On the Semantics and Pragmatics of *Yes*/*No*-Questions, *Yes*/*No*-Question Disjunctions, and Alternative Questions

Evidence from Chadic

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Abstract

In a large variety of languages, interrogative markers are closely related in form to disjunctive coordinators. Despite appearance to the contrary, the pertinent semantic question theories cannot explain this formal correlation. The framework of inquisitive semantics developed in this paper provides a natural explanation. The inquisitive-semantic analysis of *yes*/*no*-question carries over to *yes*/*no*-question disjunctions and alternative questions, but it needs to be supplemented, most notably, by a theory of focus. The paper proposes an inquisitive-semantic variant of the alternative semantics of focus and argues that the question operator is focus sensitive. This provides an account of various focus effects in non-*wh*-questions.

Contents

1 Introduction

This paper is concerned with non-*wh*-questions, viz. *yes/no*-questions, alternative questions, and *yes/no*-question disjunctions, as exemplified in (1a-c).

(1) a. Are you coming?
b. Are you coming or going?
c. Are you coming or are you going?

These questions can be characterized as containing one, two, or three disjunctions, respectively, i.e., they have the structures in (2a-c).

(2) a. [or [you are coming]]
b. [or [[you are coming] or [you are going]]
c. [[or [you are coming]] or [or [you are going]]]

In the West Chadic languages, which are the empirical focus of this paper, the *morphosyntactic* form of the questions in (1a-c) reflects the structures in (2a-c). That is, the West Chadic languages (like many other languages) have an interrogative marker that is closely related in form to a disjunctive coordinator. I call this formal relation the *interrogative-disjunctive affinity*. One of the main goals of this paper is to explain this affinity. The main insight will be that the above claim, that (1a-c) contain one to three disjunctions, is true in terms of the *logico-semantic* form of these questions. That is, I argue that these question types have the logico-semantic form in (3a-c), where '$\vee^1$' is a unary disjunction operator.

(3) a. $\vee^1$('you are coming')
b. $\vee^1$('you are coming' $\vee$ 'you are going')
c. $\vee^1$('you are coming') $\vee$ $\vee^1$('you are going')

The operator '$\vee^1$' is defined by means of the binary disjunction operator as in (4).

(4) $\vee^1(\alpha) \;=\; \alpha \vee \neg\alpha$

Thus the claim that, for instance, *yes/no*-questions have the form in (3a) can also be stated as in (5).

(5) 'are you are coming?' = 'you are coming' $\vee$ $\neg$'you are coming'

Now, this statement looks very familiar from one of the most pertinent semantic question theories: in the theory of Hamblin (1973), the meaning of a *yes/no*-question can be analyzed as in (6).

(6) 'are you are coming?' = {'you are coming'} $\cup$ {$\neg$'you are coming'}

Thus it seems that the claim that (1a-c) have the logico-semantic form in (3a-c) has long been established. I will show that this is not the case: the pertinent semantic question theories are not based on a logic that explains the interrogative-disjunctive affinity because the system of operators that is (implicitly) used in these theories is not suited to represent the logical vocabulary of natural languages. However, there is a logic that promises to explain this affinity since it is built around the idea that questions are logical disjunctions: *inquisitive logic* (Groenendijk, 2008). Inquisitive logic forms the basis for the semantic approach to non-*wh*-questions by Roelofsen and van Gool (2009). I will use and extend the proposal of Roelofsen and van Gool (2009), and define a comprehensive compositional semantic framework that has the logical structure of inquisitive logic. I call this framework *inquisitive semantics*. Inquisitive semantics is a proposition-set approach to natural language meaning. The disjunction of two sentences is interpreted as set union. The other logical vocabulary is not mapped to the Boolean algebra of sets. I will show that inquisitive semantics is the right framework to explain the interrogative-disjunctive affinity.

The paper is structured as follows. The empirical discussion in section 2 establishes the interrogative-disjunctive affinity with data from Hausa, Tangale, and Bole. This section also shows that there is considerable variation in how the disjunctive character of questions (or the inquisitive character of disjunction, if you like) becomes manifest in grammar. Section 3 defines the inquisitive-semantic framework mentioned above, focusing on the analysis of *yes/no*-questions. Section 4 is concerned with *yes/no*-question disjunctions like (1c). These raise a number of difficult empirical and theoretical problems, which would not arise if questions like (1c) turned out to be not disjunctions of two syntactic and semantic *yes/no*-questions but only the syntactic illusion of such disjunctions. I will argue that in English this might actually be the case. The discussion of Hausa and Tangale, however, will dispel any doubts that *yes/no*-question disjunctions truly exist. Therefore, I will discuss the inquisitive-semantic analysis of this question type, which will lead us to consider certain pragmatic aspects of the question-answer relation. These considerations will lead to an answerhood notion that takes non-denotational properties of questions and their replies into account: the highlighted answers of a question (i.e., its focus value, as the analysis in section 5 will show) and the scalar implicatures of a reply. The empirical discussion in section 4 brings out a formal property of *yes/no*-question disjunctions and alternative questions (henceforth called collectively *disjunctive questions*): the disjuncts of a disjunctive question are focused where they differ from each other. This will become important for the later discussion. Section 5 presents the inquisitive-semantic analysis of alternative questions. I will argue on empirical grounds that focus is a necessary ingredient for the inquisitiveness of a disjunctive phrase, i.e., focus is necessary for a disjunctive phrase to give rise to a disjunctive question (i.e., an alternative question or a *yes/no*-question

disjunction). To explain the role that focus plays for inquisitiveness, I propose an inquisitive-semantic variant of the alternative semantics theory of focus (Rooth, 1985, 1992). This focus theory allows me to identify the property that distinguishes inquisitive disjunctive coordinators from non-inquisitive ones: the former but not the latter presuppose that the focus values of their disjuncts are identical. Furthermore, I show that this focus theory explains an asymmetry of the answer space of *yes/no*-questions and *yes/no*-question disjunctions that was explained with the help of a provisional notion in section 4, viz. the asymmetry between highlighted and non-highlighted answers. In section 6, I show that focus *directly* contributes to the answerhood conditions of non-*wh*-questions: it induces inquisitive possibilities. I argue on the basis of syntactic evidence from Bole that the question operator (i.e., the unary disjunction operator discussed above) is a focus-sensitive operator: in Bole, the interrogative marker must occur adjacent to the focused constituent, which suggests an underlying relationship of semantic focus association. I define a focus-sensitive question operator and show that this operator yields the correct answerhood conditions for *yes/no*-questions in a variety of contexts. Furthermore, I define the semantic, i.e., presuppositional import of the falling pitch movement in (English) disjunctive questions and show that the presupposition induced by this pitch movement leads to the correct answerhood conditions. In the final section, section 7, I discuss the relation between inquisitiveness and interrogativity, and shortly touch upon intervention effects in alternative questions.

Before I start with the discussion, I would like to point out that the following text seeks to be as precise as possible. This means that it contains a large number of definitions and stipulations. Some of these are provisional, others are special cases of more general definitions, and yet others are preliminary and will be amended later on. This serves to make the discussion as targeted and comprehensible as possible and should not be confused with an assumed complexity of the resulting theory.

2 The Interrogative-Disjunctive Affinity

2.1 *Yes/no*-question markers and disjunctive coordinators

There are many languages that show an interrogative-disjunctive affinity: they have a interrogative marker that is formally related to a disjunctive coordinator. Among these languages are a number of West Chadic languages of the Afro-Asiatic language family. These languages provide the empirical basis of my analysis. In all of the languages under consideration, the use of the interrogative marker is optional in the sense that root *yes/no*-questions can be expressed by intonational means alone. I assume that the optionality of interrogative markers is not significant for the discussion of their logico-semantic properties, and I will

therefore neglect it. Furthermore, in some of the languages considered in this paper there are two disjunctive coordinators that are in complementary distribution. One of them is restricted to alternative questions. As may be expected, the interrogative marker is always related to this coordinator. This suggests that the related items also serve for the expression of sentence type information and/or illocutionary force information. I take this to show that the logico-semantic properties of interrogative markers and disjunctive coordiators lend themselves to this additional function. In section 7.1, I will explore certain illocutionary aspects of interrogative sentences. However, the specifics of the illocutionary properties of the various interrogative markers of interest are beyond the scope of this paper.

2.2 *Yes/no*-questions in West Chadic languages

2.2.1 *Yes/no*-questions in Hausa

In Hausa (West Chadic, group A.1), *yes/no*-questions can be expressed in a number of ways (see Newman, 2000; Jaggar, 2001).[1, 2] First, there are intonation questions. The question in (7) differs from the corresponding declarative sentence only in its intonation. The upward arrow (↑) marks the so-called *key raising* pattern: the pitch of the last H tone of a sentence and that of any succeeding L tones is raised (see Newman, 2000).[3]

(7) Zaː sù daːwoː gòː↑beː?
FUT 3PL.SU return tomorrow
'Will they return tomorrow?'

Furthermore, there are *yes/no*-questions with a sentence-final interrogative tag. There are a number of such tags, among them the particle *koː*.[4] This particle has the same form as the disjunctive coordinator of Hausa, which is shown in (8) (see Jaggar, 2001, p. 598).[5] The question-tag use of *koː* is illustrated in (9).

[1]Unless noted otherwise, the Hausa examples in this section are from Newman (2000, pp. 496ff). The glosses in the Newman examples are mine.

[2]The following abbreviations are used in the glosses throughout this paper: BM – background marker, CONT – continuative aspect, COP – copula, DEF – definiteness, F – feminine gender, FOC – focus marker, FPERF – focus-perfective, FUT – future tense, M – masculine gender, NEG – negative marker, OB – object case, PERF – perfective aspect, PL – plural number, PRT – particle, Q – question marker, REL – relative marker, RELPRO – relative pronoun, SG – singular number, SJM – subjunctive mood, and SU – subject case.

[3]There are other intonation patterns that can be employed to form an intonation question in Hausa, the final raising pattern (see Newman, 2000, p. 498) and an intonation pattern that involves sentence-final lengthening and optional L tone attachment (see Jaggar, 2001, pp. 523f). For reasons of space, this is not illustrated.

[4]Besides *koː* Newman (2000) and Jaggar (2001) mention the negative marker *ba*, the modal particle *kùwaː* 'indeed', the focus marker *neː*, and the particle *fà* 'how/what about?'.

[5]I have adapted Jaggar's glosses to the conventions in fn. 2.

(8) Mài yìwuwaː nèː sù zoː koː kadà sù zoː.
MAI possibility COP.M 3PL.SJM come or NEG 3PL.SJM come
'It's possible they may come or not come.'

(9) Zaː kà daːwoː dà wuri koː?
FUT 2SG.M.SU return soon or
'Are you going to return soon?'

Newman does not classify the question in (9) as an intonation question but he notes that *koː* must be preceeded by key raising (↑). Thus, (9) can be considered an intonation question, too. Alternatively, we could assume that the use of (9) involves two speech acts: the assertion *You will return soon* followed by the interrogation *Or?* with which the speaker seeks to confirm the preceding assertion. Then (9) would consist of two sentences, a declarative sentence followed by a one word intonation question.[6]

Finally, and most importantly, there are *yes/no*-questions in which the particle *koː* occurs in sentence-initial position.[7] These occurrences are glossed as Q in (10) and further on.

[6]It is tempting to assume that the interrogative tag *koː* 'or' is elliptical for a coordinated interrogative sentence with the content 'or am I wrong?'. However, the corresponding German tag question in (i-Q) suggests otherwise: if the addressee of (i-Q) wants to express that s/he will return soon, s/he must use the positive short answer *ja, ja* 'yes, yes', see (i-A).

(i) Q: Du kommst bald wieder, oder?
you come soon back or
'You will return soon, won't you?'
A: Ja, ja. (Ich komme bald wieder.)
yes yes I come soon back

This contrasts with answerhood conditions of the purported non-elliptical version in (ii-Q). In this case, the addressee must use the negative short answer *nein, nein* 'no, no' to express that s/he will return soon:

(ii) Q: Du kommst bald wieder, oder liege ich falsch?
you come soon back or lie I wrong
'You will return soon, or am I wrong?'
A: Nein, nein. (Ich komme bald wieder.)
no no I come soon back

Hence, we cannot assume that (i-Q) is elliptical for (ii-Q).

[7]Newman (2000, p. 501) and Jaggar (2001, p. 524) mention two other expressions that seem to function as sentence-initial interrogative markers, *anyàː* 'doubt' and *shîn/shìn*. The former is used to express doubt that the propositional content of the *yes/no*-question holds, and the latter is used by a speaker if s/he seeks to confirm the propositional content. However, these items can co-occur with *koː*, which suggests that they are modal expressions that are restricted to interrogative utterances and not interrogative markers themselves. These items would then be comparable to the discourse particle *denn* in German, which is restricted to interrogative utterances:

(10) Koː Musa nàː nan?
Q M. CONT there
'Is Musa there?'

I assume that the occurrence of *koː* in (10) is the occurrence of an interrogative complementizer. That is, I assume that *koː* is the overt form of the interrogative complementizer of Hausa. This means that (10) has the structure in (11).

(11) $[_{CP}\ [_{C[+Q]}$ koː$]\ [_{TP}$ Musa nàː nan$]]$

This assumption is supported by the fact that embedded questions can be introduced by *koː*. This is illustrated in (12a) for an embedded *yes/no*-question and in (12b) for an embedded *wh*-question (see Jaggar, 2001, p. 586, where *koː* is glossed as a complementizer).[8]

(12) a. Bàn san koː zâi zoː ba.
NEG.1SG.PERF know Q 3SG.M.FUT come NEG
'I don't know whether he will come.'
b. Bàn san koː wàː ya ɾubùːtà takàɾdâɾ ba.
NEG.1SG.PERF know Q who 3SG.M.FPERF write letter.DEF.F NEG
'I don't know who wrote the letter.'

As for the semantic properties of complementizer *koː* I will argue that it is a unary variant of the disjunctive connective: simplifying somewhat, $[_{C[+Q]}$ koː$]$

(i) a. Kann (denn) Peter Hausa?
can PRT P. H.
'Does Peter speak Hausa?'
b. Peter kann (*denn) Hausa.
'Peter speaks Hausa.'

[8] According to Jaggar (2001), some speakers allow embedded *wh*-questions without the overt *koː* complmentizer. Furthermore, the meaning of (12b) can also be expressed as in (i) (see Jaggar, 2001, p. 586).

(i) Bàn san wandà ya ɾubùːtà takàɾdâɾ ba.
NEG.1SG.PERF know RELPRO.M 3SG.M.FPERF write letter.DEF.F NEG
'I don't know who wrote the letter.'

The syntactic and semantic status of the complement of the matrix predicate of (i) is unclear. It does not seem to be an ordinary question but rather a concealed question, which I assume is not a proper interrogative clause. Embedded *yes/no*-questions can also be introduced by the conditional subordinator *in* (Jaggar, 2001, pp. 587):

(ii) kà ga in yanàː nan.
2SG.M.SJM see if 3SG.M.CONT there
'See if he is there!'

These facts do not affect the conclusion reached in the text.

denotes an operator that, applied to the denotation of its complement, yields the disjunction of this denotation with its negation, see section 3.4 for a simplified account and section 6.4 for the full account. Thus, the phonological identity of the interrogative complementizer with the disjunctive coordinator is not an accident but a reflex of its disjunctive meaning.

2.2.2 *Yes/no*-questions in Tangale

In Tangale (West Chadic, group A.2), *yes/no*-questions can be expressed by intonational means or by means of a sentence-final particle, the particle *ya*. The two options are illustrated in (13).[9] The intonation question in (13a) has a sharp pitch rise on the verb and a pitch fall at the end of the sentence. The question in (13b) with the particle lacks these properties.

(13) 'Did Mairo eat beans?'

a. Mairo ed-ug ɗom?
   M. eat-PERF beans

b. Mairo ed-ug ɗom ya?
   M. eat-PERF beans Q

Although *ya* is a sentence-final particle, I argue that it is an interrogative marker and not an interrogative tag. This assumption is supported by the fact that *ya* can not only occur in *yes/no*-questions but also in alternative questions, see (14) (see also section 4.2.3 for questions with two occurrences of the question particle).

(14) Mairo ed-go-n ɗom ya: lakikoro (ya)?
M. eat-FPERF-FOC beans or rice Q
'Did Mairo eat beans or rice?'

It seems that interrogative tags cannot be used to form alternative questions. At least, this is what the English and German data in (15a) and (b), respectively, suggest.

(15) a. #The door is open or closed, isn't it?
intended: 'Is the door open or closed?'

b. #Die Tür ist offen oder geschlossen, oder?
the door is open or closed or
intended: 'Is the door open or closed?'

As discussed in the previous section with respect to the tag question in (9), interrogative tags seek for affirmation of a preceding assertion. In the case of (15a) and (b), the asserted propositional content is 'that the door is open or closed',

[9] The Tangale examples are from the Shongom dialect. I do not mark tones in the Tangale examples. They seem not to be relevant for the discussion at hand.

which is tautological. The infelicitiy of (15a) and (b) shows that interrogative tags such as *isn't it* and *oder* cannot be used to form a question that asks which of the presented disjunctive alternatives 'that the door is open'/'that the door is closed' is true but only to seek affirmation for the non-informative proposition as a whole. Thus the fact that (14) is an alternative question strongly suggests that *ya* in (14) is not an interrogative tag but an interrogative marker (or a question particle, as I will continue to call such items).

The question in (14) furthermore shows that the question particle shares its segmental phonological properties with the disjunctive coordinator *yaː*. This coordinator can only occur in alternative questions.[10] This restriction does not follow from the semantics proposed in later sections of this paper. Rather, I assume that the distribution of the interrogative disjunctive coordinator *yaː* is restricted by a property that is dependent on the occurrence of an interrogative C head. Likewise, I assume that the question particle *ya* is dependent on interrogative C and is not a C head itself. Thus I argue that (13b) has the structure in (16).

(16) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{TP}}\ \text{Mairo edug ɗom}]\ \text{ya}\ ]]$

In (16), the question particle *ya* is right-adjoined to the TP. Other adjunction cites such as e.g. *v*P might be an option but I will not explore this possibility for Tangale (but see the discussion of Bole in section 2.2.3 and 6.3.1). The null interrogative C head, $\text{C}^{[+\text{Q}]}$, precedes its complement. This assumption is justified by the observation that the overt C head *kan* of embedded interrogatives occurs sentence-initially.[11] This is illustrated in (17a-c) with an embedded *yes/no*-question, an alternative question, and a *wh*-question, respectively.[12]

[10] Outside of alternative questions, my informants used *koː* to form disjunctive phrases. They held that *koː* is a loan word from Hausa (see section 2.2.1) but could not think of a native Tangale correlate.

[11] We could assume that *ya* is a head-initial C head if we were to argue that the TP moves overtly to Spec-C (cf. Kayne, 1994). For the *yes/no*-question in (13b), this would yield the structure in (i) at Spell-Out.

(i) $[_{\text{CP}}\ [_{\text{TP}}\ \text{Mairo edug ɗom}]\ [_{\text{C}'}\ [_{\text{C}^{[+\text{Q}]}}\ \text{ya}\ ]\ t_{\text{TP}}]]]$

An analysis along these lines does not have any non-theory-internal advantages over the one proposed in the text and will therefore not be pursued.

[12] Like in Hausa, the meaning of (17c) can alternatively be expressed by means of a concealed question:

(i) Laku pon-ug muː-m soo-g modo-m.
L. know-PERF person-REL sow-PERF millet-NEG
'Laku doesn't know who sowed millet.'

Note that in (i) the negation marker *-m* cliticizes to the right edge of the complement of the matrix verb, whereas in (17c) it cliticizes to the matrix verb. This suggests that in (i) the verbal

(17) a. Laku pon-go-m kan Mairo soo-g modo.
L. know-FPERF-NEG Q M. sow-PERF millet
'Laku doesn't know whether Mairo sowed millet.'

b. Laku pon-go-m kan Mairo soo-go modo (ya:)
L. know-FPERF-NEG Q M. sow-FPERF millet or
kan soo-go-n sau.
Q sow-FPERF-FOC guinea corn
'Laku doesn't know whether Mairo sewed millet or guinea corn.'

c. Laku pon-go-m kan soo-g modo noŋ.
L. know-FPERF-NEG Q sow-PERF millet who
'Laku doesn't know who sowed millet.'

(17a) and (b) show that the question particle *ya* and the interrogative disjunctive coordinator *ya:* are restricted to root interrogatives. This suggests that they are dependent on an element that encodes illocutionary force and not merely sentence force, i.e., on the C head of *root* interrogatives. I have to leave for future research whether this dependency is a syntactic or semantic/pragmatic relation. Moreover, *ya* cannot occur in root *wh*-questions, see (18).

(18) Ed-ug ɗom noŋ (*ya)?
eat-PERF beans who Q
'Who ate beans?'

Again, this restriction does not follow from the semantics proposed in this paper, but must be attributed to the (syntactic or interpretive) licensing conditions for the question particle *ya*. Thus is seems that only the C head of root non-*wh*-questions is a possible licensor of the question particle.

To sum up, we have found that the question particle *ya* and the interrogative disjunctive coordinator *ya:* share a number of properties. Most importantly for the discussion at hand, *ya* and *ya:* are phonologically very similar. Like in the case of Hausa, this leads me to argue that they are semantically similar, too: *ya* is a unary variant of the binary disjunction *ya:*.

2.2.3 *Yes/no*-questions in Bole

For a final example of a language that shows the interrogative-disjunctive affitity, let us briefly consider Bole (West Chadic, group A.2).[13] Like in the languages considered before, *yes/no*-questions can be expressed by intonational means or

complement remains in the complement position but is extraposed in (17c). This might be due to a different categorial status of the two complements (i.e. concealed questions are DPs and not CPs).

[13]The group index shows that Bole is closely related to Tangale. Some of the properties that make Bole of special interest in later parts of this paper, which deal with focus, could not yet be investigated for Tangale.

by means of an interrogative marker, the particle *ɗo*.[14] The sentence in (19) illustrates a sentence-final occurrence of this particle.

(19) Zara onak agoggo n Abu nzono ɗo?
Z. gave.F watch to A. yesterday Q
'Did Zara give a watch to Abu yesterday?'

The syntactic distribution of the interrogative marker will be discussed in more detail in section 6.3, but let me briefly mention that it must appear right-adjacent to the focused consituent of the sentence in which it occurs. In (19), the sentence as a whole is focused so that *ɗo* appears in sentence-final position. The question in (20) is an example in which the subject phrase is the focus of the sentence.

(20) Zara ɗo onak agoggo n Abu nzono ye?
Z. Q gave.F watch to A. yesterday BM
'Did ZARA give a watch to Abu yesterday?'

In (20), the sentence-final background marker *ye* indicates that the preverbal subject phrase is focused (see the paraphrase where small capitals indicate the focus). Correspondingly, the interrogative marker *ɗo* does not occur in sentence-final position but in front of the verb, right-adjacent to the subject phrase. This suggests that *ɗo* can only be adjoined to focused phrases or else ungrammaticality arises. This is stated in (21), where the superscript [−Foc] makes explicit that XP does not have a focus feature.

(21) $*[_{\text{XP}}\ \text{XP}^{[-\text{Foc}]}\ \text{ɗo}]$

Moreover, I assume that *ɗo* is subject to comparable licensing conditions as *ya* in Tangale, i.e., it must be licensed by an interrogative C head. For the question in (20), I propose the following structure.

(22) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{DP}}\ [_{\text{DP}}\ \text{Zara}]^{[+\text{Foc}]}\ \text{ɗo}]\ [_{\text{T}'}\ \text{T}\ [_{v\text{P}}\ [_{v\text{P}}\ t_{\text{DP}}\ \text{onak agoggo n Abu nzono}]\ \text{ye}]]]]$

For concreteness, I assume that the background marker *ye* is right-adjoined to *v*P. The subject phrase has moved to Spec-T so that its focus feature does not lead to a conflict with the interpretive requirements imposed by the background marker.

Crucially for our discussion, the interrogative marker has the same form as the disjunctive coordinator of alternative questions, see (23) (see Gimba and Schuh, n.d., the glosses are mine).

[14] I do not mark tones in the Bole examples.

(23) In zŏu-shi gà gà꞉re musùr ɗo gà꞉re oyum?
1SG put-2SG.F in granary necklace or granary money
'Should I put you in the necklace granary or the money granary?'

Thus again we find a formal affinity between an interrogative marker and a disjunctive coordinator. This calls for a semantic explanation, as indicated above and argued in detail below.

3 Explaining the Interrogative-Disjunctive Affinity: Inquisitive Semantics

3.1 Introduction

The previous sections showed that in a number of West Chadic languages there is a close formal affinity between interrogative markers and disjunctive coordinators. This affinity is also known from a variety of other, typologically unrelated languages, e.g., from Japanese (see Kuroda, 1965), Malayalam (see Jayaseelan, 2001), and the Slavic languages. Furthermore, even in the small sample of West Chadic languages we found a considerable number of morphosyntactic and arguably pragmatic differences among the interrogative markers and also among the disjunctive coordinators. This suggests that the interrogative-disjunctive affinity is a reflex of a semantic relation between interrogative markers and disjunctive coordinators.

