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QUANTIFYING QUESTION PARTICLES IN GERMAN: SYNTACTIC EFFECTS ON INTERPRETATION

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Abstract

The paper presents an analysis of the German *quantifying question particles* (QQPs) *w-so* and *w-alles*. It is shown that the syntactic position of these particles, i.e. their formal association with a particular *wh*-item, is relevant for their semantic representation, contrary to claims in Beck (1996). The effects of syntactic structure on semantic interpretation are captured by treating QQPs as modifiers on structured propositions that place additional restrictions on the question domain introduced by the *wh*-item: *w-so* introduces a plurality condition on the answer space, whereas *w-alles* has two meaning components: next to adding a plurality condition, it indicates that the question requires an exhaustive answer. The existence of explicit markers of exhaustiveness in *wh*-questions has important consequences for the analysis of *wh*-questions as inherently exhaustive (Groenendijk & Stokhof 1982, 1984) or not (Beck & Rullmann 1999).

1 Introducing *wh*-modifiers

Many languages exhibit strategies for semantically modifying the *wh*-item in a *wh*-question, such that the question domain is further restricted. Such semantic restriction on questions can target various semantic dimensions (cf. Siemund 2001 for a typological overview). First, the semantic restriction can concern the animacy of the questioned entity. This distinction is often lexicalized, as in (1ab) from English:

(1) a. *Who* did Peter see? = For which x, *x a person*, Peter saw x?
b. *What* did Peter see? = For which x, *x a thing/ event*: Peter saw x?

Second, the restriction can concern the gender of the questioned entity. Icelandic, for instance, has a three-way split between questions asking for masculine (2a), feminine (2b), and neuter entities (2c), respectively, which is expressed by means of different suffixes on the *wh*-item:

(2) a. hver-*jir* (who-PL.M) b. hver-*jar* (who-PL.F) c. hver-∅ (who-PL.N)

Third, questions can be further restricted by combining a *wh*-determiner with an overt NP-complement: The *which*-phrase in (3) restricts the question domain to the set of (contextually relevant) students:

(3) *Which student* did Peter invite? = For which x, *x a student*: Peter invited x.

Furthermore, the *wh*-item can also be modified with respect to the (expected) number of elements in the answer space. There are two sub-cases to this kind of restriction, which I will refer to as as *quantifying wh-modification*. First, the elements in the question domain and its corresponding answer space can be specified for number, as witnessed by the three-way system of Finnish in (4), and the two-way system of Hausa in (5):

(4) a. kuka = who.SG: for which x, *x an atomic person*, …
b. ketka = who.PL: for which x, *x a plural group of persons*, …

c. kumpi = who.DUAL: for which x, *x a group of two persons*, …

(5) a. wàa = who

b. *su*-wàa = PL-who

Second, the answer space can be specified for exhaustiveness, as illustrated by the following Hausa examples in (6ab). The unmodified *wh*-question in (6a) is unspecified for exhaustiveness and can be answered by naming just one individual satisfying the background predicate. In contrast, the *wh*-question in (6b) contains the particle *nee/cee*, which is analyzed as a marker of exhaustiveness in Hartmann & Zimmermann (submitted). Correspondingly, the answer must also specify a complete list of individuals satisfying the background predicate, as witnessed by the obligatory occurrence of the exhaustiveness marker:

(6) a. Q: Wàa ya zoo? (*unmodified*)
who 3sg.m.perf.rel come
'Who came?

A: Audù ya zoo.
Audu 3sg.m.perf.rel come
'Audu came (possibly together with other people).

b. Q: Wàanee-*nèe* ya zoo? (*EXH-marker*)
who-EXH 3sg.m.perf.rel come
'Who all came?'
A: Audù #(nee) ya zoo.
Audu EXH 3sg.m.perf.rel come
'It is Audu that came (and nobody else came).'

As the foregoing examples make clear, languages vary with respect to how quantifying *wh*-modification is encoded in the grammar. Some languages have lexicalized the distinction in form of different *wh*-expressions, cf. Finnish (4), while others make use of additional particles, as shown in (5) and (6) for Hausa, and in (7) for German:

(7) a. Was hast du gemacht ?
what have you done
'What have you been up to?'

b. Was hast du *so* gemacht ?

c. Was hast du *alles* gemacht

While (7a) is unspecified as for how many activities were performed, (7b) asks for a list of activities and (7c) asks for the complete list of all (relevant) activities. That is, the presence of *so* in (7b) triggers a plurality effect, and the presence of *alles* in (7c) triggers a twofold semantic effect of pluralization and maximization. The objective of this paper is to provide an in-depth semantic analysis of the quantifying question particles (henceforth: QQPs) *w-so* and *w-alles* in German, which addresses the questions in (8) from Reis (1992):

(8) i. What is the structure of *wh*-phrases containing quantifying question particles?

ii. What is the semantics and pragmatics of quantifying particles, and how exactly do they interact, for example, with the semantics and pragmatics of *wh*-interrogatives?

iii. Are there parallels to quantifying question particles in other languages?

Section 2 gives an overview over formal and semantic properties of the QQPs *w-alles* and *w-so*. Section 3 presents the semantic analysis of QQPs. Section 4 adds some cross-linguistic observations concerning similar semantic phenomena in other languages. Section 5 concludes with some remarks on the general theoretical implications for the analysis of *wh*-questions.

2 Formal and semantic properties of QQPs in German

There are few studies of German QQPs in the existing literature. Notable exceptions are Reis (1992), who concentrates mainly on the formal properties of QQPs, Beck (1996), and Beck & Rullmann (1999), who focus on the semantics of *w-alles*, and Reich (1997).

