

Towards a QUD-Based Analysis of Gapping Constructions

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Abstract

In this paper I examine what have often been considered the syntactic properties of Gapping constructions (Ross, 1970) and show that they are in fact discourse-pragmatic in nature. I offer a novel analysis of Gapping constructions by extending recent Question Under Discussion (QUD)-based accounts in Head-Driven Phrase Structure Grammar (Ginzburg and Sag, 2000; Ginzburg, 2012).

(Roberts, 1996/2012) accounts of non-sentential utterances in HPSG. In Section 2, I review three previous proposals and discuss their problems. In Section 3, I examine some widely accepted assumptions that have been used to characterize the syntax of Gapping constructions and show that they are not fully justified by empirical data. After discussing the relevance of Gapping constructions to QUD, I present a novel QUD-based analysis in Section 4. Section 5 concludes the paper.

1 Introduction

Gapping constructions are characterized by an initial, sentential clause (the *source clause*) and one or more non-initial gapped clauses in which a verb and, optionally, other material are missing (the *gapped clauses*). Some examples are given in (1).¹

- (1) a. Mary loves apples, and Tom, pears.
b. On Saturday, John bought a magazine, and on Sunday, a newspaper.
c. Kim played the guitar, Ray, the piano, and Sue, the bass.

The missing material in gapped clauses is interpreted as if it were there. In (1a), for example, the gapped clause is interpreted as ‘Tom ate pears’, receiving the interpretation of the missing material from the source clause.

In this paper I provide a novel approach to Gapping constructions that builds on recent QUD-based

2 Previous Research

Previous approaches to Gapping constructions can be grouped into three types: deletion-based (Ross, 1970; Sag, 1976; Hartmann, 2000; Chaves, 2005), movement-based (Johnson, 2009; Johnson, 2014), and construction-based (Culicover and Jackendoff, 2005; Abeillé et al., 2013). A sample analysis is given in (2).

- (2) a. [_S Mary ate apples] and [_S Tom ate pears]
b. Mary_x ate_y [_{VP} t_x t_y apples] and [_{VP} Tom t_y pears]
c. [_S Mary ate apples] and [_{XP} Tom pears]

In the deletion-based approach, shown in (2a), gapped clauses have the same structure as their non-gapped counterparts, hence the same meaning. The missing material arises as the result of a deletion under identity with the corresponding material in the source clause. In the movement-based approach, shown in (2b), Gapping constructions are assigned a conjoined VP structure that yields the semantics of complete sentences, and the missing material arises

¹Commas are used to indicate a pause throughout this paper.

as the result of an ATB-style movement of the verb. In the construction-based approach, shown in (2c), gapped clauses are treated as instances of a non-headed construction consisting of a set of phrasal remnants linked to an open proposition that contains the non-focused elements of the source clause.

Each of these approaches have their own problems, however. According to the deletion-based approach, gapped clauses have the syntactic structure of a sentence that includes no missing material. This predicts that gapped clauses would have the same distribution with their alleged non-gapped counterparts. As noted by Culicover and Jackendoff (2005, p.280), however, there are instances of gapped clauses that do not have grammatical non-gapped counterparts:

- (3) a. Paul saw Leslie, but not Leslie (*saw) Paul.
 b. You may have this cake, or him (*may have) that ice cream.

Note that the gapped clauses in (3a) and (3b) have the properties of non-finite categories: The gapped clause in (3a) is selected by a constituent negation that modifies non-sentential phrases, and the one in (3b) has an accusative subject. This suggests that the syntax of a given gapped clause is not equivalent to the syntax of its non-gapped counterpart.

So-called wide-scope readings of scopal operators (Siegel, 1984; McCawley, 1993) present a problem to the deletion-based and construction-based approaches alike. The phenomenon is illustrated by the example in (4), which has the two readings in (a) and (b), dubbed as *wide-* and *distributive-*scope readings, respectively.

- (4) Ward can't eat caviar, and Sue, beans.
 a. *Distributive-scope reading*
 Ward can't eat caviar and Sue can't eat beans. (They have different allergies.)
 b. *Wide-scope reading*
 It can't be the case that Ward eats caviar and Sue eats beans. (That's not fair!)

The first, distributive-scope reading arises if the negation and modal are each interpreted twice, once within the source clause and once within the gapped

clause; the second, wide-scope reading arises if the negation and modal are interpreted only once, taking the entire sentence within their scope.