To a certain degree, this relation is captured by the most pertinent propositional question theories, the theories of Hamblin (1973), Karttunen (1977), and Groenendijk and Stokhof (1982). In all three theories, the denotation of a *yes/no*-question can be compositionally derived in a way that brings out the disjunctive meaning of the question operator. Glossing over some details, this is illustrated in (24a) and (b). In (24a), $\mathrm{C}^{[+\mathrm{Q}]}$ designates the C head of *yes/no*-questions,[15] α is the TP complement of $\mathrm{C}^{[+\mathrm{Q}]}$, and Q_X is one of the semantic question operators in (24b)-(b"): the H(amblin), K(arttunen), and G(roenendijk)&S(tokhof) variant, respectively. In (24b), α is assumed to denote the singleton set of a proposition so that $\neg[\![\alpha]\!] = \{\lambda w[[\![\alpha]\!](w) = 0]\}$. In (24b') and (b"), $[\![\alpha]\!]$ is assumed be a proposition so that $\neg[\![\alpha]\!] = \lambda w[[\![\alpha]\!](w) = 0]$. The constant $\mathtt{a}$ in (24b') is the index of the actual world.

(24) a. $[\![\,[\mathrm{C}^{[+\mathrm{Q}]}\,\alpha]\,]\!] = [\![\mathrm{C}^{[+\mathrm{Q}]}]\!]([\![\alpha]\!]) = Q_X([\![\alpha]\!])$
b. $Q_{\mathrm{H}}([\![\alpha]\!]) = [\![\alpha]\!] \cup \neg[\![\alpha]\!]$
b'. $Q_{\mathrm{K}}([\![\alpha]\!]) = \{p \mid p(\mathtt{a}) = 1 \ \ \& \ \ p = [\![\alpha]\!]\} \cup \{p \mid p(\mathtt{a}) = 1 \ \ \& \ \ p = \neg[\![\alpha]\!]\}$

[15] I use the more precise designation $\mathrm{C}^{[+\mathrm{Q},-wh]}$ only when discussing the syntactic properties of this head.

b”. $Q_{\text{G\&S}}([\![\alpha]\!]) = \{[\![\alpha]\!]\} \cup \{\neg[\![\alpha]\!]\}$

According to (24b)-(b”), the semantic question operator denoted by $\text{C}^{[+\text{Q}]}$ forms the union of two sets that are derived from the denotation of its complement. Since the union operation of the Boolean algebra of sets corresponds to the disjunction of propositional logic, we can argue that the question operators Q_X are unary disjunction operators: unary operators that form the disjunction of two semantic objects derived from their argument. However, I will show in section 3.6 that the logical vocabulary of natural languages cannot be represented by the operators of the Boolean set algebra. I will argue that the semantic relation between interrogative markers and disjunctive coordinators can only be captured by inquisitive semantics.

Before presenting the framework of inquisitive semantics in detail, I would like to sketch how the interrogative-disjunctive affitity is explained in this framework. Inquisitive semantics is a system of hypotheses about the mapping of natural language expressions to semantic objects that form a certain algebraic structure defined by inquisitive logic (see below and Groenendijk, 2008; Groenendijk and Roelofsen, 2009; Mascarenhas, 2009; Ciardelli, 2009).[16] In inquisitive logic, the logical correlate of a *yes/no*-question has the form in (25).[17]

(25) $\varphi \vee \neg\varphi$

Hence, if $\text{C}^{[+\text{Q}]}$ is the head of a *yes/no*-question and α its TP complement, a *yes/no*-question denotation with the logical form in (25) is compositionally derived as follows:

(26) $[\![\, [\text{C}^{[+\text{Q}]}\, \alpha] \,]\!] = [\![\text{C}^{[+\text{Q}]}]\!]([\![\alpha]\!]) = Q([\![\alpha]\!]) = [\![\alpha]\!] \vee \neg[\![\alpha]\!]$ (*to be revised*)

Thus if we can define the inquisitive disjunction operator ‘$\vee$’ and the negation operator ‘$\neg$’ for the semantic objects denoted by natural language expressions, the question operator Q in (26) can truly be said to be a unary disjunction. Then we can conclude that in the languages that show the interrogative-disjunctive affinity the unary and binary disjunction are transparently lexicalized by morphologically related items. In section 3.3 and 3.4, I will present the relevant definitions of ‘$\vee$’ and ‘$\neg$’ so that we indeed achieve our explanatory goal.

[16] I use the term *semantics* to refer to the linguistic discipline. Thus I use *inquisitive semantics* differently than Groenendijk (2008), where reference is made to the semantics of the logical calculus.

[17] Here and below, the symbols ‘$\neg$’, ‘$\vee$’, ‘$\wedge$’, etc. are used to refer to the logical connectives of inquisitive logic. These will be defined for one variant of this logic in the course of the discussion. Once properly defined, the symbols will be used ambiguously. When applied to denotations of natural language sentences (i.e., to proposition sets), they stand for the connectives of inquisitive logic. In formulas of type logic, they refer to the classical Boolean connectives.

3.2 The meaning theory of inquisitive semantics

Let us take a closer look at the logical form in (25) in the previous section. In a classical logic, a sentence of the form in (25) is a tautology. In inquisitive logic, $\varphi \vee \neg\varphi$ is uninformative, too, but it has an additional property: the disjunction '$\vee$' makes the sentence *inquisitive*. In a sense, $\varphi \vee \neg\varphi$ presents φ and $\neg\varphi$ as possibilities of how things might be and thus raises the issue whether the former or the latter possibility holds. More precisely, inquisitive logic distinguishes two satisfaction sets for this formula, the set S_φ of possible worlds[18] in which φ is true and the set $S_{\neg\varphi}$ of possible worlds in which $\neg\varphi$ is true. Thus the trivial question "Is the actual world an element of *the* satisfaction set of $\varphi \vee \neg\varphi$?" turns into the non-trivial question "Is the actual world an element of S_φ or an element of $S_{\neg\varphi}$?". To discuss the linguistic relevance of this logical conception, I will now take the perspective from the corresponding semantic framework of inquisitive semantics.

Inquisitive semantics incorporates the hypothesis that the truth-conditional meaning of a sentence has two aspects, an informative aspect and an inquisitive aspect. A sentence does not denote a proposition – an unstructured set of possible worlds – but a set of propositions, each of which characterizes a possibility of how the actual state of affairs might be. Thus a sentence can be informative – if the union of all propositions in its denotation is a proper subset of the set of possible worlds – and it can also be inquisitive – if its denotation contains more than one proposition. In this case the sentence raises the issue of which of the propositions is true in the actual world. Consider, for an example, the sentence in (27).

(27) Ann or Bill plays the piano.

As pointed out in Groenendijk (2008), a disjunctive sentence like (27) has two readings: an inquisitive and a non-inquisitive reading (see section 5.2 for discussion). On the inquisitive reading, the denotation of (27) contains two propositions, 'that Ann plays the piano' and 'that Bill plays the piano'. Hence it is informative and inquisitive: the union of the two propositions excludes all possible worlds in which neither Ann nor Bill plays the piano, and it raises the issue of which of the two propositions is true in the actual world. By using (27) with this intended meaning, the speaker proposes two possible updates of the common ground and thereby prompts specific reactions from the hearer, e.g., the response in (28) (cf. Groenendijk, 2008).

(28) (Yeah,) Ann does.

The reply in (28) settles the issue raised by (27) because it leads to an update of the common ground that no longer includes the possibility that Bill plays

[18] This characterization is not only to be understood in the sense of possible world semantics. Truth assignments to propositional variables count as possible worlds, too.

the piano.[19] On the non-inquisitive reading, (27) denotes the singleton set of the proposition 'that Ann plays the piano or Bill plays the piano'. Hence it is informative but not inquisitive: the proposition excludes the same possible worlds that are excluded on the inquisitive reading, but a single proposition does not raise an issue. When (27) is used with this meaning, it prompts the approval or rejection of the corresponding update of the common ground, e.g., the approving response in (29) (cf. Groenendijk, 2008).

(29) You're right. (Ann or Bill plays the piano.)

This illustrates the meaning hypothesis of inquisitive semantics with a declarative sentence. But this hypothesis is also a hypothesis about the meaning of interrogative sentences. That is, interrogative sentences are assumed to denote sets of propositions, too. This is, of course, a very common assumption. Nevertheless, let me discuss it in the light of what was said above. Other than in the declarative case, the denotation of an interrogative sentence is always a non-singleton set, since interrogative sentences always raise an issue.[20] For example, the *yes*/*no*-question in (30) raises the issue whether or not Ann plays the piano.

(30) Does Ann play the piano?

Correspondingly, the denotation of (30) is the set of the two propositions 'that Ann plays the piano' and 'that Ann does not play the piano'. The union of these propositions is the set of all possible worlds, which means that (30) is uninformative. According to Groenendijk (2008), uninformativeness belongs to the very definition of a (logical) question. Note, however, that uninformativeness and inquisitiveness are not sufficient conditions for interrogativity: the sentences in (31) are uninformative and inquisitive but still lack the character of interrogatives.

(31) a. Ann plays the piano or she doesn't play the piano.
b. Ann plays the piano or Bill plays the piano or neither of the two plays the piano.

Thus one of the central problems inquisitive semantics faces is to identify the semantic and/or pragmatic properties that distinguish declarative from interrogative sentences. In section 7.1, I will sketch a solution to this problem in terms of certain assumptions about declarative and interrogative speech acts.

Another problem we must address concerns the grammatical conditions under which inquisitive readings can arise. The source of inquisitiveness of the inquisitive reading of (27) is the natural language disjunction *or*. In the case of the non-inquisitive reading of (27), *or* lacks the property that gives rise to in-

[19] This update requires the pragmatic strengthening of the meaning of (28) (see Groenendijk, 2008; Groenendijk and Roelofsen, 2009, and the discussion in section 4.3.4 and 4.3.5).

[20] I exclude "special interrogatives" like rhetorical questions from consideration.

quisitiveness.[21] This means that *or* is ambiguous between an inquisitive and a non-inquisitive meaning, and we can expect that *or* is also ambiguous in interrogative sentences. This expectation is in fact borne out, as shown by (32).

(32) Q: Does Ann or Bill play the piano?
A_1: Ann does. A'_1: Bill does.
A_2: Yes. A'_2: No.

The question in (32) is ambiguous between an alternative-question reading, see the adequacy of the replies in ($32A_1$) and (A'_1), and a *yes*/*no*-question reading, see the adequacy of ($32A_2$) and (A'_2). The first reading arises from the inquisitive meaning of *or*, and the second reading from its non-inquisitive meaning. The two readings of (32) can be clearly disambiguated by intonation (see section 5.2).[22] Thus we need to explain the relation between the inquisitiveness of *or* and the intonational properties that disambiguate (32-Q). This will be done in section 5.4.

Before concluding this section, a remark of caution is in order concerning the empircal basis of inquisitive semantics. It is a very common phenomenon that a declarative statement can be elaborated with another statement even if the first statement does not raise an issue in the sense above. Consider, for example, the dialogue in (33).

(33) A: Ann will arrive in the afternoon.
B: (Yeah.) She will arrive at 5:15 p.m.

The utterance of speaker B is a perfectly adequate response to speaker A's statement, and in a loose sense it settles an issue raised by A, viz. the issue of when exactly Ann will arrive. However, I think that it would be absurd to assume that (33-A) is inquisitive in the sense of inquisitive semantics, i.e. that it denotes the set of propositions 'that Ann will arrive at 5:15 p.m.', 'that Ann will arrive at 5:16 p.m.' etc. Discourse phenomena like this raise serious empirical problems for the approach of inquisitive semantics. However, in the domain considered in this paper the empirical problems are much less severe. That is, we have reliable intuitions regarding the two readings of a question like (34).

(34) Do you kick or beat your dog?

In particular, we have reliable intuitions about which intonation gives rise to which reading. Therefore, the discussion will concentrate on inquisitiveness in interrogative sentences (especially in section 5.4).

[21] For the moment, I neglect the possibility that *or* is always inquisitive and that certain grammatical environments block its inquisitive import. See section 5.2.1 and 5.2.2 for discussion.

[22] It might be that the two readings of the declarative sentence in (27) also go along with different intonations (see Groenendijk, 2008). However, the intuitions are less clear than in the case of interrogative sentences.

3.3 The formal framework

For my analysis, I will use and extend the semantic formalism proposed in Roelofsen and van Gool (2009), which is a standard proposition-set semantics (cf. Hamblin, 1973; Rooth, 1985, 1992; Kratzer and Shimoyama, 2002; Alonso-Ovalle, 2006, among many others) if we only look at the semantic objects that it defines. The inquisitive-semantics flavor comes with the (quasi-)logical operations that we define on and between these semantic objects. By these operations, we impose a non-Boolean algebraic structure on the domains of our models, the algebraic structure of inquisitive logic. I will often refer to the resulting framework as *inquisitive proposition-set semantics* or as *proposition-set variant of inquisitive logic* (or *p-set inquisitive logic* for short).

We start out with a proposition-set semantics over a type logic with two basic types, e and s (in addition to the basic type t). Thus our underlying semantic objects are e.g. entities such as 'Ann' (from the domain $\mathcal{D}_e$ of objects to which type logical expressions of type e are mapped), properties such as $\lambda x \lambda w.\text{play}_w(x)$ (from $\mathcal{D}_{\langle e,\langle s,t\rangle\rangle}$), and propositions such as $\lambda w.\text{play}_w(\text{Ann})$ (from $\mathcal{D}_{\langle s,t\rangle}$), etc. Linguistic expressions denote sets of such objects like those given in (35).[23]

(35) **Example denotations**

a. $\{\text{Ann}\}$
b. $\{\lambda x \lambda w.\text{play}_w(x)\}$
c. $\{\text{Ann}, \text{Bill}\}$
d. $\{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill})\}$

For example, the singleton-set in (35a) is the denotation of the proper name *Ann*, and that in (35b) is the denotation of the intransitive verb *play*. This is given in (36a) and (b), respectively, where $[\![\cdot]\!]$ is the denotation function.

(36) a. $[\![\textit{Ann}]\!] = \{\text{Ann}\}$
b. $[\![\textit{play(s)}]\!] = \{\lambda x \lambda w.\text{play}_w(x)\}$

Furthermore, the non-singleton set in (35c) is the denotation of the disjunctive DP *Ann or Bill* on the inquisitive reading of *or*, see (37).

(37) $[\![\textit{Ann or Bill}]\!] = \{\text{Ann}, \text{Bill}\}$

Here and in most of the discussion that follows, I will restrict attention to inquisitive *or*. Non-inquisitive *or* will be discussed in section 5. It will always be designated by $or^{[-\text{inq}]}$ to distinguish it from inquisitive *or* (designated simply by *or*). For the purpose of comparison, the denotation of the non-inquisitive disjunctive DP *Ann* $or^{[-\text{inq}]}$ *Bill* is given in (38) (see section 3.5 for a compositional

[23] Here and below, x is a variable of type e and w a variable of type s. Furthermore, the capital letter P always designates variables of type $\langle e, \langle s, t\rangle\rangle$.

definition).

(38) $[\![Ann\ or^{[-\text{inq}]}\ Bill]\!] = \{\lambda P \lambda w[P(\text{Ann})(w) \vee P(\text{Bill})(w)]\}$

Note that the denotation in (38) is a singleton set. This means that it does not give rise to inquisitive sentence denotations. The fact in (37) derives from the assumption the inquisitive disjunctive DP *Ann or Bill* denotes the set union of the denotation of the two disjuncts:

(39) $[\![Ann\ or\ Bill]\!] = [\![Ann]\!] \cup [\![Bill]\!] = \{\text{Ann}, \text{Bill}\}$

Generally, inquisitive *or* gives rise to non-singleton denotations, according to the definition in (40) from Roelofsen and van Gool (2009).[24]

(40) **The semantics of inquisitive** *or* (*to be amended*)
For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$ then $[\![\,[\alpha\ or\ \beta]\,]\!] = [\![\alpha]\!] \cup [\![\beta]\!]$.

The logical status of the set union operation in (39) and (40) will be discussed below.

The mode of semantic composition is pointwise functional application, defined in (41).

(41) **Pointwise functional application**

a. If α is a branching node with daughters β and γ, then $[\![\alpha]\!] = [\![\beta]\!] \bullet [\![\gamma]\!]$.

b. If $F \subseteq \mathcal{D}_{\langle\sigma,\tau\rangle}$ and $X = A \cup G$, where $A \subseteq \mathcal{D}_\sigma$ and $G \subseteq \mathcal{D}_{\langle\langle\sigma,\tau\rangle,\tau\rangle}$,
then $F \bullet X = X \bullet F =$
$= (\{f(a) \mid f \in F \,\&\, a \in A\} \cup \{g(f) \mid g \in G \,\&\, f \in F\}) \backslash \epsilon$.

c. $\epsilon = \{\lambda w.w \neq w\}$, where w is a variable of type s.

The operation defined in (41) is more powerful than what is standardly assumed: a set of functions f can be combined with a set that not only contains arguments a of the f-functions but also higher-order functions g that take the f-functions as argument. This will allow us to define a type-flexible question operator (see section 3.4.2). Furthermore note that we systematically remove the empty proposition $\lambda w.w \neq w$ from the sets derived by pointwise functional application (and other operations that will be defined below). This is to guarantee that a non-contradictory sentence denotes a set of non-empty propositions and that a contradictory sentence denotes the empty set.[25] The proposition set in (35d) is derived by pointwise functional application of the functor set in (35b) to the argument

[24] There might be other grammatical elements that lead to non-singleton denotations, e.g. indefinites/*wh*-words, see fn. 74. Cf. Kratzer and Shimoyama (2002) for such an assumption w.r.t. indeterminate pronouns.

[25] If in (41b) $\tau \neq \langle s, t\rangle$, the subtraction of the empty proposition is obviously vacuous and hence harmless.

set in (35c). This is shown in (42) as a step in the derivation of the denotation of the sentence *Ann or Bill plays*.

$$
\begin{aligned}
(42) \qquad [\![\textit{Ann or Bill plays}]\!] &= [\![\textit{Ann or Bill}]\!] \bullet [\![\textit{plays}]\!] \\
&= \{\text{Ann}, \text{Bill}\} \bullet \{\lambda x \lambda w.\text{play}_w(x)\} \\
&= \{f(y) \mid f \in \{\lambda x \lambda w.\text{play}_w(x)\} \;\&\; y \in \{\text{Ann}, \text{Bill}\}\}\backslash\epsilon \\
&= \{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill})\}
\end{aligned}
$$

The logical status of set union. As pointed out in section 3.2, the disjunction '$\vee$' is the source of inquisitiveness in inquisitive logic: a sentence $\varphi \vee \psi$ has two satisfaction sets S_φ and S_ψ and thus raises the issue whether the actual world is an element of S_φ or S_ψ (if any). Furthermore, we have observed that the natural language disjunction *or* has interpretive properties that we can characterize as inquisitive in this sense. Now, in (40) we equated the meaning of *or* with the union operation of set theory, which gives rise to non-singleton, i.e., inquisitive denotations. This means that we have made the assumption that the union operation is the (inquisitive) disjunction of p-set inquisitive logic. To make this fully explicit, (43) defines the logical constant '$\vee$' for this logic.

(43) **Inquisitive disjunction**
For all types τ, if $A, B \subseteq \mathcal{D}_\tau$ then $A \vee B = A \cup B$.

In the following, I will alternatively use the union symbol '$\cup$' and the disjunction symbol '$\vee$' to designate the set union of two homogeneous sets of semantic objects. The use of '$\cup$' makes it obvious that we are dealing with sets of semantic objects, and '$\vee$' emphasizes the logical status of this operation. For example, the stipulation in (40) can be equivalently given as in (44).

(44) **The semantics of inquisitive** *or* (*alternative notation, to be amended*)
For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$ then $[\![\,[\alpha \textit{ or } \beta]\,]\!] = [\![\alpha]\!] \vee [\![\beta]\!]$.

This stipulation emphasizes our claim that the disjunctive coordinator *or* is the natural language correlate of the disjunctive connective of p-set inquisitive logic.

3.4 *Yes/no*-questions in inquisitive semantics

In this section, I will discuss the approach of Roelofsen and van Gool (2009) to the meaning of *yes/no*-questions, with some additions in the technical details. The assumptions made here will be refined in section 6.4. The following section is on Hausa, where the interrogative marker is a complementizer, and section 3.4.2 is on Tangale and Bole, where the interrogative marker is a particle dependent on interrogative C.

3.4.1 *Yes/no*-question semantics I: Hausa

According to Roelofsen and van Gool (2009), the operator denoted by $C^{[+Q]}$ forms the union of the denotation of its complement and what I call the *converse* of this denotation. The complement of $C^{[+Q]}$ denotes a set of propositions, see section 3.3. If A is a set of propositions, its converse A^* is the singleton set of the proposition that is true of all worlds not included in any proposition in A, see (45).[26]

(45) **The converse operation** (*to be generalized*)
If $A \subseteq \mathcal{D}_{\langle s,t\rangle}$, then $A^* = \{\lambda w.\forall p \in A : p(w) = 0\} \backslash \epsilon$.

With this, the denotation of a *yes/no*-question $[C^{[+Q]}\ \alpha]$ (where α is a TP denoting a propostion set) is defined as given in (46) (cf. Roelofsen and van Gool, 2009).

(46) $[\![\ [C^{[+Q]}\ \alpha]\ ]\!] = [\![C^{[+Q]}]\!]([\![\alpha]\!]) = Q([\![\alpha]\!]) = [\![\alpha]\!] \cup [\![\alpha]\!]^*$ (*to be revised*)

Let us illustrate this with the Hausa *yes/no*-question in (11), repeated below for convenience.

(47) $[_{CP}\ [_{C^{[+Q]}}$ koː$]\ [_{TP}$ Musa nàː nan$]]$
'Is Musa there?'

Let us first consider the TP denotation. Since the TP in (47) does not contain a disjunction, it denotes the singleton set of a proposition:[27]

(48) $[\![\ [_{TP}$ Musa nàː nan$]\ ]\!] = \{\lambda w.\text{there}_w(\text{Musa})\}$

The converse of the set in (48) is the singleton set of the negation of $\lambda w.\text{there}_w(\text{Musa})$. This can be derived as shown in (49).

(49) $\begin{aligned} \{\lambda w.\text{there}_w(\text{Musa})\}^* &= \{\lambda w'.\forall p \in \{\lambda w.\text{there}_w(\text{Musa})\} : p(w') = 0\} \backslash \epsilon \\ &= \{\lambda w'[\lambda w[\text{there}_w(\text{Musa})](w') = 0]\} \\ &= \{\lambda w.\neg\text{there}_w(\text{Musa})\} \end{aligned}$

Consequently, by (193), (47) has the following denotation:

(50) $\begin{aligned} [\![(47)]\!] &= \{\lambda w.\text{there}_w(\text{Musa})\} \cup \{\lambda w.\neg\text{there}_w(\text{Musa})\} \\ &= \{\lambda w.\text{there}_w(\text{Musa}), \lambda w.\neg\text{there}_w(\text{Musa})\} \end{aligned}$

Two remarks are in order here. First, the proposition set derived in (50) is identical to the Hamblin denotation of (47) (and isomorphic to the Groenendijk&Stokhof denotation of this question). Still there are important differences between the inquisitive-semantics approach on the one hand, and the ap-

[26] I presuppose non-empty sets of semantic objects in all definitions of this kind.
[27] For simplicity, I ignore the indexical nature of '(to be) there'.

proaches of Hamblin and Groenendijk&Stokhof on the other, see section 3.6 and 3.7.

Second, the derivation in (50) illustrates that the converse operation is a negation operation. In fact, it is *the* negation of our p-set inquisitive logic (see section 3.4.2 for a type-flexible definition):

(51) **Negation** (*to be generalized*)
If $A \subseteq \mathcal{D}_{\langle s,t\rangle}$, then $\neg A = A^*$.

Thus, by (43) and (51), the stipulation in (193) can be rendered as in (52).

(52) **The denotation of interrogative CPs** (*to be revised*)
$[\![\, [\mathrm{C}^{[+\mathrm{Q}]}\, \alpha] \,]\!] = [\![\mathrm{C}^{[+\mathrm{Q}]}]\!]([\![\alpha]\!]) = Q([\![\alpha]\!]) = [\![\alpha]\!] \vee \neg[\![\alpha]\!]$

In the ideal case, this stipulation (or rather the revised version of it) is also correct for other question types. Therefore, (52) is taken as a hypothesis about the denotation of interrogative sentences in general. In section 5, I will show that the meaning hypothesis developed for *yes/no*-questions in fact carries over to alternative questions. If we abstract from the syntactic aspects of the stipulation in (52), the meaning of the Q operator can be given as in (53), where A is a subset of $\mathcal{D}_{\langle s,t\rangle}$.[28]

(53) **The meaning of the question operator** Q (*to be revised*)
$Q(A) = A \vee \neg A$

Note that (53) is exactly what we identified as the goal of a semantic analysis that strives to explain the interrogative-disjunctive affinity: that the question operator truly is a unary disjunction, see (26) in section 3.1. What remains to be shown is that logical operators of p-set inquisitive logic are significant in other linguistic domains than that under discussion. This will be done in section 3.6.

Graphical representations of question denotations. For the upcoming discussion it will be useful to have a graphical representation of question denotations. The denotation derived in (50) is graphically represented in figure 1(a).[29] Figure 1(b) represents the denotation of another *yes/no*-question, see below for discussion. The nodes labeled '1_' (i.e., '11' and '10') represent the worlds where Musa is at the location indicated by *there*, and the nodes labeled '0_' represent the worlds where Musa is not there. Thus the box around the two upper nodes in figure 1(a) represents the proposition $\lambda w.\mathrm{there}_w(\mathrm{Musa})$ and the box around the two lower nodes the proposition $\lambda w.\neg\mathrm{there}_w(\mathrm{Musa})$. Furthermore, the nodes labeled '_1' could represent the worlds where another person, say Yusuf, is there,

[28] Later we will drop the type restriction for the argument of Q (see section 3.4.2).

