Strategic Content

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Abstract

The at-issue/not-at-issue distinction is based on a diverse collection of contrasts, both pragmatic and semantic. Providing a unified explanation of these contrasts remains an important open problem. In this paper, I show how the pragmatic differences between at-issue and not-at-issue content can be explained as the product of interlocutors' strategic reasoning in response to their semantic differences. This explanation is first offered informally and then developed more formally within a game-theoretic setting using a modified version of the rejection game discussed in Sbardolini (2022) and Incurvati & Sbardolini (2024).

1 Introduction

Language provides us with a choice of ways to encode information for the purposes of communication. Each of (1.a-c) carries, in some sense, the information that the speaker has a friend who has moved to Paris. However, this is encoded in each sentence's content in different ways.

(1) a. A friend of mine moved to Paris and is buying an apartment.
b. A friend of mine, who moved to Paris, is buying an apartment.
c. My friend who moved to Paris is buying an apartment.

A distinction is often drawn between (1.a) and (1.b-c) in this regard. The relevant information is felt to have an importantly different status in the latter pair of sentences to the status it has in the former. I will follow widespread practice by describing this distinction in terms of what is 'at-issue'/'not-at-issue' in each sentence. That the speaker has a friend who moved to Paris is encoded in at-issue content in the former, whereas, in the latter pair, it is encoded in not-at-issue content.

The at-issue/not-at-issue distinction is associated with a collection of pragmatic contrasts. Not-at-issue content differs from at-issue content in being associated with non-controversial contributions (§2.1.1) and off-topic information (§2.1.2). Not-at-issue content has also been noted to have a persuasive use, whereby it is more likely to go unchallenged than at-issue content (§2.1.3).

At least superficially, it is somewhat unclear how these various contrasts are related. While there has been extensive work on each individually, providing a unified account remains an important open problem (Szabó (2006); von Fintel (2008), Amaral *et al.* (2007, §4)). Ultimately, we would like to be able to show how the properties of each type of content arise from a common source. It is theoretically unsatisfying to treat the various contrasts between them as strongly correlated but fundamentally unconnected.

Moreover, the lack of such an explanation might be grounds for doubt about how linguistically real the categories are. Properties of natural kinds typically have unifying explanations, which can account for why they reliably co-occur (Boyd (1991, 1999); Kornblith (1993); Millikan (1999)). If at-issue and not-at-issue contents are natural kinds, we should be aiming for our theory of types of content to be explanatory, not merely descriptively adequate (cf. Chomsky (1964, 1965)). The aim of this paper is to address this open problem. The central idea is that pragmatic contrasts between at-issue and not-at-issue content are the product of strategic decision-making by speakers and hearers. Their differences arise from rational responses to their respective availability for rejection, given a common aim of efficient communication.

I'll develop this idea within a game-theoretic setting. Participants in a conversation have a range of conversational goals. Conversational dynamics can be explained as arising from individuals' decisions about how to achieve these goals (Parikh (1987, 1991, 2001, 2010); Benz *et al.* (2006); Franke (2009, 2013); Rothschild (2013); De Jaegher & van Rooij (2014); Benz & Stevens (2018), among others). In the present case, we can understand the distinct discourse roles of at-issue/not-at-issue content as the product of interlocutors' interest in efficient, accurate, and successful communication. Speakers who care about efficient communication will encode controversial and topical information in at-issue content, while encoding non-controversial or non-topical information in not-at-issue content. Likewise, speakers can maximize their chance of successful communication by encoding information in not-at-issue content to exploit hearers' interests in balancing efficiency and accuracy.

Before proceeding, some remarks are warranted on how the proposal integrates with existing theoretical frameworks. A widespread approach in pragmatics seeks to understand conversation in terms of update to public information. The dominant tradition within this approach identifies public information with what is common ground and takes the essential effect of assertion to be update to the common ground (Stalnaker (1973, 1974, 1978, 2014); Heim (1982); Clark (1993, 1996); von Fintel (2008); Murray (2014)). This framework has been shown to be both powerful and productive, playing a central role in many successful explanations in pragmatics. Nevertheless, there remains an open question of how to explain the pragmatic differences between at-issue/not-at-issue content within the framework, one which a number of theorists have acknowledged. For example, von Fintel (2008, 163) writes:

> "[T]here is a foundational problem that any theory that distinguishes presupposition from assertion has to address and that as far as I know, has not been addressed satisfactorily: A speaker now has a choice if they want to convey a piece of new information [...] empirically, we know what governs the choice between presupposing and asserting a piece of new information: only presuppose it if it is uncontroversial. The problem is in explaining this principle: Nothing in the [Stalnakerian] framework [...] derives the principle."

Similarly, Szabó (2006, 4) writes:

> "It is a fundamental intuition that surprising things are better said than presupposed. How can we account for this? [...] Something is amiss from the framework, something that would explain our preference for assertion over accommodation when it comes to surprising or controversial information".

For those working within this approach, the present proposal can be read as an attempt to address this open question. It does so by reflecting on the considerations which guide a speaker's decision to encode their contribution to the public information in at-issue vs. not-at-issue content. Within the framework, the proposal could be articulated in this way: a speaker's assertion succeeds only if its content becomes public information. This, in turn, occurs only if each member of the audience accepts it. So speakers consider the likelihood of acceptance by each member of the audience in choosing how to structure their contribution. The model shows how this dynamic gives rise to the various pragmatic differences between at-issue and not-at-issue content.[1]

However, there also exists an alternative approach, which seeks to understand conversation in terms of update to private information alone. Proponents of this approach raise a variety of concerns about the role of public information in pragmatic explanation. Some question whether the ideal of common acceptance is attainable (Lederman (2018)), while others have presented arguments that, even if it were attainable, it could not serve as the object of assertion (Harris (2020); Nagel (2020); Goldstein & Kirk-Giannini (2022)). Some authors have also suggested there are empirical grounds for doubt about whether typical conversation requires demanding reasoning about iterated attitudes (Zawidzki (2013); Westra & Nagel (2021)). However, within this approach the pragmatic differences between at-issue and not-at-issue content remain just as much an open question.

The present paper will not attempt to adjudicate this debate. Instead, the aim is to develop the proposal in a way which would allow it to be integrated with both approaches to understanding conversation; the explanation it offers is equally available to proponents of either. In one respect, this can be seen as diminishing the interest of the proposal: Its explanatory success does not provide us with abductive evidence for one approach over the other. However, it is simultaneously a strength: All parties to the debate are in need of an account of the pragmatics of different types of content and the present proposal is ecumenical.

The paper also has a secondary aim of illustrating how game-theoretic tools can be productively employed in pragmatic theorizing. On this approach, pragmatic phenomena are explained as the result of interlocutors responses to each other's strategic decision-making. One advantage of this approach is its explanations generalize beyond purely cooperative settings in which agents are assumed to have a shared interest in coordinating on the truth.

[1] I am very grateful to a referee at *MIND* for this suggestion.

The paper divides into two parts. §2 surveys properties which distinguish not-at-issue content. §3 presents the positive proposal.

2 Dimensions of Content

There are a lot of different ways not-at-issue content can be encoded in a sentence. These include classic presupposition triggers (such as definite determiners, change of state verbs, *it*-clefts, etc.).[2] However, they also include items not typically categorized as presuppositional (such as non-restrictive relative clauses, nominal appositives, discourse connectives, etc.).[3] Since the properties to be explained are displayed by both, we are interested in not-at-issue content in this broad sense.

A widely used diagnostic for not-at-issue content (in the broad sense) appeals to its projectability from various embedding environments. (Langendoen & Savin (1971); Karttunen (1973, 1974); Karttunen & Peters (1979); Chierchia & McConnell-Ginet (1990); Simons *et al.* (2010); see Tonhauser *et al.* (2013) for cross-linguistic evidence of projectability). In (2.a), the not-at-issue content associated with the *it*-cleft (i.e., that someone proved the conjecture) is entailed by each of its various embeddings across (2.b-e). In contrast, the at-issue content of (2.a) (i.e., that Paula proved the conjecture) is not. The same holds of other presupposition triggers, as well as non-presuppositional mechanisms for encoding not-at-issue content (Chierchia & McConnell-Ginet (1990); Potts (2005, 2007); Tonhauser *et al.* (2013)).

(2) a. It was Paula who proved the conjecture
b. It wasn't Paula who proved the conjecture
c. Perhaps it was Paula who proved the conjecture.
d. Was it Paula who proved the conjecture?
e. If it was Paula who proved the conjecture, she'll get tenure.

Projectability serves as a useful test for settling whether content is at-issue or not-at-issue. There are, however, a range of other contrasts associated with the distinction, of which the following subsections provide an overview. §2.1 considers three prominent pragmatic properties of not-at-issue content. These properties each reflect differences in the roles typically assigned to the two types of content in conversation. §2.2 looks at differences in availability for direct rejection and considers reasons to think that these differences have a semantic basis.

2.1 Pragmatic Properties

This subsection focuses on three pragmatic properties which have been attributed to not-at-issue content. §2.1.1 and §2.1.2 consider the preference for using not-at-issue

[2] For overviews of presupposition trigger types, see Karttunen & Peters (1979); Soames (1989); Levinson (1983); Beaver & Geurts (2012), among others.

[3] Chierchia & McConnell-Ginet (1990); Beaver (2001); Potts (2005, 2007); Tonhauser *et al.* (2013), among others, (though cf. Schlenker (2007)).

content to encode information which is non-controversial and non-topical, respectively. §2.1.3 considers its alleged persuasive effects.

2.1.1 Non-Controversiality

Information encoded in not-at-issue content is typically expected to be non-controversial or 'taken for granted' within the conversation in which it is presented (Clark & Haviland (1977)). For example, in addressing an audience unaware that Julie had applied for a job at Google, (3.b) will typically be dispreferred relative to (3.a) (cf. Abbott (2000, 1427), von Fintel (2008, 163))). The natural explanation is that there is information which cannot be taken for granted (i.e., that Julie tried to get a job at Google) which is not-at-issue in the former, but not the latter.

(3) a. Julie failed to get a job at Google.
b. Julie applied for a job at Google but failed to get it.

Conversely, where there is a choice about how to express non-controversial information, there is typically an expectation that it will be encoded in not-at-issue content. For example, the preference for (3.a) over (3.b) is reversed if instead the information that Julie applied for the job has already been established.

