

Go Figure: A Simple Model of Nonliteral Speech

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Abstract

We develop a simple economic model of communication that distinguishes between literal or direct speech, which conveys its exact meaning according to common usage, and figurative or indirect speech, which may convey a meaning different from its literal one. The model highlights the tradeoff that figurative speech can be less costly but is also more likely to be misunderstood than literal speech. We derive conditions for speech to be figurative in equilibrium. We find that speech is more likely to be figurative if the speaker cares less about successful communication while the listener cares more about it, or if the listener is less likely to be cooperative. We then apply the model to systematically analyze particular forms of indirect speech, including terseness, irony, sexual innuendo, and veiled bribery. (JEL D83, C72, Z11)

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1. Introduction

This paper develops a simple economic model of communication that distinguishes between literal or direct speech, which conveys its exact meaning according to common usage with no possible ambiguity, and figurative or indirect speech, which may convey a meaning different from its literal one. In the model, a speaker has a thought or meaning that she may want to communicate to a listener. The speaker can send the listener a direct and unambiguous message that reveals her thought to the listener with certainty, that is, she can express his thought literally. Alternatively, the speaker can send an indirect and ambiguous message that has a common usage meaning that differs from her actual thought; that is, she can express her thought figuratively.

Expressing a thought figuratively may actually be less costly than expressing it literally, for several reasons. First, expressing a thought figuratively may simply be easier and less time-consuming than completely disambiguating it, especially if the thought is complicated. Second, by expressing a thought figuratively, the speaker can potentially “say” it without saying it, which may allow the speaker and listener to avoid offending, or avoid liability for offending, third-party listeners with whom they may have a conflict of interest. Third, it may allow the speaker to avoid liability for offending the listener if the speaker and listener turn out to have a conflict of interest. As Pinker (2008) and Pinker, Nowak, and Lee (2008) have argued, indirect speech carries the advantage of “plausible deniability.” Fourth, it may ensure that some knowledge does not become mutual, which may reduce awkwardness between the speaker and listener. However, expressing a thought figuratively, by involving a related thought, also carries a greater risk of miscommunication, because the actual thought and the related thought may be confused by the listener. Thus, the model assumes that there is a potential tradeoff between figurative and literal speech and the speaker and listener make

optimal decisions about how to speak and interpret given this potential tradeoff.

We analyze the model both in the case where the speaker and listener have common interests and in the case where they have a potential conflict of interest. From the model, we derive conditions for speech to be figurative in equilibrium. We then employ these conditions to obtain general comparative statics and to systematically analyze particular forms of figurative speech, including terseness, irony, sexual innuendo, and veiled bribery. For instance, when the speaker and listener have common interests, we find that, *ceteris paribus*, speech is figurative for a larger range of the model's parameters when the sender cares only a little about successful communication while the receiver cares a lot about it. Then, the sender puts little effort into the message, and the receiver still deciphers it, giving rise to terseness (using few words to convey much meaning). The model also explains why irony (using words to express the opposite of their literal meaning) is rarely positive and usually negative or sarcastic. If the speaker's thought is negative, then speaking ironically involves using words that have a literal meaning which is positive, whereas if the speaker's thought is positive, then speaking ironically involves using words that have a literal meaning which is negative. The costs of expressing literally a positive thought are generally much lower than those of expressing literally a negative thought. Thus, the model implies that irony is more likely to be negative than positive.

We also find that, when the speaker and listener have a potential conflict of interest, speech is figurative for a larger range of parameters if the probability that the listener is cooperative is lower, since this increases the speaker's expected cost of being direct. In an application to sexual innuendo, we find that men are more likely to proposition through innuendo than directly if fewer women are interested in sex, more women are linguistically sophisticated, the propositioning more often occurs in public, and the men are more bashful.

In an application to bribing police officers with discretion to issue speeding tickets, we find that bribes are more likely to be veiled than direct if more officers are honest, reasonable, and linguistically sophisticated, insurance premiums rise less sharply with speeding offenses, and the penalties for attempted bribery are higher.

The model also delivers the policy implication that increasing the penalties for attempted bribery reduces the probability of successful bribery even if it has no effect on the probability of attempted bribery. The reason is that it induces the briber to bribe more indirectly, which reduces the probability that the bribe succeeds. Under the U.S. federal bribery statute (18 U.S.C. § 201), the punishment for attempted bribery and completed bribery are identical, and under California Penal Code Section 67, attempted or completed bribery of a police officer is a felony, which can carry a prison term of between 2 and 4 years. Our analysis provides one justification (among other possible ones) for having a high punishment for attempted (as well as completed) bribery.

The rest of the paper is organized as follows. Section 2 discusses related literature. Section 3 develops the basic model in which the speaker and listener have common interests and employs the model to analyze two particular forms of figurative speech, terseness and irony. Section 4 extends the model to consider the possibility of a conflict of interest between the speaker and listener and employs the extended model to analyze two other forms of figurative speech, sexual innuendo and veiled bribery. Section 5 concludes by suggesting possible avenues for future work.

2. Related Literature

Our paper is related to the economics literature on communication. In the standard economic model of communication, a sender with private information sends a message to an uninformed

receiver, and the receiver then chooses an action that affects the payoffs of both the sender and receiver. One approach, initiated by Grossman (1981) and Milgrom (1981), assumes that the sender’s information is verifiable and the sender can withhold information but not lie, referred to as “verifiable disclosure games.” The second approach, initiated by Crawford and Sobel (1982), assumes that the sender’s information is unverifiable and the sender can lie arbitrarily without direct costs, referred to as “cheap talk” games.

We assume that information is not necessarily verifiable and talk is not cheap. We emphasize that direct communication can be less costly for the sender than indirect communication, but that indirect communication is also more likely to be misunderstood by the listener, who must put in effort to decipher it. Dewatripoint and Tirole (2005) analyze a model in which the sender incurs costs of effectively communicating information and the receiver incurs costs of absorbing information. Kartik (2009) introduces direct lying costs in the Crawford and Sobel framework and shows that the sender almost always claims that her type is higher than it actually is, i.e., language is “inflated” in this environment. Hertel-Smith (2011) develop a model in which the sender incurs a greater cost to send a message that is more elaborate. We make related assumptions in our model.

However, none of these papers are concerned with figurative or indirect speech, the focus of our paper. In this respect, our paper is more closely related to the emerging literature on applications of game theory to pragmatics, which is a subfield of linguistics that studies ways in which context contributes to meaning. For a selective survey, see Jaeger (2008). In particular, we build on the work of Parikh (2001, 2010), Sally (2003, 2005), van Rooij (2004, 2008), and Pinker (2008) and Pinker, Nowak, and Lee (2008). Sally (2003, 2005) analyzes communication as a coordination game without private information, drawing implications for various linguistic phenomena. Our model features private information.

Parikh (2000, 2007) develops what he calls a “game of partial information” to account for successful communication in coordination settings. In such a game, the listener’s act of understanding is explicit, whereas in a signaling game, it is part of the Bayesian updating and solution process. Moreover, in his analysis, the listener learns what game the speaker has in mind only after the speaker chooses a message. Van Rooij (2004, 2008) extends Parikh’s analysis to a standard signaling framework. Our model is different from those of Parikh and Van Rooij in that we consider uncertainty about the listener’s type as well as uncertainty about the speaker’s meaning.

Pinker (2008) and Pinker, Nowak, and Lee (2008) analyze indirect speech in a model where the speaker is uncertain about the listener’s type and the listener may be of a type who would not cooperate with the speaker. They show that indirect speech is a dominant strategy because it carries the advantage of plausible deniability in case the listener is an uncooperative type. Our model is different from theirs in that we consider uncertainty about the speaker’s meaning as well as uncertainty about the listener’s type. With uncertainty about the speaker’s type, indirect speech carries a risk of miscommunication and therefore is not a dominant strategy. Thus, our model unifies two strands of the game-theoretic linguistics literature by considering a fuller type space for the speaker and listener. Moreover, we allow the various costs and benefits of speaking and understanding to depend on the speaker’s and listener’s types.

