How Should We Formulate Quantity?

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Abstract

Neo-Gricean accounts of how exhaustivity is derived typically rely on 3 maxims: Quality and Relevance, which form the "base conditions" and set the standards for what *can* be said, and Quantity, which uses similar conditions to those found in the first two maxims to determine what *should* be said. Typical formulations of Quantity make direct reference to the base conditions, allowing alterations to either Quality or Relevance to be reflected in Quantity, as well. However, some formulations forgo this reference in favor of restating the base conditions directly in Quantity. We examine a novel scenario that alters the conditions of Quality alone, and, by looking at the exhaustivity inferences generated in this scenario, find that Quantity does indeed reference, and not restate, the base conditions. In order to determine the impact of this finding, we examine the case of Westera's (2022) *Attentional Pragmatics*, which uses a non-referential, "independent" Quantity. Ultimately, we find that if one assumes a referential, "dependent" Quantity, as would be suggested by our findings, the proposal is unable to generate the predictions necessary for one of its main conclusions.

1 Introduction

The neo-Gricean system of deriving exhaustivity inferences typically relies on three conversational maxims: Quality, Relevance, and Quantity. In a normal, cooperative conversation, it is assumed that all three of these maxims are being followed by a speaker, allowing one to draw inferences about what the speaker means to say beyond the semantic content of a sentence. The maxims are normally phrased in reference to an "assertion," a statement that has a direct informational content. The term "direct" is important here, as it distinguishes statements like "he plays a sport" from questions like "which sport does he play?"- although the implication of the question is the same as the content of the statement, only the statement directly "asserts" that information and therefore can be called an assertion.

The first two of these maxims, Quality and Relevance, provide the "base conditions" necessary for something to be meet the minimum threshold for acceptability in a standard conversation (Katzir, 2007). Typically, they are formulated as follows, for a given proposition *p* and a speaker *s*:

(1) The Base Conditions

a. Quality: $Qual(p, s) \leftrightarrow bel_s(p)$

b. Relevance: $Rel(p, s) \leftrightarrow bel_s(rel(p))$[1]

One could easily imagine why these are considered base conditions for a cooperative conversation. If speakers are not required to obey Quality, then nothing they say can be trusted, and if speakers could ignore relevance, then a conversation could never be moved in a satisfactory direction.

However, whereas the base conditions provide a standard for what should not be asserted, the third maxim, Quantity, does the opposite, instead describing what must be asserted. In further contrast to the base conditions, Quantity takes the form of a conditional, stating that everything that fulfils the antecedent must be included in the assertion. In other words, whereas the base conditions give us the bare minimum requirements for an assertion to be acceptable, Quantity gives us the gold standard, moving us past what a cooperative speaker *could* say to what they *should* say.

The formulation of this antecedent raises an interesting question. In essence, Quantity states that "If you consider something true and relevant, then include it in the assertion." One might quickly notice, though, that the antecedent's conditions sound strikingly familiar. In fact, they appear to be identical to the base conditions described above. Grice's initial presentation of the maxims does not include this "true and relevant" clause; rather, Grice's Quantity simply requires than an assertion be "as informative as possible." This simplified presentation, however, can lead to issues when maxims "clash," or have conflicting demands for the assertion. Most commonly, this clash occurs between Quality and Quantity, when a more informative assertion theoretically exists, but is not believed to be true by the speaker. (Grice, 1975) Grice implies a system of hierarchy between the maxims, where certain conditions take priority over others, but later neo-Gricean systems tend to cite the base conditions in Quantity (Katzir, 2007) (Gamut, 1991) to resolve clash within the maxims themselves. The following is a possible formulation of Quantity in this style, for a given proposition p:

(2) Dependent Quantity

$$Quan(p, s) \leftrightarrow \forall q((Qual(\mathrm{p}, s) \wedge Rel(\mathrm{p}, s)) \rightarrow p \subseteq q)$$

However, Quantity could be re-written in a way that avoids referencing the base conditions directly:

[1] When written formally, Relevance sometimes includes reference to a set of propositions under discussion in a given conversation (the "question under discussion," or QUD) (Westera, 2022) as the condition for what is relevant and what is not. As the QUD does not play a role in this discussion, a simplified version has been adopted instead.