Information can count as non-controversial for different reasons (Soames (1982, 486)). One way for something to be non-controversial is by being familiar, in the sense of having already been accepted in the preceding discourse. Faced with a choice about how to distribute information across at-issue and not-at-issue content, familiarity serves as an important guiding consideration. Definites are a particularly prominent example of this (Heim (1982); Beaver & Coppock (2015); Coppock & Beaver (2015)). In (4), the first sentence is a much more natural way of continuing the discourse than the second, in virtue of encoding the previously established information that John has a spouse in its not-at-issue content.

(4) John got married.
i. His spouse is a lawyer.
ii. ??He has a spouse and she's a lawyer.

(5) Agnes saw someone.
i. It was Maxine who Agnes saw.
ii. ??It was Agnes who saw Maxine.

The observation generalizes to other constructions. In (5), the i- and ii-continuations entail exactly the same total information. The contrast in their felicity is due to the difference in how the familiar and unfamiliar components of this information are divided across the at-issue/not-at-issue content of the *it*-cleft.[4]

However, being familiar is not the only way of being non-controversial. It is widely observed that certain kinds of novel information can also be acceptably encoded in the

[4]

not-at-issue content of an assertion (see Abbott (2008); von Fintel (2008); Tonhauser (2015) for recent surveys). Stalnaker (1974, 52, fn.2) offers (6) as an example of an assertion with informative not-at-issue content (attributed to Jerry Sadock).

(6) A: Are you coming to lunch?
B: No, I have to pick up my sister from the airport.

For B's response to be acceptable, the information that they have a sister does not need to have been previously introduced or to be otherwise available to their audience. It seems enough that B can safely assume that A will be willing to accept that they have a sister without clarification or comment. More generally, a speaker can licitly encode information in not-at-issue content as long as they are taken to be authoritative over it, in the sense that their audience is unlikely to want to challenge or otherwise raise further questions about it.[5]

In such cases, there is an important question regarding how the resulting change to the common ground is calculated. The orthodox answer is that this occurs via a process of conversational repair, or accommodation. For example, in (6), the novel information that the speaker has a sister is taken to be accommodated, rather than being integrated into the common ground directly (as it would if it had been encoded as at-issue).

Crucially, however, where deference cannot be assumed, novel information must be encoded as at-issue. For example, in a conversation in which whether the speaker has a sister is contested, the same assertion would be marked.

(7) A: I've recently discovered that you don't have a sister.
B: { i. But I do have a sister. In fact, I have to pick her up at the airport.
ii. ??I have to pick my sister up from the airport.

In (7), B's replies form a minimal pair (Szabó (2006)). The i- and ii-responses encode precisely the same information overall, but differ in whether the information that the speaker has a sister is encoded in their at-issue or not-at-issue component. Because this is precisely what is contested, however, only the former is acceptable.

[5] For the purposes of the dialectic in this section, it is worthwhile distinguishing two separate (though presumably related) questions, namely: (i) when novel information can be encoded in not-at-issue content and (ii) what happens in a conversation when it is. The present theory is intended to take a stance on (i) only.

Familiarity and novelty are often understood in terms of what is (or is not) common ground prior to an utterance. The observation that novel information can be licitly encoded as not-at-issue content then amounts to the observation that, for an utterance to be felicitous, it is not always necessary for its not-at-issue content to be common ground already. Against this background, the orthodox answer to (ii) involves an appeal to the process of accommodation. For example, in (6), the information that the speaker has a sister would be taken to be accommodated, rather than being added to the common ground directly (as it would if it had been encoded as at-issue).

However, as von Fintel (2008) and Szabó (2006) observe, this does not fully settle question (i), concerning the conditions under which novel information can be felicitously encoded in not-at-issue in the first place. The point of the present observation (based on examples such as (6) and (7)) is simply that the felicity of doing so depends on how controversial the information is.

2.1.2 Non-topicality

Information differs in how relevant it is to the purpose of a conversation. In any conversation, participants will have certain goals they aim to achieve and these goals make certain topics more important than others. These topics guide participants' decisions about what information to contribute and how to do so (Roberts (1996, 2012); Ginzburg (1996, 2012)). Among these is the decision of how to encode information. There is an expectation that information addressing the central topic of a conversation will be encoded in at-issue content, with not-at-issue content being reserved for less relevant information (Simons *et al.* (2010)).

For example, in a conversation about what academic qualifications everyone has, (8.a) would be a more natural way for someone to communicate that they have a doctorate than either of (8.b-c).

(8) a. I did a PhD in Evolutionary Biology.
b. My PhD was in Evolutionary Biology.
c. It was in Evolutionary Biology that I did a PhD.

In contrast, if the conversation were about whether anyone has expertise in Evolutionary Biology, (8.b-c) would improve significantly (and in certain settings might be preferred to (8.a)).

A related test for the contrast in topicality between at-issue/not-at-issue content draws on judgments about the relative appropriateness of responses to overt questions (cf. Simons *et al.* (2010); Tonhauser (2012); AnderBois *et al.* (2010); Koev (2013); Gutzman & Turgay (2019)).

(9) A: Who proved the conjecture in this paper?
B: { i. Paula, who is a graduate student, proved it.
ii. ??Paula, who proved it, is a graduate student.

In (9), the ii-response, in which the answer to A's question is encoded in a non-restrictive relative clause, is significantly less natural than the i-response, in which it is encoded in the main clause instead. In general, there is an expectation that information which addresses the topic of the conversation will be encoded in at-issue content.

It is possible for this expectation to be flouted, much as it is with other conversational expectations. Flouting can serve a variety of conversational goals, including politeness, humor, or rhetorical flair. Soames (1982, 487) gives the following example:

(10) A: The new guy is very attractive, isn't he?
B: Yes, his wife thinks so, too.

In (10), information relevant to the topic A is presumably implicitly interested in (whether their new colleague is romantically available) is introduced as not-at-issue instead. This allows B to feign ignorance (whether transparently or not) of A's intended topic, thereby preserving propriety, avoiding embarrassment to A, and potentially achieving a mildly humorous result. As with classic Gricean examples of flouting, the pragmatic effects of the (apparent) violation of the rule, rather than casting it into doubt, in fact provides an additional source of evidence of its existence.

2.1.3 Persuasion

Not-at-issue content is associated with a so-called 'persuasive use', whereby information encoded in not-at-issue content is more likely to go unchallenged.[6] Although explanations differ, it is commonly agreed that speakers can employ not-at-issue content to "smuggle in" information that an audience "would not necessarily accept if it was presented as the content asserted" (Stanley (2016, 138)). For example, in the context of a public debate, the claim that the country is in decline will be less likely to be objected to by the speaker's opponent when it is encoded as not-at-issue, as in (11.a), than if it is at-issue, as in (11.b).

(11) a. My opponent has failed to halt our country's decline.

b. Our country is in decline and my opponent has unsuccessfully tried to halt it.

Simon-Vandenbergen *et al.* (2007) conducted a corpus analysis of not-at-issue content in political discourse. They found that, although not-at-issue content was sometimes rejected, there was a default tendency for not-at-issue content to be accepted at a higher rate than at-issue content. They suggest that, whereas information in at-issue content is presented as being argumentatively 'in play', challenging not-at-issue content involves a deviation from expected trajectory of the conversation. As Langton (2018) puts it, objecting to not-at-issue content requires an individual to "flout co-operative norms [and] violate regulative rules about conduct in good conversation"(160).

Although many authors have focused on these kinds of political examples, the phenomenon is more general. Sedivy & Carlson (2011) note a similar effect is often exploited in advertising, for example. Despite encoding the same total information, in typical settings (12.a) will be a more effective way of conveying the alleged strengths of a company than (12.b).

(12) a. With our strong capital base, global reach and extensive expertise we can offer the stability and security you are looking for.

[Ad for Credit Suisse, Sedivy & Carlson (2011, 104)]

b. We have a strong capital base, global reach and extensive expertise. You are looking for stability and security, and we can offer it.

[6] See, in particular, Sbisà (1999); Langton & West (1999); Langton (2018), Sedivy & Carlson (2011, Chpt. 4), Stanley (2016, Chpt.4) Stanley & Beaver (2023, Chpt. 4).

These observations are supported by a variety of experimental work. For instance, Hornby (1974) reported that people are less likely to identify inaccuracies in not-at-issue content than in at-issue content. Participants were shown pictures depicting a scenario—e.g., in the case of (13), a boy petting a cat. Hornby found that the (b) sentence was rejected at lower rates than the (a) sentence, despite the fact that the two sentences differ only in how they encode information.

(13) a. It is the dog that is being petted by the boy.
b. It is the boy that is petting the dog.

These effects have been replicated in later studies on not-at-issue content associated with constituent questions (Bredart & Modolo (1988); Büttner (2007)), appositives (Baker & Wagner (1987)) and focus (Brédart & Docquier (1989); Sturt *et al.* (2004)); see Muller (2022) for a recent overview.

An independent—though related—line of research has studied the willingness of individuals to integrate inaccurate information encoded in not-at-issue content into memory.

(14) Did you see [a/the] broken headlight?

In a landmark study, Loftus & Zanni (1975) showed subjects a film of a car crash. They found that subjects were twice as likely to answer affirmatively to the variant of (14) containing a definite article—despite no broken headlight being present—than to the variant with an indefinite (see also Loftus (1975); Loftus *et al.* (1978); Vallauri & Masia (2018)). Similar results have been obtained for possessives and other ways of encoding not-at-issue content (Davis & Schiffman (1985); Fiedler *et al.* (1996); Schwarz (2015)).

These studies, taken together, provide experimental support for the persuasive use of not-at-issue content attested above. When information is encoded as not-at-issue, rather than at issue, hearers exhibit a reduced tendency to reject it and a corresponding increased tendency to accept it.[7] Importantly, these studies specifically observe this effect in cases in which subjects are primed with evidence that the proffered content is, in fact, false. This makes their results especially relevant to the rhetorical uses of not-at-issue content, whereby it can be exploited by a speaker who aims to have some information accepted (and who has some reason to doubt that their audience would do so if it was presented in at-issue content instead).

2.2 Rejectability

Not-at-issue content is typically unavailable for rejection via standard lexicalized mechanisms (Amaral *et al.* (2007); Tonhauser (2012); AnderBois *et al.* (2010, 2015); Koev (2013); Syrett & Koev (2015)). Instead, information which is encoded as not-at-issue is taken to be accepted by default.

[7] These observations will obviously imply one another on the theoretical assumption, adopted below, that acceptance and rejection exhaust a hearer's alternatives in responding to an assertion.