In the deletion-based approach, gapped clauses are predicted to be semantically equivalent to their corresponding non-gapped clauses. This follows from the alleged syntactic equivalence between a gapped clause and the corresponding non-gapped clause. In the construction-based approach, the missing material is recovered from the non-focused part of the source clause, and this predicts two possibilities: For example, (4) would be interpreted as *Ward can't eat caviar and Sue can't eat beans* (if *can't* is not focused) or as *Ward can't eat caviar and Sue eats beans* (if *can't* is focused), which is semantically odd. Thus, the only acceptable readings that these approaches predict are distributive-scope readings; wide-scope readings remain entirely unexplained.

The difficulty of explaining wide scope readings is circumvented in the movement-based approach by "lowering" the conjunction from where it appears to be located. An example structure is given in (5).

- (5) Ward_x can't eat_y [_{VP} [_{VP} t_x t_y caviar] and [_{VP} Sue t_y beans]]

But such an advantage comes at the cost of empirical perspicuity: Some instances of Gapping constructions do involve a conjoined TP:²

- (6) a. Yesterday we went to the movies, and last Thursday, to the circus. (Sag, 1976, p.265)
 b. To Robin, Chris gave the book, and to Leslie, the magazine. (Kubota and Levine, 2016)

The problem cannot be avoided by simply allowing Gapping constructions to be of two varieties, conjoined VPs or TPs. Consider the example in (7).

- (7) She can't eat caviar, and he/him, beans.

This sentence can be understood to have a wide-scope reading ('It can't be the case that she eats caviar and he eats beans'), suggesting that the sentence is an instance of a conjoined VP. But the

²This type of data was first noted by Sag (1976).

availability of the nominative subject in the gapped clause suggests that a conjoined TP structure is involved. Given this, the fact that (7) can simultaneously have a nominative subject and a wide-scope reading creates a serious problem to the movement-based approach because a single instance of an expression cannot simultaneously be assigned two different structures.

Besides, the acceptability of instances of Gapping constructions does not always match that of their corresponding *wh*-questions, as has previously been noted (Culicover and Jackendoff, 2005, pp.274-275). Between (8a) and (8b), for example, only the latter incurs a violation of constraints on extraction.

- (8) a. Robin believes that everyone pays attention to you when you speak French, and Leslie, German. (Culicover and Jackendoff, 2005, p.273)
- b. #Which language does Robin believe that everyone pays attention to you when you speak?

The contrast in acceptability like the one shown here suggests that the movement operation alleged to be involved in Gapping constructions has little empirical support.

3 Problems of some Common Assumptions

There are some widely held assumptions often used to characterize the syntax of Gapping constructions. In this section I discuss their problems and provide an alternative discourse-pragmatic account.

3.1 The Major Constituent Hypothesis

Since Hankamer (1973, p.18), it has been assumed that the remnants that occur in gapped clauses are syntactically constrained:

- (9) The Major Constituent Hypothesis: A permissible remnant is either immediately dominated by the root clause or by some verbal head.

The Major Constituent Hypothesis is supported by the contrast in acceptability like the one shown by (10a) and (10b) (Examples and judgments are due to McCawley (1988, p.287)). Under this hypothesis, *proud* in (10a) does not qualify as a major constituent while *proud of it* in (10b) does.

- (10) a. ??George became ashamed of the Washington family's past and Martha, proud. (= Martha became proud of the Washington family's past)
- b. George became ashamed of the Washington family's past and Martha, proud of it.

But a more representative set of data invalidates the Major Constituent Hypothesis. A first type of counterexamples involves remnants that are complements of a preposition, such as (11a-c) (Hudson, 1989, pp.59-64). Since P-complements do not qualify as major constituents, the acceptability of these sentences is inconsistent with the predictions generated under the Major Constituent Hypothesis.

- (11) a. John thought about Jane, and Bill, Betty.
- b. Fred has been working on semantics, and Bill, syntax.
- c. Fred sat on a chair, Mary, a stool, and Bill, a bench.

Undoubtedly, there is a tendency for speakers to prefer major constituents as the remnants of Gapping, and some speakers do not fully accept sentences like (11a-c). This tendency is what Hankamer and others have tried to capture under their respective *syntactic* hypotheses. But instead, there is reason to seek an alternative, processing-oriented account. Steedman (1990) notes that the acceptability of sentences like (11-c) is more readily apparent when considered as an answer to questions such as those in (12).