(3) Independent Quantity

$$Quan(p, s) \leftrightarrow \forall q(bel_s(p) \wedge bel_s(rel(p)) \rightarrow p \subseteq q)$$

This alternative, "independent" Quantity is equivalent to the more common, "dependent" Quantity- the same conditions that fulfil the antecedent of the dependent fulfill those of independent, and vice-versa. In a "typical" conversation, where the maxims are assumed to act exactly as described, there is no difference between the two formulations

This equivalence importantly assumes that the maxims in (1) are invariable. However, let's assume momentarily an alternative version of the maxims in (1), (1'), with variable conditions:

(1') Variable Base Conditions

a. Quality': $Qual(p, s) \leftrightarrow \alpha(p, s)$
b. Relevance': $Rel(p, s) \leftrightarrow \beta(p, s)$

Under this version of the base conditions, equivalence can no longer be so easily assumed. Independent Quantity will always make reference to relation and belief in its antecedent, whereas dependent Quantity would use whatever α and β refer to as its conditions.

This would be a non-issue if α and β were themselves equivalent to the conditions in (1). However, it has been observed that maxims are sometimes altered or outright cancelled; the game show problem, for example, imagines a scenario where the maxim of Quantity is completely ignored (Fox, 2014), and some proposals to address this problem have actually suggested further cancellations (Westera, 2022). A dependent Quantity would suggest that any alterations made to the base conditions would have to be reflected in Quantity's antecedent. If Quantity were truly independent, however, we should observe it acting identically no matter the other maxims' status.

Although both formulations lead to the same inferences in a typical conversation, is there one that better reflects the reality of how we speak? In order to figure this out we've split this paper into two sections.

In the first section, we will focus on a scenario in which Quality alone is altered, but Quantity remains unchanged. This will allow us to gauge whether those changes are reflected in Quantity, and by extension, whether Quantity makes reference to the base conditions or stands as an independent maxim. However, maxims are impossible to observe directly. While it might be possible to come to conclusions about the maxims' true forms by assessing how speakers speak, we instead focus on the inferences a *listener* generates from various utterances in a given scenario. Similarly, while it may be theoretically

possible to find situations that alter Relevance as well, Relevance is extremely resistant to alteration, as listeners tend to interpret the relevance of a given utterance as generously as possible. (Gunlogson, 2011) This squib examines the case of a game show where participants are unsure who is a liar and who is telling the truth. The liars operate under what is essentially an altered Quality, one where they say what they expect someone else to believe rather than act on their own beliefs. As participants are aware of this condition, we can directly observe how it affects the implicatures they generate and if it better aligns with what is predicted by independent or dependent Quantity. Importantly, this paper assumes a fully pragmatic account of exhaustification and implicature, although alternatives, especially those that assume a grammatical exhaustivity operator (Fox, 2007), do exist. Ultimately, we find that an independent Quantity is unable to generate the correct predictions for such a scenario, while a dependent Quantity has no issue doing so.

The question of Quantity's dependency is not merely a bureaucratic exercise. In the second section, we use a case study to examine the consequences assuming one version of Quantity over the other can have on a proposal. In particular, we examine a piece in the literature (Westera, 2022) that cannot function without an independent Quantity, and examine how assuming dependency results in a proposal that is unable to generate the predictions it claims to be able to.

2 Altering Quality

In this section, we propose a novel scenario for altering Quality exclusively and examine the predictions generated by the two versions of Quantity to determine which version of Quantity better accounts for the scenario. We also examine a potential alternative scenario and explain why it would not function for our purposes. Section 2.1 introduces our scenario, the game show *To Tell the Truth*. Section 2.2 provides the main predictions generated by the two proposals, as well as their derivations. In section 2.3, we compare these predictions to those actually expected in the scenario. Finally, in section 2.4 we consider a possible alternative method of altering Quality, the case of a liar, and explain why it was not chosen over the more complicated game show scenario.

2.1 The Scenario

The case we are examining is that of the American game show *To Tell the Truth*. This case, as will soon become apparent, is rather complex, as it requires listeners to juggle two potential Qualities (one altered and one unaltered) simultaneously. However, it carries the distinct advantage of being a real-world example (or at least as "real world" as the rules imposed by a game show can be considered) and

therefore allows us to avoid pure hypotheticals. Additionally, as will be discussed later, other, seemingly less complicated options come with their own set of issues that make them unfit for the task at hand.

