That is, adding a second sender leads to a refinement of the information structure: the DM will learn more from consulting two experts: the state can now be below 1/4, between 1/4 and 1/3, and - last - between 1/3 and 1.

2.2 Solution Concept

In what follows, I present a solution concept and characterize a specific equilibrium. It is more informative than the sequential KM equilibrium, than consulting only the less biased sender under CS.

Definition 1 *A Two-Sender Bayesian Nash Equilibrium (BNE) consists of*

• *a set of signaling strategies S_i for each sender $i \in \{1, 2\}$, with each signaling strategy being a probability distribution $\mu_i(m_i, \theta)$, where $m_i \in M_i$, is the set of feasible messages given to sender i, and θ the observed state of nature, and* $\int_{M_i} \mu_i(m_i, \theta))dm_i = 1$,

• *an action strategy for the receiver* $y(m_i(s_i), m_{-i}(s_{-i}))$, *who takes a unique action after observing a message pair* (m_i, m_{-i}) , *with his posteriors* $P(\theta|m_i, m_{-i})$ *satisfying* $P(\theta|m_i, m_{-i}) = \frac{\mu_i(m_i,\theta)\mu_{-i}(m_{-i},\theta)f(\theta)}{\int_0^1 \mu_i(m_i,t)\mu_{-i}(m_{-i},t)}$.[14]

These strategies constitute a BNE if and only if

– *the equilibrium strategy* $\hat{\mu}_i$ *solves* $\max_{\{m_i \in M_i\}} U_{S_i}(y(m_i, m_{-i}, b_i, b_{-i}, \theta))$,

– *and for any signal pair* (m_i, m_{-i}), *the equilibrium action* $\hat{y}(m_i, m_{-i})$ *solves* $\max_y \int_0^1 U_R(y, \theta)P(\theta|m_i, m_{-i})d\theta$.[15]

2.3 Characterization

I first characterize the DM's posterior beliefs, using $\mathcal{U}[x, y]$ to denote the uniform distribution over the interval $[x, y]$, and characterizing generally for any $k - partition$ equilibrium with $k = 1, ..., n$.[16]

Let $\mathcal{U}[x, y]$ denote the uniform distribution over the interval $[x, y]$, and $[a_1^{k-1}, a_1^k]$ denote a CS Best Equilibrium subinterval suggested by Sender 1 where the message spaces for each sender are defined according to a message rule communicated to the senders as in KM.

There is a simple and intuitive message rule for the two senders based on the fact the DM, in an asymmetric setting, uses the less biased sender 1 to play CS Best equilibrium message. In fact, the DM limits the possible messages admissible by Sender 1 to the known CS Best Equilibrium message, given Sender 1's bias. For the more biased Sender 2, the message rule is, given each known CS Best Equilibrium message m_1^k suggesting $\theta \in [a_1^{k-1}, a_1^k]$, to send a message $m_2^{\frac{(k-1)+k}{2}}$ that permits Sender 2 to suggest that $\theta \in [\frac{a_1^{k-1}+a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2}]$. For the rightmost interval, m_2 can indicate that $\theta \in [\frac{a_1^{n-1}+a_1^n}{2}, a_1^n]$.

It is easy to see that such a construction will give the second sender break points in the center of any CS Best Equilibrium interval played with Sender 1. The justification for such a message rule is intuitive: any higher degree of rationality than playing the original CS game, and it gives a natural justification to add a second sender while playing CS Best Equilibrium with Sender 1. This construction uses the informational power of two informed senders to a large extent; once a standard CS Best Equilibrium disclosure rule is - as the literature widely agrees upon - seen as a natural way of communication, there is no loss of generality to assume that the DM can request this specific message, given the fact that with

[14]See CS, p.1434.

[15]As Ambrus and Lu (2009) have pointed out, there is no "universally used definition" of perfect BNEs. The definition used here is tailored to the game form proposed in this paper; for a more general definition see Ambrus and Lu (2009) which is based on FN 2 in CS, p. 1434.

[16]For a similar setup with discrete messages see Krishna and Morgan (2001c).

two senders the DM is free to associate beliefs with messages received.[17]

Characterization. The DM's posterior beliefs $P(\cdot \mid m_1, m_2)$ are:

$\mathcal{U}[0, \frac{a_1^1}{2}]$ if m_1 suggests $\theta \in [0, a_1^1]$ and m_2 suggests $\theta \in [0, \frac{a_1^1}{2}]$,

$\mathcal{U}[\frac{a_1^1}{2}, a_1^1]$ if m_1 suggests $\theta \in [0, a_1^1]$ and m_2 suggests $\theta \in [\frac{a_1^1}{2}, \frac{a_1^1+a_1^2}{2}]$,

....

$\mathcal{U}[a_1^{k-1}, \frac{a_1^{k-1}+a_1^k}{2}]$ if m_1 suggests $\theta \in [a_1^{k-1}, a_1^k]$ and m_2 suggests $\theta \in [\frac{a_1^{k-1}+a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2}]$,

$\mathcal{U}[\frac{a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2}]$ if m_1 suggests $\theta \in [a_1^k, a_1^{k+1}]$ and m_2 suggests $\theta \in [\frac{a_1^{k-1}+a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2}]$,

....