- (12) a. Which boy thought about which girl?
- b. Which student has been studying which specialization?
- c. Which person sat on where?

A second type of problematic data that has been around since McCawley (1993) involves N' remnants. These are known as *determiner Gapping*:

- (13) a. No dog ate Whiskas, and cat, Alpo (= *no cat ate Alpo*).
- b. The duck is dry, and mussels, tough (= *the mussels are tough*).
- c. Bob has read many magazines, and Mary, novels (= *Mary has read many novels*). (Reeve, 2014, p.354)

Other material within a noun phrase than a determiner can additionally go missing, as shown by (14) (Small caps indicates pitch accent).

- (14) a. Many famous LINGUISTS have been DUTCH, and HISTORIANS, GREEK. (= *many famous historians have been Greek*)
 b. Italian RED wines are OUTSTANDING, and WHITE wines, EXCELLENT. (= *Italian white wines are excellent*) (McCawley, 1993, p. 246)³

Sentences like these are easier to understand if the remnants and their correlates are marked by pitch accent. Again, this suggests that remnants only tend to be phrasal constituents and that there is no hard syntactic constraint on their category.

3.2 Restriction to symmetric coordination

Many theories assume that Gapping constructions are restricted to coordination (Jackendoff, 1971; Johnson, 2009):

- (15) a. Some had eaten mussels and others shrimp.
 b. *Some had eaten mussels because others shrimp. (Johnson, 2009, his judgment)

In the movement-based approach (Johnson, 2009; Johnson, 2014), where Gapping constructions are stipulated as conjoined VPs, (15b) is *ungrammatical* because coordination and subordination are incompatible. But Kehler (2002, Ch.4) considers such sentences *unacceptable*, and provides an explanation based on an independently motivated theory of coherence (Hobbs, 1985). For Kehler, the (un)acceptability of (15a) and (15b) are correlated with the types of coherence relation involved: While (15a) involves a Resemblance relation, (15b) involves a Cause-Effect relation⁴. He argues that reasoning with Resemblance relations provides a necessary means to recover the missing material. For example, in (15a) inferring a Resemblance relation

³McCawley judges (14b) as ungrammatical, but many speakers find it acceptable when there is contrastive pitch accent on the remnants and their correlates.

⁴Resemblance relations are a class of coherence relations that hold between sentences in which contrasting entities and properties are highlighted. (Kehler, 2002, pp.15-20)

between the source and gapped clauses amounts to equating *some* with *others*, *mussels* with *shrimp*, and *had eaten* with the missing material. In (15b), however, inferences leading to Resemblance relations are unavailable because a Cause-Effect relation is targeted.

Note, however, that there are instances in which the predictions of these accounts are not observed. Sentences in (16) are naturally occurring instances of Gapping constructions that involve subordination (drawn by a Google search).

- (16) a. Truth is YOU will be in a position to hire ME, before I, YOU.⁵
 b. No doubt THEY will find US, before WE, THEM.⁶
 c. As for me all a little pup has to do is give me one of those sad, entreating looks and I am his prisoner, his pal, his confidant, and slave... Maybe WE love THEM, because THEY, US. (Statesville Daily Record from Statesville, North Carolina)⁷

The speakers I consulted for the judgment of these sentences reported that their acceptability is more obvious if there are pauses as the commas indicate and if the remnants and their correlates are marked by pitch accent. Such improved acceptability in the presence of prosodic cues is unexpected in the movement-based approach, or any theory that relies on any sort of a syntactic assumption. Kehler's analysis is not successful, either. For example, since his explanation for (15b) relies on the incompatibility between a Resemblance relation and a Cause-Effect relation to some degree, it is unclear how sentences like those in (16) would be analyzed.⁸

Alternatively, the (un)acceptability of examples considered so far in this section is expected if one assumes (i) that the missing material in a gapped clause is retrieved from the QUD (Roberts, 1996/2012) evoked by its source clause and (ii) that the ease with which a QUD is evoked and recovered

⁵<http://bit.ly/1TUTcx2>

⁶<http://bit.ly/1PUDHZA>

⁷<http://bit.ly/2bm6Ehi>

⁸In fact, assuming Kehler's definition of Resemblance relations (Kehler, 2002, pp.15-20), nothing in principle prevents understanding (15b) as an instance of a Resemblance relation.

is a function of the ease with which contrastive topics and foci are construed (Hendriks, 2004).