3. Basic Model: Common Interests

A speaker, S , has private information, $\theta \in \{\theta_1, \theta_2\}$, which he would like to convey to a listener, L , who must take an action, $a(\theta_1)$ or $a(\theta_2)$. Action $a(\theta)$ is the action that the listener would take following an inference that the speaker’s type is θ . There are two

unambiguous, literal messages, “ θ_1 ” and “ θ_2 ”, each of which is only available to the speaker in the corresponding state. Thus, sending either of them would completely reveal the state to the listener. However, it is costly for the speaker to send these messages, with cost $d_1^S > 0$ in state θ_1 and cost $d_2^S > 0$ in state θ_2 ; the motivation being that they may be long, complicated, compromising, or awkward. There is also one message, call it “ $\bar{\theta}_2$ ”, that is available to the speaker in both states and has some cost c_1^S in either state; this may represent a statement that is shorter or less complicated, compromising, or awkward. We assume that “ $\bar{\theta}_2$ ” has the literal meaning of θ_2 , and hence there is an asymmetry in that $c_1^S > c_2^S = 0$.

Upon hearing the message “ $\bar{\theta}_2$ ”, the listener may exert some effort in deciphering the message. We assume that the listener is one of two types, $\sigma \in \{\sigma_1, \sigma_2\}$: a sophisticated type, σ_1 , who always exerts effort and chooses whether to interpret “ $\bar{\theta}_2$ ” literally as indicating θ_2 or figuratively as indicating θ_1 , i.e., chooses between actions $a(\theta_1)$ and $a(\theta_2)$; and a naive type, σ_2 , who never exerts effort and always interprets “ $\bar{\theta}_2$ ” literally and so always chooses the action $a(\theta_2)$. Upon hearing the message “ θ_1 ”, the listener always chooses the action $a(\theta_1)$, and upon hearing the message “ θ_2 ”, the listener always chooses the action $a(\theta_2)$.

The speaker and listener have common interests in that both want the action $a(\theta)$ to be taken in the state θ . If the state is θ_1 and the listener takes the action $a(\theta_1)$, then the speaker receives a benefit $b_1^S > 0$ and the listener receives a benefit $b_1^L > 0$. If the state is θ_2 and the listener takes the action $a(\theta_2)$, then the speaker receives a benefit $b_2^S > 0$ and the listener receives a benefit $b_2^L > 0$. In the remaining cases, the payoffs are zero.

We denote by $q \in (0, 1)$ the prior probability that the speaker’s information is θ_1 and by $p \in (0, 1)$ the prior probability that the receiver is sophisticated. The extensive form of the game is given in Figure 1. The speaker has two information sets, which are labelled $S.1$ and $S.2$, and the type- σ_1 listener has one non-singleton information set, which is labelled $L.1$.

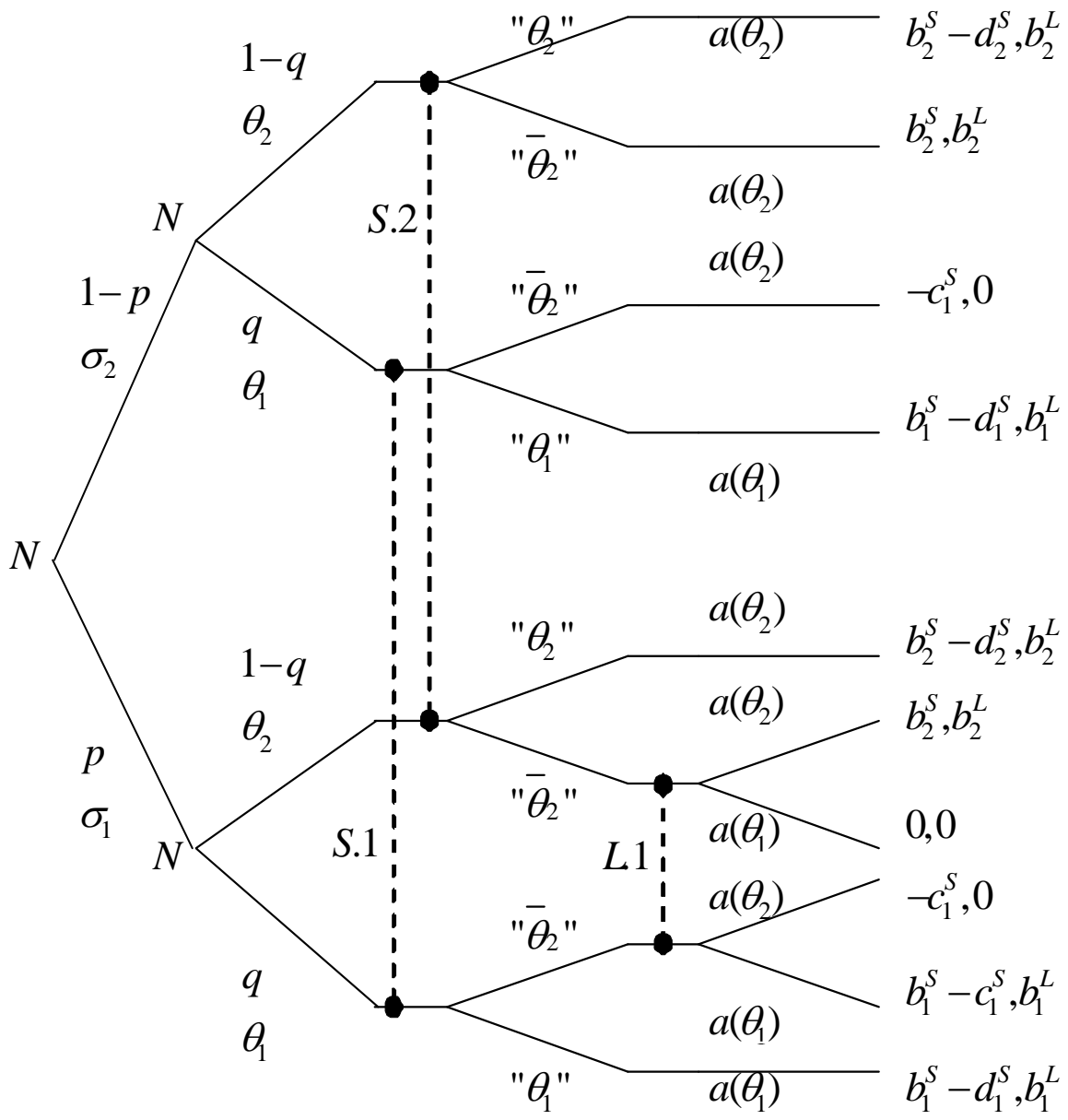


Figure 1: Extensive-Form of Model When Interlocutors Have Common Interests.

We adopt a simple implementation approach to reduce the complexity of the equilibrium analysis. Specifically, we find the parameter conditions for there to exist a perfect Bayesian equilibrium (PBE) in which speech is figurative. In the model, any PBE in which speech is figurative must have the speaker sending the ambiguous message “ $\bar{\theta}_2$ ” in state θ_1 and the listener responding by taking action $a(\theta_1)$ (i.e., interpreting “ $\bar{\theta}_2$ ” as meaning θ_1). There are two possible types PBEs in which speech is figurative. In a *type-P figurative PBE*, the speaker sends message “ $\bar{\theta}_2$ ” in state θ_1 and message “ $\bar{\theta}_2$ ” in state θ_2 , and the type- σ_1 listener responds by taking the action $a(\theta_1)$. In a *type-S figurative PBE*, the speaker sends message “ $\bar{\theta}_2$ ” in state θ_1 and message “ θ_2 ” in state θ_2 , and the type- σ_1 listener responds by taking the action $a(\theta_1)$. Note that in either of these cases, all non-singleton information sets are on the equilibrium path. Thus, any PBE in which speech is figurative is also a sequential equilibrium and satisfies higher-level refinements such as the intuitive criterion. For this reason, the conditions we provide for the existence of figurative PBEs actually coincide with the conditions for the existence of figurative PBEs that satisfy the intuitive criterion.² Note also that in a type-P or type-S figurative PBE, the probability that speech is figurative is pq (since there can be no figurative speech with a naive listener).

3.1 Existence of Figurative Equilibrium

The following proposition provides the conditions for each of the possible figurative equilibria to exist in the game in Figure 1. (Proofs of propositions are in the Appendix.)

Proposition 1 *There is a type-P figurative PBE iff the following conditions holds:*

$$q > \frac{b_2^L}{b_2^L + b_1^L} \text{ and } p \in \left[1 - \left(\frac{d_1^S - c_1^S}{b_1^S}\right), \frac{d_2^S}{b_2^S}\right]. \quad (1)$$

² There may also be PBEs in which speech is non-figurative, but these may involve non-singleton information sets that are off the equilibrium path and thus may not satisfy the intuitive criterion. Nonetheless, we have chosen to only investigate existence of figurative PBEs, since this considerably reduces the complexity of the analysis while still providing considerable insight into the workings of figurative speech.

