Local and Global Implicatures in *Wh*-Question Disjunctions

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Abstract: It has been observed that *wh*-questions cannot be joined disjunctively, the suggested reasons being semantic or pragmatic deviance. We argue that *wh*-question disjunctions are semantically well-formed but are pragmatically deviant outside contexts that license polarity-sensitive (PS) items. In these contexts the pragmatic inadequacy disappears due to a pragmatically induced recalibration of the implicature triggered by *or* (as argued in [2]). Importantly, the licensing of the PS property of *wh*-disjunctions cannot be reduced to the licensing of a lexical property of a single item but also depends on the semantics of the disjoined questions. We propose that the alternative-inducing property of *or* has as its syntactic correlate the feature [+σ] (cf. [3]), thus forcing the insertion of the operator O_{ALT}, which is responsible for the computation of implicatures at different scope sites.

Keywords: *wh*-question disjunction, global implicatures, local implicatures, polarity-sensitive items, strengthening, weakening

1 Introduction: The Deviance of *Wh*-Question Disjunctions

Wh-question disjunctions have been observed to be deviant, e.g. [18], [16]: Whereas a conjunction of two questions is fine, s. (1), a disjunction is unacceptable, s. (2).

Which dish did Al make and which dish did Bill make? (1)

Which dish did Al Make or which dish did Bill make? (2)

According to [8], the reason for the deviance of *wh*-question disjunctions is semantic. In [8]'s question theory, a question defines a partition of the logical space. A disjunction of two questions is then a union of two partitions, which is not again a partition: There are overlapping cells. Thus the disjunction of two questions is not a question. According to [16], the reason for the deviance of *wh*-question disjunctions is also pragmatic, the underlying assumption being that speech acts cannot be coordinated disjunctively. Speech acts are operations that, when applied to a

commitment state, deliver the commitments that characterize the resulting state. Speech act disjunction would lead to disjunctive sets of commitments, which are difficult to keep track of. According to [16], a question like (2) could only[1] be interpreted in the way indicated in (3), where the speaker retracts the first question and replaces it by the second. As a result there is only one question to be answered.

Which dish did Al make? Or, which dish did Bill make?   (3)

In this paper we propose that *wh*-question disjunctions do denote proper semantic questions but are pragmatically deviant outside specific contexts. We identify these specific contexts as contexts that license polarity-sensitive items (PSIs). In PSI-licensing contexts, the pragmatic inadequacy disappears due to a pragmatically induced recalibration of the implicature triggered by *or* (cf. [2]). The account developed here does not carry over to alternative questions, which can be viewed as a disjunction of *yes-no*-questions. For recent accounts of these, cf. [17], [1], [10].

2   The Semantics of *Wh*-Questions and *Wh*-Question Disjunctions

For the semantics of *wh*-questions we follow [14] and assume that a question denotes the set of its true answers. For instance, the question *How did Paul get home* has the denotation in (4). Assuming that in the evaluation world Paul got home by bus and by train, the set in (4) is the set given in (5). The weakly exhaustive answer to (4) is the conjunction of all the propositions in the set of true answers, see (6).

$[\![$How did Paul get home?$]\!] = \{p \mid \exists m \, (^\vee p \wedge p = {}^\wedge(\text{Paul got home in manner m}))\}$ (4)

$\{[\![$Paul got home by bus$]\!], [\![$Paul got home by train$]\!]\}$ (5)

Paul got home by bus and Paul got home by train.   (6)

For easier exposition we only consider singleton sets in what follows.

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[1] For some speakers, the disjunction in (2) seems to be felicitous under a reading where it is understood as a directive to choose one of the questions and answer it (thanks to Stefan Kaufmann for pointing this out to us). [9] discuss question disjunctions in the context of questions that have a choice-reading, e.g. *What did someone read?* This question can be understood as a directive to the answerer to choose a person and say for that person what s/he read, e.g. *John read 'War and Peace'*. In this sense, such a question can be understood as a disjunction of *wh*-questions, e.g. *What did John read or what did Mary read or what did Paul read...?* The answerer is to choose one of these questions and answer it. We assume here that a question with a choice reading is a special semantic object – a set of questions – which is quite different from the question denotations in all semantic question theories that have been proposed.