In a typical episode, a panel of celebrities are presented with a group of three "challengers" who all claim to be the same person. For instance, the challengers may all claim to be the trainer for a celebrity dog named Baxton. Of course, only one of these challengers can actually be the trainer (the "central character", or CC). The celebrities are tasked with posing questions to individual challengers to help them determine who is the central character and who are mere pretenders. When the central character is asked a question, they must respond as truthfully as possible. However, the pretenders are permitted to say anything at all in response. It follows, then, that although the central character follows the Quality described above, the pretenders have their own version, where *s* is the speaker and *c* is the central character:

(4) Alternate Qualities

a. Pretender's Quality

$Qual(p, s) \leftrightarrow bel_s(\Diamond bel_c(p))$

b. Central Character's Quality

$Qual(p, s) \leftrightarrow bel_s(p)$

Although the pretenders are permitted to say anything they'd like, the format of the game encourages them to say things that would seem reasonable for the person they are imitating to say. This is also why we're able to argue that Quantity remains unaltered in this scenario. In attempting to sound like a reasonable alternative to the central character, the pretender adopts similar conditions to the central character. This includes the requirement to be maximally informative. Of course, since the pretender cannot be sure what the central character actually believes, this attempt to seem informative is still based off of their assumptions about the CC's beliefs, and not their own beliefs. The question of Independent vs. Dependent is ultimately a question of when the pretender attempts to embody the central character. Dependent Quality would mean that the pretender asks the question of "would the listener believe the central character would say this" to each individual proposition included in their final assertion, as well as the assertion itself. Independent Quality, on the other hand, only requires that the final, overall assertion be one the listener might believe the CC to say, and not the individual propositions, which are still subject to the beliefs of the pretender.

A panelist, of course, never knows whether they are speaking to a pretender or the central character. Thus, a panelist always needs to consider two cases when interpreting an assertion: CASE P,

where a pretender is speaking and (4b) is used, and CASE C, where the central character is speaking and (4a) is used.

2.2 The Predictions

So, with these conditions in mind, what can we observe about Quantity? Let's consider the dog trainer example presented above, and a question-answer interaction that might arise in such a scenario:

(5) a. Panelist: "What did Baxton eat for breakfast this morning?"
b. Challenger: "Baxton had turkey and kibble for breakfast."

A panelist's thought process might follow along these lines:

> CASE P: If we assume pretender's Quality is operative, the speaker does not necessarily believe (5). Rather, we can only conclude that they consider it plausible that the true central character would believe something like (5). Since the central character must not be the one speaking if we are assuming (4b) is operative, our final Quality inference for CASE P is that "the speaker is not the CC and the speaker considers it plausible that the CC could believe that Baxton had turkey and kibble for breakfast."
>
> CASE C: Since (4a) is identical to standard Quality, we can conclude exactly what we would if this were a standard conversation: that "the speaker believes Baxton had turkey and kibble for breakfast," and, since we are assuming the CC is speaking, that "the speaker is the CC".

Of course, since the listener can't know exactly who is speaking, they must consider both equally, arriving at (6) for their final Quality inferences (where *c* is the central character, *s* is the speaker, and *b* is Baxton). Note that, for legibility's sake, the inferences from the two cases are presented independently; however, given that a listener must consider both cases possible, they are better considered as the disjuncts of a larger, unified inference.

(6) Quality Inferences

CASE P: $s \neq c \wedge bel_s(\Diamond bel_c(bf\ t_b(turkey \wedge kibble)))$

"The speaker is not the CC and considers it possible that the CC believes Baxton had turkey and kibble for break fast."

CASE C: $s = c \wedge bel_s(bf\ t_b(turkey \wedge kibble))$

"The speaker is the CC and believes that Baxton had turkey and kibble for breakfast."

Now that we have the Quality inference, we can begin to consider the two Quantity inferences, beginning with that of Dependent Quantity. As with the Quality inference, the listener must consider the possibility both that the speaker is the pretender, and that the speaker is the true central character.