$\mathcal{U}[\frac{a_1^{n-1}+a_1^n}{2}, a_1^n]$ if m_1 suggests $\theta \in [a_1^{n-1}, a_1^n]$ and m_2 suggests $\theta \in [\frac{a_1^{n-1}+a_1^n}{2}, a_1^n]$, and

$\mathcal{U}[0, \frac{a_1^1}{2}]$ if m_1 suggests $\theta \in [0, a_1^1]$ and $m_2 = \emptyset$.

The strategies of the three players are characterized as follows:

• Sender 1 plays CS Best-equilibrium strategies, given her bias and the message rule containing all CS Best Equilibrium messages,

• Sender 2 sends his message strategies according to the above specified message rule.

• DM, for any posterior belief $P(\cdot|m_1, m_2)$ of $\mathcal{U}[\frac{a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2}]$ takes action $y(m_1, m_2) = \frac{1}{2}(\frac{a_1^k}{2}, \frac{a_1^k+a_1^{k+1}}{2})$.

Proposition. *The characterized equilibrium is ex-ante Pareto superior to playing CS Best Equilibrium strategies with the less biased sender, to playing the KM sequential equilibrium, and to combine two CS Best Equilibria according to the senders' biases.*[18]

2.4 Noisy observation

In this section, I consider the situation under noise, assuming that the two experts observe the true state no longer perfectly, but under noise. With probability $1 - \varepsilon$, the senders observe the true state and the disclosure of their messages is correct, and with probability ε they observe a random state that is uniformly distributed along the state space $0, 1$.

[17] See Sobel (2010).
[18] A detailed proof and a numerical analysis for a wide range of biases is available from the author on request.

It is easy to characterize the DM's best response: knowing that each message will be a random state with probability 1, he will best respond to any message indicating the boundaries for θ of a_1^{k-1}, a_1^k by updating his beliefs that now his optimal action will be no longer chosen by believing that θ is uniformly distributed over the interval under consideration, but by "averaging" as follows and choosing action

$$y_\varepsilon^{a_i^{k-1},a_i^k} = (1-\varepsilon)\frac{a_1^{k-1}+a_1^k}{2} + \varepsilon\frac{1}{2}.$$

Reducing the following observation to this particular interval[19] one can express the first sender's expected utility by

$$E[U_1(\theta)] = -(1-\varepsilon)(\theta + b_i - y_\varepsilon^{a_1^{k-1},a_1^k})^2 - \varepsilon\int_0^1 (\theta' + b_1 - y_\varepsilon^{a_1^{k-1},a_1^k})^2 \ \ d\theta'.$$

Because of the no-arbitrage condition in CS, sender types at the break point must be indifferent in inducing action $y_\varepsilon^{a_1^{k-1},a_1^k}$ and $y_\varepsilon^{a_1^k,a_1^{k+1}}$, which leads to

$$U_i(\theta, y_\varepsilon^{a_1^{k-1},a_1^k}) = U_i(\theta, y_\varepsilon^{a_1^k,a_1^{k+1}}).$$

In words, the last interval will grow by $\frac{4b}{1-\varepsilon}$ compared to the first. It is known from CS that intervals grow by $4b$ when moving one interval of the partition to the right. Under noise, partitional equilibria become less informative and grow by $\frac{4b}{1-\varepsilon} > 4b$ for all $\varepsilon > 0$. While partitional equilibria are sustained under noise, they however become less informative.[20]

CS (p. 1441) furthermore have shown that, the number of equilibrium partitions are limited and given by b_i in the one-sender game, characterizing the largest number of steps in any equilibrium of one-sender CS model as

$$N(b_i) = \left[-\frac{1}{2} + \frac{1}{2}\sqrt{q + \frac{2}{b}} \right],$$

where the number in brackets $[z]$ is the smallest integer that is greater than or equal to z. It is easy to show that under noise, the maximum number of steps in a partition reduces only slightly and proportional to ε:

[19]This observation holds for each sender; with perfectly correlated noise the result is identical with the one-sender treatment, otherwise may, in the extreme, converge to the double of the loss compared to the one-sender setting.

[20]I thank Oliver Board for a continued discussion. See also Blume et al. (2007) for a treatment.

$$N(b_i) = \left[-\frac{1}{2} + \frac{1}{2}\sqrt{q + \frac{(1-\varepsilon)2}{b}} \right].$$

Following CS (p. 1442) one can furthermore characterize for all $< 0 < \varepsilon < 1$ and all $0 < b_i < \frac{1}{4}$ the ex-ante utility of the receiver playing CS with noise:

$$EU_R = N(b_i) = -\frac{(1-\varepsilon)^2}{12N(b^2)} - \frac{b^2(N(b)^2-1)}{3 \cdot \varepsilon^2} - \frac{\varepsilon(2-\varepsilon)}{12},$$

which is less than the receiver's expected utility without noise in the Pareto optimal equilibrium:

$$EU_R = N(b_i) = -\frac{1}{12N(b^2)} - \frac{(b^2)(N(b)^2-1)}{3}.$$

In particular, Ambrus and Lu (2009) have shown that there are limit equilibria under noise that are generally robust. They also argue that there exist simple equilibria into which class the present falls, that are stable. Different from the above treatment under noise, Fischer and Stocken (2001) find a different result. Similar to Ambrus and Lu's construction they assume that the type space is partitioned into a number of intervals, and the sender's signal reveals only in which element her actual type lies.[21]