2.1 Formal properties of QQPs (Reis 1992)

The formal properties of QQPs are discussed in much detail in Reis (1992). First, the QQP *w-alles* differs from the floated quantifier (FQ) *alle* in a number of ways. To name but a few differences, unlike the FQ, the QQP *w-alles* is morphologically invariant, showing no case or number agreement with the *wh*-item. Second, the QQP *w-alles* is compatible with *wh*-PPs, unlike the FQ *alle*, which cannot take PP-antecedents. Finally, the two expressions exhibit meaning differences, as illustrated in (9ab). While (9a) can be answered by naming one author whose books were all disliked by the critic, the QQP *w-alles* in (9b) directly specifies the possessive *wh*-item, asking for an exhaustive list of authors such that the critic disliked (some) books by these authors. See Reis (1992) for detailed discussion and additional differences between the two items.

(9) a. [*Wessen Bücher*] hat Reich-Ranicki *alle* schlecht rezensiert?
whose books has Reich-Ranicki all$_{ACC}$ critically reviewed
'Who is the author x, such that R-R critically reviewed all of x's books?'

b. [*Wessen* Bücher] hat Reich-Ranicki *alles* schlecht rezensiert?
Whose books has Reich-Ranicki all critically reviewed
'For which list of authors x,y,z,…, R-R critically reviewed books by x,y,z?'

Concentrating on QQPs, it shows that their syntactic distribution corresponds closely to that of the *wh*-items themselves. Like these, QQPs can occur in base position, in intermediate position, and in SpecCP (Reis 1992: 483-484):[1]

(10) a. Wen$_i$ (*alles*) hat er t_i (*alles*) gestern t_i (*alles*) besucht?
who all has he all yesterday all visited
'Who all did he visit yesterday?' [Reis 1992: 465, ex.2a]

b. Mit wem$_i$ (?*so) habt ihr denn t_i (so) in der Kneipe t_i (so) gesprochen?
With whom SO have you PRT SO in the pub SO talked
'Who-SO did you talk to in the pub?' [Reis 1992: 481, ex.50c]

The distribution of the QQPs in (10) suggests a close structural relation between the QQP and the *wh*-item or its trace. Here, I will follow Reis (1992) and assume that the QQPs *w-alles* and *w-so* are right-adjacent to the *wh*-item or its trace. This conclusion is strengthened by the fact that QQPs can occur adjacent to *wh*-items *in situ*, e.g. in the multiple questions in (11).

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[1] The degraded status of *so* in the *Vorfeld* in (10b) might suggest that *w-alles* and *w-so* do not belong to the same class of functional elements, a suggestion also found in Reich (1997). One possibility is that *w-so* is diachronically derived from a modal particle and has retained the basic structural properties of these elements, such as non-accentability and the obligatory occurrence in the middle field. At the same time, the analogous behaviour of *w-alles* and *w-so* in (iab), where the *wh*-item has been overtly extracted from an extraposed infinitival clause, suggests that the two expressions DO have the same status after all.

(i) a. ?Wem$_1$ hat Peter versucht [t_1 alles zu helfen]$_1$?
b. ?Wem$_1$ hat Peter versucht [t_1 so zu helfen]$_1$?
Who$_{DAT}$ has Peter tried all/SOto help

In both cases, the embedded QQP is (marginally) able to associate with the fronted *wh*-item, arguing for a tight structural relation at some level of representation. If the judgments in (iab) are correct, they support a parallel treatment of both *w-alles* and *w-so* as QQPs, while the degraded status of *so* in the Vorfeld must be due to independent reasons.

(11) a. Wer hat denn gestern [[wen] *alles*] getroffen ?
who has then yesterday whom all met

b. Wer hat denn gestern [[wen] *so*] getroffen ?
who has then yesterday whom met

'Who has met whom-ALL / whom-SO yesterday?'

These findings naturally raise the question of whether the close structural relationship between QQPs and (the traces of) *wh*-items has semantic effects. In section 3, we will answer this question in the affirmative by showing that QQPs have a direct semantic effect on the *wh*-item they syntactically construe with.

Finally, it is worth pointing out that QQPs are not restricted to matrix questions, but can also be embedded under intensional and extensional matrix predicates alike (cf. Reich 1997):

(12) a. Hans fragt sich, wen Peter alles / so trifft. (intensional V)
Hans wonders who Peter all / SO meets
'Hans wonders whom-all/ whom-SO Peter meets.'

b. Hans weiß, wen Peter alles / so trifft. (extensional V)
Hans knows who Peter all / SO meets
'Hans knows whom-all/ whom-SO Peter meets.'

The occurrence of QQPs in embedded position suggests that these elements do not quantify into questions acts in the sense discussed in Krifka (2001b) and Hara (2007).