[29] The labels are shorthands for the represented denotations. They borrow elements from the syntax of inquisitive propositional logic (see, e.g., Groenendijk and Roelofsen, 2009).

(a) ? there(M) (b) ? there(Y)

Figure 1: *Yes/no*-question denotations

and the nodes labeled '_0' the worlds where Yusuf is not there. Thus figure 1(b) is a graphical representation of the denotation of the question *Is Yusuf there?*

3.4.2 *Yes/no*-question semantics II: Tangale and Bole

In section 2.2.2 and 2.2.3, I argued that the interrogative markers of Tangale and Bole are not interrogative C heads themselves but particles that need to be licensed by interrogative C (specifically, by the null C head of root non-*wh*-questions). In principle, this leaves two options for the semantics of root *yes/no*-questions in these languages: (i) the C head denotes the Q operator proposed in section 3.4.1 and the interrogative marker is a formal element only (which serves to signal the presence of the null C head), or (ii) the C head is a formal element (encoding properties like sentence type and illocutionary force) and the interrogative marker denotes Q. I have argued before that the formal affinity between interrogative markers and disjunctive coordinators is a reflex of an underlying semantic similarity. This affinity is explained only if it is the interrogative marker that denotes Q. Furthermore, the discussion in section 6 will show that at least the interrogative marker of Bole is a semantically active element (viz. a focus-sensitive operator). This strongly suggests that the second assumption is correct.

The Tangale question in (16) (repeated below for convenience) does not pose a problem for the assumption that Q is denoted by the interrogative marker.

(54) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{TP}}$ Mairo edug ɗom] ya]]
'Did Mairo eat beans?'

In (54), the interrogative marker *ya* is adjoined to TP, which is the category selected by C. Therefore it does not make a difference for the semantic composition if it is the C head or the interrogative marker that denotes Q. That is, we can derive the meaning of (54) as schematically illustrated in (55).

(55) $[\![\,[\text{C}^{[+\text{Q}]}\,[\,\text{TP}\ ya]]\,]\!] = [\![\,[\,\text{TP}\ ya\,]\,]\!] = Q([\![\text{TP}]\!])$

However, we need a type-flexible Q operator for the interrogative marker in the Bole question in (22) (repeated in simplified form below).

(56) $[_{\text{CP}}$ C$^{[+\text{Q}]}$ $[_{\text{TP}}$ [Zara$^{[+\text{Foc}]}$ *ɗo*] $[_{\text{T}'}$ gave a watch to Abu yesterday]]]
'Did ZARA give a watch to Abu yesterday?'

In (56), the interrogative marker *ɗo* is adjoined to the subject DP. So far the Q operator can only be applied to TP denotations, i.e., to subsets of $\mathcal{D}_{\langle s,t\rangle}$. To get rid of any type restriction on the argument of Q, the converse/negation operator must be generalized to (homogeneous sets of objects of) all semantic types (see definition (45) in the previous section for the type-restricted definition). Let us first generalize the converse operation to types that do not end in t:[30, 31]

(57) **The converse operation for types that do not end in t**
If $A \subseteq \mathcal{D}_\tau$ (for a type τ that does not end in t),
then $A^* = \{\lambda b \lambda w. \forall a \in A : b(a)(w) = 0\}$

For the singleton set of the individual Zara, this definition yields as converse the singleton set of the characteristic function of all properties that do not apply to Zara:

(58) $\{\text{Zara}\}^* = \{\lambda P \lambda w. \forall x \in \{\text{Zara}\} : P(x)(w) = 0\}$
$= \{\lambda P \lambda w. \neg P(\text{Zara})(w)\}$

In (59), the converse operation is generalized to all types that end in t.[32]

(59) **The converse operation for types that end in t**
a. $\{1\}^* = \{0\}$, $\{0\}^* = \{1\}$, $\mathcal{D}_t^*$ is undefined.
b. If $A \subseteq \mathcal{D}_{\langle \sigma_1, \langle \ldots, \langle \sigma_n, t\rangle \ldots\rangle\rangle}$ (for arbitrary types σ_i, $1 \leqslant i \leqslant n, n \geqslant 1$),
then $A^* = \{\lambda b_1 \ldots \lambda b_n. \forall a \in A : a(b_1) \ldots (b_n) = 0\} \backslash \epsilon$.

For example, if an expression denotes the set of properties in (60a) (= the inquisitive disjunction of the type-lifted denotations of *Musa* and *Yusuf*) the converse of this set is the singleton set given in (60b) (= ⟦*neither Musa nor Yusuf*⟧).

(60) a. $\{\lambda P \lambda w. P(\text{Musa})(w), \lambda P \lambda w. P(\text{Yusuf})(w)\}$
b. $(60\text{a})^* = \{\lambda P \lambda w. \forall \mathcal{Q} \in (60\text{a}) : \mathcal{Q}(P)(w) = 0\} \backslash \epsilon$
$= \{\lambda P \lambda w [\neg P(\text{Musa})(w) \wedge \neg P(\text{Yusuf})(w)]\}$

Now the negation of p-set inquisitive logic can be generalized as follows.

(61) **Negation**

[30] A semantic type τ ends in t iff $\tau = t$ or there are semantic types $\sigma_1, \langle \ldots, \langle \sigma_n$ $(n \geqslant 1)$ such that $\tau = \langle \sigma_1, \langle \ldots, \langle \sigma_n, t\rangle \ldots\rangle\rangle$.

[31] In (57), a is a variable of type τ and b is a variable of type $\langle \tau, \langle s, t\rangle\rangle$.

[32] In (59), a is a variable of type $\langle \sigma_1, \langle \ldots, \langle \sigma_n, t\rangle \ldots\rangle\rangle$ and for all i, $1 \leqslant i \leqslant n$, b_i is a variable of type σ_i.

For all types τ, if $A \subseteq \mathcal{D}_\tau$ then $\neg A = A^*$.

With this in hand, we can derive the denotation of (56) in the following way. According to our previous assumptions, the subject DP without the interrogative marker denotes the singleton set of the individual Zara.[33] Hence, the subject DP with the interrogative marker has the denotation derived in (62).

(62) $$\begin{aligned} [\![[\,\text{Zara}^{[+\text{Foc}]}\ \text{ɗo}\,]]\!] &= Q(\{\text{Zara}\}) \\ &= \{\text{Zara}\} \vee \neg\{\text{Zara}\} \\ &= \{\text{Zara}\} \cup \{\lambda P \lambda w.\neg P(\text{Zara})(w)\} \\ &= \{\text{Zara}, \lambda P \lambda w.\neg P(\text{Zara})(w)\} \end{aligned}$$

If we assume for simplicity that the T′ projection denotes the singleton set of the property $\lambda x \lambda w.\text{give}_w(x, \text{Abu}, \text{watch})$, the *yes/no*-question in (56) denotes the set of propositions derived in (63).

(63) $$\begin{aligned} [\![[\text{C}^{[+\text{Q}]}\ [_{\text{TP}}\,[\,\text{Zara}^{[+\text{Foc}]}\ \text{ɗo}\,]\ \text{T}'\,]]]\!] &= \\ &= [\![[_{\text{TP}}\,[\,\text{Zara}^{[+\text{Foc}]}\ \text{ɗo}\,]\ \text{T}'\,]]\!] \\ &= [\![[\,\text{Zara}^{[+\text{Foc}]}\ \text{ɗo}\,]]\!] \bullet [\![\text{T}']\!] \\ &= \{\text{Zara}, \lambda P \lambda w.\neg P(\text{Zara})(w)\} \bullet \{\lambda x \lambda w.\text{give}_w(x, \text{Abu}, \text{watch})\} \\ &= \left\{ \begin{array}{l} \lambda w.\text{give}_w(\text{Zara}, \text{Abu}, \text{watch}), \\ \lambda w.\neg\text{give}_w(\text{Zara}, \text{Abu}, \text{watch}) \end{array} \right\} \end{aligned}$$

This is the correct result (apart from the missing focus interpretation). For the time being, this concludes the discussion of *yes/no*-questions. However, I will resume the discussion in section 6, where I consider focus effects in *yes/no*-questions and alternative questions.

3.5 The logical connectives of p-set inquisitive logic and other definitions

This section collects the definitions of the logical connectives of p-set inquisitive logic (by reference or by providing the actual definition). Furthermore, the section contains the definition of the semantics of non-inquisitive *or* and of the entailment relation.

Inquisitive disjunction. The inquisitive disjunction was defined in (43) in section 3.3.

Negation. The negation of p-set inquisitive logic was defined in (57), (59), and (61) in section 3.4.2.

[33] The semantic import of the focus feature will be discussed in section 6.

Non-inquisitive closure. To eliminate the inquisitive meaning aspect of (or arising from) a homogeneous set A of semantic objects, we refer by $!A$ to the non-inquisitive closure of A, as defined in (64).

(64) **Non-inquisitive closure**
For all types τ, if $A \subseteq \mathcal{D}_\tau$ then $!A = \neg\neg A$.

The non-inquisitive closure of a proposition set A is the singleton set of the proposition that contains all possible worlds that are elements of some proposition in A, see (65).

(65) If $A \subseteq \mathcal{D}_{\langle s,t\rangle}$, then $!A = \{\lambda w[\exists p \in A : p(w) = 1]\}$.

The non-inquisitive closure of sets of non-propositional objects will be exemplified in the following paragraph and in section 5.2.1.

Non-inquisitive disjunction. The non-inquisitive disjunction of two sets $A, B \subseteq \mathcal{D}_\tau$ (for an arbitrary type τ) can be defined as the non-inquisitive closure of the inquisitive disjunction of A and B, i.e. as $!(A \vee B)$. This is exemplified in (66) for two singleton proposition sets.

(66) $!(\{\lambda w.\text{there}_w(\text{Musa})\} \vee \{\lambda w.\text{there}_w(\text{Yusuf})\}) =$
$= \; !\{\lambda w.\text{there}_w(\text{Musa}), \lambda w.\text{there}_w(\text{Yusuf})\}$
$= \; \{\lambda w[\text{there}_w(\text{Musa}) \vee \text{there}_w(\text{Yusuf})]\}$

I do not introduce a symbol for the non-inquisitive disjunction operation. Rather I give below the meaning of the natural language equivalent of this operator (i.e., of non-inquisitive *or*) in unabbreviated form.

(67) **The semantics of** $or^{[-\text{inq}]}$
For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$ then $[\![\,[\alpha \; or^{[-\text{inq}]} \; \beta]\,]\!] = !([\![\alpha]\!] \vee [\![\beta]\!])$

The non-inquisitive meaning of the disjunction of two proper names is exmplified in (68).

(68) $[\![\,[\textit{Musa} \; or^{[-\text{inq}]} \; \textit{Yusuf}]\,]\!] = \; !(\{\text{Musa}\} \vee \{\text{Yusuf}\})$
$= \; \{\lambda P \lambda w[P(\text{Musa})(w) \vee P(\text{Yusuf})(w)]\}$

Conjunction. The conjunction of p-set inquisitive logic is defined by means of the operator '$\sqcap$' which forms the set of pairwise conjunctions of the elements of its operands, see (69).

(69) If $A, B \subseteq \mathcal{D}_{\langle s,t\rangle}$, then $A \sqcap B = \{\lambda w[p(w) \wedge q(w)] \mid p \in A \;\&\; q \in B\} \backslash \epsilon$.

In (70), this operation is generalized to homogenuous sets of semantic objects of arbitrary type.[34]

(70) a. If $A, B \subseteq \mathcal{D}_{\langle\sigma_1,\langle\ldots,\langle\sigma_n,t\rangle\ldots\rangle\rangle}$ (for arbitrary types σ_i, $1 \leqslant i \leqslant n, n \geqslant 0$), then $A \sqcap B =$
$= \{\lambda c_1 \ldots \lambda c_n[\, a(c_1)\ldots(c_n) \wedge b(c_1)\ldots(c_n)] \mid a \in A \;\&\; b \in B\}\backslash\epsilon$.

b. If $A, B \subseteq \mathcal{D}_\sigma$ (for a type σ that does not end in t),
then $A \sqcap B = \{\lambda c \lambda w[c(a)(w) \wedge c(b)(w)] \mid a \in A \;\&\; b \in B\}$.

As already mentioned above, '$\sqcap$' is the conjunction of p-set inquisitive logic:

(71) **Conjunction**
For all types τ, if $A, B \subseteq \mathcal{D}_\tau$ then $A \wedge B = A \sqcap B$.

See section 3.6.1 for linguistic examples.

Implication. Like conjunction before, the implication of p-set inquisitive logic is defined as pairwise implication between the elements of its operands, see (72).

(72) **Propositional Implication**
If $A, B \subseteq \mathcal{D}_{\langle s,t\rangle}$, then $A \rightarrow B = \{\lambda w[\, p(w) \rightarrow q(w)] \mid p \in A \;\&\; q \in B\}\backslash\epsilon$.

This definition is only given for completeness, since we will not make use of it in this paper.

Entailment. If A and B are sets of propositions, A entails B iff every proposition in A entails a proposition in B:

(73) **Entailment** (*recursive base*)
If $A, B \subseteq \mathcal{D}_{\langle s,t\rangle}$,
then $A \vdash B$ iff $\forall p \in A : \exists q \in B : \forall w \in \mathcal{D}_s : p(w) \rightarrow q(w)$.

If (73) is taken as the base case of a recursive definition, the recursive step in (74) generalizes the entailment relation to homogeneous sets of objects of all other types that end in $\langle s, t\rangle$.

(74) **Entailment** (*recursive step*)
If $A, B \subseteq \mathcal{D}_{\langle\sigma_1,\langle\ldots,\langle\sigma_n,\langle s,t\rangle\rangle\ldots\rangle\rangle}$ (for arbitrary types σ_i, $1 \leqslant i \leqslant n, n \geqslant 1$),
then $A \vdash B$ iff $\forall P \in A : \exists Q \in B : \forall d \in \mathcal{D}_{\sigma_1} : \{P(d)\} \vdash \{Q(d)\}$.

See section 6.5 for an application of the entailment relation.

[34] In (70a), a and b are variables of type $\langle\sigma_1,\langle\ldots,\langle\sigma_n,t\rangle\ldots\rangle\rangle$ and for all i, $1 \leqslant i \leqslant n$, c_i is a variable of type σ_i. In (70b), a and b are variables of type σ and c is a variable of type $\langle\sigma,\langle s,t\rangle\rangle$

3.6 Inquisitive semantics is explanatorily more adequate

In section 3.1, I pointed out that the "classical" question theories go some way to explaining the interrogative-disjunctive affinity. Here I will show that they do not achieve this goal, though. To make this argument, I will first demonstrate that the logical connectives of p-set inquisitive logic can be used to represent the logical vocabulary of natural languages.

3.6.1 P-set inquisitive logic is significant for the logical vocabulary

Above we saw that the inquisitive disjunction '$\vee$' and the negation '$\neg$' of p-set inquisitive logic are crucial for the denotation of the interrogative C head of *yes/no*-questions. In addition to this, it can be easily shown that '$\neg$' is adequate to represent the meaning of sentence negation, see (75).

(75) $$\begin{aligned} \neg[\![\textit{Ann plays}]\!] &= \{\lambda w.\text{play}_w(\text{Ann})\}^* \\ &= \{\lambda w'.\forall p \in \{\lambda w.\text{play}_w(\text{Ann})\} : p(w') = 0\}\} \\ &= \{\lambda w'[\lambda w[\text{play}_w(\text{Ann})](w') = 0]\} \\ &= \{\lambda w.\neg\text{play}_w(\text{Ann})\} \\ &= [\![\textit{Ann does not play}]\!] \end{aligned}$$

In *yes/no*-questions, sentential negation can cause various pragmatic effects (see Han and Romero, 2004; Repp, 2006). To avoid these complications, I will use the adjectival prefix *un-* to show that '$\neg$' can be used to account for the semantics of negated expressions in *yes/no*-questions. Consider the question pair in (76).

(76) a. Is Ann happy?
b. Is Ann unhappy?

The two questions in (76) have somewhat different use conditions because they "highlight" different propositions, viz. *Ann is happy* and *Ann is unhappy*, respectively (see section 4.3.2). However, as far as their answerhood conditions are concerned, they are equivalent to the extent that *happy* and *unhappy* are antonyms. That is, the positive/negative answer to (76a) is equivalent to the negative/positive answer to (76b). Let us assume that $[\![\textit{unhappy}]\!] = \neg[\![\textit{happy}]\!]$. Thus $[\![\textit{unhappy}]\!] = \{\lambda x\lambda w.\neg[\![\textit{happy}]\!](x)(w)\}$. Then it can be easily seen that (76a) and (b) have the same denotation in inquisitive semantics:

(77) $$\begin{aligned} [\![\textit{Is Ann happy?}]\!] &= \{\lambda w.[\![\textit{happy}]\!](\text{Ann})(w), \lambda w.\neg[\![\textit{happy}]\!](\text{Ann})(w)\} \\ &= \{\lambda w.\neg\neg[\![\textit{happy}]\!](\text{Ann})(w), \lambda w.\neg[\![\textit{happy}]\!](\text{Ann})(w)\} \\ &= \{\lambda w.\neg[\![\textit{unhappy}]\!](\text{Ann})(w), \lambda w.[\![\textit{unhappy}]\!](\text{Ann})(w)\} \\ &= [\![\textit{Is Ann unhappy?}]\!] \end{aligned}$$

Furthermore, the conjunction '$\wedge$' yields the correct meaning for the conjunction of two declarative sentences:

(78) $[\![\textit{Ann plays}]\!] \wedge [\![\textit{Bill sings}]\!] =$

$= \{\lambda w.\text{play}_w(\text{Ann})\} \sqcap \{\lambda w.\text{sing}_w(\text{Bill})\}$

$= \{\lambda w'[p(w') \wedge q(w')] \mid p \in \{\lambda w.\text{play}_w(\text{Ann})\} \;\&\; q \in \{\lambda w.\text{sing}_w(\text{Bill})\}\}$

$= \{\lambda w[\text{play}_w(\text{Ann}) \wedge \text{sing}_w(\text{Bill})]\}$

$= [\![\textit{Ann plays and Bill sings}]\!]$

This is also true for the conjunction of two *yes/no*-questions:

(79) $[\![\textit{Does Ann play?}]\!] \wedge [\![\textit{Does Bill sing?}]\!] =$

$= \{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\neg\text{play}_w(\text{Ann})\} \sqcap$
$\sqcap \{\lambda w.\text{sing}_w(\text{Bill}), \lambda w.\neg\text{sing}_w(\text{Bill})\}$

$= \{\lambda w'[p(w') \wedge q(w')] \mid p \in \{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\neg\text{play}_w(\text{Ann})\} \;\&$
$\& \; q \in \{\lambda w.\text{sing}_w(\text{Bill}), \lambda w.\neg\text{sing}_w(\text{Bill})\}\}$

$= \{\lambda w[\text{play}_w(\text{Ann}) \wedge \text{sing}_w(\text{Bill})], \lambda w[\text{play}_w(\text{Ann}) \wedge \neg\text{sing}_w(\text{Bill})],$
$\lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{sing}_w(\text{Bill})], \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \neg\text{sing}_w(\text{Bill})]\}$

$= [\![\textit{Does Ann play? And does Bill sing?}]\!]$

Thus we can conclude that the connectives of inquisitive logic are just the right logical operators for a proposition-set theory of natural language meaning.

3.6.2 The Boolean set operators do not represent natural language conjunction and negation

I will specifically discuss the Hamblin approach to question meaning but similar arguments can also be made with respect to the approaches of Karttunen and Groenendijk&Stokhof. Recall from section 3.1 that the Hamblin denotation of a *yes/no*-question can be derived as shown in (80).

(80) $[\![\,[\text{C}^{[+\text{Q}]}\,\alpha]]\!] = Q_{\text{H}}([\![\alpha]\!]) = [\![\alpha]\!] \cup \neg[\![\alpha]\!]$

If we want to say that the union operation '$\cup$' is a logical disjunction, we have to specify what the other operators are that together with set union comprise a logical system. I think that in the absence of such a specification the null hypothesis is that the relevant operators are the operators of the Boolean set algebra. Now, note first that the negation in (80) is not the negation of the Boolean set algebra. The Boolean negation of sets '$\neg_B$' gives the complement set of its operand, see (81).

(81) If $A \subseteq \mathcal{D}_\tau$ (for an arbitrary type τ), then $\neg_B A = \mathcal{D}_\tau \backslash A$.

Thus the Boolean negation of the singleton set of a proposition is not the singleton set of the negation of this proposition, see (82) for an example.

$$\begin{aligned}(82)\qquad \neg_B\{\lambda w.\text{play}_w(\text{Ann})\} &= \mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{play}_w(\text{Ann})\}\\ &\neq \{\lambda w.\neg\text{play}_w(\text{Ann})\}\end{aligned}$$

The negation required in (80) is that of p-set inquisitive logic. Of course, $\neg_B$ could play a role in other linguistic domains. However, $\neg_B$ seems not to be adequate to represent sentence negation, see (83).

$$\begin{aligned}(83)\qquad \neg_B[\![\textit{Ann plays}]\!] &= \mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{play}_w(\text{Ann})\}\\ &\neq [\![\textit{Ann does not play}]\!]\end{aligned}$$

The Boolean negation of *Ann plays* is inquisitive: it raises the issue 'What is the case if Ann does not play?' Taken as a Hamblin set, it represents the set of possible answers to this question. It should be clear, however, that the sentence *Ann does not play* is not inquisitive / does not represent a non-singleton set of possible answers or states of affairs. This can be seen most clearly when we consider the question *Is Ann unhappy?* Let us assume for simplicity that the adjectival negation *un-* is a sentence operator that denotes the Boolean negation of sets. Then the TP of this question has the following denotation: $[\![\textit{Ann is unhappy}]\!] = \neg_B\{\lambda w.[\![\textit{happy}]\!](\text{Ann})(w)\}$. Thus $[\![\textit{Ann is unhappy}]\!] = \mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{happy}_w(\text{Ann})\}$. On this hypothesis, the question of interest has the Hamblin denotation in (84).

$$\begin{aligned}(84)\qquad [\![\textit{Is Ann unhappy?}]\!] &= (\mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{happy}_w(\text{Ann})\})\cup\\ &\quad\cup\neg(\mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{happy}_w(\text{Ann})\})\\ &= (\mathcal{D}_{\langle s,t\rangle}\backslash\{\lambda w.\text{happy}_w(\text{Ann})\})\cup\varnothing\\ &\neq \{\lambda w.\text{happy}_w(\text{Ann}),\lambda w.\neg\text{happy}_w(\text{Ann})\}\\ &= [\![\textit{Is Ann happy?}]\!]\end{aligned}$$

The non-equivalence in (84) shows that the assumption that the adjectival negation denotes the Boolean negation of sets does not derive the equivalence of the two *yes/no*-questions in (84). The denotation derived for *Is Ann unhappy?* is obviously not an adequate representation of the meaning of this question.

What about the conjunction of the Boolean set algebra? The Boolean conjunction of sets '$\wedge_B$' is, of course, the intersection operation:

(85) If $A, C \subseteq \mathcal{D}_\tau$ (for an arbitrary type τ), then $A \wedge_B C = A \cap C$.

It can be easily seen that '$\wedge_B$' cannot be used to represent the sentence conjunction, see (86) for the conjunction of declarative sentences and (87) for the conjunction of *yes/no*-questions.

(86) $[\![\textit{Ann plays}]\!] \wedge_B [\![\textit{Bill sings}]\!] = \{\lambda w.\text{play}_w(\text{Ann})\} \cap \{\lambda w.\text{sing}_w(\text{Bill})\}$
$= \varnothing$
$\neq [\![\textit{Ann plays and Bill sings}]\!]$

(87) $[\![\textit{Does Ann play?}]\!] \wedge_B [\![\textit{Does Bill sing?}]\!] =$
$= \{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\neg\text{play}_w(\text{Ann})\} \cap$
$\cap \{\lambda w.\text{sing}_w(\text{Bill}), \lambda w.\neg\text{sing}_w(\text{Bill})\}$
$= \varnothing$
$\neq [\![\textit{Does Ann play? And does Bill sing?}]\!]$

This means that despite first appearances the Hamblin approach to question meaning does not explain the interrogative-disjunctive affinity. An explanation of this affinity requires the set of logical connectives that turn a propostion-set semantics into p-set inquisitive logic.

3.7 Semantic answerhood in inquisitive semantics

The answerhood notions of inquisitive semantics are subsumed under a more general notion, the notion of *compliance* (see Groenendijk, 2008, and subsequent work). This notion also characterizes the logical relation between two coherent (non-inquisitive) declaratives and between a question and its subquestions. For the concerns of this paper, we do not need this more general – and harder-to-grasp – notion. Therefore, I will define a number of answerhood notions that cater to the particular discussion at hand. In this section, I define two provisional notions that serve only heuristic purposes.[35] They are equivalents of the usual answerhood notions of propositional question theories. That is, they only cover non-inquisitive responses to inquisitive initiatives, viz. sentences α that denote a singleton proposition set in reply to sentences β that denote a non-singleton proposition set.[36] For these the notion of *complete answerhood* is defined as in (88).

(88) **Complete answer** (*provisional*)
α is a *complete answer* to β iff $\iota p[p \in [\![\alpha]\!]] \in [\![\beta]\!]$.