(15) A: My friend Kenzo ran a marathon.
B: No, he [didn't/??isn't].

In (15), B's negative response can only be used to target the at-issue content of A's utterance (i.e., that Kenzo ran a marathon), not its not-at-issue content (i.e., that Kenzo is the speaker's friend). One test for this is provided by the continuations which are appropriate accompanying acceptance/rejection (Tonhauser (2012, §3.1), AnderBois *et al.* (2010, §4.2)).

(16) A: Ingrid, who studied at Oxford, is an accomplished pianist.
B: { i. That's right, although [??she actually plays violin/she actually studied at Cambridge].
ii. That's wrong, although [??she *is* an accomplished pianist/she *did* study at Oxford].

In (16), 'That's [right/wrong]' obligatorily targets at-issue content. It cannot be used by B to directly accept/reject the content of the non-restrictive relative clause (i.e., that Ingrid studied at Oxford), while parenthetically rejecting/accepting the content of the main clause (i.e., that Ingrid is an accomplished pianist). A similar effect is found in positive/negative answers to polar questions.

(17) A: Does Saul realize that his brake lights aren't working?
B: { i. Yes, [he's aware/??they're broken.]
ii. No, [he's unaware/??they've been fixed.]

Amaral *et al.* (2007, 731) and Tonhauser (2012, §3.3) observe that 'yes'/'no' responses in (17) obligatorily target at-issue content of the question. Both responses, moreover, commit the speaker to accepting the not-at-issue content, that Saul's brake lights are not working.

The fact that not-at-issue content is not directly rejectable can be explained as a byproduct of its unavailability as an antecedent for anaphora (Murray (2014)). Discourse particles used for direct rejection (such as *yes/no/that's* [*right/wrong*]) are widely theorized to be propositional anaphors (cf. Krifka (2013); van Elswyk (2018, 2019, 2020)).[8] The contrasts in (15)-(17) can then be accounted for by the assumption that discourse referents are introduced for at-issue content only, with not-at-issue content being accepted by default (cf. AnderBois *et al.* (2010, 2015)). As Stalnaker puts it, what is not-at-issue "is communicated indirectly, so that there is no provision for straightforwardly rejecting it" (Stalnaker (2008, 542)). Understood this way, the unavailability of not-at-issue content for direct rejection is an instance of its more general inability to be targeted for comment using standard anaphoric tools.

Although not-at-issue content is not directly rejectable, it may be rejected via indirect mechanisms instead. von Fintel (2004) (following Shanon (1976)) notes that not-at-

[8] A closely related proposal due to Kramer & Rawlins (2009) and Roelofsen & Farkas (2015) is that response particles, although not anaphoric themselves, take a phonetically null anaphoric argument. This proposal would equally support an explanation of why they do not target not-at-issue content.

issue content can be challenged by 'Hey, wait a minute'-style responses, as found in (18.a-b). [9]

(18) a. A: My friend Kenzo ran a marathon.
B: [Hey, wait a minute/hold on]—Kenzo hates you!
b. A: Bizet, a Spanish composer, wrote *Carmen*.
B: [Hey, wait a minute/hold on]—Bizet was French!

'Hey, wait a minute'-style responses serve as a general mechanism for challenging material which—for whatever reason—cannot be targeted directly. For example, the same style of interjection is sometimes also used to contest earlier assertions which originally went unchallenged, and which are no longer available as an antecedent for discourse particles for reasons of distance.

These 'Hey, wait a minute'-style responses are conversationally inefficient, however. Not only must the targeted material be correctly identified, but they disrupt the flow of conversation and shift the topic of discussion (Simon-Vandenbergen *et al.* (2007); Stalnaker (2014); Sbisà (2023)). As a result, we expect a conversational preference on the part of all interlocutors for avoiding such indirect forms of rejection where possible.[10]

3 Strategic Conversation

Conversation can be understood on the model of a game. Individuals each have conversational goals and perform turn-based actions with the aim of achieving them. Whether (and to what extent) an individual achieves their goals depends both on their own actions and on the actions taken by others.

These features make conversations apt for study using tools developed in game theory.[11] In this section, I develop a model of at-issue/not-at-issue content within a rejection game.[12] In a rejection game, a speaker sends a message, which has independently established informational content. In response, a hearer can choose to either accept

[9] cf. Von Fintel & Matthewson (2008), Syrett & Koev (2015) for cross-linguistic and experimental evidence. Hunter & Asher (2016) and Koev (2018) observe that indirect rejection is often possible even without an explicit 'Hey, wait a minute'-style marker.

[10] Within a Stalnakerian framework, such forms of rejection are often theorized in terms of repair to an otherwise defective common ground. As Stalnaker (2014) puts it, indirect rejection "will often be a more costly kind of repair, since it may require [one] to interrupt the flow of conversation, and comment on it" (48).

[11] See Benz *et al.* (2006); Franke (2013); Jäger (2013); Benz & Stevens (2018) for overviews of work in this area. More remotely related are other frameworks for formalizing pragmatic reasoning such as rational speech act theory Frank & Goodman (2012); Goodman & Stuhlmüller (2013); Goodman & Frank (2016) and optimality theory-based approaches (Blutner (2000); Blutner & Zeevat (2004))

[12] The terminology of rejection games is due to Incurvati & Sbardolini (2024). Rejection games can be understood as a sub-class signaling games, broadly construed (Lewis (1969)). In this broad sense, signaling games do not require players to have coinciding interests, and so need not be coordination games in Lewis's sense. They also do not require that the speaker have perfect information about the accuracy of their message (although imposing this requirement would not change the equilibria of the game). Note also that, unlike in Lewisian signaling games, messages come already associated with conventional content (rather than having their content explained by the game's equilibrium strategies).

or reject. The payoffs of sender and receiver depend on the speaker's message, the hearer's response and the background state of the world. Games with this structure have been widely studied in economics (Pitchik & Schotter (1987); cf. Crawford & Sobel (1982)). More recently, rejection games have been the subject of work in pragmatics by Sbardolini (2022) and Incurvati & Sbardolini (2024) on the conditions under which individuals can be expected to communicate honestly (cf. Godfrey-Smith & Martínez (2013); Martínez & Godfrey-Smith (2016)).

Our game models a simple conversational scenario. A speaker has some information which they wish to communicate (which may or may not be accurate). In deciding how to communicate this information, they have a choice between encoding it in at-issue or not-at-issue content. A hearer then has a choice between accepting or rejecting the speaker's message. Crucially, as discussed above, sending a not-at-issue message is assumed to be more efficient, conditional on its being accepted, but less efficient, conditional on its being rejected.

Summarizing, the central result is this: In equilibria of the game, the hearer will accept a message iff it is sufficiently likely to be true and the speaker will send a not-at-issue message iff it is sufficiently likely to be accepted. As a result, not-at-issue messages will display a tendency to be less controversial relative to the hearer's expectations (§3.2.1). Additionally, the threshold above which the hearer will accept is slightly lower for not-at-issue messages than for at-issue messages. This is due to the lower efficiency costs of accepting the former. As a result, not-at-issue messages can be exploited by a speaker for persuasive effect, to maximize the chance of acceptance (§3.2.2). Finally, §3.2.3 introduces a measure of topicality and argues non-topical information will display a tendency to be encoded in not-at-issue content.

Importantly, the proposal does not depend on any specific approach to modeling the semantics of not-at-issue content (cf. von Fintel (2004, 2008)). Instead, it remains compatible with a variety of approaches, including trivalent theories, both static (Strawson (1950, 1952, 1964); Peters (1979); Rothschild (2017)) and dynamic (Heim (1983); Beaver (2001))), as well as multi-dimensional theories (Karttunen & Peters (1979); Potts (2005)); in this respect, it is ecumenical—the explanation it offers is equally available to advocates of each. This is noteworthy, since these approaches have sometimes been criticized for lacking an explanation of pragmatic phenomena such as non-controversiality (Szabó (2006)) and non-topicality (Amaral *et al.* (2007)).[13]

3.1 The Model

The game has two players, a speaker (S) and a hearer (H). An initial state of the world $\omega \in \Omega$ determines the private information of each player ($S_\omega, H_\omega \subseteq \Omega$), as well as whether the speaker's message is true or false. Each player's individual probability dis-

[13] As a referee for *MIND* notes, in another respect this is a disadvantage of the theory, since its success would not provide us with abductive grounds for favoring any particular approach to modeling not-at-issue content over others.

tribution is obtained by conditionalizing a common prior on their private information.[14] $T \subseteq \Omega$ is the set of states in which the speaker's message is true.

The speaker chooses whether to encode their message as at-issue (AI) or not-at-issue (NAI). This choice fixes the (in)efficiency costs of acceptance and rejection for both players. The hearer then chooses whether to accept (A) or reject (R). This choice determines what acceptance payoff is received by the speaker and (conditional on the state of the world) what accuracy payoff is received by the hearer.

We make the following assumptions about each player's payoffs:

- The speaker cares about *acceptance*. They prefer to succeed in their communicative goals and receive a positive payoff ($a>0$) if their message is accepted. We assume that this payoff is the same across all states of the world: the speaker doesn't care whether an accepted message is true or false.[15]

- The hearer cares about *accuracy*. They prefer to accept true messages and to reject false ones. Choosing to accept results in a positive payoff ($t > 0$) in a state in which the speaker's message is true and a negative payoff ($-f < 0$) in a state in which it is false. We assume that they are indifferent between rejecting true messages and rejecting false messages—choosing to reject in either kind of state results in neither a positive nor negative payoff.[16] This reflects the idea that rejection involves a refusal to accept a proposition, rather than an acceptance of its negation. As such, rejecting a message does not require any commitment on the part of the hearer. This distinction is sometimes drawn by contrasting rejection with a stronger discourse move of denial (e.g., Incurvati (2022)), where the latter act does incur a commitment to the negation of the asserted content (cf. Incurvati & Schlöder (2017); Schlöder (2022); Parsons (1984); Ripley (2011)).[17]

- Both players care about *efficiency*. For present purposes we will interpret efficiency narrowly, in terms of the purely conversational costs associated with a particular sequence of a message and response.[18] The conversational efficiency of a sequence can be expected to be determined by an open-ended range of fac-

[14] Players' information is required to be partitional and veridical (Aumann (1976))—i.e., $\omega \in S_\omega$ and for all $\omega' \in S_\omega : S_\omega = S_{\omega'}$ (likewise, *mutatis mutandis*, for H).