There is a type- S figurative PBE iff the following conditions holds:

$$p > \max\left[1 - \left(\frac{d_1^S - c_1^S}{b_1^S}\right), \frac{d_2^S}{b_2^S}\right]. \quad (2)$$

There is more likely to be a figurative PBE of one type or the other if p (the prior probability that the listener is sophisticated) is higher, q (the prior probability that the speaker’s state is θ_1) is higher, d_1^S (the speaker’s cost of communicating θ_1 unambiguously) is higher, c_1^S (the speaker’s cost of communicating θ_1 ambiguously) is lower, b_1^L (the listener’s benefit of understanding that the speaker’s state is θ_1) is higher, b_1^S (the speaker’s benefit of successfully communicating that the state is θ_1) is lower, or b_2^L (the listener’s benefit of understanding that the speaker’s state is θ_2) is lower.

Ceteris paribus, speech is more likely to be figurative when the sender cares only a little about the state in question (b_1^S is low) while the receiver cares a lot about it (b_1^L is high). Then, the sender puts little effort into the message, and the receiver gladly puts in the effort to decipher it, giving rise to conversational implicature.

3.2 Applications

The condition sets in Proposition 1 can help explain what makes figurative speech and conversational implicature likely to work, and what makes them likely to fail. We now employ these conditions to provide a an original, systematic analysis of several classic examples of conversational implicatures (see Grice, 1989; and chapter 3 of Rubinstein, 2000).

3.2.1 Terseness

Example 1. Matt wants beer for his party. Responding to Matt, his sister Grace says, “There’s a store on 3rd Street.”

Correspondence with model. Either there is a store on 3rd Street that sells beer, state θ_1 ,

or there is a store on 3rd Street that does not sell beer, state θ_2 . If Grace knows that there is a store on 3rd Street that sells beer, she can say, “There’s a store on 3rd Street that sells beer,” message “ θ_1 ”, or she can say, “There’s a store on 3rd Street,” message “ $\bar{\theta}_2$ ”. If Grace knows that there is a store on 3rd Street that does not sell beer, she can say, “There’s a store on 3rd Street,” message “ $\bar{\theta}_2$ ”, or she can say, “There’s a store on 3rd Street that does not sell beer,” message “ θ_1 ”. If Grace says, “There’s a store on 3rd Street”, Matt can interpret this as meaning that there is a store on third street that sells beer and therefore go to the store on 3rd street, action $a(\theta_1)$, or he can interpret it as meaning that there is a store on 3rd street that does not sell beer and thus not go to it, action $a(\theta_2)$. If Grace says, “There’s a store on 3rd Street that sells beer,” Matt always understands that there is a store on 3rd Street that sells beer and thus goes to it, action $a(\theta_1)$. If Grace says, “There’s a store on 3rd Street that does not sell beer,” he always understands that there is a store on 3rd Street that does not sell beer and thus does not go to it, action $a(\theta_2)$.

Aanalysis. Grace’s cost d_1^S of saying, “There’s a store on 3rd Street that sells beer,” is high because such prolixity is tiresome. In contrast, Grace’s cost c_1^S of saying, “There’s a store on 3rd Street,” is low since this statement is concise. Matt’s benefit b_1^L of understanding that there is a store on 3rd Street that sells beer is high because he wants beer to make his party successful. In contrast, Grace’s benefit b_1^S of communicating that there is a store on 3rd Street is low because, although she still cares a little about her brother’s party being successful, it is not her party. On the other hand, Grace’s cost d_2^S of saying, “There’s a store on 3rd Street that does not sell beer,” is high because this sentence is lengthy and tiresome. In contrast, Grace’s benefit b_2^S of communicating, and Matt’s benefit b_2^L of understanding, that there is a store on 3rd Street that does not sell beer is nearly zero because this information is irrelevant in this context. Therefore, condition set (1) in Proposition 1 holds, and there is a

type-P figurative PBE in which Grace says, “There’s a store on 3rd Street,” when she wants to communicate that there is a store on 3rd Street that sells beer, and she says, “There’s a store on 3rd Street,” when she wants to communicate that there is a store on 3rd street that does not sell beer, and Matt interprets, “There’s a store on 3rd Street,” as meaning that there is a store on 3rd Street that sells beer if Matt is sophisticated.

Now, suppose instead that Grace cares a lot about the party being successful because she is co-organizing it. Then, her benefit b_1^S of communicating that there is a store on 3rd Street that sells beer is high. In this case, neither of the condition sets (1) or (2) in Proposition 1 are satisfied, and Grace says, “There’s a store on 3rd Street that sells beer,” when there is a store on 3rd Street that sells beer, so there is no figurative PBE. ■

As this analysis suggests, terseness (the use of few words to convey much meaning) is, *ceteris paribus*, more likely to be part of an equilibrium if the speaker cares little about successful communication while the listener cares a lot about it.

3.2.2 Irony

Example 2. Ted has a reputation for being a fickle friend. Speaking to Matt about Ted at the party, Tom says, “He is a fine friend.”

Correspondence with model. Ted is not a fine friend, state θ_1 , or he is a fine friend, state θ_2 . If Tom knows that Ted is not a fine friend, he can say, “He is not a fine friend,” message “ θ_1 ”, or he can say, ironically, “He is a fine friend,” message “ $\bar{\theta}_2$ ”. If Tom knows that Ted is a fine friend, he can say, “He is a fine friend,” message “ $\bar{\theta}_2$ ”, or he can say, “He is genuinely a fine friend... He always goes out of his way to help his friends...,” message “ θ_2 ”. If Matt is sophisticated, and Tom says, “He is a fine friend,” then Matt can interpret this as meaning that Ted is not a fine friend and therefore avoid him, action $a(\theta_1)$, or he can interpret it as

meaning that Ted is a fine friend and not avoid him, action $a(\theta_2)$. If Matt is naive, and Tom says, “He is a fine friend,” then Matt always interprets this as meaning that Ted is a fine friend and thus does not avoid him, action $a(\theta_2)$. If Tom says, “He is not a fine friend,” Matt always understands that Ted is not a fine friend and thus avoids him, action $a(\theta_1)$. If Tom says, “He is genuinely a fine friend... He always goes out of his way to help his friends...,” Matt always understands that he is a fine friend and thus does not avoid him, action $a(\theta_2)$.

Analysis. The prior q that Ted is not a fine friend is high because Ted has a reputation for being a fickle friend. Moreover, Tom’s cost d_1^S of saying directly or literally that Ted is not a fine friend is very high because others at the party may hear it and tell Ted that Tom has been talking ill of him behind his back. In contrast, Tom’s cost c_1^S of saying that Ted is a fine friend may be low because such a sentence is pleasant on the surface, though technically it involves a lie. In addition, Tom’s benefit b_1^S of communicating that Ted is not a fine friend is not too high since there is not too much for Tom to gain from it, apart from helping Matt out. In contrast, Matt’s benefit b_1^L of understanding that Ted is not a fine friend is high because this would give Matt a warning not to associate with Ted. On the other hand, Tom’s benefit b_2^S of communicating that Ted is a fine friend may be high, and his cost d_2^S of disambiguating that Ted is a fine friend by saying, “He is genuinely a fine friend... He always goes out of his way to help his friends...,” when Ted is a fine friend may be low because saying something nice about a friend is pleasing as long as Matt is not embarrassed about expressing positive feelings toward a friend. Thus, condition set (2) in Proposition 1 is satisfied, and there is a type-S figurative PBE in which Tom says, “He is a fine friend,” when Ted is not a fine friend, and he says, “He is genuinely a fine friend... He always goes out of his way to help his friends...,” when Ted is a fine friend, and Matt correctly interprets, “He is a fine friend,” ironically as meaning that Ted is not a fine friend

if Matt is sophisticated. ■

Example 3. Ted has a reputation for being a faithful friend. Speaking to Matt about Ted at the party, Tom says, “He is not a fine friend.”