> CASE P: We'll start by assuming the pretender is speaking. Since they assert (5), it must be the case that it fulfils their version of Quantity. By the definition of Quantity, (5) is the strongest statement that fulfills both Relevance and the pretender's Quality. Thus, the fact that they don't assert the stronger statement "Baxton had turkey, kibble, and fish for breakfast" implies that it fails the conditions of either Relevance or Quality. Since the stronger statement is clearly relevant to the question, it must be that it does not fulfil Quality and therefore "the speaker must be uncertain whether they consider it plausible that the central character believes Baxton had fish for breakfast."
>
> CASE C: We'll now assume the central character is speaking. As before, in order to assert (5) it must obey the CC's Quantity. Thus, any stronger statement than (5) is either irrelevant or does not obey Quality. Since the stronger statement "Baxton had turkey, kibble, and fish" is clearly relevant, it must not be the case that the CC believes it to be true. Thus, we reach the inference that "the central character is uncertain whether Baxton ate fish for breakfast."[2]

By combining the conclusions from the two cases and the Quality inferences from before, we can create a final set of "complete" inferences for (5) using dependent Quantity:

[2] Typically, an additional, "epistemic," step is taken after reaching this inference, where the listener assumes that, since the speaker has good reason to know what Baxton had for breakfast, the reason they are uncertain is because they don't believe Baxton had fish at all. However, since this step is irrelevant to the arguments made in this squib, it is ignored here and in all further locations it could be included for the sake of simplicity.

(7) Final Inferences (Dependent Quantity)

CASE P: $s \neq c \wedge bel_s(\Diamond bel_c(bf\ t_b(turkey \wedge kibble))) \wedge \sim bel_s(\Diamond bel_c(bf\ t_b(fish)))$

"The speaker is not the CC and is uncertain whether the CC believes Baxton had fish for breakfast."

CASE C: $s = c \wedge bels(bf\ t_b(turkey \wedge kibble)) \wedge \sim bel_s(bf\ t_b(fish))$

"The speaker is the CC and is uncertain whether Baxton had fish for breakfast."

Independent Quantity, as expected, behaves quite differently. Most notably, although in theory the listener must consider two cases when deriving any Quantity inferences, since dependent Quantity never varies, those two cases proceed identically.

> CASE P/C: In order to assert (5), it must be the case that it obeys Quantity. Thus, any stronger statements, such as "Baxton had turkey, kibble, and fish for breakfast," must either not be relevant, or not be believed by the speaker. Since the stronger statement is clearly relevant, the speaker must not be certain it is true. Thus, it can be concluded that "the speaker is not certain whether Baxton had fish for breakfast."

Like above, we can combine this inference with the Quality inference to reach these final inferences:

(8) Final Inferences (Independent Quantity)

CASE P: $s \neq c \wedge bel_s(\Diamond bel_c(bf\ t_b(turkey \wedge kibble))) \wedge \sim bel_s(bf\ t_b(fish))$

"The speaker is not the CC, considers it possible that the CC believes Baxton had turkey and kibble for breakfast, and is uncertain whether Baxton had fish for breakfast"

CASE C: $s = c \wedge bel_s(bf\ t_b(turkey \wedge kibble)) \wedge \sim bel_s(bf\ t_b(fish))$

"The speaker is the CC and believes that Baxton had turkey and kibble, but not fish, for breakfast."

2.3 Assessing the Predictions

Now that we have our predictions, let's take another look at (5):

(5) a. Panelist: “What did Baxton eat for breakfast this morning?”
b. Challenger: “Baxton had turkey and kibble for breakfast.”

Putting ourselves in the shoes of a panelist, it makes sense that CASE C is identical no matter what Quantity is operative. The listener assumes that the central character is honest and cooperative, and thus that they follow a version of the base conditions identical to those in (1). (1) is, as discussed, the version of the base conditions that render the two Quantities equivalent, and thus it makes sense that the inferences under these circumstances would be similarly equivalent. CASE P, on the other hand, demonstrates a noticeable divergence between the two Quantities. Independent Quantity would have us believe that a listener would conclude that a pretender would be uncertain whether the CC believes Baxton to have had fish for breakfast. At first this seems to be a reasonable conclusion to come to; after all, why should a pretender have any knowledge of Baxton’s breakfast? However, a pretender, according to their altered Quality, is assumed to only say things that they believe the CC could believe. Why, then, is the pretender’s personal belief about fish for breakfast relevant? It seems more reasonable to assume, as a listener, that the reason for fish’s omission is not because of personal belief about Baxton’s breakfast, but rather uncertainty about what the CC might believe Baxton’s breakfast to be, as is stated in (7). With this in mind, it appears as though assuming Dependent Quantity more accurately reflects the thought process a panelist might have when interpreting an interaction like (5).