2.2 Semantic properties of QQPs

Semantically, QQPs show co-occurrence restrictions with *wh*-items of different semantic kinds. In particular, *w-alles* is restricted to occur with *wh*-expressions ranging over individuals, such as *wer*, *wen*, and *was* (13a-c). It is significantly worse with locative *wo* and temporal *wann* (13de), and impossible with the manner expressions *wie* 'how' and the causal *warum* 'why' (13fg).[2] The combinatory possibilities of *w-so* are considerably more relaxed, as *w-so* is only blocked with *wh*-expressions asking for reasons and causes (14g):

(13)	a.	Wer ist *alles* zur Party gekommen?	who-all came to the party?
	b.	Wen hat er *alles* eingeladen?	whom-all did he invite?
	c.	Was hat er *alles* gegessen?	what-all did he eat?
	d.	?* Wo ist er *alles* gewesen?	where-all has he been?
	e.	* Wann hast du nächste Woche *alles* Zeit?	when-all will you have time?
	f.	* Wie hat er *alles* die Aufgaben gelöst?	how-all did he solve the exercises?
	g.	* Warum/Wieso ist er *alles* gekommen?	why-all did he come?
(14)	a.	Wer ist *so* zur Party gekommen?	who-SO came to the party?
	b.	Wen hat er *so* eingeladen?	whom-SO did he invite?
	c.	Was hat er *so* gegessen?	what-SO did he eat?
	d.	Wo ist er *so* gewesen?	where-SO has he been?
	e.	Wann hast du nächste Woche *so* Zeit?	when-SO will you have time?
	f.	Wie hat er sich *so* geschlagen?	how-SO has he been doing?
	g.	?*Warum/Wieso ist er *so* gekommen?	why-SO has he come?

[2] The acceptability of the examples (13fg) improves dramatically if the construal of a plurality of reasons or manners is facilitated by the choice of a grammatically plural *wh*-phrase, such as *auf welche Arten* 'in which ways' and *aus welchen Gründen* 'for which reasons'. This shows that the degraded status of (13fg) does not follow from a general semantic incompatibility of *w-alles* and the ontological domains of manners and reasons.

Turning to the semantic contribution of the two QQPs, both of them add a *plurality* condition to the *wh*-question, such that it asks for pluralities of individuals, which furthermore must be divisible. This plural requirement is witnessed by the fact that *w-alles* and *w-so* are illicit in a *wh*-question when the reference of the *wh*-item is restricted to atomic individuals, either grammatically (15), or by the context (16) or by general world knowledge (17):

(15) * Welches Buch$_{sing}$ hat er *alles* / so gelesen?
which book has he all SO read
'Which book-ALL/SO did he read?'

(16) # Wer ist gestern *alles* / so zum neuen Papst gewählt worden?
Who is yesterday all SO to-the new pope chosen been
'Who-ALL/SO has been elected for pope yesterday?'

(17) # Wer ist *alles* / *so* die Mutter von Johanna?
who is all SO the mother of Jeanne
'Who-ALL/SO is the mother of Jeanne?'

As a consequence of the plurality condition, questions with QQPs require that the answer specify a *divisible* plural individual, instead of just an atomic individual (18), or an indivisible group individual occurring with collective predicates (19).

(18) Q: Wen hast du *alles* / *so* zu deiner Party eingeladen?
who have you all so to your party invited
'Who-all/SO Have you invited to your party?'

A1: # *Klaus.*

A2: Nur Klaus
only Klaus

(19) Q: Wer hat *alles* / *so* einander geheiratet?
who has all SO each.other married
'Who-ALL/SO married each other?'

A: # Klaus und Maria.
Klaus and Mary

In addition to the plurality condition, *w-alles* adds a second meaning component of exhaustiveness (Reis 1992: 465): The presence of this QQP necessitates a complete listing of all individuals questioned when the context is such that the questioned background predicate is satisfied by more than one individual. Exhaustiveness in questions is illustrated in (20Q), which cannot be answered by mentioning just some of the presenters at SuB11 (20A).

(20) Q: Wer hat *alles* bei SuB11 vorgetragen?
who has all at SuB11 presented
'Who-ALL presented at this year's SALT?'

A: # Ein MIT-Student und Gennaro Chierchia.
An MIT student and Gennaro Chierchia

Similarly, embedded *wh*-questions with *w-alles* do not occur easily under non-exhaustive matrix predicates:

(21) Peter listet *lückenhaft* auf, wen er (??*alles*) getroffen hat.
Peter lists incompletely PRT whom he all met has
'Peter gives an incomplete list of all the people that he met.'

Turning to the meaning of *w-so* again, Reis (1992), as well as Beck & Rullmann (1999), argues that this QQP expresses non-exhaustiveness (in addition to plurality). On closer

scrutiny, though, exhaustive answers to *wh*-questions with *w-so* turn out to be felicitous, cf. (22a). Furthermore, *wh*-questions with *w-so* can be embedded under matrix predicates implying exhaustiveness, cf. (22b) (see Reich (1997: 91) for a diverging judgment).

(22) a. Q: Was hast du gestern auf der Party *so* getrunken ?
what have you yesterday at the party SO drunk
'What-SO did you drink at yesterday's party ?'

A: Ich habe Wein, Bier und Schnaps getrunken.
I have wine beer and schnapps drunk.
'I drank wine, beer, and schnapps.'

b. Peter listet *vollständig* auf, wen er *so* getroffen hat.
Peter lists completely PRT whom he SO met has
'Peter gives an incomplete list of all the people that he met.'

The data in (22ab) show that questions with *w-so* allow for non-exhaustive answers, but do not force them. For this reason, non-exhaustiveness need not be explicitly encoded in the meaning of *w-so*. Summing up, the QQP *w-alles* adds two meaning components to *wh*-questions, namely plurality and exhaustiveness, while *w-so* adds only a plurality requirement.

2.3 Joint occurrence of QQPs

Before proceeding with the analysis of QQPs, please observe that more than one of them can be found in a single *wh*-question. Both QQPs can occur together in simple *wh*-questions (Reich 1997), cf. (23). And multiple instances of (the same) QQPs can occur in multiple questions, modifying different *wh*-expressions (Reis 1992, Beck 1996), cf. (24ab):

(23) Wen hat Gabi gestern *so alles* getroffen ?
who has Gabi yesterday SO all met
'Who-SO did Gabi meet yesterday ?'