3.3 Wide scope interpretations as the consequence of small coordination

In Section 2 it is noted that Gapping constructions that include missing scopal operators are ambiguous between wide- and distributive-scope readings (Siegel, 1984; McCawley, 1993). Examples in (4) and (13a) are repeated in (17a) and (17b), respectively.

- (17) a. Ward can't eat caviar, and Sue, beans.
b. No dog ate Whiskas, and cat, Alpo.

These sentences can be understood to have the same meaning as their respective counterparts in (18) (= distributive-scope readings). But they can also have a reading in which the negation and modal apply to the entire conjunction (= wide-scope readings).

- (18) a. Ward can't eat caviar and Sue can't eat beans.
b. No boy ate Whiskas and no cat ate Alpo.

In recent studies (Johnson, 2009; Kubota and Levine, 2016) wide-scope interpretations like those of (17a-b) have been identified as a problem in static compositional semantics: In this view, sentences like (17a-b) are problematic because there is a mismatch between the syntactic position of scopal operators and the position in which they receive the appropriate interpretation. For example, the negation and modal in (17a) are embedded within the first conjunct but can nevertheless be interpreted to take scope over the conjunction.

Johnson (2009) and Kubota and Levine (2016) propose to explain wide-scope interpretations on the basis of the observation that such interpretations are the result of the structural asymmetry between the source and gapped clauses, the latter containing missing material.⁹ But the supposed generalization

⁹Johnson assumes that determiner Gapping like (18b) is dependent on the presence of a verbal "gap", but this is problematic, as Kubota and Levine point out:

- (i) No dog barked or donkey brayed last night. (Kubota and Levine, 2016, (39b))

Kubota and Levine instead assume that determiner Gapping is dependent on the presence of a determiner gap only, hence correctly predict the felicity of (i). But they cannot handle data like (20a) as discussed below.

that the wide-scope phenomenon is bounded to coordinate structures that contain missing material has problems. Chaves (2007, p.89) provides examples in which an adverb in the first conjunct outscopes the entire coordination that does not contain missing material:

- (19) a. I usually open the window and the dog starts barking.
usually(I open the window & the dog starts barking)
b. Kim probably is playing Juliet and Fred is playing Romeo.
probably(Kim is playing Juliet & Fred is playing Romeo)

Whitman (2010) offers similar examples that have other scopal operators:

- (20) a. No one measures I.Q. when you apply for a job and you are then paired with employees of your mental ability.
neg(someone measures I.Q. when you apply for a job & then you are paired with employees of your mental ability)
b. They might have escaped and she didn't notice.
might(they have escaped & she didn't notice)

I argue, contra Johnson and Kubota-Levine, that wide-scope interpretations are the consequence of an asymmetry in the way subsequent conjuncts are interpreted in the discourse they occur in: The first conjunct updates the input context and yields a local context for the second conjunct, but not vice versa. In this dynamic view, it is predicted that the scope of an operator embedded in the first conjunct can reach into the second conjunct but the reverse would not be possible. This prediction is borne out in examples like (21): The scope of the negation in the second conjunct is conjunct-bound.

- (21) Syntax is governed by rules of well-formedness which specify [which combinations are permissible and which not].

The examples considered so far show that conjunct-bound scope-taking is a default case and that it

can be overridden by context-dependent processes (Chaves, 2007, p.89).

In order to allow scopal operators in a conjunct to outscope subsequent conjuncts from where they occur, one needs to adopt a dynamic semantic approach. To see this, consider the example in (22a) and its translation in (22b).

- (22) a. Some boy_x went to the army and his_x girlfriend, the navy.
 c. $\exists x(\text{boy}(x) \wedge \text{go-to}(x, \text{army})) \wedge \exists y(\text{girlfriend}(y, x) \wedge \text{go-to}(y, \text{navy}))$

In order for the pronoun in (22a) to be anaphorically linked to *Some boy* in the first conjunct, the existential quantifier must be given a wide scope over the conjunction. In Dynamic Predicate Logic (DPL) (Groenendijk and Stokhof, 1991), the free variable *x* in the second conjunct can be interpreted as bound by the co-indexed antecedent in the first conjunct without having to “raise” the antecedent.¹⁰ This can be achieved by treating the existential and conjunction as dynamic operators, so that the value assigned to *x* in the first conjunct remains available for the second conjunct.¹¹ The approach proposed here, if fully developed, would provide a simple, uniform treatment for various wide-scope phenomena without unnecessary complications.