Thus, if α denotes $\{p\}$, α is a complete answer to β iff $p \in [\![\beta]\!]$.

The definition in (88) shows that the proposition-set denotations of inquisitive semantics have a different status from the proposition-set denotations of a standard Hamblin/Karttunen semantics:[37] the elements of a Hamblin/Karttunen denotation (in general) are only *partial* answers. Put differently, the elements of a

[35] In section 4.3.5, I will propose a more useful answerhood notion.

[36] Throughout the whole paper, I will only touch cursorily on non-interrogative initiatives and inquisitive responses. For a discussion of inquisitive declaratives, see Groenendijk (2008).

[37] But see Dayal (1996) for a variant of the Hamblin/Karttunen semantics that gives rise to a comparable answerhood notion.

proposition set of inquisitive semantics are (weakly) exhaustive characterizations of possible states of affairs, while the elements of a Hamblin/Karttunen set are non-exhaustive characterizations, and exhaustive characterizations are derived by conjunction. In inquisitive semantics, the situation is reversed: partial answers are derived by the (non-inquisitive) disjunction of complete answers. Thus the notion of *partial answerhood* is defined as in (89).[38]

(89) **Partial answer** (*provisional*)
α is a *partial answer* to β iff $\exists \mathcal{Q} \subset [\![\beta]\!] : [\![\alpha]\!] = !\mathcal{Q}$.

Thus, if α denotes $\{p\}$, α is a partial answer to β iff $p = \lambda w[q_1(w) \vee \ldots \vee q_n(w)]$ for propositions $q_1, \ldots q_n \in [\![\beta]\!]$ $(1 \leqslant n < |[\![\beta]\!]|)$.

For the *yes/no*-question *Is Musa there?* discussed in the section 3.4, the definitions in (88) and (89) yield that *Musa is there* and *Musa is not there* are the complete answers to this question, and that it does not have partial answers. In this connection, note that we are not yet in a position to define the interpretation of the short answers *yes* and *no* in purely semantic/pragmatic terms.[39] This can be easily seen when taking another look at the diagrams in figure 1. The two propositions, e.g., in figure 1(a) cannot be distinguished as being "positive" and "negative", respectively. They are unstructured sets of possible worlds that have no other property than their extension. Therefore, we must refer to another property of *yes/no*-questions in addition to, or in place of, their denotation. This property will be identified in section 4.3.3 and reduced to focus properties in section 6.4.

The answerhood notions in (88) and (89) are not only provisional because they only cover question-answer discourses. They are also provisional because the discussion of *yes/no*-question disjunctions will lead to an answerhood notion that seems to be more appropriate for the inquisitive-semantics approach, see section 4.3.5.

4 *Yes/No*-Question Disjunctions

4.1 Introduction

The following sections are concerned with *yes/no*-question disjunctions. It is disputable if such linguistic objects exists in English (see section 4.2.1). Still, for the purposes of this introduction, let us consider the English question in (90).

(90) Are you coming or are you going?

[38] Cf. the notion of relatedness in Groenendijk (2008), which also accounts for inquisitive replies excluded here.

[39] The solution proposed in section 4.3.3 will have a pragmatic component in the sense that *yes* and *no* are analyzed as sentence anaphors.

It seems that (90) has the same answerhood conditions as the question in (91).[40]

(91) Are you coming or going?

Both questions raise the issue of which of the two alternatives, 'that the hearer is coming' and 'that the hearer is going', is true. That is, both questions are alternative questions that have (92-A_1) and (92-A_2) as congruent answers.

(92) A_1: I'm coming. A_2: I'm going.

The question in (91) is an alternative question of a kind often discussed in the literature (see e.g., Han and Romero, 2004; Beck and Kim, 2006). The form of (91) suggests that the disjunction is in the scope of a question operator, which operates on the truth-conditional content of the two disjuncts. In contrast to this, the disjunction in question (90) seems to scope over two question operators. In both disjuncts of (90), the subject is inverted with the auxiliary. On standard assumptions, subject-auxiliary inversion in root questions of English results from movement of the T head, lexicalized by the auxiliary, to the interrogative complementizer $C^{[+Q]}$ selecting the TP. Thus it is plausible to assume that (90) has the structure in (93).[41]

(93) $[_{\text{DisjP}}\ [_{\text{CP}}\ C^{[+Q]}\text{-are}\ [_{\text{TP}}\ \text{you}\ t_{\text{are}}\ \text{coming}\,]]$
$\text{or}\ [_{\text{CP}}\ C^{[+Q]}\text{-are}\ [_{\text{TP}}\ \text{you}\ t_{\text{are}}\ \text{going}\,]]]$

If we follow the usual assumption that $C^{[+Q]}$ denotes a question operator, we have to conclude that (90)/(93) denotes a disjunction of two *yes/no*-questions.

This is a remarkable result in view of the fact that *wh*-questions cannot be joined disjunctively in the same way as *yes/no*-questions. *Wh*-question disjunctions like (94) are judged to be unacceptable (see Szabolcsi, 1997) or, if they are acceptable, to give rise to marked interpretations (see below).

(94) (*)Which dish did Al make or which dish did Bill make?

According to Krifka (2001), (94) can only be understood as an utterance where the first question is retracted, and replaced by the second.[42] For some speakers, (94) has another reading, where it is understood as a request to choose one of the

[40]For the moment, I disregard the *yes/no*-question construal of strings like (91). But see section 5.2 for discussion.

[41]For simplicity, I assume that disjunctive phrases and other coordination phrases are ternary branching. Nothing hinges on this assumption.

[42]This reading requires a certain intonation, indicated in (i) by the punctuation (see Krifka, 2001).

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

questions and to answer it.[43]

It can be easily shown that the answerhood conditions observed for (90) above do not reflect a retraction or choice reading. On both readings, the response in (95-A) would be a congruent answer to (90): (95-A) answers the second *yes*/*no*-question in (90), viz. the disjunct that on the retraction reading would be the question that is left to answer, and that on the choice reading could be chosen by the answerer as the question to answer.[44]

(95) A: (No,) I'm not going.

Obviously (95-A) differs from the answers in (92), which means that it is not a congruent answer to (90) under the alternative-question reading.[45]

The fact that *wh*-question disjunctions only have marked interpretations is predicted by the partition theory of questions (Groenendijk and Stokhof, 1982, 1984). According to this theory, a question defines a partition of the set of possible world indices. The disjunction of two questions corresponds then to the union of two partitions (i.e. the pairwise union of the cells of the two partitions). This, however, is not again a partition because in all non-trivial cases there arise overlapping cells. This means that the disjunction of two questions is not a question so that additional semantic mechanisms must be employed to arrive at an intelligible interpretation (see Groenendijk and Stokhof, 1984). A comparable result can be achieved on the basis of the question theory of Hamblin/Kartunnen, where it can be shown that *wh*-question disjunctions are pragmatically deviant outside of specific contexts (see Haida and Repp, to appear*a*).

If this is so, how can we account for the fact that *yes*/*no*-question disjunctions are not equally problematic objects? I will not be able to answer this question in this paper. That is the question of why *wh*-questions and *yes*/*no*-questions differ with respect to disjunctive coordination will remain unanswered. What I will do is give a semantic account of the answerhood conditions of questions like English (90) and Hausa (103) below in the framework of inquisitive semantics, where question disjunctions have a proper denotation.

[43]Thanks to Jeroen Groenendijk and Stefan Kaufmann for pointing this out to me. See Haida and Repp (to appear*a*) for a discussion of the choice reading of *wh*-question disjunctions.

[44]If the initial *no* is retained, (95-A) is an incoherent response to (90). This suggests that at least the retraction reading is not available at all.

[45]It could be argued that (95-A) is equivalent to (92-A_1), since the two responses (contextually) entail each other. However, even if they bear the same semantic relation to (90) (w.r.t. one of its semantic values), it still remains to be explained why (95-A) has the flavor of an indirect response, whereas (92-A_1) is clearly felt to be a direct answer. See section 4.3.1 for related discussion.

4.2 Evidence for the existence *yes/no*-question disjunctions

Although the theoretical discussion in this section concentrates on *yes/no*-question disjunctions, the empirical discussion in section 4.2.2 and 4.2.3 also takes ordinary alternative questions into account. That is, I will identify *yes/no*-question disjunctions by pointing out formal differences to ordinary alternative questions. The two question types are subsumed under the cover term *disjunctive questions*.

4.2.1 *Yes/no*-question disjunctions in English – maybe not

In this section, I show that it is necessary to look at other languages than English to make sure that there are *yes/no*-question disjunctions in the first place. The reason is that the surface form of the English sentence in (90) could actually be misleading and give us the false impression that we are dealing with a disjunction of two (syntactic and semantic) questions. To see this, consider the *wh*-question in (96).

(96) Which book will Bill read and did Mary recommend?

(96) expresses a request to identify a single book, viz. the book such that Bill will read it and Mary recommended it. This paraphrase suggests that the *wh*-phrase *which book* binds an object trace in both conjuncts. This configuration can be derived by moving the *wh*-phrase accross-the-board (ATB) from the coordinated phrases to a position c-commanding the conjunction. This type of movement is depicted in (97), where X^0 is the head that triggers the ATB movement of α to its specifier.[46]

(97) $[\ \alpha\ [\ X^0\ [\ldots[_{\text{ConjP}}\ [\ldots t_\alpha \ldots]$ and $[\ldots t_\alpha \ldots]]\ldots]]]$

By standard assumptions, *wh*-movement is triggered by the interrogative complementizer, $C^{[+Q,+wh]}$. Hence, the structure of (96) can be approximated as follows:

(98) $[_{\text{CP}}$ [which book] $[_{C'}\ C^{[+Q,+wh]}\ [_{\text{ConjP}}$ [will Bill read $t_{[\text{which book}]}$]] and [did Mary recommend $t_{[\text{which book}]}$]]]

What is crucial to note here is that in addition to *wh*-movement there is subject-auxiliary inversion in both conjuncts of (96), see again (98). Importantly, the corresponding head movement of T cannot be triggered immediately by $C^{[+Q]}$, but must be triggered by a head in the left-periphery of each conjunct. This means that we have to assume a form of CP recursion in the structure of (96)

[46] ATB movement can be analyzed as sideward movement from one conjunct to the other followed by ordinary *wh*-movement (see Hornstein and Nunes, 2002; Nunes, 2004). For the current discussion, nothing hinges on the specific implementation of ATB movement.

with a non-interrogative complementizer $C^{[-Q]}$ in both conjuncts (cf. Haida and Repp, to appear*b*):[47]

(99) $[_{CP}$ [which book] $[_{C'}$ $C^{[+Q,+wh]}$
$[_{ConjP}$ $[_{CP}$ $C^{[-Q]}$-will $[_{TP}$ Bill t_{will} read $t_{[which\ book]}]]$
and $[_{CP}$ $C^{[-Q]}$-did $[_{TP}$ Mary t_{did} recommend $t_{[which\ book]}]]]]]$

Now, assuming that CP recursion like in (99) is a principled option, the purported disjunction of *yes/no*-questions in (90) could have the structure given in (100).

(100) $[_{CP}$ $C^{[+Q,-wh]}$ $[_{DisjP}$ $[_{CP}$ $C^{[-Q]}$-are $[_{TP}$ you t_{are} coming]]
or $[_{CP}$ $C^{[-Q]}$-are $[_{TP}$ you t_{are} going]]]]

This structure, however, does not give rise to a disjunction of questions but to a disjunctive question.[48] So (90) could be an "ordinary" alternative question after all.[49]

In what follows, we will see that data from Hausa and Tangale reinforce the conclusion that *yes/no*-question disjunctions truly exist.

4.2.2 Disjunctive questions in Hausa

In Hausa, we find clear instances of *yes/no*-question disjunctions. Before discussing these, let us take a look at alternative questions, i.e., at questions in

[47] One might ask why non-interrogative C triggers T-to-C movement. There is reason to assume that the *wh*-phrase moves successive-cyclically through the specifiers of the coordinated CPs (see Haida and Repp, to appear*b*, for a sideward-movement account crucially involving successive cyclic *wh*-movement). According to Pesetsky and Torrego (2001), T-to-C movement is a precondition for any movement to Spec-C, be it triggered by $C^{[+Q]}$ or $C^{[-Q]}$.

[48] To account for the T-to-C movement in (100), we could assume that there is movement of an empty operator *Op* from both disjuncts to the specifer of $C^{[+Q,-wh]}$, where again this movement proceeds successive cyclically through the specifiers of the coordinated CPs, see (i) (cf. Larson, 1985, for a related proposal).

(i) $[_{CP}$ *Op* $[_{C'}$ $C^{[+Q,-wh]}$ $[_{DisjP}$ $[_{CP}$ t_{Op} $[_{C'}$ $C^{[-Q]}$-are $[_{TP}$ t_{Op} $[_{TP}$ you t_{are} coming]]]]
or $[_{CP}$ t_{Op} $[_{C'}$ $C^{[-Q]}$-are $[_{TP}$ t_{Op} $[_{TP}$ you t_{are} going]]]]]]]

[49] The embedded question in (i) seems not to be amenable to the CP recursion account discussed above.

(i) I don't know whether I should stop smoking or whether I should start exercising.

However, embedded question disjunctions raise a number of additional issues, as can be seen from the fact that *wh*-question disjunctions become acceptable in certain embedding contexts, see (ii).

(ii) I don't know when I wrote this or why I wrote this.

See Haida and Repp (to appear*a*) for discussion.

which the disjunction occurs in the scope of an interrogative complementizer. This kind of question is exemplified in (101) (cf. Newman, 2000, p. 500).

(101) Koː zaː kà taːshì koː zaː kà zaunàː gidaː?
Q FUT 2SG.M.SU go up or FUT 2SG.M.SU remain home
'Are you going to get up or are you going to stay at home?'

As indicated by the glosses, I assume, along the lines of the discussion in section 2.2.1, that the sentence-initial *koː* is an instance of $C^{[+Q]}$ and that the sentence-medial *koː* is an instance of the disjunctive coordinator. That is I assume that (101) has the structure in (102).

(102) $[_{CP}\ [_{C^{[+Q]}}$ koː $]\ [_{DisjP}\ [_{TP_1}$ zaː kà taːshì $]\ [_{Disj}$ koː $]\ [_{TP_2}$ zaː kà zaunàː gidaː $]]]$

Importantly, the question expressed by (101) can also have another form, see (103).

(103) Koː zaː kà taːshì koː kòː zaː kà zaunàː gidaː?
Q FUT 2SG.M.SU go up or Q FUT 2SG.M.SU remain home
'Are you going to get up or are you going to stay at home?'

In (103), there is another occurrence of *koː* in sentence-medial position (relative to the overall sentence).[50] I assume that this is an occurrence of $C^{[+Q]}$ and, more specifically, that (103) has the structure in (104).

(104) $[_{DisjP}\ [_{CP}\ [_{C^{[+Q]}}$ koː $]\ [_{TP}$ zaː kà taːshì $]]$
$[_{Disj}$ koː $]\ [_{CP}\ [_{C^{[+Q]}}$ kòː $]\ [_{TP}$ zaː kà zaunàː gidaː $]]]$

According to (104), the question in (103) is a disjunction of two *yes/no*-questions. In contrast to English, there is no independent evidence to justify the assumption that the coordinated phrases in (103) are non-interrogative CPs in a CP-recursion structure. Therefore we can conclude that (103) is indeed a *yes/no*-question disjunction.

Yes/no-question disjunctions can also be found when considering embedded alternative questions, see (105).[51]

(105) Ali bai san koː Musa neː ka gayyata ba
A. NEG.3SG.M know Q M. FOC 2SG.M.SU invite NEG
koː koː Yusuf neː ka gayyata.
or Q Y. FOC 2SG.M.SU invite
'Ali does not know whether you invited Musa or Yusuf.'

[50] I do not know why there is an L tone on the last occurrence of *koː* in (103). I assume that this is for phonological reasons.

[51] I do not mark tones in (105).

Like in the root case discussed before, the three occurrences of *koː* strongly suggest that the embedded clause is a disjunction of two interrogative CPs. Moreover, the sentence in (105) highlights a structural property that is characteristic of *yes/no*-question disjunctions (and disjunctive questions in general) but that I have neglected in the discussion so far: the disjuncts are focused where they differ from each other. In (105), the two object phrases *Musa* and *Yusuf* are focus marked. This is shown by the fact that they occur in the left periphery of the two disjuncts, in front of the focus marker *neː*. The focus structure of *yes/no*- and alternative questions will be considered in detail in section 5 and 6.

Another peculiarity of (105) concerns the location of the right part *ba* of the negation bracket *bai*... *ba*: it resides in the first disjunct.[52] I assume that *ba* is a negative-concord marker that is right-adjoined to the TP of the first disjunct.[53] That is I assume the following structure for (105).

(106) $[_{\text{CP}}$ Ali $[_{\text{NegP}}$ bai $[_{\text{VP}}$ san
$[_{\text{DisjP}}\ [_{\text{CP}}\ [_{\text{C}[+\text{Q}]}$ koː $]\ [_{\text{FocP}}$ Musa$_i^{[+\text{Foc}]}\ [_{\text{Foc}'}[_{\text{Foc}}$ neː $]\ [_{\text{TP}}\ [_{\text{TP}}$ ka gayyata $t_i]$ ba $]]]]$
$[_{\text{Disj}}$ koː $]\ [_{\text{CP}}\ [_{\text{C}[+\text{Q}]}$ koː $]\ [_{\text{FocP}}$ Yusuf$_j^{[+\text{Foc}]}\ [_{\text{Foc}'}[_{\text{Foc}}$ neː $]\ [_{\text{TP}}$ ka gayyata $t_j]]]]]]]$

Again we arrive at the conclusion that there are *yes/no*--question disjunctions in Hausa.

4.2.3 Disjunctive questions in Tangale

The sentence in (107) is an alternative question of the Shongom dialect of Tangale (repeated from (14) in section 2.2.2).

(107) Mairo ed-go-n ɗom yaː lakikoro (ya)?
M. eat-PERF-FOC beans or rice Q
'Did Mairo eat beans or rice?'

Just like alternative questions in Hausa, the alternative question in (107) has a specific focus structure. The form of the verb indicates that its complement moves out of the VP before Spell-out (see Kenstowicz, 1987; Hartmann and Zimmermann, 2007*a*). This movement is optional (cf. Hartmann and Zimmermann,

[52] A comparable asymmetry can be observed in the German example in (i).

(i) Ich habe kein Geld oder irgendwelche Aktien.
I have no money or any shares
'I neither have money nor any shares.'
= 'It is not the case that I have money or that I have shares.'

However, sentence negation in German has peculiar properties in coordination structures (see Repp, 2009). Therefore this might be only a superficial similarity.

[53] Instead of adjunction to TP, we could also assume adjunction to CP or to some lower right-adjacent projection inside of TP. So far I did not find evidence to decide between these structural options.

2007*b*, and see below) and can apply only if the moved phrase has a focus feature (i.e., the phrase as a whole or one (or several) of its constituents). I assume that (107) is a monoclausal construction in which the disjunctive phrase *ɗom ya: lakikoro* 'beans or rice' is the verbal complement. For reasons to be discussed in section 5, I furthermore assume that the movement of the disjunctive phrase occurs because of a focus feature on the two disjuncts.[54] Furthermore, recall that I argued in section 2.2.2 that the interrogative marker *ya* is not a C head itself but a particle that must be licensed by an interrogative C head. This leads me to propose the following structure for (107).

(108) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{TP}}\ \text{Mairo}\ [_{\text{VP}}\ [_{\text{VP}}\ \text{edgon}\ t_{\text{DisjP}}\ ]\ [_{\text{DisjP}}\ \text{ɗom}^{[+\text{Foc}]}\ [_{\text{Disj}}\ \text{ya:}\ ]\ \text{lakikoro}^{[+\text{Foc}]}]]]\ \text{ya}\ ]]$

In (108), I assume for simplicity that the moved object phrase is right-adjoined to the VP and that the question particle *ya* is a TP adjunct.[55]

Now observe that the question in (107) can be expressed by a minimally different sentence, see (109).[56]

(109) Mairo ed-ug ɗom ya ya: lakikoro ya?
M. eat-PERF beans Q or rice Q
'Did Mairo eat beans or rice?'

The sentence in (109) can be analyzed in two ways. First, it can be analyzed as a disjunction of two interrogative CPs with ellipsis in the second disjunct, see (110).

(110) $[_{\text{DisjP}}\ [_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{TP}}\ \text{Mairo edug ɗom}^{[+\text{Foc}]}]]\ \text{ya}\ ]]$
$[_{\text{Disj}}\ \text{ya:}\ ]\ [_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{TP}}\ \sout{\text{Mairo edug}}\ \text{lakikoro}^{[+\text{Foc}]}]]\ \text{ya}\ ]]]$

According to (110), the sentence in (109) is a disjunction of two (syntactic and semantic) *yes/no*-questions.[57] The second possibility is to assume a monoclausal

[54] It may well be that the disjunctive phrase has an additional focus feature. However, I do not have evidence to support this or the contrary assumption. In any case, the focus-semantic analysis in section 6 yields the same result whether or not there is this additional feature.

[55] If it turns out that Tangale *ya* is like Bole *ɗo* in that it can only be adjoined to a focused phrase (see section 2.2.3), we must assume a different structure for (107), where *ya* is adjoined to DisjP and the then lower segment of DisjP has a focus feature (cf. fn. 54).

[56] There are still three other forms for this question: in (109), either or both question particles can be omitted. I lack the data that would show the overall distribution of *ya* in questions with the focus-marking verb form in (107). I expect it to be the same.

[57] In (110) and (111) below, I assume that the alternative terms *ɗom* 'beans' and *lakikoro* 'rice' have a focus feature. This assumption is compatible with the facts because, as mentioned above, object focus can remain unexpressed in Tangale, as in other Chadic languages (see Jaggar, 2001; Hartmann and Zimmermann, 2007*b*). Subject focus, in contrast, must be formally marked. Hence, the disjunctive phrase of a subject alternative question must be focus marked, see (i-a) vs. (b).

structure in which a single interrogative C head licenses both question particles, see (111).

(111) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ \text{Mairo}\ [_{\text{VP}}\ \text{edug}$
$[_{\text{DisjP}}\ [_{\text{DP}}\ [_{\text{DP}}\ \text{ɗom}]^{[+\text{Foc}]}\ \text{ya}\,]\ [_{\text{Disj}}\ \text{ya:}\,]\ [_{\text{DP}}\ [_{\text{DP}}\ \text{lakikoro}]^{[+\text{Foc}]}]\ \text{ya}\,]]]]$

According to (111), the sentence in (109) is not a syntactic question disjunction. However, it is a question disjunction in the sense that is relevant for us: it is a *semantic* question disjunction. I argued in section 3.4.2 that it is the interrogative marker *ya* and not the C head that denotes the question operator. Consequently, (111) denotes the disjunction of two *yes/no*-question denotations (cf. the derivation of the denotation of the Bole question in section 3.4.2). To sum up, on both analyses the sentence in (109) leads us to the conclusion that there are *yes/no*-question disjunctions in Tangale.

4.2.4 Another look at disjunctive questions in English

We have established that there are *yes/no*-question disjunctions in Hausa and Tangale. Thus we can conclude that *yes/no*-question disjunctions are a semantic option for human language in general. I therefore assume that the initial example (90) and the question in (112) have a reading where they are disjunctions of two (syntactic and semantic) *yes/no*-questions.

(112) Does ANN play the piano or does BILL play the piano?

Importantly, the sentence in (112) has the same focus structure as previously observed for some of the Chadic examples. As indicated by small capitals, the two subject expressions are accented and hence focused (cf. Roelofsen and van Gool, 2009). This is made explicit in (113).

(113) Does $\text{ANN}^{[+\text{Foc}]}$ play the piano or does $\text{BILL}^{[+\text{Foc}]}$ play the piano?

For simplicity, I will often omit the [+Foc] feature and mark focusing only typographically, viz. by small capitals. Focus also plays an important role in alternative questions. The string of words *does Ann or Bill play the piano* can be read as a *yes/no*-question and as an alternative question. However, these two

(i) a. Ed-ug ɗom Petur ya: Maryamu ya?
eat-PERF beans P. or M. Q
'Did Peter or Mary eat beans?'
b. *Petur ya: Maryamu edug ɗom ya?
intended: 'Did Peter or Mary eat beans?'

In (i-a), the disjunctive phrase occurs in the post-verbal subject position. In this position the two disjuncts *Petur* and *Mariyamu* are focus marked. In the preverbal subject position in (i-b), they are not focus marked and thus unacceptability arises. I will theoretically motivate the assumed distribution of focus features in section 5.

readings are disambiguated by focus. For example, the focus structure indicated in (114) forces the alternative-question reading.

(114) Does ANN[+Foc] or BILL[+Foc] play the piano?

The focus properties of alternative questions and their *yes*/*no*-question counterparts will be extensively discussed in section 5.2. For the moment, it is enough to say that the disjuncts of a disjunctive question are focused where they differ from each other.

Intonation plays another role in the interpretation of the questions in (113) and (114). As pointed out in Roelofsen and van Gool (2009), the second pitch accent can be realized by a rising '/' or falling '\' pitch movement. The two options are marked in (115a) and (b), respectively.

(115) a. Does /ANN or /BILL play the piano?
b. Does /ANN or \BILL play the piano?