(24) a. Wer *alles* hat damals wen *alles* furchtbar ernst genommen ?
who all has then whom all terribly serious taken
'Who all did take whom all very serious back then?' [Reis 1992: 485, ex.64a]

b. Wer hat *so* wen *alles* angerufen?
who has SO whom all called
'Who-SO called whom all?'

3 The analysis of QQPs

To my knowledge, the analysis in Beck (1996) is the only explicit formal analysis of the QQP *w-alles*. Section 3.1 introduces the analysis and its predictions. Section 3.2 provides evidence against the analysis. Section 3.3 presents an alternative analysis that is based on the observation that the syntactic position of a QQP has an effect on the semantic interpretation of its containing *wh*-question. Section 3.4 sums up the main results, while section 3.5 raises an additional issue pertaining to the status of the semantic contribution of QQPs as a presupposition or as part of the propositional question meaning.

3.1 Beck's (1996) analysis of *w-alles*

According to Beck (1996), the QQP *w-alles* raises at LF and takes the entire *wh*-question as its argument, mapping the question denotation onto a modified question denotation. Since the question denotation is construed as a Hamblin-set of answers (Hamblin 1973), *w-alles* takes this set and maps it onto a set of mutually exclusive exhaustive alternatives. Informally, the effect of *w-alles* on a question denotation is shown in (26b) (Beck 1996:9):

(25) a. [[Wer ist gegangen?]] = {Sarah left, Jenny left, Hans left} = Q
'Who left?'
↓
b. [[Wer ist *alles* gegangen?]] = {Sarah left and Jenny left and nobody else left,
'Who-all left?' Sarah left and nobody else left,
Jenny left and nonody else left, ...}

A formal characterization of the meaning of *w-alles* is given in (26), where the variables *Q* and *X* range over sets of propositions (Beck 1996:10):

(26) alles'(Q) = $\{\cap (X \cup \{\lambda w. \neg\exists q [q \notin X \& q \in Q \& q(w)]\}): X \subseteq Q\}$

The working of (26) is best illustrated by means of a concrete example: Let D = {Sarah, Jenny, Hans}, in which case Q = {λw. Sarah left in w, λw. Jenny left in w, λw. Hans left in w}. Then for arbitrary X = {λw. Sarah left in w, λw. Jenny left in w} ∈ Q, the innermost curly bracket will get the value in (27a). Union formation with X yields (27b), the big intersection of which is shown in (27c):

(27) a. $\{\lambda w. \neg\exists q [q \notin X \& q \in Q \& q(w)]\}$
= the singleton set containing the set of worlds in which the proposition λw. Hans left in w is not true, i.e. in which Hans did not leave

b. $X \cup \{\lambda w \neg\exists q [q \notin X \& q \in Q \& q(w)]\}$
= the union of sets of worlds in which Sarah left, in which Jenny left, and in which Hans did not leave

c. $\cap (X \cup \{\lambda w \neg\exists q [q \notin X \& q \in Q \& q(w)]\}): X \subseteq Q$
= the set of worlds in which Sarah left, Jenny left, und nobody else left

Applying the same procedure to all sets X ∈ Q will yield a set of mutually exclusive exhaustive propositions, as informally specified in (25b). The analysis of *w-alles* in (26), then, appears to get us the correct result for (25b).

On closer inspection, though, the analysis makes two incorrect predictions. First, since the QQP combines semantically with the question denotation as a whole, i.e. with a set of propositions, it has no means of making direct reference to the meaning of a particular *wh*-item. Therefore, the observed syntactic association of *w-alles* with a *wh*-item should be irrelevant for the meaning of the modified question as a whole, cf. Beck (1996: 10, fn.8).[3] Second, the analysis of *w-alles* in (26) makes no reference to plurality and therefore predicts answers containing a single atomic individual to be felicitous, in spite of the plurality effects observed in (15) to (17).

3.2 Evidence against Beck (1996)

There are three kinds of evidence against the analysis of *w-alles* in Beck (1999). First, it shows that the syntactic construal of the QQP with a particular *wh*-item DOES have an effect on interpretation, suggesting that the QQP does not combine with a set of propositions semantically. Consider the question variants in (28a-c) and their possible answers in context C of a papal election with only one ballot, *where each voter has only one vote*. Crucially, (28a) is felicitous in context C, whereas (28bc) are not.

(28) a. Wer$_i$ hat *alles*$_i$ bei der gestrigen Wahl für wen gestimmt?
who has all at the yesterday's election for whom voted
'*Who-all* voted for whom in yesterday's election.' [*w-alles* + SUBJ]

[3] The modified analysis of *w-alles* in Beck & Rullmann (1999) makes the same prediction.