Correspondence with model. Ted is a fine friend, state θ_1 , or he is not a fine friend, state θ_2 . If Tom knows that Ted is a fine friend, he can say, “He is a fine friend,” message “ θ_1 ”, or he can say, ironically, “He is not a fine friend,” message “ $\bar{\theta}_2$ ”. If Tom knows that Ted is not a fine friend, he can say, “He is not a fine friend,” message “ $\bar{\theta}_2$ ”, or he can say, “He is really not a fine friend... He betrays his friends in horrible ways...,” message “ θ_2 ”. If Matt is sophisticated, and Tom says, “He is not a fine friend,” then Matt can interpret this as meaning that Ted is a fine friend and therefore not avoid him, action $a(\theta_1)$, or he can interpret it as meaning that Ted is not a fine friend and thus avoid him, action $a(\theta_2)$. If Matt is naive, and Tom says, “He is not a fine friend,” then Matt always interprets this as meaning that Ted is a fine friend and thus does not avoid him, action $a(\theta_1)$. If Tom says, “He is a fine friend,” Matt always understands that Ted is a fine friend and therefore does not avoid him, action $a(\theta_1)$. If Tom says, “He is really not a fine friend... He betrays his friends in horrible ways...,” Matt always understands that Ted is not a fine friend and therefore avoids him, action $a(\theta_2)$.

Analysis. The prior q that Ted is a fine friend is high because Ted has a reputation for being a faithful friend. However, Tom’s cost d_1^S of communicating that Ted is a fine friend is low if Tom is not embarrassed about expressing positive feelings about a friend. In contrast, Tom’s cost c_1^S of saying, “He is not a fine friend,” when he is a fine friend is high because this sentence is unpleasant in addition to involving a lie. Thus, neither of the condition sets (1) and (2) in Proposition 1 are satisfied, and Tom says, “He is a fine friend,” when Ted is a fine friend, so there is no figurative PBE. ■

This analysis suggests that irony will typically be negative or sarcastic. By definition, irony need not be sarcastic. According to the *American Heritage Dictionary*, verbal irony is “the use of words to express something opposite to their literal meaning,” while sarcasm is “a sneering or cutting remark intended to wound.” However, research by psychologists and linguists demonstrates that most instances of verbal irony are considered to be sarcastic (see Lee and Katz, 1998, Gibbs, 2000 and Bryant and Fox Tree, 2002). Our economic model provides an explanation. The model implies that figurative speech is more likely to arise when the cost of expressing a thought literally is higher. If the speaker’s thought is negative, then speaking ironically involves using words that have a literal meaning that is positive. The costs of expressing literally a positive thought are generally low. On the other hand, if the speaker’s thought is positive, then speaking ironically involves using words that have a negative meaning. The costs of expressing literally a negative thought are generally high. Thus negative irony is significantly more likely than positive irony.

4. Extended Model: Potential Conflict of Interest

So far, we have assumed that the speaker and listener both derive a benefit if the listener correctly interprets the speaker’s type. However, the speaker may derive no benefit from the listener correctly interpreting the speaker’s type if the listener is of a type who would not cooperate with the speaker’s type. We now extend the model to allow for this possibility. The model is the same as the basic model except that now the listener is also one of two additional types, $\eta \in \{\eta_1, \eta_2\}$: a type, η_1 , who would cooperate with the speaker regardless of the speaker’s type, and a type, η_2 , who would only cooperate with the speaker following an inference that the speaker’s type is θ_2 . Thus, the listener is now one of a total of four types, $(\sigma, \eta) \in \{(\sigma_1, \eta_1), (\sigma_1, \eta_2), (\sigma_2, \eta_1), (\sigma_2, \eta_2)\}$. Action $a(\theta, \eta)$ is the action that the

type- (σ, η) listener would take following an inference that the speaker's type is θ .

As before, if the speaker's type is θ_1 , the speaker sends the unambiguous, literal message “ θ_1 ” or the ambiguous, figurative message “ $\bar{\theta}_2$ ”. If the speaker's type is θ_2 , the speaker sends the unambiguous message “ θ_2 ” or the ambiguous message “ $\bar{\theta}_2$ ”. The speaker's costs of sending unambiguous messages may depend on the listener's type. If the listener's type is (σ, η_1) , the speaker's costs of sending messages “ θ_1 ” and “ θ_2 ” are $d_{11}^S > 0$ and $d_{21}^S > 0$, respectively. If the listener's type is (σ, η_2) , the speaker's costs of sending messages “ θ_1 ” and “ θ_2 ” are $d_{12}^S > 0$ and $d_{22}^S > 0$, respectively. The cost $d_{12}^S > 0$ may be particularly high since the type- (σ, η_2) listener would not cooperate with the speaker following an inference that the speaker's type is θ_1 . If the speaker's type is θ_1 , the speaker incurs costs $c_{11}^S > 0$ and $c_{12}^S > 0$ of sending the ambiguous message “ $\bar{\theta}_2$ ” if the listener's type is (σ, η_1) and (σ, η_2) , respectively. The type- (σ_1, η) listener either interprets “ $\bar{\theta}_2$ ” literally as indicating θ_2 or figuratively as indicating θ_1 , i.e., chooses between actions $a(\theta_1, \eta)$ and $a(\theta_2, \eta)$. The type- (σ_2, η) listener always interprets “ $\bar{\theta}_2$ ” as indicating θ_2 and so always chooses action $a(\theta_2, \eta)$.

If the listener's type is (σ, η_1) , the speaker and type- (σ, η_1) listener both want action $a(\theta, \eta_1)$ to be chosen if the speaker's type is θ . More precisely, if the state is θ_1 , and the type- (σ, η_1) listener takes action $a(\theta_1, \eta_1)$, then the speaker receives a benefit $b_{11}^S > 0$ and the type- (σ, η_1) listener receives a benefit $b_{11}^L > 0$. If the state is θ_2 , and the type- (σ, η_1) listener takes action $a(\theta_2, \eta_1)$, the speaker receives a benefit $b_{21}^S > 0$ and the type- (σ, η_1) listener receives a benefit $b_{21}^L > 0$.

If the listener's type is (σ, η_2) , the speaker and type- (σ, η_2) listener both want action $a(\theta_2, \eta_2)$ to be chosen if the speaker's type is θ_2 . However, only the type- (σ, η_2) listener wants action $a(\theta_1, \eta_2)$ to be chosen if the speaker's type is θ_1 . More precisely, if the state is θ_2 , and the type- (σ, η_2) listener takes $a(\theta_2, \eta_2)$, then the speaker receives a benefit $b_{22}^S > 0$

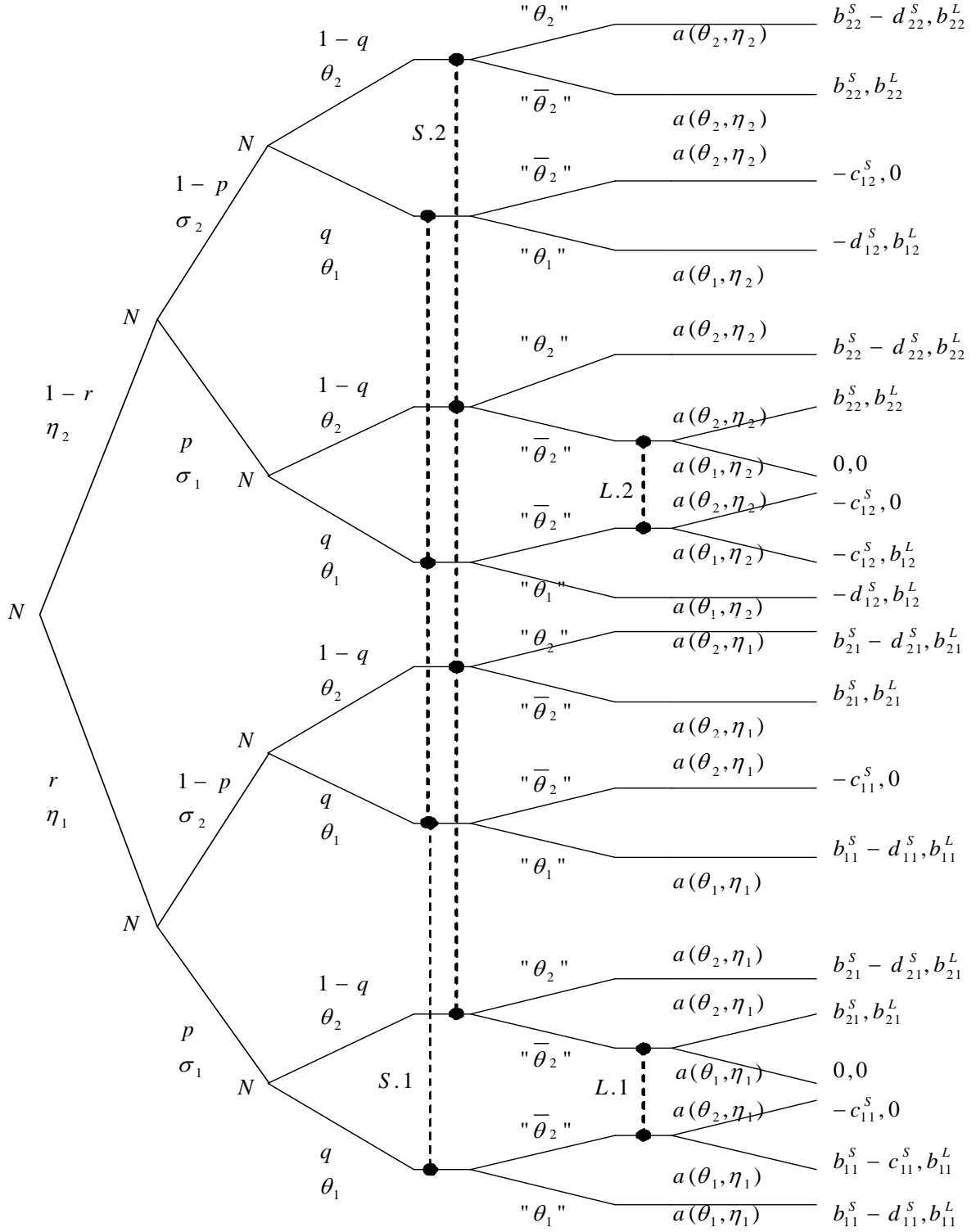
and the type- (σ, η_2) listener receives $b_{22}^L > 0$. However, if the state is θ_1 , and the type- (σ, η_2) listener takes $a(\theta_1, \eta_2)$, then the speaker receives no benefit, i.e., $b_{12}^S = 0 < b_{11}^S$, while the type- (σ, η_2) listener receives a benefit $b_{12}^L > 0$.