[15] This assumption can be relaxed by introducing a measure of *sympathy*, making the speaker's payoff a weighted sum of their own utility function and that of the hearer (see Sally (2003); Incurvati & Sbardolini (2024)).Where a speaker assigns non-zero weight to hearer utility, accepted true messages will yield a higher payoff than accepted false messages. As a result, their equilibrium strategy will also be sensitive to their credences about accuracy: the more confident the speaker is that a message is true, the more inclined they will be to try to influence the hearer to accept it.

[16] This payoff structure follows a common approach in the epistemic literature on accuracy, which takes true/false beliefs to be associated with positive/negative value respectively, while associating suspension with an epistemic value of zero. A common further assumption in this literature is that individuals disvalue inaccurate beliefs more than they value accurate beliefs (Levi (1967); Easwaran (2016); Dorst (2019)). This assumption could be imposed by requiring $t < f$, without changing the details of what follows.

[17] Note that there may of course be an opportunity cost associated with rejecting a true message. This is reflected in the relative difference between the payoff of acceptance and rejection of truths (rather than being directly encoded into the payoffs themselves) .

[18] Thus, for the time being we set aside individual sources of inefficiency, such as the processing costs or production costs associated with a message.

tors, including but not limited to: (a) its duration; (b) the degree to which it deviates from the expected trajectory of conversation; (c) the potential it creates for misunderstanding/miscommunication; (d) the degree to which it disrupts the existing discourse structure/topic. I consider various ways in which these factors could be operationalized in §3.3.

The assumptions we will make about the efficiency of different message-response sequences are motivated by the observations about acceptance and rejection in §2.2. Accepting or rejecting an at-issue message results in a fixed cost ($-c < 0$). This reflects the idea that at-issue content corresponds to a proposal, to which a hearer must signal assent/dissent before the conversation can proceed (Stalnaker (1978); Farkas & Bruce (2010); AnderBois *et al.* (2010, 2015). Rejecting a not-at-issue message is associated with an increased cost ($-c' < -c$). This reflects the idea that rejecting not-at-issue content involves greater inefficiency, due the absence of a direct mechanism for doing so and the disruption associated with 'Hey, wait a minute'-responses (§2.2). Note that efficiency costs are borne by both players, on the assumption that all participants in a conversation care about smooth communication. While efficiency is relevant to the hearer's decision making, we assume that costs associated with inefficiency are less significant than the costs/benefits of accuracy. That is, $c, c' < t, f$.[19]

These assumptions about payoffs are discussed further and more realistic modifications are considered below. The full structure of the game is given in Section A. Figure 1 offers a diagram of the game in extensive normal form. Dashed lines indicate players' ignorance about the state of the world.

The scenario is modeled by a dynamic game with incomplete information (Harsanyi (1967)). It is dynamic, since players act sequentially. The hearer's choice of whether to accept or reject is made with awareness of whether the speaker has chosen to send an at-issue or not-at-issue message. It has incomplete information, since neither player's information settles the state of the world. Both players are uncertain what information the other has and the accuracy of the information in the message. Within the game, the players' uncertainty about the state of the world plays an important role in their decision making. The hearer's choice of action depends on their uncertainty about whether the message is true. Likewise, the speaker's choice of action depends on their uncertainty about what information the hearer has.

Each player has a strategy, which specifies what they will do given any possible information state (and, in the case of the hearer, any possible choice of action by the speaker). A player's strategy is optimal (relative to their opponent's strategy) iff, given any information state and sequence of preceding actions, the player's strategy specifies an action which has maximal expected utility, conditional on the player's information and given that their opponent responds according to their own strategy. A bayesian sub-game equilibrium is a pair of speaker and hearer strategies, each of which is optimal

[19]This assumption can be dropped, but a hearer who disvalues inaccuracy less than the inefficiency of rejecting a false message will accept any not-at-issue message.

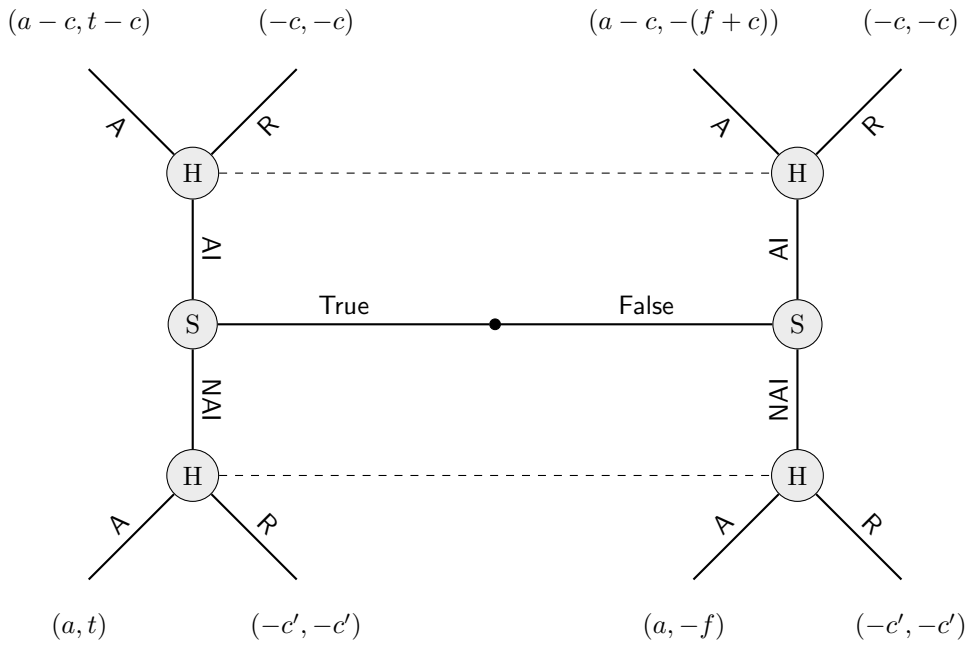

Figure 1: The Rejection Game with AI/NAI content in extensive form.

relative to the other.

To find these equilibria of the game, we need to consider the players' respective reasoning about optimal strategies, starting with the speaker. We can divide set of states into two conditions, depending on whether the message being sent is true or false. The players' payoffs in these two conditions are depicted in Figure 2, below.

True

	A	R
AI	$(a-c, t-c)$	$(-c, -c)$
NAI	(a, t)	$(-c', -c')$

False

	A	R
AI	$(a-c, -(f+c))$	$(-c, -c)$
NAI	$(a, -f)$	$(-c', -c')$

Figure 2: The two sub-games in normal form.

The speaker's payoffs are the same in both sub-games—i.e., the payoff they receive does not differ on the basis of whether the message is true or false. Conditional on the hearer accepting, the speaker prefers to encode their message in not-at-issue content (a) rather than in at-issue content ($a-c$), since the former is more efficient. Conditional on the hearer rejecting, however, the speaker prefers to encode their message in at-issue content ($-c$) rather than in not-at-issue content ($-c'$), since the latter is less efficient. So the expected utility of each type message depends on what the speaker expects the hearer to do in response. Since this depends on the hearer's strategy, we need to turn

to consider the hearer's reasoning.

The hearer's payoff depends on whether the message is true or false. Conditional on receiving a true message of either type, she prefers to accept (since $t - c > -c$ and $t > -c'$). Conditional on receiving a false message of either type she prefers to reject, (since $-(f + c) < -c$ and $-f < -c'$). So the relative expected utility of each action for the hearer depends on their confidence in the truth of the speaker's message.[20] [21]

$$\text{(I)} \qquad EU_H^{\omega,\sigma_S}(\mathsf{A}|\mathsf{AI}) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\mathsf{AI}) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{f}{t+f}$$

$$\text{(II)} \qquad EU_H^{\omega,\sigma_S}(\mathsf{A}|\mathsf{NAI}) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\mathsf{NAI}) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{f-c'}{t+f}$$

(I) and (II) state the thresholds above which accepting at-issue and not-at-issue messages, respectively, will be optimal. A proof is provided in Section A, which is sketched here. Accepting and rejecting an at-issue message both incur the same efficiency cost (c) for the hearer. Accordingly, the hearer will weakly prefer acceptance to rejection for an at-issue message iff they take likelihood of the message being true, weighted by the positive accuracy payoff, $(Pr_{H_\omega}(T) \cdot t))$ to exceed the likelihood of it being false, weighted by the negative accuracy payoff $((1 - Pr_{H_\omega}(T)) \cdot f$ or, equivalently, $f - Pr_{H_\omega}(T) \cdot f)$. This holds iff $Pr_{H_\omega}(T) \cdot t + Pr_{H_\omega}(T) \cdot f \geq f$, from which (I) is immediate via factorization. The proof proceeds in the same way for not-at-issue messages, except that in this case, only rejection is associated with an inefficiency cost. As a result, acceptance is preferred to rejection for a not-at-issue message iff $Pr_{H_\omega}(T) \cdot t + Pr_{H_\omega}(T) \cdot f \geq f - c'$, from which (II) is again immediate.

Observe that the threshold for acceptance in the latter case ($\frac{f-c'}{t+f}$) is lower than in the former ($\frac{f}{t+f}$). This reflects the relative inefficiency cost associated with rejecting not-at-issue content (rather than accepting it). In contrast, in responding to an at-issue message the hearer faces the same efficiency cost whether they accept or reject—accordingly, the hearer's response to an at-issue message is based solely on considerations of accuracy.

We can now return to consider how the speaker should reason about their optimal strategy, in light of the hearer's strategy. Faced with a choice about how to encode their message, the speaker reasons as follows. Sending an at-issue message is associated with a fixed inefficiency cost ($-c$), whether the hearer accepts or rejects. On the other hand, sending a not-at-issue message is associated with the risk of a greater inefficiency cost ($-c'$), but this cost is borne only if the message is rejected. Thus, the relative efficiency

[20] For $a \in A_S$: $EU_H^{\omega,\sigma_S}(\cdot|\cdot)$ is the expected utility of an action for H, given a state ω and speaker strategy σ_S, conditional on the history $\langle a \rangle$.