A: Cardinal X voted for *Ratzinger*, Kardinal Y for *the African candidate*, ...

b. # Wer hat bei der gestrigen Wahl für [wen *alles*] gestimmt?
who has at the yesterday's election for whom all voted
'Who voted for *whom-all* in yesterday's election?' [*w-alles* + OBJ]

A: Cardinal X voted for *Ratzinger and the African candidate*, cardinal Y voted for *the two Asian candidates, ...*

c. # Wer$_i$ hat *alles*$_i$ bei der gestrigen Wahl für [wen *alles*] gestimmt?
Who has all at the yesterday's election for whom all voted
'*Who-all* voted for *whom-all* in yesterday's election?'[*w-alles*+SUBJ,*w-alles*+OBJ)

A: same as in (28b)

The decisive factor for the felicity or infelicity of the questions in (28a-c), relative to C, is the presence or absence of an object-related *w-alles* in the question. The questions in (28bc) are infelicitous in C because they ask for (exhaustive) pluralities from the object domain that co-vary with elements of the subject domain. This, however, is impossible in C given that each voter can only vote for one candidate. In contrast, (28a) is felicitous in C, as there is more than one voter, thus satisfying the requirements of plurality and exhaustiveness on the subject domain. In sum, the difference in acceptability between (28a) and (28bc) shows clearly that the syntactic association of a QQP with a subject or object *wh*-item DOES have an effect on the semantic interpretation after all.[4] This suggests that the meaning of the QQP does not modify a set of propositions, as in (26), but has direct access to the meaning of the *wh*-item instead.

The second kind of evidence against the analysis of *w-alles* in (26) comes from its failure to account for plurality effects. While bare plural answers to questions with *w-alles* are fine, cf. (29A1), answers which specify only an atomic individual must be marked by additional material, such as *nur* 'only', or *als einzige(r/s)* 'alone', cf. (29A2/A3) and also (18).

(29) Q: Wer ist *alles* gegangen?
'Who-all left?'

A1: Jenny und Sarah sind gegangen.
'Jenny and Sarah left.'

A2: # Jenny ist gegangen.
'Jenny left.'

A3: *Nur* Jenny/ Jenny ist *als einzige* gegangen.
'Only Jenny / Jenny alone left.'

Given that (29A1) is a felicitous answer to (29Q) even without an overt indication of exhaustiveness, (29A2) should also be felicitous according to the meaning of *w-alles* in (26) and the informal rendering of the question denotation in (25b), contrary to fact. Furthermore, as seen in (28a-c), the plurality effect imposed by *w-alles* does not target the question denotation as a whole, but only affects the meaning of the syntactically modified *wh*-item. In

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[4] The difference in acceptability between (ia) and (ib) shows that the same holds for the other QQP, *w-so*. In context C from (28), (ia), where *w-so* is syntactically construed with the subject, is an appropriate question, but (ib), where *w-so* is syntactically construed with the object, is not:

(i) a. Wer$_i$ hat t_i *so* bei der gestrigen Papstwahl wen gewählt?
'Who-SO voted for whom in yesterday's papal election?' (*w-so* + S)

b. # Wer hat bei der gestrigen Papstwahl [wen *so*] gewählt?
,Who voted for whom-SO in yesterday's papal election?'

Again, the difference in acceptability follows from the plurality condition that the QQP imposes on the meaning of the *wh*-item that it modifies syntactically:

order to derive the correct interpretation, the QQP-meaning must therefore have direct access to the meaning of the *wh*-item.

Finally, there are semantic agreement effects between the *wh*-item and the exhaustive QQP, which are unexpected if the QQP were to modify the question denotation as a whole: In locative and temporal *wh*-questions, *w-alles* is replaced by the expressions *überall* (Reis 1992) and *immer*, which show semantic agreement with the modified *wh*-item in ranging over places and times/events, respectively.

(30) a. Wo bist du *?alles / überall gewesen?
where are you all everywhere been
'Where-all have you been?'

b. Wann bist du nächste Woche *alles/immer zu sprechen?
when are you next week all always to speak
'When-all can I talk to you next week?'

If the meaning of the QQP were to combine with the question denotation as a whole, semantic agreement would be unexpected for the question denotation will always be of type <<s,t>,t> at this level, irrespective of whether the question is about individuals, places, or times. If the QQP operates directly on the meaning of the *wh*-item, though, semantic agreement will fall out immediately.

In sum, the fact that the syntactic position of a QQP has an effect on semantic interpretation, as well as the plurality and agreement effects observed with QQPs argue for an alternative analysis of QQPs on which their meaning has direct access to the meaning of the *wh*-item.

3.3 An alternative analysis: QQPs as modifiers on structured propositions

This section provides an alternative analysis of QQPs that (i.) accounts for the observed syntactic and semantic relation between the QQP and the *wh*-item, (ii.) captures the plurality and exhaustiveness effects observed with *w-alles*, and (iii.) captures the plurality effects observed with *w-so*.

The analysis is based on the following assumptions. First, *wh*-items denote appropriately restricted sets of individuals, as argued in Cooper (1983), Jacobson (1995), and Sternefeld (2001). This is illustrated in (31)

(31) a. $[[\text{who}]] = \{x \mid x \in \text{PERSON}\}$ b. $[[\text{where}]] = \{z \mid z \in \text{PLACE}\}$

Second, grammatically singular *wh*-items (*who*, *what,…*) are semantically underspecified as to number, and contain both atomic and plural individuals (cf. Jacobson 1995):

(32) $[[\text{who}]] = \{x \mid x \in {}^*\text{PERSON}\}$
$= \{\text{Peter, Klaus, Johann, Peter+Klaus, Peter+Johann+Klaus, ...}\}$

Third, we assume with Krifka (2001a) that *wh*-questions denote structured propositions of a special kind: They consist of a question domain (QD) and a background predicate (BP). The question domain is provided by the meaning of the *wh*-item, which denotes a set of individuals that are appropriately restricted depending on its lexical shape. The background predicate is provided by the λ-abstracted remainder of the question without the *wh*-item.[5]

(33) $< \lambda x.\lambda w.\ x \text{ left in } w\ ,\ \{x \mid x \in {}^*\text{PERSON}\} >$
BP QD

[5] Krifka (2001a) states two restrictions on question-answer congruence between a structured question $<BG_Q$, QD) and its corresponding structured answer $<BG_A$, F>, where F stands for the focus constituent: (i.) BG_Q and BG_A must be identical, and (ii.) F must be a member of QD.