2.4 Why Not Something More Simple?

Before we move on to our case study, let’s take a moment to discuss why the *To Tell the Truth* example was chosen. It would be entirely reasonable to question why it is we resort to such a contrived scenario to alter Quality. A potentially simpler option may come to mind, namely the case of a liar. It appears cut and dry. After all, what better way is there to change the maxim which says “tell the truth” to simply “do not tell the truth?” Let’s imagine our listener has a friend, someone who famously never tells the truth. More specifically, they only say something if they believe it is not true. Like in the *To Tell the Truth* example, this fact is known to the listener, so they’re able to make judgements about what the liar is saying. We can even imagine a possible formulation of this liar’s Quality looking something like this:

(9) Liar’s Quality

$$Qual(p, s) \leftrightarrow bel_s(\sim p)$$

Like before, we can take this new Quality and see what the predictions would look like for our Dependent and Independent Quantities. Let’s use a simplified version of (5) to see what sorts of inferences are drawn.

(10) a. Listener: “What did Baxton eat for breakfast this morning?”

b. Liar: “Baxton had turkey for breakfast.”

As in the *To Tell the Truth* example, the Quality inference is unaffected by which version of Quantity is operative. Thus, the inference process for Quality would look something like this: We know the liar only says things they believe not to be true. Thus, the fact that they said that Baxton had turkey means that they actually believe Baxton did not have turkey.

(11) Quality Inference (Liar’s Quality)

$bel_s(\sim bf\ t_b(turkey))$

We can then consider the inferences that would be predicted by our two versions of Quantity:

DEPENDENT: The liar did not assert “Baxton had turkey and fish for breakfast.” Since the conditions of Quantity dictate that the liar include everything relevant they believe is false in their assertion, it must be the case that “Baxton had fish” is either irrelevant or not believed to be untrue by the liar. Since “Baxton had fish” is clearly relevant, however, we can conclude that “the liar is not certain that Baxton did not have fish for breakfast.”

(12) Final Inference (Dependent Quantity)

$bel_s(\sim bf\ t_b(turkey)) \wedge \sim bel_s(\sim bf\ t_b(fish))$

“The speaker believes Baxton did not have turkey and is not certain Baxton didn’t have fish.”

INDEPENDENT: The liar did not assert “Baxton had turkey and fish for breakfast.” Since the conditions of Quantity dictate that the liar include everything they consider true and relevant in their assertion, the fact that they did not include fish in the assertion implies that they either are not certain Baxton had fish or they consider that fact irrelevant. Since it is clearly relevant, we must conclude that “the liar is not certain that Baxton had fish for breakfast.”

(13) Final Inference (Independent Quantity)

$bel_s(\sim bf\ t_b(turkey)) \wedge \sim bel_s(bf\ t_b(fish))$

“The speaker believes Baxton did not have turkey and is not certain that Baxton had fish.”

While at first these predictions seem rather similar in the sense that they both imply uncertainty about other food items, this changes if we generalize fish to "any food item not mentioned," as can easily be done since no other food items are mentioned, and then take the epistemic step. Suddenly, Independent Quantity would predict that "Baxton had nothing to eat" and Dependent would say "Baxton had everything except turkey to eat," two extremely divergent interpretations of the same sentence. Normally, our next step would be to look at what listeners actually predict in the scenario presented, as we will with our original game show scenario, but in this case, that may not be possible. Let's first take a look at some irregularities that may have been noticed while presenting the above information.