3 Conclusion

So, what can you do as a CEO or manager when planning to meet two staff experts and asking them for advice? The results of this paper are: Among all experts in your staff find the one with the smallest bias. Then, give her a message space according to CS. Pick a second expert who has small biases and endow him with a message space that permits each possible disclosure to break the intervals of the first expert. As a result, you will be close to twice as much informed when consulting two experts.

To structure communication with staff experts before meeting them and hear their expertise is intuitive, and communication in organizations is typically structured through particular rules. What is new in the findings of this paper is the reduced role of biases: for a large range of (small) biases, the above characterized equilibrium is stable, and it performs well under noise, while fully revealing equilibria will generally break down.

The paper's findings fit well into the existing literature. The paper shows that by using disclosure rules, DMs can generally achieve a higher degree of information transmission. It so closes a lacuna that

[21] See also Ambrus and Lu (2009) for a treatment of additive noise.

has remained open since KM: on one side of the spectrum the game proposed here is generally more informative than the KM sequential equilibrium and CS. As a practically feasible game form it can be ranked between simpler forms of interval disclosure on one side, and more informative but less practicable equilibria on the other. It is also less informative than Ambrus and Lu's (2009) concept almost fully revealing equilibria. Their concept, along the line between partitional equilibria and FRE comes close to the simple equilibrium characterized here. It furthermore requires a relatively complicated labeling of a "grid" system of disclosure in which signaling profiles are divided and arranged in "blocks" with both senders revealing the state to a partition in the "grid," and in changing sequence.[22].

Compared to their solution, which is robust to noise and involves specific assumptions for out-of-equilibrium beliefs, it is worth mentioning that there exists a simpler "grid" disclosure model:[23] each sender is asked to report the true state to the nearest tenth. With high probability, honest reports will match, permitting the DM to implement a near optimal action. If the reports do not match, e.g. because of noise, both senders will be punished by a deviation of the DM's action. Compared to the game form proposed here, the remaining difficulty of this grid construction is to find an accurate grid size, which involves a trade-off between the amount of noise and the fineness of the grid. To optimally construct such a concept would require particular knowledge from the DM about noise.

It is worth comparing the results with those of the related literature. First of all, this paper has deliberately focused on feasible game forms that link theory with practice. It therefore has made use of an "asymmetric treatment" of the two senders. Such treatment may be typically found when focusing on information revelation in hierarchical organizations, as Li (2009) has pointed out. His analysis, however, is closer to the one used in Austen-Smith (1993) and Gilligan and Krehbiel (1989) through discrete setup. Newton (2009) in a model with veto power has raised similar questions, extending the literature of partitional and semi-revealing equilibria since KM. It is straightforward to understand such research being a fruitful alternative for delivering additional results for feasible disclosure forms, and to so bridge the gap to the literature departing from fully-revealing forms of disclosure, such as Ambrus and Lu (2009) have done. To restate the value of extensions in this field: fully revelation may be too much to expect, but expertise with multiple senders will generally be more valuable than with one sender.

This directly connects to the next point. A second promising area for future research is to extend multisender expertise to disclosure forms with more than two senders. As is known from the literature,

[22]See Ambrus and Lu (2009), p. 9

[23]To my best knowledge, this equilibrium has not been published but is attributed to Joel Sobel.

fully revealing equilibria without noise are trivial with three senders. Still, the underlying idea of restricting, controlling and designing information in multiplayer settings will remain an important area for larger settings such as business networks and communication. Hagenbach and Koessler (2009) in a paper on strategic communication networks show that whether communication takes place between two agents depends not only on the conflict of interest between these agents, but also on the number and preferences of the other agents with whom they communicate. Similarly, Galeotti et al (2010) find for a multiplayer network setting that truthful information transmission to the next players in the network will depend on the degree of conflict.

Lastly, the results of this paper also point toward a treatment with commitment power, which in this meaning is different from the literature on delegation and contracts. To restrict, tailor or control communication by a second sender will generally influence the complexity of messages. This has been shown in the current setup, but also stressed by Sobel (2010) in a more general vein. Commitment does not mean necessarily to escape cheap talk by adding costly state verification at the end of the game. A sender will, by committing to a disclosure strategy, establish a meaning of messages, where each message corresponds to a posterior distribution over states. This, as well, is left for future research. [24]

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[24]This idea of committing to specific messages also relates to other research on asymmetric equilibria outside the realm of cheap talk, such as presented in Bagwell (1995) and Oechssler and Schlag (1997). When playing equilibria with one sender only and not best replying to the other, may improve social welfare. This – at last – also bridges the gap to the literature on interactive implementation such as Baliga, Cochron and Sjostrom (1997) and Baliga and Sjostrom (1999). See also KM's note in their seminal paper.

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