Applying the background predicate to the individual members of the question domain in a point-wise fashion will yield a set of propositions, a representation more ore in line with the question semantics in Hamblin (1973) and Karttunen (1977). It is possible that the point-wise application of BP to QD is brought about by a covert question operator Q. Important for our purposes is that the meaning contribution of the *wh*-item forms a semantic unit that can be accessed and modified by the meaning of the QQP at some point in the semantic derivation.

The final assumption concerns the semantic role of the QQPs themselves: QQPs modify structured question denotations as in (33) by placing additional restrictions on their question domain, which corresponds to the meaning of the *wh*-item. This way, the QQP has direct access to the meaning of the *wh*-item, as required.[6] The lexical entries for *w-so* and *w-alles* are given in (34), where the predicate *DIV* stands for *divisible*:

(34) a. w-so'< P, Q> = <P , {x | x ∈ Q & **DIV(x)** }>
plurality

b. w-alles' <P, Q> = <P, {x | x ∈ Q & **DIV(x)** & **¬∃z [z>x & z ∈ Q & z ∈ P]** }>
plurality *exhaustiveness*

By introducing the additional restriction *DIV(x)*, *w-so* restricts the question domain such that it contains only divisible, e.g. plural individuals satisfying the background predicate P. By introducing *DIV(x)* and an exhaustiveness condition that serves to exclude any larger alternatives to any x contained in the question domain, *w-alles* restricts the latter such that it contains only the maximal divisible individual satisfying the background predicate P.

The reader may wonder why the plurality condition is not simply stated in form of a cardinality restriction on *x*, namely *x>1*. The empirical reason for the choice of the predicate *DIV(x)* over a cardinality restriction was already given in (19), repeated as (36).

(36) Q: Wer hat *alles / so* *einander* *geheiratet*?
who has all SO each.other married
'Who-ALL/SO married each other?'

A: # Klaus und Maria.
Klaus and Mary

As (36) shows, it is infelicitous to answer a *wh*-question containing a QQP and a collective predicate by naming just one collective group individual satisfying the predicate *even though this collective group consists of more than one entity* (in this case Klaus and Maria). Therefore, a simple cardinality restriction would incorrectly rule in (36A) as a felicitous answer to (36Q). The predicate *DIV(x)*, in contrast, will rule out any single group individual as a possible answer to (36Q), given that these are indivisible. For this reason, a felicitous answer to (36Q) will have to contain at least two group individuals. The choice of *DIV(x)* over $|x| > 1$ allows for another interesting prediction: All divisible entities, in particular the denotations of bare plural expressions (on their existential reading, Diesing 1990) and bare

[6] An even more local way of combining the meanings of QQP and *wh*-item would be to treat *wh*-items as predicate modifiers of type <et,et>, such that the meaning of *who* would be: *[[who]] = λP.λx. P(x) & human'(x)*, with existential binding and the formation of alternative propositions attributed to an abstract functional Q-operator. On this analysis, QQPs would be of type <<et,et>>, <et,et>>, modifying the question denotation by introducing the predicate *DIV(x)* and the exhaustiveness condition (E. Zimmermann, p.c.). The meaning for *wer so* 'who SO' on this account is given in (i).

(i) [[wer so]] = λP.λx. P(x) & human'(x) & DIV(x)

Given that an analysis along these lines would require type-shift operations with non-subject *wh*-phrases, we will keep to the less local account in terms of modified structured propositions in what follows.

mass nouns, should qualify as appropriate answers to *wh*-questions modified by QQPs. (37ab) show that prediction is indeed borne out:

(37) a. Q: Wen hat Mila so eingeladen? A: Kinder aus der Kita. ✓
Who has Mila SO invited children from the daycare
'Whom-SO did Mila invite?' '(Some) children from the daycare.'

b. Q: Was hat der Laster so geladen? A: Holz. ✓
what has the truck SO loaded wood
'What-SO is the truck loaded with?' 'Wood.'

With the lexical entries of *w-so* and *w-alles* in place, we can now proceed to derive the meaning of entire *wh*-questions: The meaning of the unmodified *wh*-question *Wer ist gegangen?* 'Who has left' is given in (38a). The meanings of the *wh*-questions modified by *w-so* and *w-alles* are shown in (38b) and (38c), respectively:

(38) a. [[Wer ist gegangen? *Who has left?*]] =
<λx. x left,{x| x ∈ *PERSON}>

possible answers: {Sarah left, Jenny left, Sarah und Jenny left…}

b. [[Wer ist *so* gegangen? *Who-SO has left?*]] =
<λx. x left , {x| x ∈ *PERSON & **DIV(x)** }>

possible answers: {Sarah and Jenny left, Sarah and Jenny and Hans left,…}

c. [[Wer ist *alles* gegangen? *Who-all has left?*]] =

<λx. x left, {x| x∈ *PERSON & **DIV(x)** & **¬∃z[z>x & z ∈** *PERSON **& z left]** }>

possible answers: {Sarah and Jenny left and nobody else left, Sarah and Hans left and nobody else left, …}

As can be seen from the respective sets of possible answers, the semantic representations in (38bc) adequatly capture the meaning of *wh*-questions modified by a QQP.