The first irregularity pertains to Independent Quantity. More specifically, how would it operate in this scenario at all? Our predictions above take the assertion in (10) at face value, and then apply the maxims to it. But how could (10) have been uttered at all under these conditions? Liar's Quantity says the liar can only say what they believe is untrue, yet, simultaneously, Independent Quantity says they must include everything they consider true in the assertion. This would mean, for example, that if the liar knows Baxton had kibble and nothing else for breakfast, that they would somehow have to express "Baxton had kibble" (as required by Independent Quantity) while also only saying things they consider untrue (as required by the liar's Quality). This simply isn't possible, and before even considering the actual inferences, drops Independent Quantity from the running.

Independent Quantity not working in this scenario isn't necessarily a win for Dependent Quantity, however. Our second irregularity is Dependent Quantity's prediction that the liar believes Baxton ate everything but turkey for breakfast. While there is certainly some wild scenario where this may be possible, in all reasonable cases this seems unreasonable. Additionally, as with Independent Quantity, there remains the question of how a sentence like (10) can be asserted at all, given the conditions. For instance, if we take the kibble example again, the liar's expected assertion would be "Baxton had everything except kibble for breakfast." Certainly more reasonable than the outright contradiction the conditions imposed by Dependent Quantity, but not accurate to what one might expect of a liar, either.

So what does this mean, then? Is the liar scenario proof that we actually need some sort of third Quantity that accounts for these sorts of situations? Not at all. Something this scenario critically assumes is that Quantity would be operative at all when speaking with a liar. Why should we make this assumption, though? A liar is an inherently uncooperative speaker. Maximizing informativeness is completely irrelevant when your assertions are inherently uninformative. The liar situation provides a simple alteration of Quality, sure, but fails to account for the fact that such a scenario would alter Quantity as well, leaving it unfit for our needs. Unlike the liar scenario, however, the conditions imposed by *To Tell the Truth* allow Quantity to remain operative even when considering the pretender's

perspective, as discussed above. Certainly, the game show chosen makes things a bit more complicated, but it allows us to control for the other maxims far better than other, more simplified scenarios.

3 Case Study: Attentional Pragmatics

This section examines Matthijs Westera's 2022 proposal *Attentional Pragmatics*, and, more specifically, how it addresses Danny Fox's Game Show Problem. We find that Westera's proposal, which introduces a set of 3 additional maxims parallel to the traditional neo-Gricean maxims, cannot account for the dilemma introduced by the Game Show Problem without assuming an independent Quantity.

3.1 Attentional Pragmatics

Matthijs Westera's *Attentional Pragmatic*s (2022) bills itself as a solution to a number of problems concerning the pragmatic (neo-Gricean) approach to exhaustivity. One of the issues addressed is the Game Show Problem, the proposed solution to which this paper will focus on specifically. In order to tackle these problems, Westera argues, an additional set of Quality, Relevance, and Quantity maxims can be introduced, paralleling the originals but concerning themselves with what an utterance draws attention to, rather than what an utterance asserts. These attentional (or A-) maxims do not replace the original neo-Gricean maxims (which Westera refers to as informational, or I-, maxims), but instead provide an additional pathway for deriving exhaustivity when the I-maxims are insufficient.

A-maxims do not apply to an assertion, but rather to an "attentional intent" (A), a set of all things a speaker intends to draw attention to with an utterance. Since the A-maxims all deal with attention, they are all written in terms of the attentional intent:

(14) The A-Maxims (Westera, 2022)

a. *A-Quality(A)* = $\forall a(A(a) \rightarrow \Diamond(^{\vee}a \wedge \forall b((b \subset a \wedge A(b)) \rightarrow \sim {}^{\vee}b))$

'Intend to draw attention only to propositions you consider possible, in particular, possible [sic] independently of any thing stronger to which you intend to draw attention.'

b. *A-Relevance(A, Q)*[3] = $\forall a(A(a) \rightarrow Q(a))$

'Intend to draw attention only to relevant propositions.'

c. *A-Quantity(A, Q)* = $\forall a((\text{A-Quality}(\{a\}) \wedge \text{A-Relevance}(\{a\}, Q)) \rightarrow A(a))$

'Intend to draw attention to all relevant propositions you consider independently possible.'

Though these maxims parallel the I-maxims, there are some key differences. Most notably, A-Quality requires that a speaker consider a proposition possible, whereas its counterpart I-Quality would require that a speaker consider a proposition true. This will later become relevant when these maxims are put into the game show scenario, which will be discussed in the next section. In order to solidify our understanding of these maxims, and how they would allow exhaustivity to be derived without using the I-maxims, let us reconsider the example of Baxton's breakfast, this time outside of the context of *To Tell the Truth*.