They propose that the falling accent marks that exactly one of the disjunctive alternatives 'that Ann plays the piano' and 'that Bill plays the piano' is the case. Thus the falling accent leads to an exhaustive interpretation of the disjunction. I assume that the falling accent marks exhaustization in a different sense than this, viz. in the sense of Zimmermann (2001) (see section 6.5 for discussion). Zimmermann observes that the last element of a list answer to a constituent question can be realized with or without falling intonation. Thereby, the non-falling intonation expresses "undecidedness or uncertainty as to whether the list is exhaustive". The falling intonation expresses that the list is "taken to be exhaustive" (see Zimmermann, 2001, p. 261). I will neglect this intonational/interpretive property until section 6.5, where I follow Zimmermann in the assumption that the falling pitch movement is interpreted as an operation that turns a list (in the cases considered above, a list of disjunctive alternatives) into a list that must be taken to be exhaustive.

4.3 The meaning of *yes*/*no*-question disjunctions in inquisitive semantics

4.3.1 An asymmetry of answers: direct answers vs. indirect replies

In inquisitive semantics, a question disjunction has a proper denotation in the sense that the denoted semantic object is again an inquisitive proposition set. By (43) and (44), a disjunctive expression denotes the union of the denotations of its disjuncts. Thus the *yes*/*no*-question disjunction in (116a) has the denotation derived in (116b).

(116) a. Is Musa there or is Yusuf there?

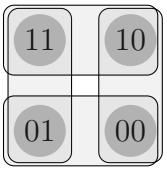
b. $[\![(116a)]\!] = [\![\text{Is Musa there?}]\!] \vee [\![\text{Is Yusuf there?}]\!]$

$= \{\lambda w.\text{there}_w(\text{Musa}), \lambda w.\neg\text{there}_w(\text{Musa})\} \cup$

$\cup\{\lambda w.\text{there}_w(\text{Yusuf}), \lambda w.\neg\text{there}_w(\text{Yusuf})\}$

$= \left\{ \begin{array}{l} \lambda w.\text{there}_w(\text{Musa}), \lambda w.\neg\text{there}_w(\text{Musa}), \\ \lambda w.\text{there}_w(\text{Yusuf}), \lambda w.\neg\text{there}_w(\text{Yusuf}) \end{array} \right\}$

The set in (116b) is graphically represented in figure 2.



? there(M) $\vee$? there(Y)

Figure 2: The disjunction of two *yes/no*-questions

According to the definition in (88), the question in (116) has four complete answers, viz. (the denotations of) the sentences in (117) (cf. Groenendijk and Roelofsen, 2009).

(117) A_1: Musa is there. A'_1: #Musa is not there.
A_2: Yusuf is there. A'_2: #Yusuf is not there.

Only (117-A_1) and (A_2) are direct answers to the question under consideration. The responses in (117-A'_1) and (A'_2) are felt to be indirect replies if they are coherent at all. It seems that (117-A'_1) and (A'_2) are coherent replies only if the subject is intonationally marked as a contrastive topic. By using this intonation, however, the answerer signals that s/he does not commit her-/himself to the non-rejected alternative, (117-A_2) and (A_1), respectively. In contrast to this, the responses in (117-A_1) and (A_2) allow the conclusion that the respective positive alternative does not hold.[58] This means that, contrary to the prediction of the proposal developed so far, (117-A_1)and (A_2) have a different answer status with respect to the question in (116a) than (117-A'_1) and (A'_2). To account for this asymmetry, we have to resort to another property of (116a) in addition to its denotation.

4.3.2 Highlighting: an additional semantic value

Figure 2 displays very clearly that the denotation of a *yes/no*-question disjunction does not account for the asymmetry discussed in the previous section: it is symmetric. Actually, the problem arising from this symmetry is not specific

[58] Unless, of course, the subject in (117-A_1) and (A_2) is intonationally marked as a contrastive topic.

to *yes/no*-question disjunctions. A corresponding problem can already be attested for the underlying *yes/no*-questions. The denotation of a *yes/no*-question is a set of a proposition and its negation. Consequently, a *yes/no*-question $[_{\text{CP}}\, \text{C}^{[+\text{Q}]}\, \alpha]$ and the corresponding alternative question $[_{\text{CP}}\, \text{C}^{[+\text{Q}]}\, [\, \alpha \; \textit{or}\; \alpha_{\text{neg}}\,]]$ have the same denotation (see section 5.1 for a discussion of the latter). However, a *yes/no*-question like (118a) has different answerhood conditions from the corresponding alternative question in (118b): the *yes/no*-question, but not the alternative question, can be answered with the short answers *yes* or *no* (see Krifka, to appear, for discussion).

(118) a. Is Musa there?
b. Is Musa there or not?

This is a problem not only for inquisitive semantics, but for almost all propositional question theories (for an exception, see Abels, 2004, where *yes/no*-questions denote singleton sets).

A possible solution to the problem of explaining the use conditions of short answers is to refer to other linguistic objects than question denotations. Here I will present what I call the *highlighting account* of Roelofsen and van Gool (2009) because it offers valuable insights into the problem at hand. In section 6, however, I will show that we can derive the results of the highlighting account from a more comprehensive theory of focus. Roelofsen and van Gool (2009) define a second semantic value in addition to the denotation – the set of semantic objects that an expression *highlights* (henceforth *the H-set*). The function $[\![\cdot]\!]_{\text{H}}$, which gives the H-set of its argument, is defined as given below. Note, however, that I will show in section 5.5 that H-sets are only auxiliary objects that can be derived from the denotation and the focus-semantic value of a question.

(119) **H-set** (*auxiliary*)

$$[\![\alpha]\!]_{\text{H}} = \begin{cases} [\![\beta]\!]_{\text{H}} & \text{if } \alpha = [_{\text{CP}}\, \text{C}^{[+\text{Q}]}\, \beta\,], \\ [\![\beta]\!]_{\text{H}} \vee [\![\gamma]\!]_{\text{H}} & \text{if } \alpha = [_{\text{DisjP}}\, \beta \; \textit{or}\; \gamma\,], \\ [\![\alpha]\!] & \text{otherwise.} \end{cases}$$

In general, what an expression highlights is (the elements of) its denotation, see the third clause in (119). However, an interrogative clause $[_{\text{CP}}\, \text{C}^{[+\text{Q}]}\, \beta\,]$ does not highlight all the elements of its denotation $[\![\beta]\!] \vee [\![\beta]\!]^*$: it does not highlight the proposition in $[\![\beta]\!]^*$ but only the highlighted elements of $[\![\beta]\!]$, see the first clause in (119). Thus the H-set of (118a) is the singleton set $\{\lambda w.\text{there}_w(\text{Musa})\}$. The second clause in (119) is necessary to ensure that the disjunction of two expressions (e.g. of two questions) only highlights the highlighted material of the two disjuncts.

Let us consider the H-set of the alternative question in (118b), for which I assume the structure in (120) (where strike-through marks phonological deletion

and the ATB-movement of the auxiliary is reconstructed at LF).

(120) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\text{-is}\ [_{\text{DisjP}}\ [_{\text{TP}_1}\ \text{Musa}\ t_{\text{is}}\ \text{there}]\ \text{or}\ [_{\text{TP}_2}\ \sout{\text{Musa}}\ t_{\text{is}}\ \text{not}\ \sout{\text{there}}]]]$

By the third clause of (119), the H-set of TP_1 and TP_2 corresponds to their denotation, see (121a,b). By the first and second clause of (119), (120) has the H-set derived in (121c).

(121) a. $[\![\text{TP}_1]\!]_{\text{H}} = [\![\text{TP}_1]\!] = \{\lambda w.\text{there}_w(\text{Musa})\}$

b. $[\![\text{TP}_2]\!]_{\text{H}} = [\![\text{TP}_2]\!] = \{\lambda w.\neg\text{there}_w(\text{Musa})\}$

c. $\begin{aligned}[\![(120)]\!]_{\text{H}} &= [\![\text{DisjP}]\!]_{\text{H}} \\ &= [\![\text{TP}_1]\!]_{\text{H}} \vee [\![\text{TP}_2]\!]_{\text{H}} \\ &= \{\lambda w.\text{there}_w(\text{Musa})\} \cup \{\lambda w.\neg\text{there}_w(\text{Musa})\} \\ &= \{\lambda w.\text{there}_w(\text{Musa}), \lambda w.\neg\text{there}_w(\text{Musa})\}\end{aligned}$

Figure 3(b) shows the H-set of (118b), which is identical to its denotation. Figure 3(a) represents the H-set of (118a). Note how it differs from the denotation of that question, which, recall, is identical to that of (118b) (see figure 1(a)).

(a) ?there(M) (b) ?(there(M)$\vee\neg$there(M))

Figure 3: The H-sets of two denotationally identical questions

The asymmetry displayed by figure 3(a) indicates that the H-set of a question is the additional linguistic "property" alluded to at the end of section 3.7 and 4.3.1. With the aid of H-sets, we can define the meaning of the short answers *yes* and *no* and explain the different status of positive and negative answers to *yes*/*no*-question disjunctions. This will be done in the next section. However, keep in mind that I will show that H-sets are only auxiliary objects.

4.3.3 The meaning of *yes* and *no*

The short answers *yes* and *no* can be analyzed as operators on the H-set of the question they answer. Let us assume that *yes* and *no* are anaphoric to the preceding question:[59]

(122) Q: $[_{\text{CP}}$ Is Musa there?$]_1$

A: Yes_1. A′: No_1.

[59] I ignore the use of *yes* and *no* in response to non-interrogative utterances (see Roelofsen and van Gool, 2009, for discussion).

Then the meaning of the sentence anaphors yes_n and no_n can be defined as given in (123), where α_n is their anaphoric antecedent.

(123) **The denotation of *yes* and *no***

a. $[\![yes_n]\!] = \{\iota p.p \in [\![\alpha_n]\!]_{\mathrm{H}}\}$

b. $[\![no_n]\!] = \neg[\![yes_n]\!] \quad (= [\![yes_n]\!]^*)$

Thus yes_n denotes the H-set of its anaphoric antecedent if this set is a singleton, and yes_n is not defined otherwise; no_n denotes the negation of yes_n if defined. Since the H-set of CP_1 in (122-Q) is a singleton, the denotation of yes_1 and no_1 is (correctly) defined for this antecedent:

(124) a. $\begin{aligned}[t][\![yes_1]\!] &= \{\iota p.p \in [\![\mathrm{CP}_1]\!]_{\mathrm{H}}\} \\ &= \{\iota p.p \in \{\lambda w.\mathrm{there}_w(\mathrm{Musa})\}\} \\ &= \{\lambda w.\mathrm{there}_w(\mathrm{Musa})\} \\ &= [\![\textit{Musa is there}]\!]\end{aligned}$

b. $\begin{aligned}[t][\![no_1]\!] &= \neg\{\lambda w.\mathrm{there}_w(\mathrm{Musa})\} \\ &= \{\lambda w.\neg\mathrm{there}_w(\mathrm{Musa})\} \\ &= [\![\textit{Musa is not there}]\!]\end{aligned}$

The definitions in (123) also explain the incoherence of the short answers in (125).

(125) Q: $[_{\mathrm{CP}}$ Is Musa there or not? $]_2$

A: #Yes_2. A′: #No_2.

The incoherence follows from the fact that $[\![yes_2]\!]$ and $[\![no_2]\!]$ are not defined in the context of CP_2 in (125-Q): the H-set of CP_2 is a two-membered set so that the result of the application of the ι-operator in (123a) is not defined.

4.3.4 Explaining the asymmetry in *yes*/*no*-question disjunctions

Let us now turn to the asymmetric answer pattern of *yes*/*no*-question disjunctions from above, repeated in (126).

(126) Q: Is Musa there or is Yusuf there?

A_1: Musa is there. $\mathrm{A'}_1$: #Musa is not there.

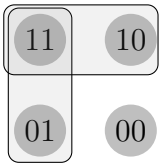
A_2: Yusuf is there. $\mathrm{A'}_2$: #Yusuf is not there.

We have observed that the denotation of (126-Q) is not sufficient to account for the fact that the positive answers (126-A_1)/(A_2) have a different status from the negative answers ($\mathrm{A'}_1$)/($\mathrm{A'}_2$), viz. that the former are direct answers, while the latter can only be used as indirect replies. It is the H-set of (126-Q) that brings about the difference between positive and negative answers. By the second clause of (119), this set is the disjunction of the H-sets of the disjunctively coordinated

yes/no-questions, see (127).

(127) $[\![(126\text{-Q})]\!]_{\mathrm{H}} = [\![\textit{Is Musa there?}]\!]_{\mathrm{H}} \vee [\![\textit{Is Yusuf there?}]\!]_{\mathrm{H}}$
$= \{\lambda w.\mathrm{there}_w(\mathrm{Musa}), \lambda w.\mathrm{there}_w(\mathrm{Yusuf})\}$

The H-set contains only counterparts to the positive answers. It is depicted in figure 4. (The denotation of (126-Q) was given in figure 2.)



? there(M) $\vee$? there(Y)

Figure 4: The H-set of a *yes/no*-question disjunction

In the following, I will use the description *highlighted answer* to refer to a sentence α that denotes a proper subset of the H-set of a question β:

(128) **Highlighted answer**
α is a *highlighted answer* to β iff $[\![\alpha]\!] \subset [\![\beta]\!]_{\mathrm{H}}$.

According to (128), highlighted answers can be inquisitive or non-inquisitive. That is, α can resolve the issue raised by β in part or in full (see fn. 61 for an example of a partial highlighted answer). For simplicity, I concentrate on non-inquisitive answers in the following discussion.

Viewed on its own, figure 4 suggests that only highlighted answers have the status of direct answers. However, this is not true in general: the negative answer to a *yes/no*-question is clearly felt to be a direct answer but, as discussed in the previous sections, it is not highlighted. So why do the negative answers to a *yes/no*-question disjunction have a different status from the negative answer to a *yes/no*-question? The reason is, I argue, that the former are *implicated* by the highlighted answers. The negative answer of a *yes/no*-question, in contrast, is not implicated by the highlighted answer. This argument requires an account of how scalar implicatures are derived in question-answer discourses. Recall from section 4.3.1 that by using (126-A_1) in response to (126-Q) the speaker rejects the positive alternative (A_2), which means that (A_1) implicates the negative answer (A'_2). The negative answer (126-A'_2), in contrast, does not implicate the positive answer (A_1) (and likewise for (126-A_2) and (A'_1)). This suggests that scalar implicatures are derived on the basis of the H-set of a question and not on the basis of its denotation. The following pragmatic reasoning brings this out (cf. Groenendijk, 2008, for a comparable line of reasoning without the highlighting aspect). By using (126-Q) (instead of, e.g., *Is Musa not there or is Yusuf not there?*), the speaker highlights the positive answers (126-A_1) and (A_2). Thereby

she signals her interest in obtaining the information that $\lambda w.\text{there}_w(\text{Musa})$ is true (in the actual world) or the information that $\lambda w.\text{there}_w(\text{Yusuf})$ is true. From the point of view of the responder, the speaker should also be interested in obtaining the information whether $\lambda w[\text{there}_w(\text{Musa}) \wedge \text{there}_w(\text{Yusuf})]$ is true since this would be compatible with both pieces of information. However, the more informative sentence *Musa is there and Yusuf is there* is blocked because it is not a complete or partial answer to (126-Q). By blocking this sentence as an answer, the speaker suggests that not both $\lambda w.\text{there}_w(\text{Musa})$ and $\lambda w.\text{there}_w(\text{Yusuf})$ are true. By responding with just (A_1), the responder signals that he agrees with that suggestion. Thus his answer (A_1) implicates (A'_2) (and, by the same reasoning, answer (A_2) implicates (A'_1)). In contrast to this, the negative answers (A'_1) and (A'_2) do not conform with the interest expressed by the speaker. Therefore, they cannot be used to signal agreement with the suggestion of the speaker. Moreover, the speaker does not highlight the negative answers. So she does not suggest that not both $\lambda w.\neg\text{there}_w(\text{Musa})$ and $\lambda w.\neg\text{there}_w(\text{Yusuf})$ are true. Consequently, the negative answers do not have an implicature.

Although this reasoning seems plausible,[60] I propose to adopt a formal account of pragmatic strengthening. Specifically, I propose to use the strengthening operator O_{ALT} in (129) (cf. Chierchia, 2006; Haida and Repp, to appear*a*), which applies to a proposition p and strengthens it relative to a set ALT of alternative propositions.

(129) $\quad \text{O}_{\text{ALT}}(p) = \lambda w[p(w) \wedge \forall q \in \text{ALT}[q(w) \rightarrow \forall w'[p(w') \rightarrow q(w')]]]$

An application of the strengthening operator is exemplified in (130).

(130) $\quad \text{ALT} = \{\lambda w.\text{there}_w(\text{Musa}), \lambda w.\text{there}_w(\text{Yusuf})\}$
$\quad\quad \text{O}_{\text{ALT}}(\lambda w.\text{there}_w(\text{Musa})) =$

[60] Somewhat problematically, (126-A_1) and (A_2) are also strengthened when used in response to question (i) below.

(i) Is Musa there or is Yusuf there or are both there?

This shows that the strengthening of the positive answers is independent of the blocking of the more informative sentence *Musa is there and Yusuf is there*. Of course, this does not invalidate the pragmatic reasoning in the text. In the context of (i), a different line of reasoning could lead to the same effect.

$$
\begin{aligned}
&= \lambda w[\text{there}_w(\text{Musa}) \wedge \\
&\qquad \wedge \forall q \in \text{ALT}[q(w) \rightarrow \forall w'[\text{there}_{w'}(\text{Musa}) \rightarrow q(w')]]] \\
&= \lambda w[\text{there}_w(\text{Musa}) \wedge \\
&\qquad \wedge [[\text{there}_w(\text{Musa}) \rightarrow \forall w'[\text{there}_{w'}(\text{Musa}) \rightarrow \\
&\qquad\qquad \rightarrow \text{there}_{w'}(\text{Musa})]] \wedge \\
&\qquad\quad \wedge [\text{there}_w(\text{Yusuf}) \rightarrow \forall w'[\text{there}_{w'}(\text{Musa}) \rightarrow \\
&\qquad\qquad\qquad \rightarrow \text{there}_{w'}(\text{Yusuf})]]]] \\
&= \lambda w[\text{there}_w(\text{Musa}) \wedge \\
&\qquad \wedge [[\text{there}_w(\text{Musa}) \rightarrow \top] \wedge [\text{there}_w(\text{Yusuf}) \rightarrow \bot]]] \\
&= \lambda w[\text{there}_w(\text{Musa}) \wedge \neg\text{there}_w(\text{Yusuf})]
\end{aligned}
$$

O_{ALT} is used to strengthen an answer relative to the question it answers. As discussed above, an answer is strengthened only if it is a highlighted answer. This is reflected by the following definition of the *discourse value* (*dVal*) of an answer α relative to a question β, which assigns different values to highlighted and non-highlighted answers.

(131) **Discourse value**

$$
\text{dVal}_\beta(\alpha) = \begin{cases} \{\text{O}_{[\![\beta]\!]_{\text{H}}}(p) \mid p \in [\![\alpha]\!]\} & \text{if } \alpha \text{ is a highlighted answer to } \beta \\ [\![\alpha]\!] & \text{otherwise.} \end{cases}
$$

According to the first clause of (131), a highlighted answer is strengthened relative to the H-set of the question it answers.[61] The rationale of this assumption is that the H-set is what the speaker presents as the space of alternatives from which the responder is to choose one (or more if the issue cannot be fully settled). This also motivates why non-highlighted answers are not strengthened: a question does not evoke a space of alternatives for non-highlighted answers (but see section 6 for evidence that this statement needs to be qualified).

The discourse value of (126-A_1) and (A'_2) relative to (126-Q) is derived in (132a) and (b), respectively.[62]

(132) a. $\text{dVal}_{(126\text{-Q})}((126\text{-A}_1)) = \{\text{O}_{[\![(126\text{-Q})]\!]_{\text{H}}}(p) \mid p \in [\![(126\text{-A}_1)]\!]\}$
$= \{\lambda w[\text{there}_w(\text{Musa}) \wedge \neg\text{there}_w(\text{Yusuf})]\}$

[61] According to (131), an answer that does not fully settle the issue raised by a question is pragmatically strengthened too. Consider, for an example, the question-answer discourse in (i).

(i) Q: Did Ann invite Bill, Cesc, or Dirk?
A: She invited Bill or Dirk.

The discourse value of (i-A) is the set of propositions 'that Ann invited Bill and not Cesc and not Dirk' and 'that Ann invited Dirk and not Bill and not Cesc'. This seems to be an empirically adequate result. That is, by uttering (i-A) the responder agrees to the suggestion made by the speaker of (i-Q) that Ann invited only one of the three persons mentioned.

[62] See (130) for the derivation of the strengthened meaning of (126-A_1).

b. $\text{dVal}_{(126\text{-Q})}((126\text{-A}'_2)) = [\![(126\text{-A}'_2)]\!]$
$= \{\lambda w.\neg \text{there}_w(\text{Yusuf})\}$

The discourse value of (126-A_1) but not that of (A'_2) is its strengthened meaning, since only the former is a highlighted answer to (126-Q).[63] Therefore, the discourse value of (126-A_1) entails (A'_2), but not vice versa.[64] Thus, in the context of (126-Q), (A_1) implicates (A'_2), but not vice versa. This means that the only use of (A'_2) is to avoid to provide information about the truth of $\lambda w.\text{there}_w(\text{Musa})$. That is, the use of ($A'_2$) is always a move of an indirect answer strategy, and the same holds for (126-A'_1).[65] This explains the different status of positive and negative answers to *yes/no*-question disjunctions.

There is no asymmetry between the positive and the negative answer to a *yes/no*-question: the negative answer to, e.g., the question *Is Musa there?* is necessary to communicate that $\lambda w.\text{there}_w(\text{Musa})$ is not true. Thus it is a move of a direct answer strategy.

4.3.5 A semantic/pragmatic answerhood notion

The difference between the positive and negative answers to a *yes/no*-question disjunction can also be described in terms of whether or not they settle the issue raised by the question.[66] Let us assume that a question-answer discourse denotes the conjunction of the denotation of the question and the discourse value of the answer. Thus if β is a question and α is an answer to β, the discourse $\beta - \alpha$ has the denotation given in (133).

(133) **The denotation of a question-answer discourse**
$[\![\beta - \alpha]\!] = [\![\beta]\!] \wedge \text{dVal}_\beta(\alpha)$

Given this assumption, we can observe that e.g. (126-A_1) settles the issue raised by (126-Q). That is, the discourse of (126-Q) and (A_1) has a non-inquisitive denotation, see (134). (Recall from section 3.5 that '$\sqcap$' is the pairwise propositional conjunction of the elements of its operands.)

[63] Note that (126-A_1) has the same discourse value relative to question (i) in fn. 60. This means that we can account for the fact that (126-A_1) is strengthened in response to this question, too.

[64] For sets of propositions A, B, A entails B iff for every $p \in A$ there is a $q \in B$ such that p entails q.

[65] I assume that indirect replies must be prosodically marked as such and that this is the reason for the prosodic constraints noted in section 4.3.1 for the negative answers.

[66] However, the difference cannot be reduced to these terms. That is, we still need to consider the implicature relations discussed in the previous section to explain why negative answers can only be used as indirect replies. Otherwise all "non-settling" answers would have the status of indirect replies, which I think is not correct.

$$
\begin{aligned}
(134)\qquad [\![(126\text{-Q}) - (126\text{-A}_1)]\!] &= [\![(126\text{-Q})]\!] \wedge \mathrm{dVal}_{(126\text{-Q})}((126\text{-A}_1)) \\
&= \left\{ \begin{array}{l} \lambda w.\mathrm{there}_w(\mathrm{Musa}), \lambda w.\neg\mathrm{there}_w(\mathrm{Musa}), \\ \lambda w.\mathrm{there}_w(\mathrm{Yusuf}), \lambda w.\neg\mathrm{there}_w(\mathrm{Yusuf}) \end{array} \right\} \sqcap \\
&\quad \sqcap \{\lambda w[\mathrm{there}_w(\mathrm{Musa}) \wedge \neg\mathrm{there}_w(\mathrm{Yusuf})]\} \\
&= \{\lambda w[\mathrm{there}_w(\mathrm{Musa}) \wedge \neg\mathrm{there}_w(\mathrm{Yusuf})]\}
\end{aligned}
$$

In contrast to this, (126-A$'_2$) does not settle the issue raised by (126-Q), since the discourse of (126-Q) and (A$'_2$) still has an inquisitive denotation:

$$
\begin{aligned}
(135)\qquad [\![(126\text{-Q}) - (126\text{-A}'_2)]\!] &= [\![(126\text{-Q})]\!] \wedge \mathrm{dVal}_{(126\text{-Q})}((126\text{-A}'_2)) \\
&= \left\{ \begin{array}{l} \lambda w.\mathrm{there}_w(\mathrm{Musa}), \lambda w.\neg\mathrm{there}_w(\mathrm{Musa}), \\ \lambda w.\mathrm{there}_w(\mathrm{Yusuf}), \lambda w.\neg\mathrm{there}_w(\mathrm{Yusuf}) \end{array} \right\} \sqcap \\
&\quad \sqcap \{\lambda w.\neg\mathrm{there}_w(\mathrm{Yusuf})]\} \\
&= \left\{ \begin{array}{l} \lambda w[\mathrm{there}_w(\mathrm{Musa}) \wedge \neg\mathrm{there}_w(\mathrm{Yusuf})], \\ \lambda w[\neg\mathrm{there}_w(\mathrm{Musa}) \wedge \neg\mathrm{there}_w(\mathrm{Yusuf})], \\ \lambda w.\neg\mathrm{there}_w(\mathrm{Yusuf}) \end{array} \right\}
\end{aligned}
$$

This observation motivates the following answerhood notion.