[21] Observe that speaker's choice between sending an at-issue/not-at-issue message carries no information for the hearer. This is a reflection of the fact that the speaker's payoffs are the same across true and false conditions—they have no incentive to behave differently according to whether their message is accurate. While, intuitively, the content of message the speaker sends can make a difference to the hearer's probability distribution over states of the world, the fact that the speaker is sending a message with this content is part of the structure of the game (which is assumed to be mutually known). As a result, any information the hearer 'gains' from the speaker's message is already 'built in' to Pr_{H_ω}.

cost of sending a not-at-issue (rather than at-issue) message will be the cost associated with rejection weighted by likelihood of rejection, minus the fixed cost associated with sending an at-issue message. Accordingly, a speaker who is sufficiently confident that a message of either kind will be accepted will prefer to send it as not-at-issue rather than at-issue. (Note, crucially, that (I)-(II) guarantee that the likelihood of the message being accepted when sent as not-at-issue will be at least as great as the likelihood of its being accepted when sent as at-issue).

As we just saw, the threshold at which a rational hearer will accept is lower for not-at-issue messages than it is for at-issue messages. So the speaker also needs to consider the relative benefit of sending a not-at-issue message in terms of its effect on the likelihood of acceptance. This will be equal to the value associated with an accepted message, weighted by the likelihood the hearer would reject an at-issue message but not a not-at-issue message.

Putting this together, the relative expected utility of each type of message for the speaker depends on their level of confidence that a message of that type will be accepted. Let $|a'|_a^{\sigma_H}$ be the set of states in which a hearer with strategy σ_H responds to a speaker's action of a by playing a'. So, for example: $|\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}$ is the set of states in which the strategy σ_H would recommend accepting an at-issue message. Then sending a not-at-issue message is optimal for the speaker under the following conditions:

$$EU_S^{\omega,\sigma_H}(\mathsf{NAI}) \geq EU_S^{\omega,\sigma_H}(\mathsf{AI})$$

(III) iff

$$a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{NAI}}^{\sigma_H} - |\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}) \geq c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H}) - c$$

A proof is provided in section A (Fact 1) and, again, sketched here. The expected utility of sending a not-at-issue message for the speaker is its payoff when accepted, weighted by the likelihood of acceptance ($a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{NAI}}^{\sigma_H})$) minus its inefficiency cost when rejected, weighted by the likelihood of rejection ($c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H})$). The expected utility of sending an at-issue message for the speaker is its payoff when accepted, weighted by its likelihood of acceptance ($a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{AI}}^{\sigma_H})$), minus its efficiency cost (c). Note that the efficiency cost is not weighted by the likelihood of rejection, since this cost is incurred regardless of the hearer's response. So the former will be (weakly) preferred iff $a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{NAI}}^{\sigma_H}) - a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}) \geq c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H}) - c$, from which (III) is immediate via factorization. Or, put another way: Sending a not-at-issue message is (weakly) preferred to sending an at-issue message iff its relative expected benefit with regards to acceptance is at least as great as its relative expected cost with regards to inefficiency.

The equilibria of the game are pairs of speaker and hearer strategies under which each player always chooses an action with optimal expected utility, given their information and the strategy of their opponent. In all such equilibria messages are accepted whenever they are sufficiently likely to be true (given the hearer's information) and a not-at-issue message is sent when the likelihood that doing so will affect whether the

hearer accepts outweighs the inefficiency risk of rejection (given the speaker's information).[22]

It may be instructive to consider each player's equilibrium strategy under a concrete assignment of payoffs. For the hearer, suppose that $f = 2t = 10$; that is, the cost of accepting a false message is twice the yield of accepting a true one. Equally, suppose that $c' = 5c = 1$; that is, the cost in inefficiency of rejecting not-at-issue content is five times that of accepting/rejecting at-issue content. Then a hearer playing their equilibrium strategy will accept an at-issue message whenever they take the likelihood of its being true to exceed $\frac{2}{3}$ and a not-at-issue message whenever they take it to exceed $\frac{3}{5}$.

Figure 3 depicts the conditions under which the speaker will weakly prefer sending a not-at-issue message in equilibrium, given these efficiency costs. The x-axis corresponds to the value the speaker assigns to their message being accepted (i.e., $x = a$). The y-axis corresponds to the probability the speaker assigns to the persuasive effect of sending a not-at-issue message. That is, the likelihood (given their information) of being in a world in which sending a not-at-issue message rather than an at-issue message makes a difference to the hearer's response (i.e., $y = Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}|^{\sigma_H}_{\mathsf{AI}}))$). In Figure 3, $Pr_{S_\omega}(|R|^{\sigma_H}_{\mathsf{NAI}})$ is set at $\frac{3}{5}$. That is, the speaker assigns a probability of $\frac{3}{10}$ to being in a world in which hearer assigns the message a probability below $\frac{3}{5}$ of being true.

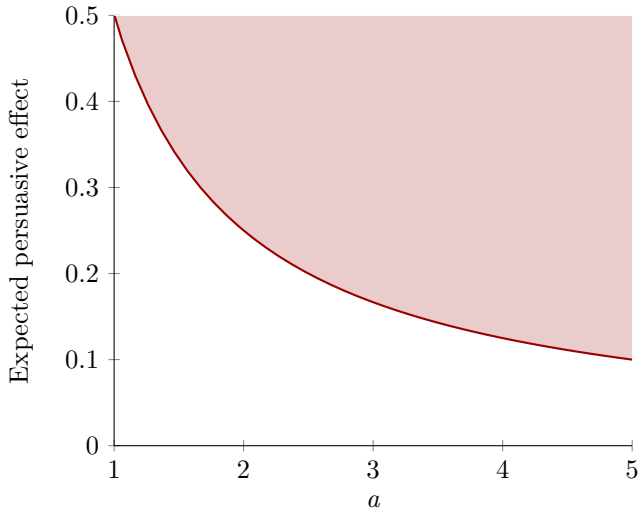

Figure 3: $c' = 5c = 5$, Probability of rejection for NAI message =.3

The region shaded red corresponds to values for which sending a not-at-issue message is preferred. Notice that a preference for sending a not-at-issue message is associated both with higher values on the x-axis (greater value assigned to acceptance) and higher values on the y-axis (greater probability assigned to the persuasive effect of sending a

[22]Note that the game has multiple equilibria, since it is left unsettled how agents should act where there is more than one optimal action. The differences between these equilibria are not significant for our purposes.

not-at-issue message).

3.2 Discussion

In this section, we will look how the model accounts for the pragmatic features of not-at-issue content discussed in §§2.1.1-3.

3.2.1 Non-controversiality

The model explains the tendency of not-at-issue content to be less controversial than at-issue content as a byproduct of the differences between the efficiency costs of the two types of message. Not-at-issue messages are associated with greater inefficiency conditional on rejection ($c' > c$) but lower inefficiency conditional on acceptance ($c > 0$). As a result, the expected costs of sending a not-at-issue message decreases as the likelihood of acceptance increases. Sending a not-at-issue message is preferred only if it is sufficiently likely to be accepted. The precise threshold above which a not-at-issue message will be sent in equilibrium is dependent on the relative inefficiency associated with the two kinds of message (i.e., the ratio of c' to c). In the limit, it is always sufficient for a not-at-issue message to be optimal that its expected efficiency cost (i.e., c' multiplied by the likelihood of rejection) is no greater than the fixed efficiency of cost sending an at-issue message (i.e., c).[23]

The key observation from §2.2 is that the efficiency costs of not-at-issue messages are unequally distributed across rejection/acceptance conditions. Acceptance is the default—to count as accepting a not-at-issue message, the speaker does not need to signal their assent in any way. In contrast, rejection involves significant disruption to the conversation, often requiring a change of topic and a deviation from the conversation's expected course. It is this which explains why the speaker's decision about which kinds of message to send is dependent on how likely they take acceptance to be.

Note that, crucially, the status of being 'non-controversial' does not need to be glossed in terms of the speaker and hearer's common attitudes. Instead, it is a matter of the speaker's estimation of the hearer's credence in the truth of the message (since this is all that is relevant to whether the hearer accepts or rejects).

3.2.2 Persuasion

The model predicts that not-at-issue messages are less likely to be challenged than at-issue messages in equilibrium. This is because of the additional costs associated with rejecting not-at-issue content, which make the threshold for acceptance (i.e., $\frac{f-c'}{t+f}$) lower than that for at-issue content (i.e., $\frac{f}{t+f}$).[24] As a result, encoding information in not-at-issue content incentivizes acceptance on the part of the hearer.

[23] That's because in this case the left-hand side of the inequality in (III) will be less-than-or-equal to 0, whereas the right-hand side is always non-negative.

[24] There may well be certain costs associated with rejecting not-at-issue content which are specifically borne by the hearer. Langton (2018) and Camp (2020) observe that the hearer risks being viewed as being uncooperative and/or confrontational. In refusing to accept not-at-issue content "she [the hearer] is being a nuisance, or worse" Langton (2018, 160). As Camp observes "Often, it is easier to go along with the conversational flow". While these other kinds of costs plausibly have an important

A speaker can exploit this fact to increase the likelihood of their message being accepted. The size of this effect (in terms of the extent of its influence on the speaker's behavior) depends on both:

- how likely it is (conditional on the speaker's information) that the likelihood that the message is true (conditional on the hearer's information) falls in the interval $(\frac{f}{t+f}, \frac{f-c'}{t+f}]$ (i.e., the magnitude of $Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}|^{\sigma_H}_{\mathsf{AI}}))$;
- how much the speaker values acceptance (i.e., the magnitude of a).

The greater the probability the speaker assigns to states in which the hearer will accept only a not-at-issue message (i.e., $|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}|^{\sigma_H}_{\mathsf{AI}}$) , the greater the expected value of sending a not-at-issue message. In this way, the model provides a game-theoretic defense of the informal idea that (a) there is a persuasive use of not-at-issue content which can be exploited by speakers and (b) this persuasive use arises due to the fact that not-at-issue content is harder to challenge (Caffi (1997, 761); Simon-Vandenbergen *et al.* (2007, 49); Sedivy & Carlson (2011, Chpt. 4)).[25] [26]

3.2.3 Non-Topicality

The model of the previous section did not include a measure of the topicality of a message. This made the model simpler, but leaves it silent on how topicality interacts with the at-issue/not-at-issue distinction. We can address this by introducing a parameter, $\tau \in [0, 1]$, representing how relevant the information which the speaker intends to communicate is to the topic(s) of the conversation.