4 A QUD-based analysis

In 3.1 and 3.2 of Section 3 it was observed that acceptable instances of Gapping constructions are those in which the connections between the remnants and their correlates are easily recognizable. Building on the insights from Levin and Prince (1986), I argue that such connections provide necessary information to recover a QUD evoked by the source clause of Gapping constructions. I assume that such a QUD is locally available in the pragmatics of the gapped clause in the form of a propositional abstract.

I adopt a construction-based HPSG grammar proposed by Ginzburg and Sag (2000) to model Gapping constructions. Informally, the strategy I adopt

¹⁰Nothing hinges on the choice of DPL here, however. Any other type of dynamic semantics would in principle suffice.

¹¹See Poesio and Zucchi (1992) and Wang et al. (2006) for a similar treatment for Telescoping and other similar phenomena.

for the licensing of gapped clauses is to think of them as non-sentential utterances of underspecified category that provide an answer to the QUD introduced by their respective source clauses. To model the discourse context of Gapping constructions, I adopt Ginzburg’s (2012) Dialogue Game-Board (DGB), an independently motivated feature used to model discourse. DGB provides a structured view of discourse by keeping track of which question gets introduced at a given point in discourse and which gets dundated. It is an object of type *dgb*, which specifies information about Maximal Question Under Discussion (MAX-QUD), which itself contains Focus Establishing Constituents (FEC) and Question (Q).

$$(23) \left[\begin{array}{c} dgb \\ \text{MAX-QUD} \left[\begin{array}{cc} \text{FEC} & \text{set}(\text{SemObj}) \\ \text{Q} & \text{Question} \end{array} \right] \\ \dots \qquad \dots \end{array} \right]$$

Roughly speaking, elements within the FEC set correspond to focal utterances (defined as semantic objects), and the Q feature contains the question currently being discussed.¹²

The DGB of a source clause *Mary loves Paul* (as in *Mary loves Paul, and Sue, Bill*) is shown in (24).

$$(24) \text{Uttering}(\text{Mary loves Paul}) \rightsquigarrow \left[\begin{array}{c} dgb \\ \text{MAX-QUD} \left[\begin{array}{cc} \text{FEC} & \left\{ \left[\text{SEM } m \right], \left[\text{SEM } p \right] \right\} \\ \text{Q} & \lambda y. \lambda x. \text{love}(x, y) \end{array} \right] \end{array} \right]$$

The AVM in (24) specifies the partial DGB of a discourse to which the sentence *Mary loves Paul* has just entered. There are two focal elements in the set, *m* and *p* introduced by *Mary* and *Paul*, respectively. These are recorded as possible correlates that would be matched with the focal elements of the incoming sentence. The value of Q in (24) is an open proposition which basically corresponds to the part of the sentence that is not focused.

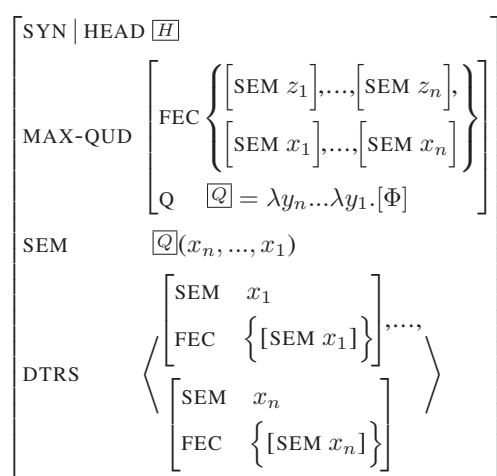
I assume that source clauses are partial answers, and as such they allow a question to persist into

¹²Cf. FEC is defined as a set of Locutionary Propositions in Ginzburg’s (2012, pp.234-237) original formulation.

the upcoming discourse. This means that updating a given discourse by introducing a potential source clause to it would not result in downdating the relevant question in Q. Rather, an incoming gapped clause is entering into a context which has been created by its source clause and is still ‘alive’.

Next, in (25) I introduce the constraints characterizing *gapped phrase*. The key idea here is that gapped clauses are resolved to the variables of the open proposition introduced by the source clause.

(25) *gapped phrase*:



($n \geq 2$)

The SYN(TAX) | HEAD value of the mother is underspecified, and this allows gapped clauses to combine with connectives selecting a non-finite category like *as well as* and *and/but not*.