For the disjunction of *wh*-questions we propose that such a disjunction denotes the set of propositions that results from the pairwise disjunction of any two propositions from the respective disjuncts, s. (7). Thus every proposition in the answer set of the first question is conjoined disjunctively with every proposition in the answer set of the second question. For (8) this delivers (9) if in fact Paul got home by bus at 3 a.m. and in no other way and at no other time.

$$[\![\; Q_1 \text{ or } Q_2]\!] = \{p_1 \vee p_2 \mid p_1 \in [\![\; Q_1 \;]\!] \wedge p_2 \in [\![\; Q_2]\!]\}, \tag{7}$$

$$\textit{where } p \vee q = {}^{\wedge}({}^{\vee}p \vee {}^{\vee}q) \text{ for p, q of type } <s,t,>$$

$$[\![\; [_{Q_1} \text{ How did Paul get home?}] \text{ or } [_{Q_2} \text{ When did Paul get home?}]]\!] \tag{8}$$

$$\{ \; [\![\text{Paul got home by bus}]\!] \vee [\![\text{Paul got home at 3 a.m.}]\!] \} \tag{9}$$

The deviance of the question disjunction in (8) can be explained if we consider its pragmatics, more specifically, if we look at it from the point of view of Gricean reasoning [7]. By [14], the weakly exhaustive answer to (8) – viz. (6) above – is a coordination of two propositions that are true in the evaluation world. Conjoining these by *or* violates Grice's Maxim of Quantity: *and* would be more informative without violating Quantity. We suggest that this is the reason for the unacceptability of *wh*-question disjunctions: *wh*-question disjunctions are unanswerable and therefore deviant. This result can be derived 'more directly' without Gricean reasoning if we consider strongly exhaustive (= enriched) answers, s. section 4.

Before closing this section, we would like to point out that our proposal might be rejected on the assumption that the over-informative *and*-answer should pose no problems because it is generally possible to give over-informative answers to questions, cf. (10). So this should be possible for disjoined *wh*-questions as well.

Q: Has someone called for me? A: Yes, Paul did. (10)

We argue below (section 4) that *wh*-question disjunctions do not have a true strongly exhaustive answer and therefore the existence presupposition of *wh*-questions – that there should be such a true strongly exhaustive answer – cannot be satisfied. In this sense there is no such thing as an over-informative answer in these cases.

3   Non-Deviant *Wh*-Question Disjunctions

In the previous section we discussed the observation that *wh*-question disjunctions are deviant and gave an account for why this should be. Note that we only considered matrix questions in that section. Moving on to embedded questions at first sight does not change the picture: Speakers judge the sentence in (11) to be unacceptable.

*The police found out how or when Paul got home that night.   (11)

For some speakers, (11) improves if the question words are heavily accented and if there also is an intonational phrase break after the first question word, as indicated in (12). These phonological means, we suggest, indicate the readings in (12a) or (12b):

%The police found out HOW, or WHEN Paul got home that night.   (12)

a.   The police found out HOW, or rather WHEN Paul got home that
     night.
b.   The police found out HOW, or ~~the police found out~~ WHEN Paul got
     home that night.

(12a) is a retraction reading, similar to the one in (3) discussed in section 1. (12b) is an instance of right node raising, i.e. ellipsis, so that we are not dealing with a question disjunction here but with a disjunction of the matrix clause assertions. These readings are irrelevant for the present discussion. As for the (surface) coordination of the question words *how, when*, s. below.