I will assume that the more topical a message is, the more important it is to the hearer whether it is accurate. That is, the hearer takes the cost of accepting a false message to increase with its relevance (and similarly, *mutatis mutandis,* the benefit of accepting a true message). This encodes the idea that how topical a message is depends on how closely connected its status is to the interlocutors conversational goals. A simple way of implementing this idea is just to weight the accuracy payoffs for the hearer by topicality. Thus, the payoff of acceptance will be $\tau \cdot t$, for a true message and $-\tau \cdot f$ for a false message (along with whatever inefficiency costs are involved).[27]

role to play, the present model reflects only those efficiency costs which are borne by both parties (e.g., disruption, change in topic, etc.). Additional costs borne by the hearer will increase the persuasive effect associated with not-at-issue messages.

[25] As Caffi (1997) puts it: "precisely because it is shielded from challenge, communication via presuppositions lends itself to manipulatory purposes" (761).

[26] There may be further reasons not-at-issue content is more likely to be accepted. For example, if it is commonly assumed that both players information tends to be accurate, not-at-issue messages will tend to be more likely to be true than at-issue messages. This might account for the alleged "under-the-radar" character of not-at-issue content, whereby not-at-issue messages are subject to less critical evaluation that their at-issue counterparts (Langton (2018, 159), Stanley & Beaver (2023, Chpt.4), Deigan (2022, §1.2)). A hearer with limited cognitive resources may allocate less attention to assessing the accuracy of not-at-issue messages. It is also possible that, over a repeated games, the (expected) non-controversial status of not-at-issue content could become partially conventionalized. Langton argues that such a convention can also be exploited to incentivize acceptance.

[27] We assume that topicality does not affect the acceptance-related payoffs of the speaker. That's because it is a fixed assumption of the model that the message represents information which the

Where $\tau = 0$, the accuracy of the message will have no bearing on the hearer's payoff. Thus the hearer will be indifferent between accepting and rejecting any at-issue message and will strictly prefer accepting any not-at-issue message. Where $\tau > 0$, the relative expected utility of each action for the hearer can be stated as follows.

$$\text{(I}') \qquad EU_H^{\sigma,\omega}(\mathsf{A}|\mathsf{AI}) \geq EU_H^{\sigma,\omega}(\mathsf{R}|\mathsf{AI}) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{\tau \cdot f}{\tau \cdot (t+f)}$$

$$\text{(II}') \qquad EU_H^{\sigma,\omega}(\mathsf{A}|\mathsf{NAI}) \geq EU_H^{\sigma,\omega}(\mathsf{R}|\mathsf{NAI}) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{(\tau \cdot f) - c'}{\tau \cdot (t+f)}$$

The threshold above which the hearer will accept an at-issue message remains unchanged (i.e., $\frac{\tau \cdot f}{\tau \cdot (t+f)} = \frac{f}{(t+f)}$). However, the threshold above which accepting a not-at-issue message is optimal (i.e., $\frac{(\tau \cdot f) - c'}{\tau \cdot (t+f)}$) decreases as τ gets smaller. As a result, the smaller the value of τ, the greater the proportion of states in which a hearer will accept a not-at-issue message.

This change in the threshold for accepting not-at-issue messages has a corresponding effect on the speaker's actions in equilibrium. Optimal behavior for the speaker remains governed by the inequality in (III). However, as the topicality of the message decreases, there will be an increase in the proportion of states in which the speaker sends a not-at-issue message under their optimal strategy. That's because of the corresponding increase in the proportion of states within which the hearer will accept a not-at-issue message. As τ decreases: (i) the relative expected efficiency cost of a not-at-issue message (i.e., $Pr_{S_\omega}(|\mathsf{R}|^{\sigma_H}_{\mathsf{NAI}}) \cdot c' - c$) falls, and (ii) the relative expected acceptance payoff (i.e. $a \cdot Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}|^{\sigma_H}_{\mathsf{AI}})$) rises. As a result, information will be encoded in not-at-issue content at a higher rate the less relevant it is to the topic.

3.3 Operationalizing Efficiency

The results in this section depended on assumptions about how to model the relative (in)efficiency of different sequences of discourse contributions. In particular, it was assumed that accepted/rejected not-at-issue messages had lower/higher efficiency costs (respectively) than accepted/rejected at-issue messages, which were assumed to be of equal efficiency.[28]

Since there is a diverse range of factors which contribute to conversational efficiency, we should not expect to be able to operationalize efficiency directly via any single test. Still, we can identify a variety of methods by which to measure the separate factors which influence efficiency.[29] For example:

speaker has an interest in communicating, whether it is relevant or not. Put another way: the game is designed to give us a model of how a speaker should decide to encode information they have chosen to communicate, not of how a speaker should choose which information to communicate.

[28] The assumption that accepted/rejected at-issue messages have the same efficiency costs could be weakened, as long as the efficiency costs of both still fall in between the respective efficiency costs of accepting and rejecting a not-at-issue message.

[29] See Clark & Brennan (1991, 229-232) for extensive discussion of additional possible tests for conversational costs in assertion-response sequences.

(a) The temporal costs of sequences of a given type could be measured directly by average duration. The prediction would be that sequences comprising accepted not-at-issue messages are shortest, followed by at-issue messages (with either response) and that sequences comprising rejected not-at-issue messages take longest.

(b) The degree to which sequences of a given type violate the preferred/expected trajectory of conversation could be measured via a range of proxies. For example, Nagel (2020) (following Bolden (2006); Heritage (2018)) suggests the presence of specific discourse markers (such as *oh*) as an indicator for (defeated) expectation. Sidnell (2010, Chpt.5) proposes various other ways of testing interlocutors' shared preference/expectation for different discourse sequences, including: (i) average delay to subsequent contributions; (ii) frequency of pre-emptive palliative/ameliorative utterances; (iii) frequency of accompanying explanation; and (iv) frequency of '*pro-forma*' agreement.

(c) The potential for miscommunication or misunderstanding could be measured by considering the rate at which sequences of a given type triggers a 'repair' response (cf. Albert & de Ruiter (2018), for a similar proposal). The prediction would be that repair responses are triggered more frequently by sequences comprising rejected not-at-issue messages and less frequently by sequences comprising accepted not-at-issue messages, with accepted/rejected not-at-issue messages triggering repair at a rate somewhere between the two.

(d) Work in pragmatics provides various hypotheses about when a sequence will require revision/modification to the established discourse structure, along with testable predictions about what occurs when this happens. Disruption of the discourse structure is expected to be associated with, among other effects: (i) increased ambiguity in pronoun resolution; (ii) reduced availability in long-distance anaphora; (iii) increased ambiguity regarding rhetorical relations between utterances; (iv) changes in topic/questions-under-discussion (Hobbs (1979); Roberts (1996, 2012); Kehler (2002); Asher & Lascarides (2003)). In recent empirical work, Duff & Altshuler (2024) employ self-paced reading times as an operationalization of the cost of reanalysis of discourse structure (cf. Mak & Sanders (2010)).

4 Multi-Message Models

In the game in the previous section, we assumed that a speaker is always able to choose between sending a piece of information as an at-issue message or a not-at-issue message. This enabled us to focus exclusively on those factors which influence a speaker's choice between the two ways of encoding information.

This assumption is artificial, however. In reality, a speaker does not have the option of sending a purely not-at-issue message—every sentence has to have some at-issue content. For instance, consider a speaker who wants to convey only the information (a) that Paula is a graduate student and (b) that she proved the conjecture. The speaker

has a choice between asserting (19.a), (19.b), or (19.c). They do not, however, have the option of asserting a sentence which encodes both as not-at-issue (cf. Lambrecht (2012, 236)).

(19) a. Paula is a graduate student and proved the conjecture.
b. Paula, who is a graduate student, proved the conjecture.
c. Paula, who proved the conjecture, is a graduate student.

In this way, the decision a speaker faces is not whether to encode information as at-issue or not-at-issue, but which information to encode as at-issue and which (if any) to encode as not-at-issue.

To capture this aspect of the speaker's decision problem, we can consider a complex rejection game in which a speaker must choose how to send two or more pieces of information, with the requirement that at least one must be encoded as at-issue. This game is given in full in Section B.

The complex game can be understood as the composition of multiple simple rejection games, played simultaneously. Each speaker action in the complex game is a combination of actions in the simple game, with the restriction that the complex action comprising exclusively of not-at-issue messages is excluded. A complex action corresponds to a decision, for each individual piece of information, whether to encode it as at-issue or not-at-issue. Each hearer action in the complex game is likewise a combination of simple hearer actions, corresponding to a decision, for each piece of information, whether to accept or reject. Payoffs for each player are just the sum of their payoffs from the simple game, for each piece of information. Fact 2 (Section B) states that a piece of information will be sent as not-at-issue in an equilibrium of a multi-message game iff it is sent as not-at-issue in an equilibrium of the corresponding simple sub-game, unless two conditions hold. First, every other piece of information in the multi-message game is also sent as not-at-issue in every equilibrium of its corresponding simple sub-game; and, second, the relative expected utility of sending that information as not-at-issue rather than at-issue in its sub-game is strictly smaller than the relative expected utility of sending any other piece of information as not-at-issue rather than at-issue in its sub-game.

For example, let A_1 be the message that Paula is a graduate student, and A_2 the message that Paula proved the conjecture. Then (19.a) will be preferred to (19.b-c) under any equilibrium strategy iff for $n \in \{1, 2\}$:

$$a \cdot Pr_{S_\omega}(|\mathsf{A}_n|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}_n|^{\sigma_H}_{\mathsf{AI}}) < c' \cdot |\mathsf{R}_n|^{\sigma_H}_{\mathsf{NAI}} - c.$$

In the model discussed in page 18 (where $c' = 5c = 5$ and assuming $a = 2$), this will hold as long as, for not-at-issue variants of both messages, the probability of a persuasive effect is smaller than the probability of rejection minus $\frac{1}{5}$. Otherwise, (19.b) will be preferred to (19.c) under any equilibrium strategy iff:

$$a\cdot(Pr_{S_\omega}(|\mathsf{A}_1|^{\sigma_H}_{\mathsf{NAI}}-|\mathsf{A}_1|^{\sigma_H}_{\mathsf{AI}})-Pr_{S_\omega}(|\mathsf{A}_2|^{\sigma_H}_{\mathsf{NAI}}-|\mathsf{A}_2|^{\sigma_H}_{\mathsf{AI}}))>c'\cdot(Pr_{S_\omega}(|\mathsf{R}_1|^{\sigma_H}_{\mathsf{NAI}})-Pr_{S_\omega}(|\mathsf{R}_2|^{\sigma_H}_{\mathsf{NAI}}))$$

Again, this will hold given the model discussed iff, for the not-at-issue variants of both messages, the speaker takes the probability of a persuasive effect for A_1 minus the probability of a persuasive effect for A_2 to be more than $2\frac{1}{2}$ times greater than the likelihood of rejection for A_1 minus the likelihood of rejection assigned to A_2 (since $c' = 2\frac{1}{2}a$).