The constraints on MAX-QUD are partly from the source clauses. The objects in the FEC set correspond to the source clause’s focal elements as well as the remnants of the gapped clauses that are also focal elements. \overline{Q} is an open proposition that corresponds to the unfocused part of the source clause (Φ) and a set of lambda variables.

The constraints on SEM ensure that the semantics of a given gapped clause is obtained on the basis of the propositional abstract \overline{Q} and the semantics of the daughters by applying beta reduction: It is computed by replacing the lambda variables $\lambda y_1 \dots \lambda y_n$ in Q with the semantics of the daughters x_n, \dots, x_1 .

Lastly, the D(AUGH)T(E)RS list contains a list of signs that correspond to the remnants. It is specified that the semantics of the daughters must be

structure-shared with the semantics of the objects within FEC, which ensures that there are no remnants are not focal elements.

The structure in Figure 1 provides an analysis of an instance of *gapped phrase*, *Sue Bill*, that is introduced to the context updated by the source clause *Mary loves Paul*.

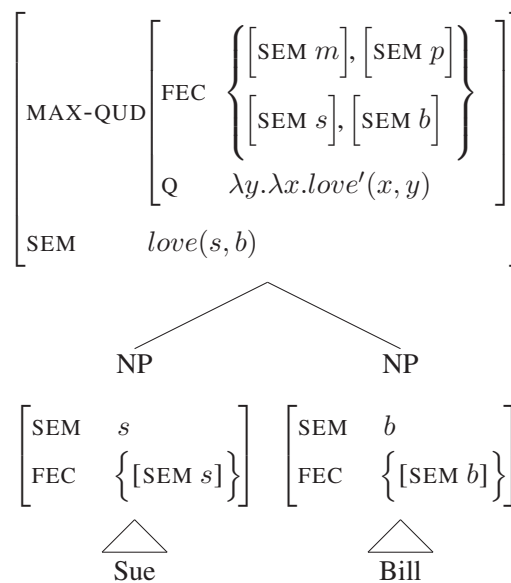


Figure 1: Gapped clause *Sue Bill*

Here s and b represent the semantics of the daughters, *Sue* and *Bill*, respectively. The FEC set contains the semantic objects introduced by the focal elements in the source clause, *Mary* and *Paul*. The semantics of the mother $\text{love}(s, b)$ is obtained by applying the propositional abstract to the semantics of the daughters.

The analysis I have proposed so far has a number of advantages. As is well-known, a given remnant and its correlate must establish contrastive foci (**Mary_x loves apples and she_x, pears*). In my analysis, this is expected because the remnants and their correlates are required to be members of their respective FEC set (See (25)). Furthermore, the precise constraints on contrastive foci are motivated independently by theories of focus (Rooth, 1985; Büring, 2003), which allows us to have a simpler theory of Gapping.

Second, the current analysis does not require that a given remnant-correlate pair must satisfy some sort of structural parallelism: In (25) the head values of

the daughters are not required to be identical to the head values of the respective focal elements. Thus, case-mismatch between a remnant and its correlate like the one in (26) is allowed.

(26) You may have this cake, or him, that ice cream.

Third, in the analysis I proposed, the semantics of gapped clauses is computed by beta-reducing a propositional abstract that contains lambda variables. Because lambda is order-sensitive, the impossibility of case-mismatch like the one shown in (27) is correctly predicted.

(27) #Casablanca was directed by Michael Curtiz, and Roman Polanski, Chinatown. (= Roman Polanski directed Chinatown)

One can think of the reason for the oddness of (27) intuitively: The gapped and source clauses are answers to two different questions, *Which movie was directed by which director?* and *Which director directed which movie?*, respectively. The proposed QUD-based analysis captures this intuition directly by requiring that the semantics of gapped clauses make reference to the structure of the QUD introduced by their respective source clauses.

5 Conclusion

In this work I proposed a QUD-based analysis of Gapping constructions integrated in a more general constraint on fragment utterances, following Ginzburg and Sag (2000) and Ginzburg (2012). The QUD-based constraint on Gapping constructions I proposed enables the semantics of gapped clauses to be constructed based on the semantics of the expressed information and the information retrieved from a contextually provided question under discussion. This QUD-based account correctly predicts the availability of subordinators and sub-phrasal remnants in certain cases of Gapping constructions, and the possibility of wide scope operators in various contexts, all of which pose serious challenges to previous accounts. Further research is required to investigate the precise effect of prosodic factors on acceptability.

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