Let $r \in (0, 1)$ be the prior probability that the listener's type is η_1 . The extensive form of the game is given in Figure 2. The speaker has two information sets, labelled $S.1$ and $S.2$, and the listener has two non-singleton information sets, labelled $L.1$ and $L.2$.

For simplicity, we assume that $d_{12}^S - c_{12}^S > d_{11}^S - c_{11}^S$ (the listener's cost savings from indirectly communicating θ_1 is greater if the listener is uncooperative) and $b_{21}^S > b_{22}^S$ and $d_{22}^S > d_{21}^S$ (the speaker's benefit of communicating θ_2 is greater if the listener is cooperative and the speaker's cost of directly communicating θ_2 is greater if the listener is non-cooperative).

There are six possible types of figurative PBEs in this game. In a *type-PS1 figurative PBE*, the speaker sends message " $\bar{\theta}_2$ " in state θ_1 and in state θ_2 , the type- (σ_1, η_1) listener responds by interpreting " $\bar{\theta}_2$ " as θ_1 and thus taking action $a(\theta_1, \eta_1)$, and the type- (σ_1, η_2) listener responds by interpreting " $\bar{\theta}_2$ " as θ_2 and thus taking action $a(\theta_2, \eta_2)$. In a *type-SS1 figurative PBE*, the speaker sends message " $\bar{\theta}_2$ " when the speaker's type is θ_1 and message " θ_2 " when the speaker's type is θ_2 , the type- (σ_1, η_1) listener responds by interpreting " $\bar{\theta}_2$ " as θ_1 and thus taking action $a(\theta_1, \eta_1)$, and the type- (σ_1, η_2) listener responds by interpreting " $\bar{\theta}_2$ " as θ_2 and thus taking action $a(\theta_2, \eta_2)$. In a type-PS1 or type-SS1 figurative PBE, the probability that speech is figurative is rpq .

In a *type-PP figurative PBE*, the speaker sends " $\bar{\theta}_2$ " in state θ_1 and in state θ_2 , the type- (σ_1, η_1) listener responds by interpreting " $\bar{\theta}_2$ " as θ_1 and thus taking $a(\theta_1, \eta_1)$, and the type- (σ_1, η_2) listener responds by interpreting " $\bar{\theta}_2$ " as θ_1 and thus taking $a(\theta_1, \eta_2)$. In a *type-SP figurative PBE*, the speaker sends " $\bar{\theta}_2$ " in state θ_1 and " θ_2 " in state θ_2 , the type- (σ_1, η_1) listener responds by interpreting " $\bar{\theta}_2$ " as θ_1 and thus taking $a(\theta_1, \eta_1)$, and the type- (σ_1, η_2)



listener responds by interpreting “ $\bar{\theta}_2$ ” as θ_1 and thus taking $a(\theta_1, \eta_2)$. In a type-PP or type-SP figurative PBE, the probability that speech is figurative is pq .

In a *type-PS2 figurative PBE*, the speaker sends “ $\bar{\theta}_2$ ” in state θ_1 and in state θ_2 , the type- (σ_1, η_1) listener responds by interpreting “ $\bar{\theta}_2$ ” as θ_2 and taking $a(\theta_2, \eta_1)$, and the type- (σ_1, η_2) listener responds by interpreting “ $\bar{\theta}_2$ ” as θ_1 and taking $a(\theta_1, \eta_2)$. In a *type-SS2 figurative PBE*, the speaker sends “ $\bar{\theta}_2$ ” in state θ_1 and “ θ_2 ” in state θ_2 , the type- (σ_1, η_1) listener responds by interpreting “ $\bar{\theta}_2$ ” as θ_2 and taking $a(\theta_2, \eta_1)$, and the type- (σ_1, η_2) listener responds by interpreting “ $\bar{\theta}_2$ ” as θ_1 and taking $a(\theta_1, \eta_2)$. In a type-PS2 or type-SS2 figurative PBE, the probability that speech is figurative is $(1 - r)pq$.

Note that in all the possible figurative PBEs, all non-singleton information sets are on the equilibrium path. Thus, as in the basic model, any PBE in which speech is figurative is also a sequential equilibrium and satisfies higher-level refinements such as the intuitive criterion.

4.1 Existence of Figurative Equilibria

The following proposition provides the conditions for each of the possible figurative equilibria to exist in the game in Figure 2.

Proposition 2 *There is a type-PS1 figurative PBE iff the following conditions hold:*

$$\begin{aligned} q &\in \left(\frac{b_{21}^L}{b_{21}^L + b_{11}^L}, \frac{b_{22}^L}{b_{22}^L + b_{12}^L} \right) \text{ and} \\ r &< \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S}{d_{22}^S + pb_{21}^S - d_{21}^S} \right]. \end{aligned} \quad (3)$$

There is a type-PP figurative PBE iff the following conditions holds:

$$\begin{aligned} q &> \max \left[\frac{b_{21}^L}{b_{21}^L + b_{11}^L}, \frac{b_{22}^L}{b_{22}^L + b_{12}^L} \right] \text{ and} \\ r &< \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S} \right], \end{aligned} \quad (4)$$

There is a type-SP figurative PBE iff the following conditions holds:

$$r \in \left[\frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S}, \frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S} \right], \quad (5)$$

There is a type-PS2 figurative PBE iff the following conditions hold:

$$q \in \left(\frac{b_{22}^L}{b_{22}^L + b_{12}^L}, \frac{b_{21}^L}{b_{21}^L + b_{11}^L} \right) \text{ and} \quad (6)$$

$$r < \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S - d_{21}^S} \right].$$

There is no type-SS1 or type-SS2 figurative PBE.

There is more likely to be a figurative PBE of one type or another if d_{12}^S (the speaker's cost of communicating the state θ_1 unambiguously when the listener would only cooperate with the speaker following an inference that the speaker's state is θ_2) is higher, c_{11}^S (the speaker's cost of communicating the state θ_1 ambiguously when the listener would cooperate with the speaker regardless of the inference about the speaker's state) is lower, c_{12}^S (the speaker's cost of communicating the state θ_1 ambiguously when the listener would only cooperate with the speaker following an inference that the speaker's state is θ_2) is lower, or b_{11}^S (the speaker's benefit of successfully communicating the state θ_1 when the listener would always cooperate with the speaker) is lower.