The tendency for not-at-issue messages to be less controversial, less topical, and more persuasive persists in the equilibria of the complex game. The most important difference is that, in deciding whether to encode a piece of information in not-at-issue content, the speaker must compare the expected utility of doing so not only to the expected utility of encoding it as at-issue, but also to the expected utility of encoding other pieces of information as not-at-issue instead.

In well-functioning, co-operative conversations, speakers tend not to attempt to communicate information which they expect to be rejected. This would correspond to an external condition on the game that speakers only select messages to communicate for which the probability of acceptance is sufficiently high.[30] When combined with the a multi-message model, however, this condition yields an interesting prediction. If a speaker attempts to communicate only information which they expect to be accepted, then they will encode as much of that information as possible in the not-at-issue content of their utterance. In this case, the at-issue content will encode whichever piece of information has the highest combination of controversiality, topicality, and opportunity for persuasion.

A number of authors have argued that this is exactly what we find, at least in normal contexts (Abbott (2000); Simons (2005)). A typical utterance, they claim, is expected to have exactly one 'main point', which is encoded in its at-issue content. Indeed, attempts to encode more than one piece of information as at-issue in a can lead to oddness in certain context (Lambrecht (2012, 237)). An oft-cited example of this pattern is focal stress pattern, since sentences standardly have a single focal element, with the focused element fixing the utterance's at-issue content (Chomsky (1971); Erickson & Mattson (1981)).

5 Conclusion

At-issue and not-at-issue content exhibit a variety of pragmatic differences. By considering a rejection game with two content types, I've aimed to show how these differences emerge from strategic reasoning about conversational efficiency.

This game is a simplified model of conversation. It abstracts away from a variety

[30] This would be an external condition since the game discussed in §3 does not model a speaker's choice of what information to communicate. Instead, it models only their choice of how to communicate the information they have independently decided to.

of rhetorical and stylistic factors which may influence an agent's choice between at-issue/not-at-issue messages. For example, Abbott (2000) presents corpus evidence that definite determiners are more common in written language than spoken language. Similarly, it also abstracts away from certain types of efficiency cost which are not shared by both interlocutors. For example, work in psycholinguistics suggests that the task of evaluating whether to accept not-at-issue content is significantly more cognitively demanding for implausible content than for plausible content (Singh *et al.* (2016); Müller & Mari (2021)). It is a working assumption that the tendencies found in equilibria persist in the presence of such additional factors (even if diminished).

However, in at least one important respect, this game is not an idealized model of conversation. Unlike Gricean and neo-Gricean approaches, it is not assumed that interlocutors are cooperative beyond what is required by mutual self-interest (Atlas (1977); Atlas & Levinson (1981); Levinson (1983); Grice (1989); Simons (2007)). As such, the explanation it offers is not limited to conversations in which the speaker and hearer are engaged in an mutual attempt to coordinate on the truth. This is important, since the pragmatic differences between not-at-issue and at-issue content persist beyond such conversations. In this way, the game offers a model of non-ideal communication, which extends to conversations between non-cooperative and/or partially competitive interlocutors.

Appendix

A Simple Game

A simple rejection game with AI/NAI content is a tuple $\Gamma = \langle \mathbb{P}, \mathbb{H}, \theta, \Omega, Pr, \mathbb{U} \rangle$

- $\mathbb{P}$ is the set of players $\{S, H\}$, comprising a speaker (S) and a hearer (H).
- $\mathbb{H} = A_S \times A_H$ is the set of (total) histories. Each history $h \in \mathbb{H}$ is a sequence of actions drawn from an action set for each player.
  - $A_S = \{\mathsf{AI}, \mathsf{NAI}\}$ is the set of actions for the speaker, which correspond to sending the message as at-issue content or not-at-issue content.
  - $A_H = \{\mathsf{A}, \mathsf{R}\}$ is the set of actions for the hearer, which correspond to either accepting or rejecting the speaker's message.

  h' is a partial history iff there is some $h \in \mathbb{H}$ such that h' is an initial segment of h.
- θ is a function mapping players to partial histories which can be extended by an action in their action set. $h \in \theta(X)$ iff for some $a \in A_X : h \circ a$ is a partial history. Thus, $\theta(S) = \{\varnothing\}$ and $\theta(H) = \{\langle \mathsf{AI} \rangle, \langle \mathsf{NAI} \rangle\}$. Intuitively, $\theta(X)$ is the set of partial histories in which X faces a decision.
- Ω is the set of states. Each $\omega \in \Omega$ determines a type for each player and for Nature (N).
  - $N_\omega \in \{\mathsf{True}, \mathsf{False}\}$ is the state of Nature. Each type corresponds to an assignment of either true or false to the speaker's message. We let $T = \{\omega \in \Omega | N_\omega = \mathsf{True}\}$
  - $S_\omega, H_\omega \subseteq \Omega$ are the information states of the speaker and hearer, respectively. For each $X \in \mathbb{P} : \omega \in X_\omega$ and for all $\omega' \in X_\omega : X_\omega = X_{\omega'}$.
- Pr is a (common) prior probability function over states.
- $\mathbb{U} = \{u_S, u_H\}$ comprises a utility measure for each player. For $h \in \mathbb{H}$ and $\omega \in \Omega$: $u_X(N_\omega, h)$ is the payoff that $X \in \mathbb{P}$ receives from the sequence of actions in h when in state ω .

We make the following assumptions about the payoff function. a is a positive constant measuring the value of accepted messages (for the speaker). t and f are positive constants measuring the (dis)value of (in)accuracy (for the hearer). c and c' are positive constants measuring the disvalue of accepting/rejecting at-issue messages and rejecting not-at-issue messages, respectively. We assume that $t, f, a > c' > c > 0$. Then payoffs are as depicted in Figure 4.

A speaker strategy is a function from possible information states and $h \in \theta(S)$ to speaker actions in A_S. A hearer strategy is a function from possible information states

	True		False	
	A	R	A	R
AI	$(a-c, t-c)$	$(-c, -c)$	$(a-c, -(f+c))$	$(-c, -c)$
NAI	(a, t)	$(-c', -c')$	$(a, -f)$	$(-c', -c')$

Figure 4: The two sub-games in normal form.

and $h \in \theta(H)$ to hearer actions in A_H. For $a \in A_S$, we let $|a|_a^{\sigma_H} = \{\omega | \sigma_H(H_\omega, \langle a' \rangle) = a\}$ be the set of states in which σ_H plays a in response to $\langle a' \rangle$.

For each player, we define the expected utility of an action relative to a possible state and strategy for their opponent.

$$EU_S^{\omega,\sigma_H}(a|\varnothing) = \sum_{\omega' \in S_\omega} : Pr(\omega') \cdot u_S(N_{\omega'}, \langle a \rangle \circ \sigma_H(H_{\omega'}, \langle a \rangle))$$
$$EU_H^{\omega,\sigma_S}(a|h) = \sum_{\omega' \in H_\omega} : Pr(\omega') \cdot u_H(N_{\omega'}, h \circ \langle a \rangle)$$

We define, for each player $X \in \mathbb{P}$ and opponent strategy, σ_Y, the set of sub-game optimal strategies $\mathcal{O}_X^{\sigma_Y}$.

$$\sigma_X \in \mathcal{O}^{\sigma_Y} \text{ iff for all } \omega \in \Omega,\ h \in \theta(X) \text{ and } a \in A_X\text{:}$$
$$EU_X^{\omega,\sigma_Y}(\sigma_X(X_\omega, h)|h) \geq EU_X^{\omega,\sigma_Y}(a|h)$$

Thus, a pair of strategies $\langle \sigma_S, \sigma_H \rangle$ is a bayesian sub-game equilibrium iff $\sigma_S \in \mathcal{O}_S^{\sigma_H}$ and $\sigma_H \in \mathcal{O}_H^{\sigma_S}$. In a bayesian sub-game equilibrium, each player's strategy maximizes their expected utility in each possible history and state, given the strategy played by their opponent.

Fact 1. $\langle \sigma_S, \sigma_H \rangle$ is a bayesian subgame equilibrium iff (a) and (b) hold.[31]

(a) For all $\omega \in \Omega$: $\sigma_S(S_\omega, \varnothing) = \begin{cases} \mathsf{NAI} & \text{if } a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{NAI}}^{\sigma_H} - |\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}) > c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H}) - c; \\ \mathsf{AI} & \text{if } a \cdot Pr_{S_\omega}(|\mathsf{A}|_{\mathsf{NAI}}^{\sigma_H} - |\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}) < c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H}) - c \end{cases}$

(b) For all $\omega \in \Omega$: $\begin{cases} \sigma_H(H_\omega, \langle \mathsf{AI} \rangle) = \begin{cases} \mathsf{A} & \text{if } Pr_{H_\omega}(T) > \frac{f}{t+f} \\ \mathsf{R} & \text{if } Pr_{H_\omega}(T) < \frac{f}{t+f} \end{cases} \\ \sigma_H(H_\omega, \langle \mathsf{NAI} \rangle) = \begin{cases} \mathsf{A} & \text{if } Pr_{H_\omega}(T) > \frac{f-c'}{t+f} \\ \mathsf{R} & \text{if } Pr_{H_\omega}(T) < \frac{f-c'}{t+f} \end{cases} \end{cases}$

Proof: Observe that the expected utility of actions for each player are as follows, for all $\omega \in \Omega$:

[31] Note that, where $\mathsf{NAI}^{\sigma_H} - |\mathsf{A}|_{\mathsf{AI}}^{\sigma_H}) = c' \cdot Pr_{S_\omega}(|\mathsf{R}|_{\mathsf{NAI}}^{\sigma_H}) - c$, (a) is trivially satisfied. In this case, an optimal strategy can recommend either AI or NAI. Similarly, mutatis mutandis, for (b).

$$\text{(i)} \begin{cases} EU_S^{\omega,\sigma_H}(\mathsf{NAI}|\varnothing) = a \cdot Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}}) - c' \cdot Pr_{S_\omega}(|\mathsf{R}|^{\sigma_H}_{\mathsf{NAI}}) \\ EU_S^{\omega,\sigma_H}(\mathsf{AI}|\varnothing) = a \cdot Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{AI}}) - c. \end{cases}$$

$$\text{(ii)} \begin{cases} EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{AI}\rangle) = (Pr_{H_\omega}(T) \cdot t - Pr_{H_\omega}(F) \cdot f) - c; \\ EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{AI}\rangle) = -c. \end{cases}$$

$$\text{(iii)} \begin{cases} EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{NAI}\rangle) = Pr_{H_\omega}(T) \cdot t - Pr_{H_\omega}(F) \cdot f; \\ EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{NAI}\rangle) = -c'. \end{cases}$$

To prove **Fact 1**, we prove, first, that all and only speaker strategies satisfying (a) will be optimal (relative to an arbitrary σ_H). From (i), it follows by basic math that:

$$EU_S^{\omega,\sigma_H}(\mathsf{NAI}|\varnothing) \geq EU_S^{\omega,\sigma_H}(\mathsf{AI}|\varnothing)$$
$$\text{iff}$$
$$a \cdot Pr_{S_\omega}(|\mathsf{A}|^{\sigma_H}_{\mathsf{NAI}} - |\mathsf{A}|^{\sigma_H}_{\mathsf{AI}}) \geq c' \cdot Pr_{S_\omega}(|\mathsf{R}|^{\sigma_H}_{\mathsf{NAI}}) - c$$

So a speaker strategy will be sub-game optimal (relative to σ_H) iff it satisfies (a).