3.4 Advantages of the analysis

The semantic analysis of QQPs in section 3.3 accounts in a systematic way for the semantic effect of the syntactic position of QQPs on *wh*-questions, illustrated in (28). By assumption, the syntactic construal of *wh*-item and QQP results in co-indexation, which determines which restriction of the question domain will be further specified by the QQP. The effects of syntactic position on semantic interpretation are illustrated once more in (40ab) for the minimal pair in (39ab):

(39) a. Wer_i hat t_i so_i gestern bei der Papstwahl wen gewählt?
'Who-SO voted for whom at yesterday's papal elections?'

b. Wer hat gestern bei der Papstwahl [wen_j so_j] gewählt?
'Who voted for whom-SO at yesterday's papal elections?'

(40) a. [[39a]] =
<λyλx. x hat y gewählt, {y| y∈ *PERSON}, {x| x∈ *PERSON & **DIV(x)**}>

b. [[39b]] =
<λyλx. x hat y gewählt, {y| y ∈ *PERSON & **DIV(y)**}, {x| x ∈ *PERSON} >

Apart from accounting for the effects of syntax on interpretation, the analysis has the following advantages: First, it captures the plurality effects observable with *w-alles* and *w-so*, by making a divisibility requirement part of the lexical meaning of both QQPs. Second, it captures the semantic agreement effects showing up with *w-überall* und *w-immer*, as the QQP

directly modifies the question domain (person, thing, place, time) introduced by the *wh*-expression, cf. (30ab) in section 3.2. Third, it captures multiple occurrences of *w-alles* and *w-so* modifying different *wh*-items with the corresponding semantic effects in multiple questions, cf. (24ab) in section 2.3. Fourth and last, the analysis captures the joint occurrence of both QQPs in simple questions, cf. (23), since the meaning contributions of *w-so* and *w-alles* do not contradict each other: The plural requirement of *w-so* constitutes part of the meaning of *w-alles* as well. All in all, then, the proposed analysis successfully accounts for the syntactic and semantic behaviour of QQPs. However, this still leaves us with the question of whether the meaning contribution of QQPs comes in form of a presupposition, or whether it contributes to the propositional content of the question itself.

3.5 The meaning of QQPs: Presuppositional or propositional

There are two kinds of evidence that suggest that the plurality and exhaustiveness effects observed with QQPs are presuppositional in nature, rather than forming part of the propositional content of the question per se. The first kind of evidence concerns the fact that the plurality requirement on answers to questions containing a QQP can be cancelled by inserting additional material, such as *nur* 'only' or *als einziger* 'alone', which would explicitly state that the background predicate is satisfied by only one atomic individual, cf. (18) and (29A2) repeated here as (41) for convenience :

(41) Q: Wer ist *alles* gegangen? A: *Nur* Jenny/ Jenny ist *als einzige* gegangen.
'Who-all left?' 'Only Jenny / Jenny alone left.'

Compare this to the infelicitous question-answer pair in (42), where the answer is in clear contradiction to the propositional content of the question, substituting *Frau* 'woman' for *man* 'Mann', and cannot easily be saved by replacing the relevant material without being perceived as an incongruent discourse move.

(42) Q: Welcher Mann ist gegangen? A: #Es war eine Frau und sie heißt Maria
which man has gone It was a woman and she is.called M.
'Which man has gone?' #'It was a woman and she's called Mary.'

The second kind of evidence shows up in connection with the truth-conditions of sentences with embedded *wh*-questions. The relevant fact here is that the exhaustiveness introduced by *w-alles* in an embedded *wh*-question cannot easily be negated by negation in the matrix clause (A. Haida, p.c.). This is what we would expect, however, if exhaustiveness contributed to the propositional content of the embedded *wh*-question, and consequently to the truth conditions of the entire clause. To get a feel for the effects we are after, consider first (43), where negation in the matrix clause can target and negate the exhaustiveness introduced by the exhaustive focus particle *only* in the embedded clause:

(43) Mary does not know that Klaus invited only his parents,

but she knows at least that Klaus invited his parents.

Now consider (44), which involves a configuration that is similar to the one found in (43): The first embedded *wh*-question contains a marker of exhaustiveness, the QQP *w-alles*, and is embedded under a matrix negation. Unlike in (43), though, the sequence in (44) is ill-formed.

(44) # Maria weiß nicht, wen Klaus *alles* eingeladen hat,
Mary knows not whom Klaus all invited has

aber sie weiß immerhin, wen Klaus eingeladen hat.
but she knows at least whom K. invited has

intended reading: 'Mary does not know all the people that Klaus invited, but she knows at least some of the people that Klaus invited.'

The infelicity of (44) will be accounted for directly if the meaning contribution of *w-alles* comes in form of a presupposition, leaving the truth-conditions of the clause unaffected. In that case the truth-conditions of (44) would read as 'Mary does not know whom Klaus invited, but she knows at least whom he invited', a clear contradiction.