Lastly, note that if r (the prior probability that the listener would always cooperate with the speaker) is sufficiently low, one of the condition sets (3), (4), or (6) is satisfied as long as q is not too low (so one type of figurative PBE arises as long as q is not too low); if r is intermediate, only condition set (5) is satisfied (so only a type-SP figurative PBE arises); and if r is sufficiently high, then none of the condition sets (3)-(6) are satisfied (so no figurative PBE of any type arises). Thus, ceteris paribus, speech is less likely to be figurative if the probability that the listener is cooperative is higher, since this reduces the speaker's expected cost of being direct.

4.2 Applications

We now employ the conditions in Proposition 2 to systematically analyze two other classic examples of indirect speech (see, Pinker, 2008, and Pinker, Nowak, and Lee, 2008).

4.2.1 Sexual Innuendo

Example 4. Speaking to Grace after the party, Ted says, “Want to come to my place and see my etchings?”

Correspondence with model. Ted is interested in sex with Grace, state θ_1 , or interested in showing Grace his drawings, state θ_2 . Grace is interested in sex with Ted (and not his drawings), state η_1 , or interested in seeing Ted’s drawings (and not in sex with him), state η_2 . If Ted is interested in sex with Grace, he can say, “Want to have sex?,” message “ θ_1 ”, or he can say, “Want to come and see my etchings?,” message “ $\bar{\theta}_2$ ”. If Ted is interested in showing Grace his drawings, he can say, “Want to come and see my etchings?,” message “ $\bar{\theta}_2$ ”, or he can say, “Drawings are my passion... Want to come and see my latest ones? Or I can bring them to you tomorrow...,” message “ θ_2 ”.

Suppose Grace is interested in sex with Ted. If Grace is sophisticated, and Ted says, “Want to come and see my etchings?,” then Grace can interpret this as meaning that Ted is interested in sex with her and therefore say “yes,” action $a(\theta_1, \eta_1)$, or she can interpret it as meaning that Ted is interested in showing his drawings and thus say “no,” action $a(\theta_2, \eta_1)$. If Grace is naive, and Ted says, “Want to come and see my etchings?,” Grace always interprets this as meaning that Ted wants to show his drawings and thus says “no,” action $a(\theta_2, \eta_1)$. If Ted says “Want to have sex?,” she always understands that Ted wants to have sex and thus says “yes,” action $a(\theta_1, \eta_1)$. If Ted says, “Drawings are my passion... Want to come and see my latest ones? Or I can bring them to you tomorrow...,” she always understands that Ted

wants to show his drawings and thus says “no,” action $a(\theta_2, \eta_1)$.

Now, suppose Grace is interested in seeing Ted’s drawings. If Grace is sophisticated, and Ted says, “Want to come and see my etchings?,” Grace can interpret this as meaning that Ted is interested in sex with her and therefore say “no” and possibly also slap Ted in the face for his indecency, action $a(\theta_1, \eta_2)$, or she can interpret it as meaning that Ted is interested in showing his drawings and thus say “yes,” action $a(\theta_2, \eta_2)$. If Grace is naive, and Ted says, “Want to come and see my etchings?,” Grace always interprets this as meaning that Ted wants to show his drawings and thus says “yes,” action $a(\theta_2, \eta_2)$. If Ted says “Want to have sex?,” she always understands that Ted wants to have sex with her and thus says “no” and possibly slaps him, action $a(\theta_1, \eta_2)$. If Ted says, “Drawings are my passion... Want to come and see my latest ones? Or I can bring them to you tomorrow...,” she always understands that Ted wants to show his drawings and thus says “yes,” action $a(\theta_2, \eta_2)$.

A situation where there is a type-PP or type-SP figurative PBE. The prior q that Ted is interested in sex with Grace is extremely high since Ted is a young man, and as most young men, is extremely interested in sex. Grace’s benefit b_{21}^L of correctly understanding that Ted is interested in showing his drawings when Grace is interested in sex and not drawings is low. Grace’s benefit b_{11}^L of correctly understanding that Ted is interested in sex when Grace is also interested in sex is high since this would result in a mutually satisfying sexual exchange. On the other hand, Grace’s benefit b_{22}^L of correctly understanding that Ted is interested in showing his drawings when Grace is interested in seeing Ted’s drawings is moderate since although this would result in a mutually satisfying artistic exchange, such an exchange would not be nearly as satisfying as a mutually satisfying sexual exchange. In addition, Grace’s benefit b_{12}^L of correctly understanding that Ted is interested in sex when Grace is interested in drawings and not sex is extremely high, for if she were to misunderstand that Ted is

interested in showing his drawings, then she would go to Ted's place only to find out that he is only interested in sex with her, which would make for an extremely uncomfortable situation. Thus, $q > \max[b_{21}^L/(b_{21}^L + b_{11}^L), b_{22}^L/(b_{22}^L + b_{12}^L)]$.

On the other hand, the prior r that Grace is interested in sex with Ted is very low, while the prior p that Grace is sophisticated is very high. Moreover, Ted's cost d_{12}^S of saying unambiguously, "Want to have sex?" when Grace is interested in his drawings and not in sex with him, is extremely high because this would result in an extremely awkward situation. Not only would Grace have to turn him down, so Ted would feel rejected, but Ted would know that she turned him down because she is not interested in sex with him (whereas if Ted said, "Want to come and see my etchings," and Grace turned him down, then there would still be the possibility that she turned him down because she thought that he meant that he wants to show his drawings and was not interested in his drawings). In addition, Grace would know that Ted knows that she turned him down because she does not want to have sex with him, and Ted would know that Grace knows that Ted knows..., which would also contribute to the intense awkwardness of the situation. Ted's cost d_{11}^S of saying unambiguously, "Want to have sex?" when Grace is interested in sex is also high (although not nearly as high as the cost d_{12}^S of sending this message when Grace is not interested in sex) since this message is crude and could make potential third-party listeners around them uncomfortable. Thus, $r < (d_{12}^S - c_{12}^S)/(d_{12}^S - c_{12}^S + (1 - p)b_{11}^S - d_{11}^S + c_{11}^S)$.

Now, either $r < (d_{22}^S - pb_{22}^S)/(d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S)$, in which case condition set (4) in Proposition 2 is satisfied and there is a type-PP figurative PBE, or $r > (d_{22}^S - pb_{22}^S)/(d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S)$, in which case (5) in Proposition 2 is satisfied and there is a type-SP PBE. In either case, Ted says, "Want to come and see my etchings," when he is interested in sex, and Grace interprets this as meaning that Ted is interested in sex if she is sophisticated and

regardless of whether she is interested in sex or interested in seeing the drawings.

A situation where there is no figurative PBE. If, instead, the prior r that Grace is interested in sex with Ted is high, the prior p that Grace is (linguistically) sophisticated is low, Ted's cost d_{12}^S of saying unambiguously, "Want to have sex?," when Grace is not interested in sex is not too high (because Ted is not bashful), and Ted's cost d_{11}^S of saying unambiguously, "Want to have sex?," when Grace is interested in sex is low (because nobody is around), then neither of the conditions (3)-(6) in Proposition 2 are satisfied, and Ted says, "Want to have sex?," when he wants to have sex, so there is no figurative PBE. ■

4.2.2 Veiled Bribery

Example 5. Ted is pulled over by a police officer for speeding 5 m.p.h. above the limit as he passed a truck. When the officer asks for his license, Ted pulls out his wallet, turning it at an angle where the bills are in plain view, and says, "Gee officer, is there any way you could let me go with a warning?"

Correspondence with model. Ted is asking the officer to accept a bribe, state θ_1 , or he is asking for leniency, state θ_2 . The officer is dishonest and unreasonable (would accept a bribe if he thought that Ted was asking him to accept a bribe, and would not let Ted off with a warning if he thought that Ted was asking for leniency, even though the infraction was somewhat technical), state η_1 , or honest and reasonable (would not accept a bribe and would arrest Ted for attempted bribery if he thought that Ted was asking him to accept a bribe and he could arrest him for attempted bribery, and would let Ted off with a stern warning if he thought Ted was asking for leniency, since the infraction was somewhat borderline), state η_2 . If Ted is asking the officer to accept a bribe, he can say, "I'll give you \$100 if you don't report this," message " θ_1 ", or he can say, "Gee officer, is there any way you could let me

go with a warning?," message " $\bar{\theta}_2$ ". If Ted is asking for leniency, he can say, "Gee officer, is there any way you could let me go with a warning?," message " $\bar{\theta}_2$ ", or he can say, avoiding any suggestive antics with his wallet, "I'm sorry... I just felt unsafe going side-by-side with the truck... I've learned my lesson and will be extra careful from now on...," message " θ_2 ".