(15) Alan: "What did Baxton have for breakfast this morning?"
Brenda: "Baxton had turkey and kibble for breakfast."

First, we should figure out what the attentional intent is for Brenda's response. Brenda draws attention to two things that Baxton had for breakfast: turkey and kibble. At first, one might assume that the attention set looks like this: $\{bf\ t_b(turkey),\ bf\ t_b(kibble)\}$. However, conjunctions like the one in Brenda's response are actually considered propositions of their own under Westera's model. This means that our intentional intent actually looks like this: $\{bf\ t_b(turkey \wedge kibble)\}$[4].

[3] The Q here refers to the Question Under Discussion, a set of all propositions relevant at a given point of the conversation. "Q(a)" can be considered roughly equivalent to the "bel_s(rel(a))" seen in the neo-Gricean maxims above.

[4] Conjunction is the only connector that behaves this way. The attentional intent of the disjunctive version of (12B), "Baxton had turkey or kibble for breakfast," would not include the proposition $bf\ t_b(turkey \vee kibble)$, for example.

With an attentional intent in hand, we can move on to the actual derivation of exhaustivity. To start, we consider a proposition not found in A, such as "Baxton had fish for breakfast." Under A-Quantity, Brenda would only have two reasons for not mentioning fish: either it is not relevant, or they do not consider it possible. One could easily imagine fish being a possible, and therefore relevant, response to (15A), so it must be the alternative. Thus, it must be that Brenda doesn't consider it possible that Baxton ate fish, our exhaustive reading. Additionally, as a consequence of conjunctions forming their own propositions, the absence of the individual propositions "Baxton had turkey" and "Baxton had kibble" implies that Brenda does not consider them individually possible that is to say, that Brenda doesn't think Baxton could have eaten turkey without also eating kibble, and vice-versa.

In contrast to the traditional neo-Gricean derivation, this process does not require an epistemic step. Instead, since A-Quality deals in possibility rather than necessity, the conclusion that a proposition does not obey A-Quality is enough to conclude a speaker does not believe something. Other than this lack of an epistemic step, however, the A-maxims derive exhaustivity in a very similar way to the standard neo-Gricean approach.

3.2 The Game Show Problem

Of course, Westera's solution cannot be examined without first having an understanding of what the Game Show Problem is. The problem was first introduced in Fox's *Cancelling the Maxim of Quantity: Another challenge for a Gricean theory of Scalar Implicatures* as a gap in a purely pragmatic approach to ex haustivity. Fox's paper, much like this one, presents a game show scenario where the Gricean maxims appear to be altered. Here, readers are asked to imagine a simplified game where a host provides clues as to which of a number of boxes contain a cash prize. The host knows the location(s) of the money, but does not reveal it directly. Additionally, the contestant is aware that the host knows the money's location. For example, a host may provide a clue like this:

(16) Host: "There is money in box 20 or 25." (Fox, 2014)

The maxim of Quantity requires that a speaker be as informative as possible. For the host to utter something like (16), Fox argues, they must not obey Quantity, as otherwise they would have chosen to reveal the exact location of the money, which is known to them.

An utterance like (16), outside of the context of this game show, should come with two inferences: that the speaker does not know exactly where the money is (the "ignorance inference"), and that there is not money in both boxes (the "exhaustivity inference"). Both of these inferences, critically, are derived from Quantity. In the case of the ignorance inference, the fact that the speaker does not

specify which of the two boxes the money is in, it must be the case that doing so would violate the conditions of either Quality or Relevance. Since the location of the money is clearly relevant, it must be that specifying would violate Quality, and thus, the speaker doesn't have reason to believe it's in one box or the other specifically. The exhaustivity inference follows much the same pattern, this time, however, considering the assertion that the money is in both boxes. As before, since the speaker doesn't assert this over the disjunction, and it is clearly relevant, it must be the case that the speaker doesn't have reason to believe the money is in both boxes. In this case, however, we can take the additional step of assuming that the speaker would have reason to know it were in both boxes if it were true (the "opinionatedness assumption"). Thus, the fact that they don't have reason to believe it is in both is due to them knowing it is not in both. From this, a listener concludes that the money must not be in both boxes.