Now, digging a bit deeper we find that there are actually instances of embedded disjoined questions that are acceptable. As a matter of fact, there are quite a number of contexts that license embedded disjoined questions:

The police did not find out how or when Paul got home that night. *(negation)*   (13)

If the police find out how or when Paul got home that night they can solve the crime. *(antecedent of conditional)*   (14)

Few detectives found out how or when Paul got home that night. *(downward-entailing quantifier)*   (15)

The police hoped to find out how or when Paul came home that night. *(strong intensional predicate)*   (16)

The police might have found out how or when Paul came home that night. *(modalized context)*   (17)

The police refuse to find out how or when Paul came home that night. *(adversative predicate)*   (18)

Have the police found out how or when Paul got home that night? *(question)*   (19)

Find out how or when Paul came home that night! *(imperative)*   (20)

These contexts are all contexts that license PS items. Thus, *wh*-question disjunctions can be classified as polarity-sensitive:

Generalization: The PS Property of *Wh*-Question Disjunctions. *Wh*-question disjunctions are licensed in downward-entailing contexts and in non-downward-entailing contexts that are non-veridical.

A context is non-veridical if for any sentence $C(\phi) —\!/\!\rightarrow \phi$ (= if ϕ occurs in a non-veridical context the truth of ϕ does not follow). Some non-veridical contexts, like negation, are also anti-veridical, which means that if ϕ occurs in such a context the falsity of ϕ follows [5].

Before we proceed we would like to point out that the question word disjunctions considered above indeed correspond to the disjunction of full questions. This can be seen quite easily from the fact that it is possible to coordinate disjunctively the complementizer *if* with a *wh*-word, see (21). Such a disjunction must involve ellipsis as it cannot be derived semantically as a term conjunction.

The police did not find out if or when Paul got home that night. (21)

What about matrix clause ellipsis? -- For the unacceptable example in (11) above, which involved a matrix context that did not license PSIs, we considered the possibility that it might improve for some speakers if the intonational means signal matrix clause ellipsis. For the felicitous examples in (13) through (20) this option is not available. Let us illustrate this for the negation context in (13). If this sentence is assumed to be derived from matrix clause ellipsis its meaning is different:

The police did not find out how or when Paul got home that night. (22)

$$\Leftrightarrow$$

The police did not find out how ~~Paul got home that night~~ or when Paul got home that night.

$$\Leftarrow/\Rightarrow$$

The police did not find out how ~~Paul got home that night~~ or ~~the police did not find out~~ when Paul got home that night.

We conclude from this that ellipsis of the matrix clause is not available as a general point of departure for a unified analysis of disjoined embedded questions. The ellipsis is confined to the embedded clauses. Thus, for the sentence in (13) we assume a syntactic structure like the one below:

[$_{CP root}$ The police did not find out [$_{orP}$ [$_{CP1}$ how ~~Paul got home that night~~]

[$_{or'}$ or [$_{CP2}$ when Paul got home that night]]]] (23)

The (unenriched) meaning of (13) is given in (24), where *ans* corresponds to the Hamblin-style answer operator in [11]. We assume that predicates like *find out* do not embed questions directly: They embed answers to the question, whence the

application of *ans*, which delivers the intersection of the propositions in the answer set to the question.

$$\neg\text{find\_out (the\_police, ans}(\{p_1 \vee p_2 \mid p_1 \in [\![Q_1]\!] \wedge p_2 \in [\![Q_2]\!]\})) \tag{24}$$

$$\text{where ans}(Q) = \cap_{p \in Q} p$$

4   Computing Local and Global Implicatures: Explaining the PS Property of *Wh*-Disjunctions

In section 2 we explained the deviance of matrix *wh*-question disjunctions by appealing to Gricean reasoning: The disjunctive operator *or* gives rise to a scalar alternative – the conjunctive operator *and* –, which would have been the better choice by the Maxims of Quantity and Quality. In the previous section we proposed that *wh*-question disjunctions are polarity-sensitive. Now, scalar implicatures have also been argued to play an important role in the licensing of PS items like *any*. [13] suggest that *any*-NPs are indefinites which come with an instruction to the hearer to consider domains of individuals that are broader than what one would usually consider, i.e. *any*-NPs are domain wideners. In downward-entailing contexts like negation domain widening strengthens a statement because excluding a larger domain of individuals leads to a more informative statement than excluding a smaller domain of individuals. [15] links these consideration directly to quantity implicatures and suggests that a NPI like *any* activates alternatives with smaller domains, which triggers the implicature that the alternative selected is the strongest one the speaker has evidence for. The fact that *wh*-question disjunctions are licensed in exactly those contexts that license PS items is thus very suggestive of a close link along these lines of reasoning.