Suppose the officer is dishonest and unreasonable. If the officer is sophisticated, and Ted says, "Gee officer, is there any way you could let me go with a warning?," then the officer can interpret this as meaning that Ted is attempting to bribe him and thus says "yes" and accept a bribe, action $a(\theta_1, \eta_1)$, or he can interpret it as meaning that Ted is asking for leniency and thus say "no" and issue him a ticket, action $a(\theta_2, \eta_1)$. If the officer is naive, and Ted says, "Gee officer, is there any way you could let me go with a warning?," then the officer always interprets this as meaning that Ted is asking for leniency and thus says "no" and issues him a ticket, $a(\theta_2, \eta_1)$. If Ted says, "I'll give you \$100 if you don't report this," the officer always understands that Ted wants to bribe him and thus says "yes" and accepts a bribe, action $a(\theta_1, \eta_1)$. If Ted says, "I'm so sorry... I just felt unsafe going side-by-side with the truck... I've learned my lesson and will be extra careful from now on...," the officer always understands that Ted is asking for leniency and thus says "no" and issues him a ticket, action $a(\theta_2, \eta_1)$.

Now, suppose the officer is honest and reasonable. If the officer is sophisticated, and Ted says, "Gee officer, is there any way you could let me go with a warning?," the officer can interpret this as meaning that Ted is asking him to accept a bribe and thus say "no" and issue him a ticket, action $a(\theta_1, \eta_2)$, or he can interpret it as meaning that Ted is asking for reasonable leniency and thus say "yes" and let him off with a stern warning, $a(\theta_2, \eta_2)$. If the officer is naive, and Ted says, "Gee officer, is there any way you could let me go with a warning?," the officer always interprets this as meaning that Ted is asking for leniency

and thus says “yes” and lets him off with a stern warning, $a(\theta_2, \eta_2)$. If Ted says, “I’ll give you \$100 if you don’t report this,” the officer always understands that Ted is asking him to accept a bribe and thus says “no” and arrests him for attempted bribery, $a(\theta_1, \eta_2)$. If Ted says, “I’m so sorry... I just felt unsafe going side-by-side with the truck... I’ve learned my lesson and will be extra careful from now on...,” the officer always understands that Ted is asking for reasonable leniency and thus says “yes” and lets him off with a warning, $a(\theta_2, \eta_2)$.

A situation where there is a type-PS1 figurative PBE. The dishonest/unreasonable officer’s benefit b_{11}^L of correctly understanding that Ted is asking him to accept a bribe if Ted says, “Gee officer, is there any way you could let me go with a warning?,” is high, since he is interested in taking a bribe. The dishonest/unreasonable officer’s benefit b_{21}^L of correctly understanding that Ted is asking for leniency when Ted says, “Gee officer, is there any way you could let me go with a warning?,” is moderate, since he does not care much about being reasonable with his discretion to apply the law and is not much worried about being accused by Ted of being willing to be bribed as there would be no hard evidence.

The honest/reasonable officer’s benefit b_{22}^L of correctly understanding that Ted is asking for reasonable leniency when Ted says, “Gee officer, is there any way you could let me go with a warning?,” is high, since he cares about being fair with his discretion to apply the law. Moreover, the honest/reasonable officer’s benefit b_{12}^L of correctly understanding that Ted is offering a bribe if Ted says, “Gee officer, is there any way you could let me go with a warning?,” is moderate, since although the officer can then get some satisfaction from issuing Ted a ticket, he cannot arrest Ted for attempted bribery since Ted’s message is ambiguous and plausibly deniable. Moreover, the prior q that Ted is bribing the officer is not too low since it is not uncommon for people who are pulled over to try to curry favor in order to avoid a fine. Thus, $q \in [b_{21}^L/(b_{21}^L + b_{11}^L), b_{22}^L/(b_{22}^L + b_{12}^L)]$.

On the other hand, the prior r is low since most officers are honest/reasonable. Moreover, Ted's cost d_{12}^S of saying unambiguously to the officer, "I'll give you \$100 if you don't report this," when the officer is honest/reasonable, is extremely high, for this would result in Ted being arrested and convicted for attempted bribery. Moreover, Ted lives in California, where attempted (as well as completed) bribery of a police officer is a felony, which can result in a prison sentence of between 2 and 4 years (California Penal Code Section 67). In contrast, Ted's cost c_{12}^S of saying ambiguously to the officer, "Gee officer, is there any way you could let me go with a warning?," when the officer is honest/reasonable, is much lower since there is little chance of this message resulting in a conviction for attempted bribery as it carries the advantage of plausible deniability. In addition, while Ted's cost d_{11}^S of saying unambiguously to the officer, "I'll give you \$100 if you don't report this," when the officer is dishonest/unreasonable, is also high, it is not nearly as high as d_{12}^S . In this case, the officer would not arrest Ted but rather accept his bribe, so the bribe would be completed, and although there would still be a probability that a third party would overhear their exchange and report them to another authority, which would result in an arrest for completed bribery, the punishments for completed and attempted bribery are the same and the chances of getting arrested when the officer is dishonest/unreasonable are much lower than when the officer is honest/reasonable. In fact, d_{12}^S is so large relative to other parameters that $r < (d_{12}^S - c_{12}^S)/(d_{12}^S - c_{12}^S + (1 - p)b_{11}^S - d_{11}^S + c_{11}^S)$.

Furthermore, Ted's cost d_{22}^S of saying unambiguously to the officer, "I'm sorry... I just felt unsafe going side-by-side with the truck... I've learned my lesson and will be extra careful from now on...," is about the same whether he faces a dishonest/unreasonable or an honest/reasonable officer, i.e., $d_{21}^S \approx d_{22}^S$, and is high since this message is long and tiresome. In contrast, Ted's benefit b_{21}^S of successfully communicating to a dishonest/unreasonable

officer that he is asking for leniency is close to zero, for although he may get some modicum of satisfaction simply from making a plea, he will still be issued a ticket. Thus, $r < d_{22}^S / (d_{22}^S + pb_{21}^S - d_{21}^S)$. Hence, condition set (3) in Proposition 2 is satisfied, and there is a type-PS1 figurative PBE in which Ted says, “Gee officer, is there any way you could let me go with a warning?,” whether he is asking the officer to accept a bribe or asking for leniency, and if the officer is sophisticated, he interprets this as meaning that Ted is asking him to accept a bribe if he is dishonest/unreasonable and interprets it as meaning that Ted is asking for leniency if he is honest/reasonable.

A situation where there is no figurative PBE. If, instead, the prior r that the officer is dishonest/unreasonable is high, Ted’s cost d_{12}^S of saying unambiguously, “I’ll give you \$100 if you don’t report this,” when the officer is honest/reasonable, is not too high (because Ted lives in a place where the punishment for attempted bribery is not too high), Ted’s cost d_{11}^S of saying unambiguously, “I’ll give you \$100 if you don’t report this,” when the officer is dishonest/unreasonable is low (because the street is deserted and there’s nobody around), Ted’s benefit b_{11}^S of successfully communicating to the officer that he is asking him to accept a bribe is high (because Ted really wants to avoid a ticket, e.g., his insurance premiums would rise substantially since this is his second offense in the last year), and the prior p that the officer is (linguistically) sophisticated is low, then neither of the condition sets (3)-(6) in Proposition 2 are satisfied, and Ted says directly, “I’ll give you \$100 if you don’t report this,” when he is asking the officer to accept a bribe. ■

The model also delivers a policy implication in this application. In any type of figurative PBE, the probability of a completed bribe is rpq (the officer must be dishonest/unreasonable and sophisticated and Ted must intend to bribe). In contrast, in any PBE that is not figurative, the probability of a completed bribe is rq (the officer must be dishonest/unreasonable

and Ted must intend to bribe, but the officer need not be sophisticated since even an unsophisticated officer understands a bribe when it is direct). On the other hand, in any PBE, figurative or not, the probability of an attempted bribe is q (since Ted always attempts to bribe if he intends to bribe, the question being only how he attempts to bribe in this case). Now, as the analysis above suggests, a figurative PBE is more likely if the punishment for attempted bribery (d_{12}^S) is higher. Thus, increasing the punishment for attempted bribery increases the probability of completed bribery even if it does not affect the probability of attempted bribery. The reason is that it induces the briber to bribe more indirectly, which reduces the probability that the bribe succeeds. This provides one justification (among other possible ones) for having a high punishment for attempted (as well as completed) bribery.