One would expect, of course, that in this game show, where Quantity is cancelled, neither of these inferences would be present. The ignorance inference is, indeed, absent; after all, the host, by the setup of the game, must know the location of the money exactly. However, as Fox observes, the exhaustivity inference persists. Take, for example, this retort by the contestant upon the reveal that the money was in both boxes:

(17) Contestant: "What you said was wrong. You said there was money in box 20 OR box 25. But, in fact, there was money in both boxes." (Fox, 2014)

If there was no implication that the money could not be in both boxes, the contestant could not take issue with the presence of money in both. The only way (17) is an acceptable retort is if (16) were truly exhaustive.

This presents a problem for the neo-Gricean method of deriving exhaustivity. If exhaustivity is truly a product of Quantity, why is it found here, where Quantity is not operative? Fox argues that this is evidence for an alternative, non-pragmatic pathway for inferring exhaustivity. Westera, however, proposes an additional set of maxims which should, in his estimation, provide a pragmatic method for finding exhaustivity that does not depend on Quantity.

3.3 Attentional Pragmatics and the Game Show Problem

Now that we understand the basics of Attentional Pragmatics, we can begin to unpack how Westera applies it to the Game Show Problem. Westera does not take issue with anything presented in 3.2, however, he does introduce a new assumption: that the host may pretend to know less about the locations of the prizes than they actually know, but may not pretend to know more (in other words, lie). With this in mind, Westera concludes that A-Quality must not be operative, as, by pretending to know

less information, a host allows themselves to include propositions they do not consider possible. The other A-maxims remain untouched, however. Westera argues that since A-Quantity is still operative, the attentional pathway can still derive exhaustivity, using the method described in 3.1.

This conclusion is debatable, however. To see why, let us consider A-Quantity. At first, this seems to be a clear case of a dependent Quantity. After all, A-Quality and A-Relation are directly cited in the formalization. On the other hand, the base conditions (or their A-maxim equivalents), are not referenced at all in the informal version. Instead, the written form only refers to "relevant propositions you consider independently possible," without any mention of other maxims. While at first this would seem a simple case of ambiguity, the choice of an independent or dependent Quantity is crucial for being able to derive exhaustivity in this case.

Let's start with what is, as established in the above sections, the typical assumption for a Quantity: that it is, indeed, dependent on the base conditions. As Westera describes, A-Quality has been cancelled. At first, cancellation would appear to be outside the scope of this paper, which deals with Quality being altered, rather than outright absent. However, this cancellation can easily be considered a case of alteration, instead. More specifically, since the host can draw attention to propositions they don't consider possible, A-Quality is weakened to the point of being a tautology:

(18) Host's A-Quality

$$\textit{A-Quality}(A) = \forall a(A(a) \rightarrow \Diamond^{v} a \vee \sim \Diamond^{v} a)$$

'Intend to draw attention only to propositions you consider possible or do not consider possible.'

Considering cancellation as a case of alteration rather than absence allows us to avoid the issue of what happens when A-Quantity refers to something that isn't there. Of course, (18) no longer places any restrictions on what fulfills A-Quantity, leaving relevance as the only condition with any force. This, however, would force the inference that a proposition like "there is money in boxes 20 and 25" is somehow irrelevant to the matter at hand, which it clearly is not. Worse than predicting an incorrect inference, a dependent A-Quality predicts nothing at all!

Since a dependent A-Quality is a non-starter, let's move on to the independent variation. This would allow for correct predictions, as the cancellation of A-Quality would have no impact on the conditions of A-Quantity. However, for this to be the case, Westera would need to make explicit the independence of A Quantity from the attentional base conditions, and, more importantly, account for why the A-maxims differ from the I-maxims in this regard.

4 Conclusion

At first glance, Dependent and Independent Quantity seem totally equivalent. It makes sense, then, that the formulation of Quantity as dependent has been taken for granted as long as it has. However, as we establish with the case of *To Tell the Truth* establishes, making Quantity dependent on the base conditions is crucial for its functioning in scenarios where the base conditions are altered.

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