    What will be important for the data we consider here is the observation that implicatures can also arise in embedded contexts. This is somewhat unexpected if pragmatic reasoning is assumed to follow all syntactic and semantic computations, and it has led [2] to argue for a 'more grammatical' view of implicatures, which we take our findings to be supporting evidence for. To start with, consider the following embedded disjunction:

The police found out that Paul got home by bus or that he got home at 3 a.m.   (25)

The preferred reading of *or* in (25) is the exclusive one: (25) could describe the findings of the police if the busses stop at 12 p.m. – Paul would have been home by 12 if he took the bus, or later (such as at 3 a.m.) if he did not take the bus. The implicature in (25) is a local scalar implicature, see (26), the global implicature would be the one in (27), and it is weaker than the local implicature: it is compatible with the police attaining the knowledge that it is possible that $(p \wedge q)$.

$$\text{find\_out(the\_police, } (p \lor q) \land \neg(p \land q)) \tag{26}$$

$$\text{find\_out(the\_police, } (p \lor q)) \land \neg\text{find\_out(the\_police, } (p \land q)) \tag{27}$$

$\cong$ The police found out that $(p \lor q)$ and the police did not find out
anything with respect to $(p \land q)$

[2], [3] suggest that the difference between local and global implicatures can be put down to an operator O_{ALT} for scalar enrichment that can attach at various scope sites:

$$O_{ALT}(p) = p \land \forall q \in \text{ALT} [{}^{\lor}q \rightarrow p \subseteq q] \tag{28}$$

O is a mnemonic for *only* : p and its entailments are the only members of ALT that hold. In the case of *or*: ALT = $\{p_1 \lor p_2, p_1 \land p_2\}$ for $p = p_1 \lor p_2$. In the case of (25), O_{ALT} applies to the embedded *or*P, yielding the enriched meaning given below:

$$\text{find\_out(the\_police, } O_{ALT}(p_1 \lor q_2)) \tag{29}$$

$$\Leftrightarrow$$

$$\text{find\_out(the\_police, } (p \lor q) \land \neg(p \land q))$$

where $p_1 = $ ⟦Paul got home by bus⟧, $p_2 = $ ⟦Paul got home at 3 a.m.⟧

Turning to embedded *wh*-question disjunctions like (11) from section 3 above, repeated below for convenience, the insertion of O_{ALT} at the level of *or*P yields the following equivalence:

*The police found out how or when Paul got home that night. (= (11)) $\qquad$ (30)

$$\text{find\_out(the\_police, } O_{ALT}(\text{ans}(\{p_1 \lor p_2 \mid p_1 \in \text{⟦CP}_1\text{⟧} \land p_2 \in \text{⟦CP}_2\text{⟧}\})))$$

$$\Leftrightarrow$$

$$\text{find\_out(the\_police, } (p_1 \lor p_2) \land \neg(p_1 \land p_2))$$

where (by our assumptions on the meaning of questions) p_1 *and* p_2 *are*
true in the actual world

Importantly, the strongly exhaustive answer to the embedded question in (11) is false in the actual world. This produces a presupposition failure under the factive verb *find out*, and more generally, a failure of the existence presupposition of the embedded *wh*-question Q, viz. $\exists p ({}^{\lor}p \land p = O_{ALT}(\text{ans}(Q)))$, which explains why *wh*-disjunctions neither can be embedded under non-factive verbs like *tell* (not illustrated). Furthermore, this also explains the matrix case without Gricean reasoning: In the

matrix case, O_{ALT} can only be inserted at the matrix level. This produces a violation of the presupposition that there must be a true strongly exhaustive answer.