5. Conclusion

In this paper, we developed a simple model of communication that yielded insight into how context affects the figurativeness or indirectness of speech. We applied the model to systematically analyze various forms of indirect speech, including terseness and irony (when interlocutors have common interests), and sexual innuendo and veiled bribery (when interlocutors have a potential conflict of interest). The model could also be applied to analyze other forms of indirect speech, such as metaphors (e.g., “You are my sunshine” vs. “I would be sad all the time without you”), political euphemisms (“They employed enhanced interrogation techniques” vs. “They used torture”), underground exchanges (“Is it snowing?” vs. “Do you have any cocaine to sell?”), and collusion (“I’m raising my prices” vs. simply raise my prices without verbal explanation).

It might also be interesting to test the predictions of the model experimentally. Subjects could be offered a choice of messages with different levels of directness, and one could observe

whether their choices vary with the parameters of the conversational situation in the ways predicted by the model.

Lastly, it might be fruitful to extend the model to explore conversational dynamics. First, one might try to add to the model an earlier stage in which a person can say something that sets the context for the exchange and may influence the beliefs of the other person, thereby changing the equilibrium. Some types may want to change the equilibrium in particular ways. Second, one might try to add to the model a subsequent stage in which a person can follow up on a related issue or ask for clarification on a previous one. Clarification would undo the figurativeness of speech, but in many cases, the listener may choose not to ask for clarification. Such conversational dynamics may also determine the figurativeness of speech.

6. Appendix

Proof of Proposition 1. Let β be the type- σ_1 listener's belief that the speaker's type is θ_1 if the speaker chooses the ambiguous message " $\bar{\theta}_2$ ", i.e., the probability of being at the first node in $L.1$. The expected payoffs to the type- σ_1 listener of choosing $a(\theta_1)$ and $a(\theta_2)$ are then βb_1^L and $(1 - \beta)b_2^L$, respectively. Thus, the listener chooses $a(\theta_1)$ at $L.1$ iff

$$\beta > \frac{b_2^L}{b_2^L + b_1^L}. \quad (7)$$

To have a figurative PBE of any type, (7) must be satisfied, so the listener chooses $a(\theta_1)$ at $L.1$. Then, at $S.1$, the speaker's expected payoffs from choosing " θ_1 " and " $\bar{\theta}_2$ " are $b_1^S - d_1^S$ and $pb_1^S - c_1^S$, respectively. Thus, the speaker chooses " $\bar{\theta}_2$ " at $S.1$ iff

$$p > 1 - \left(\frac{d_1^S - c_1^S}{b_1^S} \right). \quad (8)$$

At $S.2$, the speaker's expected payoffs from choosing " θ_2 " and " $\bar{\theta}_2$ " are $b_2^S - d_2^S$ and $(1-p)b_2^S$, respectively. Thus, the speaker chooses " $\bar{\theta}_2$ " at $S.2$ iff

$$p < \frac{d_2^S}{b_2^S}. \quad (9)$$

If equations (8) and (9) are both satisfied, then $\beta = q$. Thus, there is a type-P figurative PBE if

$$q > \frac{b_2^L}{b_2^L + b_1^L} \text{ and } p \in [1 - (\frac{d_1^S - c_1^S}{b_1^S}), \frac{d_2^S}{b_2^S}]. \quad (10)$$

If equation (8) is satisfied but equation (9) is reversed, then $\beta = 1$. Thus, there is a type-S figurative PBE if

$$p > \max[1 - (\frac{d_1^S - c_1^S}{b_1^S}), \frac{d_2^S}{b_2^S}]. \quad (11)$$

If equation (8) is reversed but equation (9) is satisfied, or both equations (8) and (9) are reversed, then there cannot be a figurative PBE. Hence, there is a type-P figurative PBE iff (10) holds, and there is a type-S figurative PBE iff (11) holds. ■

Proof of Proposition 2. Let β_1 be the type- (η_1, σ_1) listener's probability of being at the first node in $L.1$ and let β_2 be the type- (η_2, σ_1) listener's probability of being at the first node in $L.2$. We have $\beta_1 = \beta_2 = \beta$. The listener chooses $a(\theta_1, \eta_1)$ at $L.1$ iff

$$\beta > \frac{b_{21}^L}{b_{21}^L + b_{11}^L}. \quad (12)$$

The listener chooses $a(\theta_1, \eta_2)$ at $L.2$ iff

$$\beta > \frac{b_{22}^L}{b_{22}^L + b_{21}^L}. \quad (13)$$

First, suppose equation (12) is satisfied while equation (13) is reversed. Then, the speaker chooses " $\bar{\theta}_2$ " at $S.1$ iff

$$r < \frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \quad (14)$$

and chooses “ $\bar{\theta}_2$ ” at $S.2$ iff

$$r < \frac{d_{22}^S}{d_{22}^S + pb_{21}^S - d_{21}^S}. \quad (15)$$

If equations (14) and (15) are both satisfied, then $\beta = q$. Thus, there is a type-PS1 figurative PBE if

$$q \in \left(\frac{b_{21}^L}{b_{21}^L + b_{11}^L}, \frac{b_{22}^L}{b_{22}^L + b_{12}^L} \right) \text{ and} \quad (16)$$

$$r < \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S}{d_{22}^S + pb_{21}^S - d_{21}^S} \right].$$

If equation (14) is satisfied but equation (15) is reversed, then $\beta = 1$. In this case, there cannot be a figurative PBE since such a PBE would require $1 < b_{22}^L / (b_{22}^L + b_{21}^L)$, which is not possible given our assumptions. If equation (14) is reversed but equation (15) is satisfied, or both equations (14) and (15) are reversed, then there cannot be a figurative PBE either. Hence, there is a type-PS1 figurative PBE iff conditions (16) holds and there is no type-SS1 figurative PBE.

Second, suppose equations (12) and (13) are both satisfied. Then, the speaker chooses “ $\bar{\theta}_2$ ” at $S.1$ iff (14) is satisfied, and chooses “ $\bar{\theta}_2$ ” at $S.2$ iff

$$r < \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S}. \quad (17)$$

If equations (14) and (17) are both satisfied, then $\beta = q$. Thus, there is a type-PP figurative PBE if

$$q > \max \left[\frac{b_{21}^L}{b_{21}^L + b_{11}^L}, \frac{b_{22}^L}{b_{22}^L + b_{12}^L} \right] \text{ and} \quad (18)$$

$$r < \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S} \right],$$

If equation (14) is satisfied but equation (17) is reversed, then $\beta = 1$. Thus, there is also a type-SP figurative PBE if

$$r \in \left[\frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S + pb_{21}^S - d_{21}^S}, \frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S} \right], \quad (19)$$

If equation (14) is reversed but equation (17) is satisfied, or both equations (14) and (17) are reversed, there cannot be a figurative PBE either. Hence, there is a type-PP figurative PBE iff (18) holds and a type-SP figurative PBE iff (19) holds.

Third, suppose equation (12) is reversed while equation (13) is satisfied. Then, the speaker chooses “ $\bar{\theta}_2$ ” at *S.1* iff (14) is satisfied, and chooses “ $\bar{\theta}_2$ ” at *S.2* iff

$$r < \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S - d_{12}^S}. \quad (20)$$

If equations (14) and (20) are both satisfied, then $\beta = q$. Thus, there is a type-PS2 figurative PBE if

$$\begin{aligned} q &\in \left(\frac{b_{22}^L}{b_{22}^L + b_{12}^L}, \frac{b_{21}^L}{b_{21}^L + b_{11}^L} \right) \text{ and} \\ r &< \min \left[\frac{d_{12}^S - c_{12}^S}{d_{12}^S - c_{12}^S + (1-p)b_{11}^S - d_{11}^S + c_{11}^S}, \frac{d_{22}^S - pb_{22}^S}{d_{22}^S - pb_{22}^S - d_{21}^S} \right]. \end{aligned} \quad (21)$$

If equation (14) is satisfied but equation (20) is reversed, then $\beta = 1$. In this case, there cannot be a figurative PBE since such a PBE would require $1 < b_{22}^L / (b_{22}^L + b_{21}^L)$, which is not possible given our assumptions. If equation (14) is reversed but equation (20) is satisfied, or both equations (14) and (20) are reversed, then there cannot be a figurative PBE either. Hence, there is a type-PS2 figurative PBE iff (21) holds, and there is no type-SS2 figurative PBE. ■

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