4 QQPs from a cross-linguistic perspective

We will close the discussion of QQPs and their meaning with a few observations on their cross-linguistic status. In fact, even a quick survey shows that there are quite a few languages with QQPs, or at least with grammatical constructions that have analogous semantic interpretations: Among the European languages, Dutch features the QQPs *allemaal* and *zoal*, with interpretations corresponding to German *w-alles* and *w-so* (Beck & Rullmann 1999), and some variants of Irish English feature the exhaustive QQP *what all* (McCloskey 2000). As mentioned in section 1, QQPs in German and Hausa show a similar semantic behaviour, too, cf. (5) and (6). In both languages, QQPs can restrict the meaning of *wh*-questions with respect to plurality and exhaustiveness, as summarized in table 1:

Table 1: QQPs in German and Hausa

German	Hausa	Semantic Specification
wer	wàa	*unspecified*: +/- plural, +/- exhaustive
--	wàanee-**nèe**	+/- plural, **+ exhaustive**
wer…**so**	**su**-wàa	**+ plural**, +/- exhaustive
wer...**alles**	**su**-wàanee-**nèe**	**+ plural, + exhaustive**

Table 1 also brings out some differences in the QQP-systems of the two languages: In Hausa, the two logically independent meaning components of plurality and exhaustiveness are lexicalized in form of two different QQPs, namely *sú* and *nee/cèe*, respectively. These can modify the *wh*-question either alone, or together. In German, in contrast, there is no QQP that would specify exhaustiveness without expressing plurality, as the QQP *w-alles* signals both plurality and exhaustiveness at the same time.

The existence of QQPs in languages typologically as far apart as German (Indo-European) and Hausa (Chadic, Afro-Asiatic) gives rise to typological questions of the following sort: (i.) Which other languages have formal devices of expressing plurality and/or exhaustiveness in *wh*-questions? (ii.) How are these devices realized syntactically? Are there, for instance, *wh*-in situ languages with sentence-peripheral QQPs? A brief look at Japanese and Korean shows that there are no sentence-peripheral QQPs at least in these two classical *wh*-in situ languages. At the same time, though, both languages have the possibility of restricting the *wh*-expression to range over plural entities alone, namely by reduplicating the indeterminate (question) pronoun, cf. (45ab). In Japanese, this strategy is somewhat marginal and perceived as sub-standard (S.Tomioka, p.c.), while it is more general in Korean (M.-J. Kim, p.c.).

(45) a. paatii-ni *dare-dare*-ga kite-ima-sita-ka? [Japanese]
party-LOC who-who-NOM come-be-past-Q
'I know many people came to the party, but could you name a few of those who came?' → plural, but no full answer expected [S. Tomioka, p.c.]

b. Chelswu: (presupposing that there were several people at the party.)
Phathi-ey *nwukwu-nwukwu*-(ka) o-ess-ni?
party-GOAL who-who-(NOM) come-PAST-Q.informal
'Who (and who) came to the party?'

Yenghi: Mina-wa jiyung-iuy kachok-i o-ess-e.
Mina-CONJ jiyung-GEN family-NOM come-PAST-DECL.informal
'Mina and Jiyung and her family came.'

The VOS-language Malagasy, finally, features another cross-linguistic counterpart of the exhaustive QQP *w-alles*. In this language, the distributivity marker *avy* co-occurs with *wh*-expressions to force a plural, or even exhaustive *wh*-question (Keenan 2006)

(46) *Aiza avy no misy azy ireo tsirairay avy?*
where DIST FOC exist 3ACC DEM.PLeach each
'In which places are each of them (pieces of furniture)?'

What this brief and incomplete survey shows, then, is that the semantic effects observed with German QQPs are of a more general nature and are found in a whole range of both related and unrelated languages. Surely, this finding should warrant more research into parallels and differences in the cross-linguistic expression of plurality and exhaustiveness in *wh*-questions.

5 Conclusion and Consequences

The paper puts forward an analysis of QQPs that treats them as modifiers over structured propositions, adding the meaning components of plurality (*w-so*) or plurality and exhaustiveness (*w-alles*) to the meaning of questions. A crucial, though so far implicit ingredient of the present analysis is the assumption that unmodified *wh*-questions are unspecified with respect to plurality, and more importantly to exhaustiveness. Obviously, this assumption stands in contradiction to the treatment of (unmodified) questions as inherently exhaustive in Groenendijk & Stokhof (1982, 1984), who analyze questions as introducing partitions over possible worlds. Despite the arguments in favour of Groenendijk & Stokhof's account, the existence of overt exhaustiveness markers in *wh*-questions, such as e.g. the German QQP *w-alles* and the distributive marker *avy* in Malagasy, constitutes a challenge for this line of thought. If unmodified *wh*-questions are necessarily interpreted as exhaustive, what could the function of these apparent exhaustiveness markers be? In conclusion, we will briefly point out two possible approaches to this problem, of which the first one proves problematic, while the second appears to be more promising.

First, one could try to reconstruct the meaning contribution of the QQPs *w-so* and *w-alles* in the following way: Unmodified *wh*-questions are semantically specified as *+exhaustive*. To this basic interpretation, the QQP *w-alles* adds a meaning component of plurality (instead of plurality and exhaustiveness), whereas the QQP *w-so* adds the meaning components of plurality and *non-exhaustiveness*. Notice that on this revised analysis, it would be the QQP *w-so*, which is semantically more complex. There are at least two reasons for eschewing this kind of reanalysis, though. Conceptually, it is not clear how the effects of non-exhaustiveness can be formalized in Groenendijk & Stokhof's treatment of questions in terms of partitions, which are exhaustive by their very nature.

The alternative, and - given the occurrence of exhaustive elements in a range of languages – more promising solution would be to give up on the assumption that questions are inherently exhaustive, and to attribute the exhaustiveness effects observable with unmodified questions to pragmatic inferences with matrix questions (van Rooij & Schulz 2004), or to the meaning of the matrix predicate with embedded questions (Beck & Rullman 1999). The analysis of exhaustive QQPs may thus well contribute to a better understanding of the semantics of questions in general.

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