If the local insertion of O_{ALT} produces an unacceptable sentence we might wonder, of course, why it is not global insertion that is applied. The resulting enriched meaning would be the following (cf. (27) above).

find_out(the_police, $(p_1 \lor p_2)$) $\land$ ¬find_out(the_police, $(p_1 \land p_2)$)   (31)

    $\cong$ *where* p_1 and p_2 are true in the actual world *& where* ¬find_out
    means did not acquire knowledge about.

Inserting O_{ALT} at the root level leads to a rather weak interpretation but it does not lead to deviance. Still, this reading does not seem to be available. This is surprising given that O_{ALT} generally can be inserted at any scope site (cf. [4]). We have some preliminary evidence that under very specific contextual conditions the preference for the local implicature can be overridden. Unfortunately we do not have the space to discuss this here (see [11]).

Let us turn next to felicitous embedded *wh*-question disjunctions starting with downward-entailing contexts, e.g. (13) with negation. [2] observes that the downward-entailing property of an operator like negation in the matrix clause typically induces a recalibration of the implicature because local enrichment would lead to weakening in these contexts. Thus, O_{ALT} applies to the matrix clause, s. (32). The equivalence in (32) holds because ¬find_out(x, $p_1 \lor p_2$) $\subseteq$ ¬find_out(x, $p_1 \land p_2$)).

The police did not find out how or when Paul got home that night. (= (13))   (32)

    O_{ALT} (¬find_out(the_police, ans({$p_1 \lor p_2 \mid p_1 \in$ [[CP$_1$]] $\land p_2 \in$ [[CP$_2$]]}))))

                    $\Leftrightarrow$

    ¬find_out(the_police, $p_1 \lor p_2$), where p_1 and p_2 are true in the actual world

In the present case, application of O_{ALT} to the matrix clause does not produce an implicature. That the result in (32) is correct can be seen from the fact that *The police do not believe that Paul came home by bus or that he came home at 3 a.m.* is equivalent with *The police believe neither that Paul came home by bus nor that he came home at 3 a.m.* (with embedded declaratives we must use a non-factive matrix predicate to avoid interfering presuppositions). This result carries over to all other downward-entailing contexts.

Turning to contexts that are not downward-entailing but nevertheless license embedded *wh*-question disjunctions, let us consider questions. That questions are not downward entailing can be see from the fact that the positive answer to an *or*-question like the one in (33), is entailed by the positive answer to an *and*-question like the one in (34). In other words, the *or*-question is actually weaker than its alternative.

A: Have the police found out how or when Paul got home that night? B: Yes.   (33)

A: Have the police found out how and when Paul got home that night? B: Yes.   (34)

Why would *or* be licensed if the semantics of the disjoined questions licenses the use of *and*? Asking weaker questions often is pragmatically advantageous [15]. First observe that positive *yes-no* questions come with no particular bias as to the expected answer (*yes* or *no*). In order to optimize the information gain from both possible answers, the speaker will try to maintain an equilibrium between the informational value of the positive and the negative answer ([15], also cf. [19]'s notion of *entropy*). Importantly, the weaker a question is the more balanced the answers are, and the better the information gain is in proportion to the likelihood of the answer. This can be seen quite easily when considering guessing games where participants must guess e.g. the occupation of an invited person. In such a game, asking the rather weak question in (35) maximizes the information gain because the likelihood of receiving the *yes-* vs. the *no*-answer is roughly the same. This is different in a strong question like (36), where the *no*-answer would yield hardly any information gain.

Are you involved in the production/ distribution of a product?   (35)

Are you a hearing aid audiologist?   (36)

For questions as licensing contexts, inserting O_{ALT} at the root level rather than at the embedded level yields the weaker question.