(136) **Settling answer**

α is a *settling answer* to β iff

(i) $[\![\alpha]\!] \subset [\![\beta]\!]$ and

(ii) $[\![\beta - \alpha]\!]$ is non-inquisitive.

The first clause of (135) serves to ensure that overinformative replies do not count as settling answers. For instance, the sentence *Ann is taller than Bill and Cesc* settles the issue of whether Ann is taller than Bill. But it is not a settling answer to the *yes/no*-question *Is Ann taller than Bill?* since its denotation is not a subset of the question denotation. When used in response to this question, *Ann is taller than Bill and Cesc* is an overinformative reply, since it entails the positive answer to the *yes/no*-question but not vice versa. The second clause of (135) has the effect that the meaning contribution of a reply does not merely consist in its semantic value (i.e., in its denotation) but rather in its discourse value (i.e., in the pragmatically strengthened denotation). Thus the notion of a settling answer is a pragmatic answerhood notion in the sense that it takes into account potential pragmatic implicatures of a reply. However, it essentially remains a semantic answerhood notion, since it excludes any reply that is not in the semantically defined answer space.[67] That is, the notion of a settling answer is not intended to explain the (in)adequacy of (non-)settling answers in discourse. As is well known, the use of an overinformative reply is often perfectly adequate and in

[67]For answerhood notions that are not semantic notions in this sense, see Groenendijk and Stokhof (1984, 1990).

some cases even more adequate than the use of a settling answer. There are also pragmatically inadequate uses of settling answers. A pertinent example is the *yes* answer in response to the question *Can you tell me the time?* in its typical use. Thus the notion of a settling answer serves only to determine whether a sentence – via its semantic meaning and implicatures – settles precisely the issue raised by the semantic meaning of a question.

5 Alternative Questions and Focus

5.1 Alternative questions in inquisitive semantics

According to Groenendijk (2008) and subsequent work in inquisitive logic, the logical correlate of an alternative question has the form in (137).

(137) $?(\varphi \vee \psi)$

The question mark in (137) is the equivalent to the Q operator of our proposition-set variant of inquisitive logic. That is, $?\varphi$ is an abbreviation for $\varphi \vee \neg\varphi$. The Hausa and Tangale examples that we considered in section 4.2.2 and 4.2.3 mirror exactly this form. To see this more clearly, let us take another look at the Hausa alternative question in (101). The structure of this question is repeated in (138).

(138) $[_{\text{CP}}\ [_{\text{C}^{[+\text{Q}]}}\ \text{ko:}\ ]\ [_{\text{DisjP}}\ [_{\text{TP}_1}\ \text{za:}\ \text{kà}\ \text{ta:shì}\ ]\ [_{\text{Disj}}\ \text{ko:}\ ]\ [_{\text{TP}_2}\ \text{za:}\ \text{kà}\ \text{zaunà:}\ \text{gida:}\ ]]]$
'Are you going to get up or are you going to stay at home?'

According to our previous assumptions, the interrogative complementizer *ko:* denotes a unary inquisitive disjunction operator (i.e., the Q operator) and the disjunctive coordinator *ko:* denotes the binary inquisitive disjunction operator.[68] This means that (138) has the denotation in (139).

(139) $Q([\![\text{TP}_1]\!] \vee [\![\text{TP}_2]\!])$

This reaffirms the proposal of Groenendijk (2008). However, I will show that we have to take other grammatical properties of alternative questions into account to arrive at an adequate explanation of their answerhood conditions. To see this, let us consider the denotation in (139) in more detail. The derivation in (140) arrives at the extension of the proposition set given by (139).

[68] Actually, the latter is presumably ambiguous between an inquisitive and a non-inquisitive meaning like its English counterpart. However, it requires further empirical research to establish this.

$$
\begin{array}{lll}
(140) \quad Q([\![\mathrm{TP}_1]\!] \vee [\![\mathrm{TP}_2]\!]) & = & Q(\{\lambda w.\mathrm{getup}_w(\mathrm{you})\} \cup \{\lambda w.\mathrm{stay}_w(\mathrm{you})\}) \\
& = & Q(\{\lambda w.\mathrm{getup}_w(\mathrm{you}), \lambda w.\mathrm{stay}_w(\mathrm{you})\}) \\
& = & \{\lambda w.\mathrm{getup}_w(\mathrm{you}), \lambda w.\mathrm{stay}_w(\mathrm{you})\} \vee \\
& & \vee \neg\{\lambda w.\mathrm{getup}_w(\mathrm{you}), \lambda w.\mathrm{stay}_w(\mathrm{you})\} \\
& = & \{\lambda w.\mathrm{getup}_w(\mathrm{you}), \lambda w.\mathrm{stay}_w(\mathrm{you})\}) \cup \\
& & \cup\{\lambda w[\neg\mathrm{getup}_w(\mathrm{you}) \wedge \neg\mathrm{stay}_w(\mathrm{you})]\} \backslash \epsilon \\
& = & \left\{ \begin{array}{l} \lambda w.\mathrm{getup}_w(\mathrm{you}), \lambda w.\mathrm{stay}_w(\mathrm{you}), \\ \lambda w[\neg\mathrm{getup}_w(\mathrm{you}) \wedge \neg\mathrm{stay}_w(\mathrm{you})] \end{array} \right\}
\end{array}
$$

The lexical meanings assumed in (140) serve for illustration only. To capture the intended meaning of (138), we would have to stipulate that the extensions of the properties 'getup' and 'stay' are complementary in the worlds of our models. Then the third proposition in the final set in (140) would have been subtracted because it was identical to ϵ.[69] However, this is not what I am interested here when focusing on the third proposition. Rather I want to point out that alternative questions such as (141-Q) are predicted to have three complete and settling answers, viz. (141A_1)–(A_3) (cf. Groenendijk, 2008).

(141) Q: Did you fail the MATH or the SCIENCE exam?
A_1: I failed the math exam. A_2: I failed the science exam.
A_3: I failed neither the math exam nor the science exam.

It can be easily seen that (141A_3) is a complete answer to (141-Q). It is also a settling answer since the highlighted answers (A_1) and (A_2) do not entail (A_3) after pragmatic strengthening (see section 4.3.4).

Now, I agree that (141-A_3) is a coherent reply to (141-Q). Still I would like to argue that we have to distinguish between the case where (141-A_3) is a settling answer to (141-Q) and the case where it is a presupposition protest (cf. Roelofsen and van Gool, 2009). As it stands, our analysis predicts that (141) is a way to express the same request as the sequence of questions in (142), where the first question is a *yes/no*-question with a non-inquisitive disjunctive object phrase (see section 5.2.2 for discussion).

(142) Did you fail the math or science EXAM? If so, which of the two?

This is clearly not correct for the variant of (141-Q) in which the second pitch accent is realized by a falling pitch movement:

(141) Q_f: Did you fail the /MATH or the \SCIENCE exam?

[69] The denotation of the alternative question *Is Musa there or not?*, which we discussed in section 4.3.2, is necessarily a two-membered set, since $\lambda w.[\neg\mathrm{there}_w(\mathrm{Musa}) \wedge \neg\neg\mathrm{there}_w(\mathrm{Musa})]$ is logically the empty proposition. This is the reason why alternative questions of this form have the same denotation as the corresponding *yes/no*-question.

(141-Q_f) can be used adequately only in situations in which it is justified to assume that the hearer did not perform satisfactorily in one of the exams. This is not the case for the question sequence in (141), and also not for the rising variant (141-Q_r) of the alternative question of interest, given below.

(141) Q_r: Did you fail the /MATH or the /SCIENCE exam?

This means that (141-A_3) has the status of an answer in response to (141-Q_r) and (142) and the status of a presupposition protest in response to (141-Q_f). It is tempting to explain the fact that (141-A_3) is not an answer to (141-Q_f) with the fact that it is not a *highlighted* answer, see figure 5 (a) vs. (b), where the box in the lower right corner of diagram (a) represents (A_3).

(a) denotation of ?failed(m∨s) (b) H-set of ?failed(m∨s)

Figure 5: The denotation and H-set of an alternative question

This attempt, however, is bound to fail since the negative answer to a *yes/no*-question would be affected in the same way as the problematic "third answer" (141-A_3).[70] Therefore I propose a different approach, which takes the focus properties and the semantic import of the falling pitch movement of the second focus accent in (141-Q_f) into account.[71] This approach also solves a second problem that the analysis proposed above does not address. As noted repeatedly in the empirical sections of this paper, disjunctive questions have a specific focus structure. I will discuss this phenomenon in the following two sections and provide an explanation for it in section 5.4. The "third answer" problem discussed above will be addressed in section 6.5, where I will propose an interpretation of the falling pitch movement.

5.2 The role of focus for inquisitiveness

5.2.1 The alleged effect of focus on the H-set

In this section, I will discuss a proposal that implies that disjunctive questions disallow certain focus structures. I will reject this proposal on several grounds,

[70] According to the analysis presented above, alternative questions *are* *yes/no*-questions (at least as regards their semantics). They just happen to contain an inquisitive disjunction in the scope of Q.

[71] Since we will derive the H-set of a question from its denotation and its focus value, the two approaches are actually related to each other.

mainly because the empirical facts suggest a stronger restriction: disjunctive questions *require* a certain focus structure, see the next section.

According to Roelofsen and van Gool (2009), focus has an effect on the H-set of an expression. Evidence for this assumption comes from the question in (143-Q) in which the disjunctive phrase is pronounced differently than in an alternative question (see below): as indicated by the hyphens, the disjunctive phrase is pronounced connectedly (as one phrase) and furthermore with a rising accent on the second disjunct. As shown in (143-A_1) and (A_2), (143-Q) allows for a *yes* answer and a *no* answer (amended by an additional sentence; see section 6.1 for discussion).

(143) Q: Does Ann-or-/BILL play the piano?
A_1: Yes. A_2: No, Cesc does.

The intonation of (143-Q) is taken to express a focus structure where the disjunctive phrase as a whole is focused:

(144) Does [Ann or Bill]$^{[+\text{Foc}]}$ play the piano?

From this, Roelofsen and van Gool (2009) conclude that focus collapses the H-set of the focused constituent to a singleton set and thus eliminates inquisitive possibilities. This runs counter to what we generally expect the effect of focus to be, viz. to *induce* alternatives. And indeed, the discussion in section 6.1 will support the assumption that the focus feature in (144) induces inquisitive possibilities. Nevertheless, let us proceed here with the proposal of Roelofsen and van Gool (2009) as this will allow a more substantial discussion later on.

In (145), I define the collapsing of inquisitive possibilities by means of the closure operator '!' (see section 3.5).

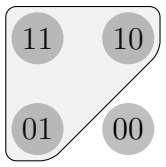
(145) **The H-set of focused expressions** (*auxiliary, to be rejected*)
$[\![\alpha^{[+\text{Foc}]}]\!]_{\text{H}} = !\,[\![\alpha]\!]_{\text{H}} \quad (= \neg\neg\,[\![\alpha]\!]_{\text{H}})$

According to (145), a focused constituent induces a different H-set than a non-focused one, cf. section 4.3.2. To give an example, the H-set of the focused phrase in (144) is not a two-membered set as in the unfocused case but a singleton, see (146).

(146) $$\begin{aligned}[\![\,[\text{Ann or Bill}]^{[+\text{Foc}]}]\!]_{\text{H}} &= !\{\text{Ann}, \text{Bill}\} \\ &= \{\lambda P \lambda w.\exists x \in \{\text{Ann}, \text{Bill}\} : P(x)(w) = 1\} \\ &= \{\lambda P \lambda w[P(\text{Ann})(w) \vee P(\text{Bill})(w)]\}\end{aligned}$$

Consequently, the question in (144) induces the H-set given in (147) (if we assume for simplicity that [$_{\text{VP}}$ play the piano] has the denotation $\{\lambda x \lambda w.\text{play}_w(x)\}$). This set is depicted in figure 6.

(147) $[\![(144)]\!]_{\mathrm{H}} = \{\lambda w[\mathrm{play}_w(\mathrm{Ann}) \vee \mathrm{play}_w(\mathrm{Bill})]\}$



$?\,\mathrm{play}([\mathrm{A} \vee \mathrm{B}]^{\mathrm{Foc}})$

Figure 6: The alleged effect of focus on the H-set

This means that the question in (144) is comparable to a *yes/no*-question and different from an alternative question in that it has a singleton H-set. The H-set in (147) thus helps to explain the answer pattern in (143).

For another example, consider the structure in (148), where the TP as a whole is focused.

(148) $[_{\mathrm{CP}}\ \mathrm{C}^{[+\mathrm{Q}]}\ [_{\mathrm{TP}}\ \mathrm{Ann\ or\ Bill\ play\ the\ piano}]^{[+\mathrm{Foc}]}]$

The H-set of the unfocused TP is the two-membered set in (149a). Since the closure operator collapses the two elements of this set into a single object, the H-set of the focused TP is the singleton set derived in (149b).

(149) a. $\{\lambda w.\mathrm{play}_w(\mathrm{Ann}), \lambda w.\mathrm{play}_w(\mathrm{Bill})\}$

b. $[\![\,[_{\mathrm{TP}}\ \mathrm{Ann\ or\ Bill\ play\ the\ piano}]^{[+\mathrm{Foc}]}]\!]_{\mathrm{H}} =$
$= \ !(149\mathrm{a})$
$= \ \{\lambda w.\exists p \in (149\mathrm{a}) : p(w) = 1\}$
$= \ \{\lambda w[\mathrm{play}_w(\mathrm{Ann}) \vee \mathrm{play}_w(\mathrm{Bill})]\}$

Consequently, (148) has the same H-set as the question in (144), which is the desired result since in both cases the disjunction is embedded in the focused constituent. If, on the other hand, the disjunction coordinates two focused constituents as in (150a), the inquisitive alternatives evoked by the disjunction are not collapsed into one, see (150b,c) (for further discussion, see Roelofsen and van Gool, 2009).

(150) a. $[_{\mathrm{CP}}\ \mathrm{C}^{[+\mathrm{Q}]}\ [_{\mathrm{TP}}\ [_{\mathrm{DisjP}}\ \mathrm{Ann}^{[+\mathrm{Foc}]}\ \mathrm{or\ Bill}^{[+\mathrm{Foc}]}]\ \mathrm{play\ the\ piano}]]$

b. $[\![\,\mathrm{DisjP}\,]\!]_{\mathrm{H}} = [\![\,\mathrm{Ann}^{[+\mathrm{Foc}]}]\!]_{\mathrm{H}} \vee [\![\,\mathrm{Bill}^{[+\mathrm{Foc}]}]\!]_{\mathrm{H}}$
$= \ !\{\mathrm{Ann}\} \cup !\{\mathrm{Bill}\}$
$= \ \{\lambda P\lambda w.P(\mathrm{Ann})(w)\} \cup \{\lambda P\lambda w.P(\mathrm{Bill})(w)\}$
$= \ \{\lambda P\lambda w.P(\mathrm{Ann})(w), \lambda P\lambda w.P(\mathrm{Bill})(w)\}$

c. $[\![(150\mathrm{a})]\!]_{\mathrm{H}} = \{\lambda w.\mathrm{play}_w(\mathrm{Ann}), \lambda w.\mathrm{play}_w(\mathrm{Bill})\}$

Hence, (150a) is predicted to be an alternative question. This prediction is borne out, as shown by (151).

(151) Q: Does ANN or BILL play the piano?
A_1: Ann. A_2: Bill.
A_3:#Yes. A_4:#No

The question in (151-Q) expresses the focus properties of (150a), i.e., the two focused phrases are accented (as indicated by small capitals). The coherence of the replies in (151-A_1)/(A_2) and the incoherence of (A_3)/(A_4) shows that (151-Q) is in fact an alternative question and not a *yes*/*no*-question. Thus, for the questions considered so far, the stipulation in (145) yields the correct result.

In general terms, the analysis of Roelofsen and van Gool (2009) suggests that a disjunctive phrase in an interrogative sentence gives rise to an alternative question unless it is a part of the focus. Thus the idea of this approach can be described as follows: disjunctive expressions have inquisitive import, and it requires additional grammatical means, i.e., specific focus structures to "deactivate" this import. Problematically, however, the next section will present data that contradict a generalization along these lines. We will arrive at a conclusion that, at first glance, appears to be problematic for inquisitive semantics: disjunctive expressions in interrogative sentences do not have inquisitive import unless they are "activated" by a specific focus structure.

5.2.2 Alternative questions require a specific focus structure

In the previous section, we considered questions in which the disjunctive phrase was part of the focus or the individual disjuncts were focused. In this section, I discuss cases where the disjunctive phrase and the focused constituent are distinct (see Han and Romero, 2004, for related discussion). Consider, for an example, the question in (152-Q) together with the replies in (152-A_1)–(A_4).

(152) Q: Does ANN play the piano or the violin?
A_1:%The piano. A_2:%The violin.
A_3: Yes. A_4: No, Bill does.

In (152-Q), the subject expression carries a focus accent and no other constituent does. Therefore, we can assume that only the subject phrase is focused, which means that the disjunctive object phrase is not part of the focus. According to Roelofsen and van Gool (2009), (152-Q) should thus be an alternative question and not a *yes*/*no*-question. However, the answer pattern in (152) suggests otherwise: (A_3) and (A_4) are perfectly adequate responses, which shows that (152-Q) can be interpreted as a *yes*/*no*-question. The replies in (152-A_1)/(A_2), in contrast, are not fully adequate responses in the sense that the replies in (153) are more adequate than (152-A_1)/(A_2) (with variability in the speaker judgements,

see below).

(153) A'_1: Yes, the piano. A'_2: Yes, the violin.

The replies in (153) again show that (152-Q) can be interpreted as a *yes/no*-question. Clearly, they are overinformative responses, since their first part, *yes*, already settles the issue raised by the *yes/no*-question. The replies in (152-A_1)/(A_2) can also count as overinformative responses to the *yes/no*-question, since they entail the positive answer *Ann plays the piano or the violin.* Therefore, I want to suggest that they *are* overinformative responses and that the above variability in judgement reflects preferences as to whether the *yes/no*-question is to be answered with *yes* before providing information that exceeds the literal request. Then the judgements in (152-A_1)/(A_2) show that (152-Q) cannot be interpreted as an alternative question.

The fact that (152-Q) allows for a *yes/no*-question interpretation contradicts the assumption that a disjunctive phrase has inquisitive import unless it is part of the focus. Moreover, if my interpretation of the facts is correct and (152-Q) cannot be interpreted as an alternative question then focus is a necessary ingredient for the inquisitiveness of a disjunctive phrase in an interrogative sentence: a disjunctive phrase in an interrogative sentence gives rise to an alternative question only if the individual disjuncts are focused (where they differ). This is, of course, what many researchers on the topic have already stated in one form or another (see Roberts, 1996; Bartels, 1997; Romero, 1998; Han and Romero, 2004; Beck and Kim, 2006). Moreover, this generalization is in accord with a phenomenon that is pervasive in *wh*-questions, viz. the phenomenon that a *wh*-word can function as a question word only if it is focused (cf. Beck, 2006). Below, this correlation is illustrated with German data but we find comparable evidence in a large variety of other languages (see Haida, 2007). In German, *wh*-words can function as indefinites so that we can study the formal differences between interrogative and indefinite *wh*-words. The question in (154a) forms a minimal pair with the string-identical question in (154b), the minimal contrast being whether the *in-situ wh*-pronoun *was* 'what/something' is accented, i.e., focused or not.

(154) a. Wer mag WAS?
who likes what
(i) 'Who likes what?'
(ii) *'Who likes something?'

b. Wer MAG was?
(i) *'Who likes what?'
(ii) 'Who likes something?'

In (154a), *was* is accented/focused, and it must be interpreted as a question word, see (154a-i) vs. (a-ii). In (154b), *was* is not accented/focused, and it must be interpreted as a non-specific indefinite, see (154b-ii) vs. (b-i). Thus, as far the

correlation between focusing and inquisitivess is concerned, disjunctive phrases are non-*wh*-counterparts to the *in-situ wh*-phrases in (154a) and (b), respectively.

Let us consider another constituent question to support our conclusion that focus is a necessary ingredient for the inquisitiveness of a disjunctive phrase. The sentence in (155) is a subject question of Tangale.

(155) Ed-ug ɗom *yaː / koː lakikoro noŋ?
eat-PERF beans or or$^{[-\text{inq}]}$ rice who
'Who ate beans or rice?'

In (155), the subject *wh*-word *noŋ* 'who' is in the postverbal focus position, since, as noted above, question words are inherently focal. Importantly, the object phrase, with the meaning 'beans or rice', cannot be formed with the inquisitive disjunctive coordinator *yaː* but must be formed with the non-inquisitive coordinator *koː*.[72] The reason is that the formal conditions for the focusing of the disjuncts *ɗom* 'beans' and *lakikoro* 'rice' are not met: in Tangale, unmarked object focus is only possible if there is no focus-marked expression in the sentence, and in (155-Q) the subject phrase is focus marked by being placed post-verbally. Thus the data in (155) again show a correlation between focusing and inquisitivess.

How can we account for this correlation? In the introductory section 3.2, I already discussed the inquisitive/non-inquisitive ambiguity of disjunctive declarative sentences. In this connection, I made the assumption that the disjunctive coordinator is ambiguous between an inquisitive and a non-inquisitive meaning, i.e., that there is an inquisitive *or* and a non-inquisitive *or* (aka *or*$^{[-\text{inq}]}$). The approach discussed in the previous section can be seen as an attempt to get rid of this lexical ambiguity. This attempt, I argued, failed because it is not empirically adequate. Therefore, I propose to explain the correlation between focusing and inquisitiveness on the basis of the lexical ambiguity assumption. This assumption is furher supported by the fact that in Tangale the inquisitive disjunction is lexicalized differently from the non-inquisitive disjunction (i.e., by *yaː* and *koː*, respectively). I argue that the correlation between focusing and inquisitiveness follows from a restriction on the distribution of inquisitive *or*. This explanantion requires a semantic theory of focus, which will be presented in the following

[72] In section 2.2.2, I characterized *yaː* as an "*interrogative* disjunctive coordinator" because it is restricted to interrogative clauses. Semantically, *yaː* is inherently inquisitive. That is, it always gives rise to an alternative question:

(i) Q: Petur ed-ug ɗom yaː lakikoro ya?
P. eat-PERF beans or rice Q
'Did Peter eat beans or rice?'
A: #oː
yes

The disjunctive coordinator *koː* cannot be inquistive in questions. I lack the data for declarative sentences.

section.

5.3 An inquisitive-semantic focus semantics

To account for the focus effects above and for other focus effects to be discussed in later parts of this paper, I define the inquisitive-semantic correlate of the alternative semantics for focus (Rooth, 1985, 1992). There are two main differences between the standard alternative semantics and its inquisitive variant: (I) In the standard alternative semantics, a (non-quantificational) DP denotes an entity, and its focus value – its alternative set – is a set of entities (a contextually restricted subset of $\mathcal{D}_e$). This set represent the focus alternatives of the DP, i.e., of the denoted entity. In inquisitive semantics, a DP already denotes a set of entities. Therefore, the alternative set of a DP must be (in a sense) a set of sets of entities. In order not to inflate inquisitiveness, I assume that the focus value of a DP is a set of principle filters of entity sets (i.e., a subset of $\mathcal{D}_{\langle e,\langle s,t\rangle\rangle}$). The principle filter of an entity set singles out those properties that apply to each entity in the set. Thus a principle filter represents a set in a non-inquisitive, "conjunctive" way (see the examples below). (II) In the standard alternative semantics, the focus value of a declarative sentence is a set of propositions. These sets are the equivalent of Hamblin/Karttunen denotations of *wh*-questions. As discussed in section 3.7, the proposition sets of inquisitive semantics have a different status from Hamblin/Karttunen sets: the former are (weakly) exhaustive characterizations of states of affairs, whereas the latter are (in general) non-exhaustive characterizations. Correspondingly, in an inquisitive focus semantics the focus value of a proposition must be a set of exhaustive characterizations of states of affairs. This is achieved by the assumption that the focus value of, e.g., a DP is the set of principle filters of the *powerset* of a contextually restricted set of entities.

This leads to the definition in (156), where $[\![\cdot]\!]^a_{\mathrm{F}}$ is the function that gives the focus value of its argument relative to the space of alternatives c. The focus value of an expression α will be termed the *F-set* of α (relative to c). I will omit the parameter c whenever the space of alternatives does not have an influence on the focus value.

(156) **The F-set of focused expressions** (*to be generalized*)

a. If $[\![\alpha]\!] \subseteq \mathcal{D}_e$, then $[\![\alpha^{[+\mathrm{Foc}]}]\!]^c_{\mathrm{F}} = \Pi_e(\mathcal{P}(c(\mathcal{D}_e)))$.

b. If $c(\mathcal{D}_e) \neq \varnothing$, then $[\![\alpha]\!] \subseteq c(\mathcal{D}_e) \subseteq \mathcal{D}_e$.

c. If $\mathcal{S} \subseteq \mathcal{P}(\mathcal{D}_e)$,
then $\Pi_e(\mathcal{S}) = \{\lambda P \lambda w.\forall x \in A : P(x)(w) = 1 \mid A \in \mathcal{S}\}$.