Next, we prove that that all and only hearer strategies satisfying (b) will be optimal (relative to an arbitrary σ_S). Observe that $Pr_{H_\omega}(F) \cdot f = f \cdot (1 - Pr_{H_\omega}(T)) = f - (Pr_{H_\omega}(T) \cdot f)$. So $Pr_{H_\omega}(T) \cdot t - Pr_{H_\omega}(F) \cdot f = Pr_{H_\omega}(T) \cdot (t + f) - f$. Thus, from (ii) and (iii), respectively, we have that:

$$EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{AI}\rangle) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{AI}\rangle) \quad \text{iff} \quad Pr_{H_\omega}(T) \cdot (t + f) - (c + f) \geq -c.$$
$$EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{NAI}\rangle) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{NAI}\rangle) \quad \text{iff} \quad Pr_{H_\omega}(T) \cdot (t + f) \geq f - c'.$$

Or, equivalently:

$$EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{AI}\rangle) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{AI}\rangle) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{f}{t+f}$$
$$EU_H^{\omega,\sigma_S}(\mathsf{A}|\langle \mathsf{NAI}\rangle) \geq EU_H^{\omega,\sigma_S}(\mathsf{R}|\langle \mathsf{NAI}\rangle) \quad \text{iff} \quad Pr_{H_\omega}(T) \geq \tfrac{f-c'}{t+f}$$

So a hearer strategy will be sub-game optimal (relative to σ_S) iff it satisfies (b).

B Complex Game

We define an n-message game $\hat{\Gamma} = \langle \hat{\mathbb{P}}, \hat{\mathbb{H}}, \hat{\theta}, \hat{\Omega}, Pr, \hat{\mathbb{U}} \rangle$ as follows (relative to an underlying simple game, Γ). We let $\hat{\mathbb{P}} = \mathbb{P}$ and let $\hat{Pr}$ and $\hat{\theta}$ be defined as above on $\hat{\Omega}$ and $\hat{\mathbb{H}}$, respectively.

- $\hat{\mathbb{H}} = \hat{A}_S \times \hat{A}_H$ is the set of (total) histories.
  - $\hat{A}_S = {A_S}^n/\{\mathsf{NAI}\}^n$ is the set speaker actions. Intuitively, each $\hat{a} \in \hat{A}_S$ corresponds to a choice of how to encode each of n messages in an utterance (at-issue or not-at-issue). Thus, each speaker action is an n-tuple of actions drawn from A_S, (with $\langle \mathsf{NAI}, ..., \mathsf{NAI}\rangle$ excluded).

– $\hat{A}_H = \hat{A}_H^n$ is the set hearer actions. Intuitively, each $\hat{a} \in \hat{A}_H$ corresponds to a choice, for each of the n messages in the speaker's utterance, of whether to accept or reject it.

– $\hat{a}_i$ is the ith member of $\hat{a} \in \hat{A}_S$ (*mutatis mutandis*, for H).

- $\hat{\Omega}$ is the set of states. For each $\hat{\omega} \in \hat{\Omega}$, $N_{\hat{\omega}} = \{0,1\}^n$ is an n-tuple corresponding to an assignment of true or false to each speaker message. We let $T_i = \{\hat{\omega} | (N_{\hat{\omega}})_i = 1\}$. $S_{\hat{\omega}}, H_{\hat{\omega}} \subseteq \hat{\Omega}$ are information states, as above.

- $\hat{\mathbb{U}} = \{\hat{u}_S, \hat{u}_H\}$ comprises a utility measure for each player. For $\langle \hat{a}, \hat{a}' \rangle \in \hat{\mathbb{H}}$ and $\hat{\omega} \in \hat{\Omega}$:

$$\hat{u}_X(N_{\hat{\omega}}, \langle \hat{a}, \hat{a}' \rangle) = \sum_{i \leq n} u_X((N_{\hat{\omega}})_i, \langle \hat{a}_i, \hat{a}'_i \rangle)$$

That is, $\hat{u}_X(N_{\hat{\omega}}, \langle \hat{a}, \hat{a}' \rangle)$ is the sum of the payoffs assigned to each sub-state of nature/sub-history pair in the simple game.

Where $\hat{h} \in \theta(H)$, we define, for each $i \leq n$:

$$(EU_i)_S^{\hat{\sigma}_H, \omega}(\hat{a} | \varnothing) = \sum_{\omega' \in S_{\hat{\omega}}} : \hat{Pr}(\hat{\omega}') \cdot u_S((N_{\hat{\omega}'})_i, \langle \hat{a}_i \rangle \circ \sigma_H(H_{\hat{\omega}}, \hat{a})_i))$$

$$(EU_i)_H^{\hat{\sigma}_S, \omega}(\hat{a} | h) = \sum_{\omega' \in S_{\hat{\omega}}} : \hat{Pr}(\hat{\omega}') \cdot u_H((N_{\hat{\omega}'})_i, \langle (h_1)_i \rangle \circ \hat{a}_i))$$

For each player X, we define the i-optimal strategies relative to $\hat{\sigma}_Y$, $\hat{\omega}$ and $\hat{h} \in \hat{\theta}(X)$as follows:

$$\hat{\sigma}_X \text{ is } i\text{-optimal relative } \langle \hat{\sigma}_Y, \hat{\omega}, \hat{h} \in \hat{\theta}(X) \rangle \text{ iff for all } \hat{a} \in \hat{A}_S : \\ (EU_i)_X^{\hat{\omega}, \hat{\sigma}_Y}(\hat{\sigma}_X(X_{\hat{\omega}}, h)_i | \hat{h}_i) \geq (EU_i)_X^{\hat{\omega}, \hat{\sigma}_Y}(a_i | h_i)$$

Where $Aut(\hat{a})$ is the set of permutations of $\hat{a}$:

Fact 2. $\langle \hat{\sigma}_S, \hat{\sigma}_H \rangle$ is a bayesian sub-game equilibrium iff (a') and (b').

(a') For all $i \leq n$: for all $\hat{\omega} \in \hat{\Omega}$: if $\hat{\sigma}_S$ is not i-optimal relative to $\hat{\sigma}_H$, $\hat{\omega}$ and $\varnothing$ then:

$(a'.1)$ $\hat{\sigma}(S_{\hat{\omega}}, \varnothing)_j = \mathsf{NAI}$ iff $j \neq i$; and

$(a'.2)$ for any $\hat{a} \in Aut((S_{\hat{\omega}}, \varnothing)))$: $\sum_{j \leq n} (EU_j)_S^{\hat{\sigma}_H, \hat{\omega}}(S_{\hat{\omega}}, \varnothing)_j | \varnothing) \geq \sum_{j \leq n} (EU_j)_S^{\hat{\sigma}_H, \hat{\omega}}(\hat{a}_j | \varnothing)$

(b') For all $i \leq n$, $\hat{h} \in \hat{\theta}(H)$ and $\hat{\omega} \in \hat{\Omega}$: $\hat{\sigma}_H$ is i-optimal relative to $\hat{\sigma}_S$, $\hat{h}$ and $\hat{\omega}$.

Proof : Observe that payoffs for each player X are calculated pointwise by the payoff at $\langle (N_{\hat{\omega}})_i, \langle \hat{a}_i, \hat{a}'_i \rangle \rangle$ under u_X, for each $i \leq n$. Since $\hat{A}_H = {A_H}^n$, it follows that $\hat{\sigma}_H$ will be optimal iff for each $i \leq n$, it is i-optimal relative to each $\hat{h}$, $\hat{\omega}$ and $\hat{\sigma}_S$.

Similarly, since $\hat{A}_S \subseteq {A_S}^n$, it follows that $\hat{\sigma}_S$ will also be optimal if for all $i \leq n$, it is i-optimal relative to $\varnothing$, $\hat{\omega}$ and $\hat{\sigma}_H$. However, the converse direction of the biconditional does not hold, since $\hat{A}_S \not\supseteq {A_S}^n$. Where, for each $i \leq n$, NAI is the unique action which is i-optimal (relative to $\varnothing$, $\hat{\omega}$ and $\hat{\sigma}_H$), $\hat{\sigma}_S(H_\omega, \varnothing)$ may be optimal without being i-optimal for all i. Instead, we show that in this case, the optimal speaker action(s) will be sequence(s) in which AI occurs exactly once. Suppose otherwise, for contradiction. Then there is some optimal $\hat{a}$ such that $\hat{a}_i = \hat{a}_j = \mathsf{AI}$ and $i \neq j$. But then, by assumption, $(EU_i)_S^{\hat{\sigma}_H,\omega}((\mathsf{NAI}_i; \hat{a}_{-i})|\varnothing) > (EU_i)_S^{\hat{\sigma}_H,\omega}(\hat{a}|\varnothing)$. Contradiction.

So consider an arbitrary $\hat{a}$ in which AI occurs exactly once. Since the set of actions in which AI occurs exactly once comprise all and only permutations of $\hat{a}$, it follows that the optimal actions relative to $\varnothing$, $\hat{\omega}$ and $\hat{\sigma}_H$ will be all and only elements of $Aut(\hat{a})$ with maximal expected utility relative to $\varnothing$, $\hat{\omega}$ and $\hat{\sigma}_H$.

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