5   Conclusion

Our analysis lends strong support to the central claim of [2] that the syntactic distribution of PS items is determined by grammatically conditioned pragmatic principles. The PS property of *wh*-disjunctions is semantically composed of two independent properties: the semantic/pragmatic property of *or* to induce (scalar) alternatives, and the semantics of the disjoined questions. This means that the licensing of the PS property cannot be reduced to the licensing of a lexical property of a single item (as has been suggested e.g. for *any* as having the property of denoting a 'dependent variable', cf. [6]. If there is a syntactic feature involved in the licensing of the PS property it must be the syntactic correlate of the alternative-inducing property of an element like *or*, cf. the feature $[+\sigma]$ in [2]. This is what we assume here: *or* always comes with $[+\sigma]$, which forces the insertion of O_{ALT} as discussed above.

References

1 Beck, S., Kim, S.-S.: Intervention Effects in Alternative Questions. Journal of Comparative Germanic Linguistics 9, 165--208 (2006)

2 Chierchia, G.: Scalar Implicatures, Polarity Phenomena, and the Syntax/Pragmatics Interface. In: Belletti, A. (ed.) The Cartography of Syntactic Structures. Structures and Beyond, vol. 3, pp. 39--103 .Oxford University Press, Oxford (2004)

3 Chierchia, G.: Broaden Your Views. Implicatures of Domain Widening and the "Logicality" of Language. Linguistic Inquiry 37, 535--590 (2006)

4 Chierchia, G., Fox, D., Spector, B.: The Grammatical View of Scalar Implicatures and the Relationship between Semantics and Pragmatics. In: Maienborn, C., von Heusinger, K., Portner, P. (eds.) Semantics: An International Handbook of Natural Language Meaning. De Gruyter, Berlin (to appear)

5 Giannakidou, A.: Polarity Sensitivity as (Non)Veridical Dependency. Benjamins, Amsterdam (1998)

6 Giannakidou, A.: Negative and Positive Polarity Items: Variation, Licensing, and Compositionality. In: Maienborn, C., von Heusinger, K, Portner, P. (eds.) Semantics: An International Handbook of Natural Language Meaning. De Gruyter, Berlin (to appear)

7 Grice, P.: Studies in the Way of Words. Harvard University Press, Cambridge, MA (1989)

8 Groenendijk, J., Stokhof, M.: Semantic Analysis of *Wh*-Complements. Linguistics and Philosophy 5, 175--233 (1982)

9 Groenendijk, J., Stokhof, M.: Studies on the Semantics of Questions and Pragmatics of Answers. PhD Thesis, University of Amsterdam (1984)

10 Haida, A. The Syntax and Semantics of Alternative Questions: Evidence from Chadic. Proceedings of Sinn und Bedeutung 14. Vienna (to appear)

11 Haida, A., Repp, S.: Disjunction in *Wh*-Questions. Proceedings of NELS 40 (to appear)

12 Heim, I.: Interrogative Semantics and Karttunen's Semantics for *Know*. In: Proceedings of IATL 1, pp. 128—144. Akademon, Jerusalem (1994)

13 Kadmon, N., Landmann, F.: Any. Linguistics and Philosophy 15, 353--422 (1993)

14 Karttunen, L.: Syntax and Semantics of Questions. Linguistics and Philosophy 1, 3--44 (1977)

15 Krifka, M.: The Semantics and Pragmatics of Polarity Items. Linguistic Analysis 25, 209--257 (1995)

16 Krifka, M.: Quantifying into Question Acts. Natural Language Semantics 9, 1--40 (2001)

17 Romero, M., Han, C.-h.: Focus, Ellipsis and the Semantics of Alternative Questions. In: Beyssade, C., Bonami, O., Hofherr, P.C., Corblin, F. (eds.) Empirical Issues in Formal Syntax and Semantics, vol. 4., pp. 291 --307. Presses Universitaires de Paris-Sorbonne, Paris (2003)

18 Szabolcsi, A.: Quantifiers in Pair-List Readings. In: Szabolcsi, A. (ed.) Ways of Scope Taking, pp. 311--347. Kluwer, Dordrecht (1997)

19 van Rooy, R.: Negative Polarity Items in Questions: Strength as Relevance. Journal of Semantics 20, 239--273 (2003)