The parameter c, which I called above "the space of alternatives", designates a function on the set of domains which gives the subset of the contextually relevant

focus alternatives of each type. In general, this set is a superset of the denotation of the focused expression.[73] The function Π_e gives a set of principle filters: for each entity set A in the argument set $\mathcal{S}$, $\Pi_e(\mathcal{S})$ contains the principle filter of A. Hence the F-set of a focused proper name – for instance, *Ann* – is the set of generalized quantifiers given in (157).

(157) $\quad [\![Ann^{[+\text{Foc}]}]\!]^c_{\text{F}} = \{\lambda P \lambda w.\forall x \in A : P(x)(w) = 1 \mid A \subseteq c(\mathcal{D}_e)\}$

Let us further assume that the F-set of an unfocused expression α is defined in the standard way, viz. as given in (158) (see section 3.3 for the definition of the bullet operation '•', that is, of pointwise functional application).

(158) **The F-set of unfocused expressions**

(i) If α is a (non-functional) lexical item, then $[\![\alpha]\!]_{\text{F}} = [\![\alpha]\!]$.

(ii) If α is a branching node with daughters β and γ, then $[\![\alpha]\!]_{\text{F}} = [\![\beta]\!]_{\text{F}} \bullet [\![\gamma]\!]_{\text{F}}$.

In the following example, I assume that the contextually relevant focus alternatives of the focused expression *Ann* are Ann, Bill, and Cesc so that $c(\mathcal{D}_e) = \{\text{Ann}, \text{Bill}, \text{Cesc}\}$. Then the F-set of the phrase $[Ann^{[+\text{Foc}]}\ plays]$ is the set of propositions derived in (159).

(159)
$$
\begin{aligned}
&[\![\, [Ann^{[+\text{Foc}]}\ plays\,] \,]\!]^c_{\text{F}} = \\
&= [\![Ann^{[+\text{Foc}]}]\!]^c_{\text{F}} \bullet [\![\ plays\ ]\!]_{\text{F}} \\
&= \{\lambda P \lambda w.\forall x \in A : P(x)(w) = 1 \mid A \subseteq c(\mathcal{D}_e)\} \bullet \{\lambda x \lambda w.\text{play}_w(x)\} \\
&= \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid A \subseteq c(\mathcal{D}_e)\} \\
&= \left\{ \begin{array}{l} \lambda w.w = w, \\ \lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill}), \lambda w.\text{play}_w(\text{Cesc}), \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})], \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})] \end{array} \right\}
\end{aligned}
$$

The last set representation in (159) illustrates that the F-set of $[\text{Ann}^{[+\text{Foc}]}\ \text{plays}]$ contains alternatives to the proposition 'that Ann plays', which most notably includes conjunctions like 'that Ann plays and Bill plays'. Thus focus gives rise to *scalar* alternatives to the (proposition in the) denotation of a sentence since focus induces partially ordered alternative sets. The F-set of $[\text{Ann}^{[+\text{Foc}]}\ \text{plays}]$ also contains the tautological proposition $\lambda w.w = w$, which is induced by the empty set in the powerset of $c(\mathcal{D}_e)$. The tautological proposition is an element of the F-set of any sentential expression that contains a focused constituent (see section

[73] In section 6.4.3, I will discuss the assumption that $c(\mathcal{D}_e)$ is the empty set if there are no contextually relevant alternatives to the focused expression.

6.4.3 and 6.5 for discussion and qualification). Furthermore, it is worth noting that the F-set in (159) roughly corresponds to the inquisitive-semantic denotation of the subject *wh*-question *Who plays?*[74]

The definition in (160) can be generalized in the usual way to expressions of all types, see (160).[75]

(160) **The F-set of focused expressions**

a. For any type τ, if $[\![\alpha]\!] \subseteq \mathcal{D}_\tau$ then $[\![\alpha^{[+\text{Foc}]}]\!]^c_{\text{F}} = \Pi_\tau(\mathcal{P}(c(\mathcal{D}_\tau)))$.

b. If $c(\mathcal{D}_\tau) \neq \varnothing$, then $[\![\alpha]\!] \subseteq c(\mathcal{D}_\tau) \subseteq \mathcal{D}_\tau$.

c. (i) If $\mathcal{S} \subseteq \mathcal{P}(\mathcal{D}_\tau)$, where $\tau = \langle\sigma_1, \langle \ldots, \langle\sigma_n, t\rangle \ldots\rangle\rangle$,
then $\Pi_\tau(\mathcal{S}) = \{\lambda b_1 \ldots \lambda b_n.\forall a \in A : a(b_1) \ldots (b_n) = 1 \mid A \in \mathcal{S}\}\backslash\epsilon$.

(ii) If $\mathcal{S} \subseteq \mathcal{P}(\mathcal{D}_\tau)$, where τ is a type that does not end in t,
then $\Pi_\tau(\mathcal{S}) = \{\lambda b \lambda w.\forall a \in A : b(a)(w) = 1 \mid A \in \mathcal{S}\}$.

This definition is illustrated in (161) with a phrase in which the predicate is focused. In the last step of the derivation in (161), I assume that the set $c(\mathcal{D}_{\langle e,\langle s,t\rangle\rangle})$ of contextually relevant focus alternatives of the focused predicate *plays* is the set $\{\lambda x \lambda w.\text{play}_w(x), \lambda x \lambda w.\text{sing}_w(x), \lambda x \lambda w.\text{dance}_w(x)\}$.

---

[74] This statement presumes an inquisitive *wh*-question semantics, which, however, still needs to be worked out. Nevertheless, I think that it is reasonable to assume the following denotation for the *wh*-pronoun *who*.

(i) $[\![\text{who}]\!] = \Pi_e(\mathcal{P}(\mathcal{D}_e)\backslash\varnothing)$

By (i) and (193), the *wh*-question *Who plays?* would then have the following denotation.

(ii) $$\begin{aligned} [\![\,[\text{C}^{[+\text{Q}]}\,[\text{who plays}]]\,]\!] &= Q([\![\,[\text{who plays}]\,]\!]) \\ &= \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid \varnothing \subset A \subseteq \mathcal{D}_e\} \cup \\ &\quad \cup \{\forall x \in \mathcal{D}_e : \text{play}_w(x) = 0\} \end{aligned}$$

(Cf. Ciardelli, 2009, for the model-theoretic meaning of existential quantification.)

[75] In (160b-i), a is a variable of type $\langle\sigma_1, \langle \ldots, \langle\sigma_n, t\rangle \ldots\rangle\rangle$ and for all i, $1 \leqslant i \leqslant n$, b_i is a variable of type σ_i. In (160b-ii), a is a variable of type τ and b is a variable of type $\langle\tau, \langle s, t\rangle\rangle$.

(161) $[\![\,[\mathit{Ann}\ \mathit{plays}^{[+\mathrm{Foc}]}]\,]\!]^c_{\mathrm{F}} =$

$= [\![\mathit{Ann}]\!]_{\mathrm{F}} \bullet [\![\,\mathit{plays}^{[+\mathrm{Foc}]}]\!]^c_{\mathrm{F}}$

$= \{\mathrm{Ann}\} \bullet \{\lambda x \lambda w.\forall P \in A : P(x)(w) \mid A \subseteq c(\mathcal{D}_{\langle e,\langle s,t\rangle\rangle})\}$

$= \{\lambda w.\forall P \in A : P(\mathrm{Ann})(w) = 1 \mid A \subseteq c(\mathcal{D}_{\langle e,\langle s,t\rangle\rangle})\}\backslash\epsilon$

$$= \left\{ \begin{array}{l} \lambda w.w = w, \\ \lambda w.\mathrm{play}_w(\mathrm{Ann}), \lambda w.\mathrm{sing}_w(\mathrm{Ann}), \lambda w.\mathrm{dance}_w(\mathrm{Ann}), \\ \lambda w[\mathrm{play}_w(\mathrm{Ann}) \wedge \mathrm{sing}_w(\mathrm{Ann})], \lambda w[\mathrm{play}_w(\mathrm{Ann}) \wedge \mathrm{dance}_w(\mathrm{Ann})], \\ \lambda w[\mathrm{sing}_w(\mathrm{Ann}) \wedge \mathrm{dance}_w(\mathrm{Ann})], \\ \lambda w[\mathrm{play}_w(\mathrm{Ann}) \wedge \mathrm{sing}_w(\mathrm{Ann}) \wedge \mathrm{dance}_w(\mathrm{Ann})] \end{array} \right\}$$

This F-set roughly corresponds to the inquisitive-semantic denotation of the *wh*-question *What does Ann do?*

As for the functional vocabulary, I will only consider the interrogative C head and the inquisitive and non-inquisitive disjunction. For $\mathrm{C}^{[+\mathrm{Q}]}$, I assume that it is semantically inert with regard to focus semantics. That is, the F-set of an interrogative CP is identified with the F-set of the TP complement of $\mathrm{C}^{[+\mathrm{Q}]}$:

(162) **The F-set induced by** $\mathrm{C}^{[+\mathrm{Q}]}$

$[\![\,[\mathrm{C}^{[+\mathrm{Q}]}\ \mathrm{TP}]\,]\!]_{\mathrm{F}} = [\![\mathrm{TP}]\!]_{\mathrm{F}}$

For inquisitive and non-inquisitive *or*, I assume that the focus values induced by these elements is derived from the F-sets of their disjuncts and reflects their denotational meaning in all other respects. That is, non-inquisitive *or* yields the non-inquisitive closure of this set:

(163) **The focus value induced by** $\mathit{or}^{[-\mathrm{inq}]}$

For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$ then $[\![\,[\alpha\ \mathit{or}^{[-\mathrm{inq}]}\ \beta]\,]\!]_{\mathrm{F}} = !([\![\alpha]\!]_{\mathrm{F}} \vee [\![\beta]\!]_{\mathrm{F}})$.

Inquisitive *or* yields an F-set that is the disjunction of the F-sets of its disjuncts:

(164) **The focus value induced by** *or* (*to be modified*)

For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$ then $[\![\,[\alpha\ \mathit{or}\ \beta]\,]\!]_{\mathrm{F}} = [\![\alpha]\!]_{\mathrm{F}} \vee [\![\beta]\!]_{\mathrm{F}}$.

The effect of the stipulations in (164) and (163) will be illustrated in section 5.5. The definition in (163) will be modified in section 6.5.

5.4 Inquisitive and non-inquisitive *or* in interrogative sentences

With this focus semantics in hand, we are in the position to explain the distribution of inquisitive *or* in interrogative sentences. We have repeatedly observed that the disjuncts of an alternative question as well as the disjuncts of a *yes*/*no*-question disjunction are focused where they differ from each other. I

assume that this is due to a requirement that inquisitive *or* imposes on its disjuncts. More precisely, I assume that the operator denoted by inquisitive *or* has the presupposition that the focus values of its operands are identical.[76] This is captured by the stipulation in (165).

(165) **The semantics of inquisitive** *or*
For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$

$$\text{then } [\![\, [\alpha \textit{ or } \beta] \,]\!] = \begin{cases} [\![\alpha]\!] \cup [\![\beta]\!] & \text{if } [\![\alpha]\!]_F = [\![\beta]\!]_F \\ \textit{undefined} & \text{otherwise.} \end{cases}$$

By this definition, inquisitive *or* does not have a defined meaning if its disjuncts are not focused. To see this, consider the question in (166).

(166) Does Ann *or/or$^{[-\text{inq}]}$ Bill play the PIANO$^{[+\text{Foc}]}$?

The F-sets of the two disjuncts *Ann* and *Bill* are not identical since they are not focused: by definition (158), $[\![Ann]\!]_F = [\![Ann]\!] = \{\text{Ann}\} \neq \{\text{Bill}\} = [\![Bill]\!] = [\![Bill]\!]_F$. This means that inquisitive *or* cannot occur in (166), which explains why (166) cannot be interpreted as an alternative question.

Inquisitive *or* has a defined meaning if the disjuncts are focused as in (167), repeated from (151) with some structural specifications for clarity.

(167) Does ANN$^{[+\text{Foc}]}$ or/*or$^{[-\text{inq}]}$ BILL$^{[+\text{Foc}]}$ play the piano?

The F-sets of the disjuncts in (167) are identical, since by definition (156)/(160) $[\![Ann^{[+\text{Foc}]}]\!]^c_F = \{\lambda P \lambda w. \forall x \in A : P(x)(w) = 1 \mid A \subseteq c(\mathcal{D}_e)\} = [\![Bill^{[+\text{Foc}]}]\!]^c_F$. This explains why (167) can be interpreted as an alternative question. It should be obvious that this account carries over to disjunctive questions in which only parts (i.e., subconstituents) of the disjuncts are focused.

For non-inquisitive *or*, I assume that it does not have the identity presupposition of inquisitive *or*. That is, the meaning assumed for $or^{[-\text{inq}]}$ in section 3.5 in the paragraph on *Non-inquisitive disjunction* remains unaltered. Not having the identity presupposition, non-inquisitive *or* can occur in (166), giving rise to the *yes/no*-question interpretation that we observe. However, without further assumptions $or^{[-\text{inq}]}$ can also occur in (167). This makes the false prediction that

[76] This assumption simplifies matters somewhat. The example in (i) shows that, in general, the identity presupposition is too strong.

(i) Did ANN call Bill a Republican or did SUE insult him?

The F-sets of the two disjuncts of (i) are only identical in models and contexts in which for each of the contextually relevant agents calling Bill a Republican is logically equivalent to insulting him (see Rooth, 1992, for related discussion). I ignore this complication in the following discussion.

(167) can be interpreted as a *yes/no*-question.

To prevent this, we have to assume the Principle of *Maximize Presupposition* (Heim, 1991). According to this principle, speakers seek to maximize the presuppositional content of their utterances to the extent that the context or grammatical environment satisfies this content (and likewise for interpreters). This means that the identity presupposition of inquisitive *or* precludes the use of $or^{[-\text{inq}]}$ in environments in which this presupposition is satisfied: inquisitive *or* maximizes the presuppositional content that is satisfied by the environment, while $or^{[-\text{inq}]}$ does not. This explains why (167) does not allow for a *yes/no*-question interpretation.

5.5 Deriving the H-set from the denotation and the F-set

I have already mentioned that I would like to do without H-sets as independent semantic objects. The reason is that the theoretical status of these objects is unclear. Their only purpose is to eliminate the semantic import of the interrogative complementizer so that we can distinguish between the "positive" proposition(s) and the "negative" proposition in a question denotation. The description *highlighting* suggests a relation to focus, although Roelofsen and van Gool (2009) do not make this explicit. If we compare the definition of H-sets in section 4.3.2 with the definition of F-sets in section 5.3, we find a number of correspondences: the first and the second clause of the H-set definition in (119) corresponds to the definition of the focus-semantic import of $\text{C}^{[+\text{Q}]}$ and inquisitive *or* in (162) and (230), respectively.[77] The remaining differences between H-sets and F-sets are due to the alternative-inducing property of focus. These differences can be masked by considering only certain spaces of alternatives and only elements of the F-set that are also elements of the denotation of an expression. That is, it can be shown that the H-set of an expression α is identical to the intersection of the denotation and the F-set of α in a *minimal non-trivial* space of alternatives, see (168). Thus we can derive the former from the latter.[78]

(168) **The derivation of the H-set of an expression**

a. For any type τ, if $[\![\alpha]\!] \subseteq \mathcal{D}_\tau$, then $[\![\alpha]\!]_{\text{H}} = [\![\alpha]\!] \cap [\![\alpha]\!]^{\overline{c}}_{\text{F}}$, where $\overline{c}$ is the smallest space of alternatives that is non-trivial for τ.

b. (i) $c \leqslant c'$ iff for all types $\sigma : c(\mathcal{D}_\sigma) \subseteq c'(\mathcal{D}_\sigma)$.
(ii) c is non-trivial for τ iff $[\![\alpha]\!]^c_{\text{F}} \neq \Pi_\tau(\{\varnothing\})$.

[77] Arguably, (162) and (230) are as stipulatory as the corresponding clauses of (119). However, F-sets are needed anyway and H-sets can be eliminated if we make these stipulations.

[78] The equation in (168) shows that the conjunction of the Boolean set algebra has its place in proposition-set approaches to natural language meaning. However, recall that the argument in section 3.6 and 3.6.2 was that the Boolean conjunction does not represent the natural language conjunction, while the conjunction of p-set inquisitive logic does.

By the second clause of (156)/(160), a minimal non-trivial alternative space is an alternative space in which the F-set of a focused expression is identical to its denotation. Below I show that the identity in (168a) holds for the *yes/no*-question in (166) and the alternative question in (167). The structure of (166) is given in (169).

(169) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{DisjP}}\ \text{Ann or}^{[-\text{inq}]}\ \text{Bill}]\ \text{play}\ [_{\text{DP}}\ \text{the piano}]^{[+\text{Foc}]}]]$

According to our assumptions, (169) denotes the set in (170), where $[\![(169\text{-TP})]\!]$ is the denotation of its TP. I assume that the denotation 'piano' of the object DP is an instrument type.

$$\begin{aligned}(170)\qquad [\![(169)]\!] &= [\![(169\text{-TP})]\!] \vee \neg[\![(169\text{-TP})]\!] \\ &= \{\lambda w[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})]\} \cup \\ &\quad \cup \{\lambda w[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})]\}^* \\ &= \left\{ \begin{array}{l} \lambda w[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})], \\ \lambda w.\neg[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})] \end{array} \right\}\end{aligned}$$

By definition (163), the F-set of the disjunctive phrase of (169) is identical to the denotation of this phrase. The focusing of the object phrase *the piano* induces alternatives to the denotation of *the piano*. For the minimal non-trivial space of alternatives $\bar{c}$, it holds that $[\![\,[_{\text{DP}}\ \text{the piano}]^{[+\text{Foc}]}]\!]^{\bar{c}}_{\text{F}} = \{\text{piano}\}$. Thus (169) has the F-set in (171).

(171) $[\![(169)]\!]^{\bar{c}}_{\text{F}} = \{\lambda w.w = w, \lambda w[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})]\}$

By definition (119) in section 4.3.2, the H-set of (169) is identical to $[\![(169\text{-TP})]\!]$, see the first equation in (172). Thus it is identical to the intersection of the denotation and the F-set of (169) in the minimal non-trivial space of alternatives, see the second and third equation in (172).

$$\begin{aligned}(172)\qquad [\![(169)]\!]_{\text{H}} &= [\![(169)_{\text{TP}}]\!] \\ &= \{\lambda w[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})]\} \\ &= [\![(169)]\!] \cap [\![(169)]\!]^{\bar{c}}_{\text{F}}\end{aligned}$$

Next, the structure and denotation of (167) is given in (173) and (174), respectively.

(173) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{TP}}\ [_{\text{DisjP}}\ \text{Ann}^{[+\text{Foc}]}\ \text{or Bill}^{[+\text{Foc}]}]\ \text{play the piano}]]$

$$\begin{aligned}(174)\qquad [\![(173)]\!] &= [\![(173\text{-TP})]\!] \vee \neg[\![(173\text{-TP})]\!] \\ &= \{\lambda w.\text{play}_w(\text{Ann}, \text{piano}), \lambda w.\text{play}_w(\text{Bill}, \text{piano})\} \cup \\ &\quad \cup \{\lambda w.\text{play}_w(\text{Ann}, \text{piano}), \lambda w.\text{play}_w(\text{Bill}, \text{piano})\}^* \\ &= \left\{ \begin{array}{l} \lambda w.\text{play}_w(\text{Ann}, \text{piano}), \lambda w.\text{play}_w(\text{Bill}, \text{piano}), \\ \lambda w.\neg[\text{play}_w(\text{Ann}, \text{piano}) \vee \text{play}_w(\text{Bill}, \text{piano})] \end{array} \right\}\end{aligned}$$

By definition (156)/(160) and (163), the F-set of the disjunctive phrase of (173) is identical to the focus value of a focused proper name, see (175).

(175) $$\begin{aligned}[\![\,_{\text{DisjP}}\ \mathit{Ann}^{[+\text{Foc}]}\ \mathit{or}\ \mathit{Bill}^{[+\text{Foc}]}]\,]\!]^{c}_{\text{F}} &= [\![\mathit{Ann}^{[+\text{Foc}]}]\!]^{c}_{\text{F}} \vee [\![\mathit{Bill}^{[+\text{Foc}]}]\!]^{c}_{\text{F}} \\ &= [\![\mathit{Ann}^{[+\text{Foc}]}]\!]^{c}_{\text{F}}\ \ (= [\![\mathit{Bill}^{[+\text{Foc}]}]\!]^{c}_{\text{F}})\end{aligned}$$

The smallest space of alternatives that satisfies the second clause of (156)/(160) and the non-triviality condition of (168) is the space $\bar{c}$, for which it holds that $[\![\mathit{Ann}^{[+\text{Foc}]}]\!]^{\bar{c}}_{\text{F}} = [\![\mathit{Bill}^{[+\text{Foc}]}]\!]^{\bar{c}}_{\text{F}} = \{\text{Ann}, \text{Bill}\}$. Hence, (173) has the following focus value:

(176) $$[\![(173)]\!]^{\bar{c}}_{\text{F}} = \left\{\begin{array}{l}\lambda w.w = w, \\ \lambda w.\text{play}_w(\text{Ann}, \text{piano}), \lambda w.\text{play}_w(\text{Bill}, \text{piano}), \\ \lambda w[\text{play}_w(\text{Ann}, \text{piano}) \wedge \text{play}_w(\text{Bill}, \text{piano})]\end{array}\right\}$$

Now observe that, as in the case considered before, the H-set of (173) is the intersection of $[\![(173)]\!]$ and $[\![(173)]\!]^{\bar{c}}_{\text{F}}$:

(177) $$\begin{aligned}[\![(173)]\!]_{\text{H}} &= [\![(173)_{\text{TP}}]\!] \\ &= \{\lambda w.\text{play}_w(\text{Ann}, \text{piano}), \lambda w.\text{play}_w(\text{Bill}, \text{piano})\} \\ &= [\![(173)]\!] \cap [\![(173)]\!]^{\bar{c}}_{\text{F}}\end{aligned}$$

This means that we can get rid of the function $[\![\cdot]\!]_{\text{H}}$ defined in (119) and treat H-sets as auxiliary objects only. I continue to use $[\![\cdot]\!]_{\text{H}}$, but only as a shorthand to refer to the intersection of the denotation and the F-set in the minimal non-trivial space of alternatives.

6 A Focus-sensitive Question Operator

6.1 Focus in non-*wh*-questions induces inquisitive alternatives

The discussion in the previous sections has shown that focus plays an important role in non-*wh*-questions. In this section, I will show that there are still other focus effects in these questions. I start with the discussion of *yes*/*no*-questions. Consider the *yes*/*no*-question in (178-Q) in which the subject expression is accented and hence focused. There is a difference between the positive reply in (178-A_1) and the negative reply in (178-A_2). While a simple *yes* is a completely adequate response, a simple *no* is not: (A_2) has the flavor of a non-cooperative reply because it does not completely satisfy the request for information expressed by (178-Q).

(178) Q: Does ANN play the piano?
A_1: Yes. A_2: #No.

Thus focus influences the (semantic or pragmatic) answerhood conditions of (178-Q). As argued in section 4.3.3, the short answer *no* refers anaphorically to the preceding question and yields the negation of its H-set (where it is presupposed that the H-set is singleton). This means that (178-A_2) expresses that Ann does not play the piano. But, as observed, this is not enough for it to be an adequate negative response. The *no* reply must be supplemented by another assertion. One possible addition is to explicitly deny that there is someone who plays the piano, see (179-A).

(178) Q: Does ANN play the piano?

(179) A: No, NO one does.

Another possibility to supplement the *no* reply is to tell who, instead of the assumed person Ann, plays the piano, see (180-A).

(178) Q: Does ANN play the piano?

(180) A: No, BILL does.

Thus it seems that the subject focus in (178-Q) evokes a subject question that can be paraphrased as 'Who plays the piano if it is not Ann?'. This assumption is supported by the fact that the reply in (181-A) has a completely different status:

(178) Q: Does ANN play the piano?

(181) A: #No, she plays the violin.

The reply in (181-A) is marked as incoherent, which it is if the additional sentence is pronounced with neutral declarative intonation. However, (181-A) is coherent if the subject pronoun is pronounced with contrastive-topic intonation. Importantly, even when pronounced in a way that makes it a coherent reply, (181-A) does not completely satisfy the information request expressed by (178-Q): if (181-A) is left without another utterance, the speaker of (178-Q) would be justified to ask *Well, but who plays the piano?* Thus the phenomenon under discussion is not the coherence or incoherence of (181-A) but the fact that (181-A) cannot be used to settle the issue raised by (178-Q). The reason for this obviously is that the added sentence in (181-A) does not answer the subject question evoked by (178-Q).

The opposite pattern can be observed for the *yes*/*no*-question in (182-Q), in which the object phrase is accented and hence focused.[79]

(182) Q: Does Ann play the PIANO?
A_1: No, she plays the violin. A_2: #No, Bill does.

[79] I ignore VP-focus and other focus projections here.

The reply in (182-A_1), but not that in (A_2) settles the issue raised by (182-Q).[80] This means that the object focus in (182-Q) evokes the object question 'What does Ann play if it is not the piano?'.[81]

To sum up, we find that subject focus in a *yes/no*-question evokes a subject question and object focus an object question. There are two possible explanations for this, a semantic and a pragmatic one. The semantic explanation is that the question operator is focus sensitive. On this explanation, focus has a direct influence on the answerhood conditions of a question (see section 6.4). The pragmatic explanation would be that focus induces conditions on the context of use of a question, which have an indirect influence on its answerhood conditions. I will discuss the pragmatic explanation first before showing that there is strong empirical evidence for the semantic explanation.

6.2 The pragmatic explanation

It can be argued that the focus effect observed in *yes/no*-questions is not specific to this type of sentence. According to Beaver and Clark (2008), the focus alternatives evoked by a declarative utterance must be congruent with the most immediate question that the interlocutors of a discourse are trying to resolve. This (often implicit) question is the so-called Current Question (henceforth the *CQ*). Thus the phenomenon observed above could be taken to show that an interrogative utterance, too, must be congruent with the CQ (prior to the interrogative utterance). The argument could go as follows. An utterance of, e.g., (182-Q) makes this question the CQ. The focus alternatives evoked by (182-Q) must be congruent with the prior CQ (henceforth CQ^{-1}). If we refer to the focus alternatives of the TP of (182-Q), CQ^{-1} is the object question 'Which instrument does Ann play?'. Since a simple *no* reply resolves the CQ but does not fully resolve CQ^{-1}, CQ^{-1} again becomes the CQ. Thus a simple *no* reply does not satisfy the request for information expressed by (182-Q) because it does not completely answer the (prior) Current Question induced by the focus alternatives of (182-Q).

[80] Similar to the previous example, (182-A_2) is a coherent reply if the subject receives a strong pitch accent. Still, on its own, (182-A′) cannot be used to settle the issue raised by (182-Q).

[81] Note that the *yes/no*-questions in (178-Q) and (182-Q) evoke the same replies as the *wh*-questions in (i-Q) and (ii-Q), respectively (cf. Bäuerle and Zimmermann, 1993, for the corresponding observation with respect to alternative questions).

(i) Q: Who plays the piano, ANN?
A_1: Yes (, Ann plays the piano).
A_2: No, Bill does. A'_2: #No, she plays the drums.

(ii) Q: Which of the instruments does Ann play, the PIANO?
A_1: Yes (, Ann plays the piano).
A_2: No, she plays the drums. A'_2: #No, Bill does.

This is a reasonable approach to explaining the focus effect under consideration, and it does not assume a focus-sensitive question operator. It constitutes a conceptual argument against a focus-sensitive question operator because it seems that the CQ approach is needed for declarative utterances anyway, and it carries over to interrogative utterances, as demonstrated above. Nevertheless, I argue, it remains an empirical question whether or not the question operator is focus sensitive. In the following section, I will present empirical evidence which can only be reasonably explained on the assumption that the question operator is focus sensitive in the sense that it conventionally associates with the focus value of its complement (see Beck, 2006; Beck and Kim, 2006, for other evidence).

6.3 The semantic explanation: empirical arguments

The empirical evidence for the assumption that the question operator is focus sensitive comes from the observation that in some languages there is a *formal* relationship between an interrogative marker and the focused constituent(s) of a question. Bole, which we already considered in section 2.2.3, is one such language, another one is Turkish (Altaic, Turkic). These two languages will be discussed in the following paragraphs. A third language in which there is a formal relationship between an interrogative marker and focused constituents is Sinhala (Indo-Iranian, Indo-Aryan), discussed in Hagstrom (1998) and Cable (2007).

6.3.1 Bole

As already pointed out in section 2.2.3, the interrogative marker *ɗo* must occur right adjacent to the focused constituent of the question in which it occurs. This is shown most cleary by the paradigm in (183) and (184).

(183) 'Did ZARA give a watch to Abu yesterday?'

a. Onu agoggo n Abu ye Zara ɗo nzono?
gave.M watch to A. BM Z. Q yesterday

b. Onu agoggo n Abu nzono ye Zara ɗo?
gave.M watch to A. yesterday BM Z. Q

c. Zara ɗo onak agoggo n Abu nzono ye?
Z. Q gave.F watch to A. yesterday BM

The questions in (183) are *yes/no*-questions in which the subject expression *Zara* is marked as the focus of the question. Focused subjects occur either postverbally following the background marker *ye*, as in (183a,b), or preverbally with sentence-final *ye*, as in (183c). Importantly, in all three questions the interrogative marker *ɗo* occurs right-adjacent to the focused subject. If it does not, as in (184), unacceptability arises.

(184) *Onu agoggo n Abu ye Zara nzono ɗo?
gave.M watch to A. BM Z. yesterday Q
intended: 'Did ZARA give a watch to Abu yesterday?'

The sentence in (185) (repeated from section 2.2.3) shows that *ɗo* can occur right-adjacent to the temporal adverbial *nzono* 'yesterday'.

(185) Zara onak agoggo n Abu nzono ɗo?
Z. gave.F watch to A. yesterday Q
'Did Zara give a watch to Abu yesterday?'

The question in (185) has sentence-focus structure: it has the canonical word order S–V–DO–IO–ADV, and there is no background marker. Thus the temporal adverbial is embedded in the focused constituent, to which *ɗo* is adjoined. Thus we can conclude that *ɗo* is subject to the formal requirement stated in (186) (repeated from section 2.2.3).

(186) *$[_{XP}$ XP$^{[-Foc]}$ ɗo]

According to (186), the adjunction site of *ɗo* must be a focus marked phrase (i.e., a phrase that has the [+Foc] feature).

The paraphrase of the questions in (183) indicates that subject focus in Bole *yes/no*-questions has the same interpretive effect as in the corresponding English question: it evokes a subject question. In contrast to this, the *yes/no*-question in (185), which has sentence-focus structure, does not evoke a constituent question.[82] Thus focus has the same effect on the answerhood conditions of *yes/no*-questions as in English, and this effect correlates with a formal property of the grammatical element that denotes the question operator.

6.3.2 Turkish

In Turkish we can observe a similar phenomenon as in Bole: the interrogative marker *mI* of non-*wh*-questions must be cliticized to the focused constituent (see Kornfilt, 1997, pp. 190ff, from which all but the last example are taken).[83] The question in (187) is a "canonical" Turkish *yes/no*-question: it has the canonical word order S-DO-IO-V and the question particle is cliticized to the verb. According to Kornfilt (1997), this placement of *mI* indicates that the whole sentence is "in the scope of" the question operator.

[82] In a sense, (185) evokes the constituent question 'What happened?'. See section 6.4.4 for a discussion of the interpretation of sentence-focus questions.

[83] The capital letter *I* stands for a [+high] vowel before application of vowel harmony by which it is specified for backness and rounding. The fact that *mI* is subjected to word-level phonological rules like vowel harmony shows its clitic status (see Kornfilt, 1997). Although it is a clitic, *mI* is written separated from its host in Turkish orthography. I follow this convention.

(187) Hasan kitab-ı Ali-ye ver-di mi?
H. book-ACC A.-DAT give-PAST Q
'Did Hasan give the book to Ali?'

In Turkish, constituent focus is expressed by strong stress and high pitch (indicated below with an accent on the vowel of the last syllable of the focused constituent), and by word order: in non-contrastive contexts, the focused constituent occurs in the immediately preverbal position. This is exemplified with the declarative sentence in (188) in which the subject expression *Hasan* is focused.

(188) Kitab-ı Ali-ye Hasán ver-di.
book-ACC A.-DAT H. give-PAST
'HASAN gave the book to Ali.'

In the interrogative counterpart to this sentence, the *yes/no*-question particle is not cliticized to the verb but to the focused subject, see (189).

(189) Kitab-ı Ali-ye Hasán mı ver-di?
book-ACC A.-DAT H. Q give-PAST
'Did HASAN give the book to Ali?'

In contrastive contexts, the focused constituent need not occur in the immediately preverbal position and is marked by intonation alone. This is illustrated with the declarative example in (190).

(190) Kitab-ı Hasán Ali-ye ver-di.
book-ACC H. A.-DAT give-PAST
'HASAN gave the book to Ali.'

In the corresponding *yes/no*-question, we again find the question particle attached to the focused constituent:[84]

(191) Kitab-ı Hasán mı Ali-ye ver-di?
book-ACC H. Q A.-DAT give-PAST
'Did HASAN give the book to Ali?'

Kornfilt (1997) asserts that in (189) and (191) only the focused constituent is in the scope of the question particle *mI*. Kornfilt's paraphrases suggest that the focusing of the subject phrase evokes a subject question in the sense discussed above. This is confirmed by the observation that the information request expressed by the question in (189), repeated in (192-Q), cannot be satisfied by a simple negative reply.

[84]Kornfilt notes that word order is more important in constructions in which focus is marked by intonation alone than in constructions in which there is a focus-related particle. This leads her to state that the *yes/no*-question particle *mI* (among other particles such as *sadece* 'only' and *bile* 'even') has a secondary function of expressing focus (*emphasis* in her terms).

(192) Q: Kitabı Aliye Hasán mı verdi?
'Did HASAN give the book to Ali?'
A: Evet, Hasan verdi.
'Yes, Hasan gave (it to him).'
A′: Hayır, Hasan ver-me-di. #(Mustafa ver-di).
No H. give-NEG-PAST M. give-PAST
'No, Hasan did not give (it to him). Mustafa gave (it to him).'

The simple positive reply in (192-A) settles the issue raised by (192-Q). A negative reply, in contrast, is felt to be incomplete if it does not specify who gave the book to Ali if it was not Hasan. Therefore, (192-A′) is incoherent without the added sentence *Mustafa verdi* 'Mustafa gave (it to him)'. So we can assume that focus in Turkish *yes/no*-questions has the same interpretive effect as in English and Bole. Importantly, in addition we found that, similar to what we observed in Bole, the interrogative marker *mI* is cliticized to the focused constituent.

6.3.3 Conclusion

In Bole and Turkish, the interrogative marker is subject to the formal condition that it occur adjacent/cliticized to the focused constituent. There is no functional motivation for a formal relationship between these elements. In *yes/no*-questions, clausal typing is performed by the interrogative marker itself and not, as, for example, in English *wh*-questions, by a morphologically distinguished type of phrase (viz. a *wh*-phrase) that the interrogative complementizer attracts to the left periphery (cf. Cheng, 1991). It does not make sense to assume that the interrogative marker of non-*wh*-questions "attracts" the focused constituent for typing reasons. Furthermore, it is implausible to assume that the formal relationship between the interrogative marker and the focused constituent is *purely* formal. Rather, this relationship should be seen as a reflex of a semantic dependency of the question operator from the focus value of the focused constituent. I will explore this view in the following section.

6.4 A focus-sensitive question operator

6.4.1 Definition

The data discussed in the previous section suggest that the question operator Q is a focus-sensitive operator. For simplicity, I assume that the association with focus is established by the operator-argument relation.[85] That is, I assume that Q operates on the pair of the denotation and the F-set of the complement of the grammatical element denoting Q, see (193) and (194).

[85]For a structurally more flexible implementation, see the analysis in Beck (2006); Beck and Kim (2006).

(193) **The denotation of interrogative CPs**

$[\![\,[\mathrm{C}^{[+\mathrm{Q}]}\,\alpha]\,]\!] = [\![\mathrm{C}^{[+\mathrm{Q}]}]\!](\langle [\![\alpha]\!], [\![\alpha]\!]^{c}_{\mathrm{F}}\rangle) = Q(\langle [\![\alpha]\!], [\![\alpha]\!]^{c}_{\mathrm{F}}\rangle)$ (*Hausa*, *English*)

(194) **The meaning of the question operator Q**

$Q(\langle A, F\rangle) = A \vee (\neg A \wedge F)$

The form of the definition in (194) sticks to the letter of the explanatory goal set at the outset, viz. to show that Q is "a unary disjunction operator". Of course, it is a formally trivial matter to reduce the arity of an operator to one. However, note that the crucial aspect of our explanatory goal is not the arity of Q but its disjunctive meaning.[86]

In (193), α is the TP complement of the interrogative C head. In Bole and Turkish, the interrogative markers can be attached to various categories, and I assume the same for the Tangale marker *ya*. Therefore, in (195a), α is a (focused) constituent of arbitrary category.[87]

(195) **The denotation of interrogative XPs**

a. $[\![\,[\alpha\ \mathrm{IM}\,]\,]\!] = Q(\langle [\![\alpha]\!], [\![\alpha]\!]^{c}_{\mathrm{F}}\rangle)$

b. IM = *do* (in Bole), *ya* (in Tangale), or *mI* (in Turkish)

Note that all of the connectives in (194) are type flexible. Furthermore, $\neg[\![\alpha]\!]$ and $[\![\alpha]\!]^{c}_{\mathrm{F}}$ are always subsets of the same domain (e.g., if α is a proper name, $\neg[\![\alpha]\!], [\![\alpha]\!]^{c}_{\mathrm{F}} \subseteq \mathcal{D}_{\langle e,\langle s,t\rangle\rangle}$). Therefore, the definition in (195a) is sound.

According to (194), the focus-semantic object F is conjoined with the negated denotation $\neg A$ but not with A. This is to account for the fact that focus has an effect on the negative answer to a *yes*/*no*-question but not on the positive answer.

6.4.2 An example

To see how the definitions in the previous sections work out, let us consider the *yes*/*no*-question in (196), in which the subject expression *Ann* is focused. The CP and TP of this question are shown in the lines underneath. I will refer to them with (196-CP) and (196-TP), respectively.

(196) Does Ann play?

$[_{\mathrm{CP}}\ \mathrm{C}^{[+\mathrm{Q}]}\ [_{\mathrm{TP}}\ \mathrm{Ann}^{[+\mathrm{Foc}]}\ \mathrm{plays}]]$

$[_{\mathrm{TP}}\ \mathrm{Ann}^{[+\mathrm{Foc}]}\ \mathrm{plays}]$

[86] The grammatical elements that denote Q are unary in the sense that they only have a single edge feature (Chomsky, 2005).

[87] The range of possible categories is presumably restricted. However, this need not be specified in (195).

The denotation and F-set of (196-TP) is given in (197a) and (b), respectively (for the latter, cf. (159) in section 5.3).

(197) a. $[\![(196\text{-TP})]\!] = \{\lambda w.\text{play}_w(\text{Ann})\}$

b. $[\![(196\text{-TP})]\!]^c_{\text{F}} = \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid \varnothing \subset A \subseteq c(\mathcal{D}_e)\}$

According to (194), the negation of $[\![(196\text{-TP})]\!]$ is conjoined with $[\![(196\text{-TP})]\!]^c_{\text{F}}$. For reasons that will become apparent shortly, I call this object the "*no*-remnant" of (196) (henceforth, NoRem(196)). If we assume that $c(\mathcal{D}_e) = \{\text{Ann}, \text{Bill}, \text{Cesc}\}$, NoRem(196) is the proposition set derived in (198).

(198)
$$\begin{aligned}
\text{NoRem}(196) &= \neg[\![(196\text{-TP})]\!] \wedge [\![(196\text{-TP})]\!]^c_{\text{F}} = \\
&= \{\lambda w.\neg\text{play}_w(\text{Ann})\} \sqcap \\
&\quad \sqcap \left\{ \begin{array}{l} \lambda w.w = w, \lambda w.\text{play}_w(\text{Ann}), \\ \lambda w.\text{play}_w(\text{Bill}), \lambda w.\text{play}_w(\text{Cesc}), \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})], \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})] \end{array} \right\} \\
&= \left\{ \begin{array}{l} \lambda w.\neg\text{play}_w(\text{Ann}), \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})], \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})] \end{array} \right\}
\end{aligned}$$

Hence, by (193) and (194), (196-CP) has the denotation in (199).

(199)
$$\begin{aligned}
[\![(196\text{-CP})]\!] &= [\![(196\text{-TP})]\!] \vee (\neg[\![(196\text{-TP})]\!] \wedge [\![(196\text{-TP})]\!]^c_{\text{F}}) \\
&= \{\lambda w.\text{play}_w(\text{Ann})\} \cup \text{NoRem}(196) \\
&= \left\{ \begin{array}{l} \lambda w.\text{play}_w(\text{Ann}), \lambda w.\neg\text{play}_w(\text{Ann}), \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})], \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\neg\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})] \end{array} \right\}
\end{aligned}$$

Now I will show that the denotation derived in (199) indeed accounts for the answerhood conditions of (196). Let us first consider the short answer *yes*, which, as before, I assume to be anaphoric to the preceding question. For easier reference, I henceforth use the example number of the antecedent as the index of an anaphoric item. So, for example, $yes_{(196)}$ anaphorically refers to (196-CP), see

below.

(196) Does Ann play?

(200) $\text{Yes}_{(196)}$.

The short answer in (200) is a perfectly adequate reply to (196), and it settles the issue raised by (196). To see that this is explained by the proposed analysis, we have to consider the H-set of (196). By definition (119) in section 5.5, the H-set of (196-CP) is derived as shown in (201).[88]

(201) $$\begin{aligned}[\![\text{(196-CP)}]\!]_{\text{H}} &= [\![\text{(196-CP)}]\!] \cap [\![\text{(196-CP)}]\!]^{c}_{\text{F}} \\ &= \{\lambda w.\text{play}_w(\text{Ann})\}\end{aligned}$$

Consequently, the denotation of $yes_{(196)}$ is defined: it denotes the singleton set of the proposition in the H-set of (196-CP), see (202a).[89] The discourse value of $yes_{(196)}$ relative to (196-CP) is identical to its denotation, see (202b).[90]

(202) a. $$\begin{aligned}[\![yes_{(196)}]\!] &= \{\iota p.p \in [\![\text{(196-CP)}]\!]_{\text{H}}\} \\ &= \{\iota p.p \in \{\lambda w.\text{play}_w(\text{Ann})\}\} \\ &= \{\lambda w.\text{play}_w(\text{Ann})\}\end{aligned}$$

b. $$\begin{aligned}\text{dVal}_{\text{(196-CP)}}(yes_{(196)}) &= \{\text{O}_{[\![\text{(196-CP)}]\!]_{\text{H}}}(p) \mid p \in [\![yes_{(196)}]\!]\} \\ &= \{\lambda w.\text{play}_w(\text{Ann})\}\end{aligned}$$

Thus the discourse of (196) and $yes_{(196)}$ again denotes this singleton proposition set, see (203).[91]

(203) $$\begin{aligned}[\![\text{(196)} - yes_{(196)}]\!] &= [\![\text{(196-CP)}]\!] \wedge \text{dVal}_{\text{(196-CP)}}(yes_{(196)}) \\ &= \{\lambda w.\text{play}_w(\text{Ann})\}\end{aligned}$$

By definition (136) in section 4.3.5, this means that $yes_{(196)}$ is a settling answer to (196): the denotation of $yes_{(196)}$ is a subset of the denotation of (196-CP), and (203) is non-inquisitive.

As discussed in section 6.1, a question like (196) cannot be adequately answered with simply *no*, see (204).

(196) Does Ann play?

(204) $\#\text{No}_{(196)}$.

[88] Recall that $[\![\text{(196-CP)}]\!]^{c}_{\text{F}} = [\![\text{(196-TP)}]\!]^{c}_{\text{F}}$, by the assumption that $\text{C}^{[+\text{Q}]}$ is semantically inert w.r.t focus interpretation.

[89] See definition (123) in section 4.3.3.

[90] See definition (131) in section 4.3.5. By definition (128), $yes_{(196)}$ is a highlighted answer to (196-CP) so that it is pragmatically strengthened. However, the strengthening operation is vacuous, since $[\![yes_{(196)}]\!] = [\![\text{(196-CP)}]\!]_{\text{H}}$.

[91] See definition (133) in section 4.3.5.

The simple *no* reply in (204) is not a fully adequate answer to (196) because it does not settle the issue raised by this question. This follows from the above analysis. First, note that the denotation of $no_{(196)}$ is defined, since $[\![yes_{(196)}]\!]$ is defined: $[\![no_{(196)}]\!]$ is the negation of $[\![yes_{(196)}]\!]$, see (205a).[92] The discourse value of $no_{(196)}$ relative to (196-CP) is identical to its denotation, since it is not a highlighted answer.[93]

(205) a. $[\![no_{(196)}]\!] = \neg[\![yes_{(196)}]\!] = \{\lambda w.\neg \text{play}_w(\text{Ann})\}$
b. $\text{dVal}_{(196\text{-CP})}(no_{(196)}) = [\![no_{(196)}]\!]$

The discourse of (196) and $no_{(196)}$ evokes fewer inquisitive possibilities than (196) alone, but it is still inquisitive:

(206) $$[\![(196) - no_{(196)}]\!] = [\![(196\text{-CP})]\!] \wedge \text{dVal}_{(196\text{-CP})}(no_{(196)})$$
$$= \left\{ \begin{array}{l} \lambda w.\neg \text{play}_w(\text{Ann}), \\ \lambda w[\neg \text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})], \\ \lambda w[\neg \text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Cesc})], \\ \lambda w[\neg \text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill}) \wedge \text{play}_w(\text{Cesc})] \end{array} \right\}$$

This means two things: (i) A simple *no* reply is not a settling answer to (196).[94] (ii) A simple *no* reply is an informative response, since it eliminates the highlighted proposition from the set of inquisitive possibilities, viz. the proposition that the speaker of (196-Q) seeks to be affirmed with *yes*. Property (i) explains why a *no* reply can be supplemented by another assertion, and (ii) explains why it must be supplemented, for example, by the assertion in (207).

(196) Does ANN play?

(207) $\text{No}_{(196)}$, Bill plays.

The reply in (207) settles the issue raised by (196). If we interpret the comma in (207) as conjunction, the utterance in (207) denotes the singleton set in (208a), which is also the discourse value of (207), see (208b).

(208) a. $$[\![\, no_{(196)},\ \textit{Bill plays} \,]\!] = [\![no_{(196)}]\!] \wedge [\![\, \textit{Bill plays} \,]\!]$$
$$= \{\lambda w.\neg \text{play}_w(\text{Ann})\} \sqcap \{\lambda w.\text{play}_w(\text{Bill})\}$$
$$= \{\lambda w[\neg \text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})]\}$$
b. $\text{dVal}_{(196\text{-CP})}(no_{(196)},\ \textit{Bill plays}) = [\![\, no_{(196)},\ \textit{Bill plays} \,]\!]$

Hence, (207) is a settling answer to (196):

[92] See definition (123) in section 4.3.3.

[93] See definition (131) in section 4.3.5.

[94] Note that the set in (206) is the *no*-remnant of (196). Thus the *no*-remnant represents the inquisitive possibilities that are not eliminated by a simple *no* reply.

(209) $[\![(196) - no_{(196)}, \textit{ Bill plays}]\!] =$

$= [\![(196\text{-CP})]\!] \wedge \mathrm{dVal}_{(196\text{-CP})}(no_{(196)}, \textit{ Bill plays})$

$= \{\lambda w[\neg \mathrm{play}_w(\mathrm{Ann}) \wedge \mathrm{play}_w(\mathrm{Bill})]\}$

Thus we correctly predict that (207) is a perfectly adequate reply that satisfies the information request expressed by (196).

The reply in (210), in contrast, does not satisfy this information request.

(196) Does ANN play?

(210) #No$_{(196)}$, Ann sings.

It should be obvious that $[\![(196) - no_{(196)}, \textit{ Ann sings}]\!]$ is still inquisitive, since the added sentence does not eliminate any of the inquisitive possibilities in the *no*-remnant of (196). This explains why (210) (on its own) is not an adequate response to (196).

Finally, consider the reply in (211).

(196) Does ANN play?

(211) No$_{(196)}$, no one does.

The added sentence eliminates all inquisitive possibilities from the *no*-remnant of (196) but one: the proposition $\lambda w.\neg \mathrm{play}_w(\mathrm{Ann})$ is compatible with the added sentence so that the discourse of (196) and (211) yields the information state that no one plays. This is an adequate result.

To sum up so far, I have proposed an analysis of the question operator according to which it not only operates on the denotation but also on the focus value of its complement. I have demonstrated that the proposed analysis explains the answerhood conditions of *yes*/*no*-questions in which the subject expression is focused.

6.4.3 Context conditions

In this section, I will consider discourses that give the impression that focus in a *yes*/*no*-question does not evoke a constituent question. However, I will argue that this impression is only apparent in one class of cases and can be explained on principled grounds in another class of cases. I will discuss this phenomenon by considering (verbal and non-verbal) utterance contexts that restrict the space of alternatives to one (proper) alternative to the focused expression and to the empty set, respectively. For relevant examples of the first case, consider the discourses in (212) and (213).

(212) A: Ann does not play an instrument, not even the piano.
Does BILL play the piano?
B: No.

(213) A: Ann is a multi-instrumentalist but her best instrument is the piano. Does BILL play the piano?
B: No.

In both discourses, speaker B's reply is a fully adequate response to speaker A's utterance, and it satisfies the information request expressed by the interrogative part of A' utterance. This is remarkable because the subject expression *Bill* of the question posed by A is focused: In the previous sections, I argued that subject focus in a *yes*/*no*-question evokes a subject question. However, B's reply does not answer the subject question evoked by A's question ('Who plays the piano if it is not Bill?'). How can we explain that the simple *no* reply of speaker B is still a settling answer to A's question? I will use the following abbreviations to refer to the different parts of speaker A's utterance in the two discourses: (212-D of A) and (213-D of A) refer to the declarative part in (212) and (213), respectively; (Q of A) refers to the interrogative part, which is the same in both discourses.

Note that the both discourses are adequate in a context in which Ann and Bill are the only contextually relevant individuals for the interpretation of the focused expression *Bill*. This means that we can assume that $c(\mathcal{D}_e) = \{\text{Ann}, \text{Bill}\}$. On this assumption, (Q of A) has the denotation in (214).

(214) $$[\![\text{(Q of A)}]\!] = \begin{Bmatrix} \lambda w.\text{play}_w(\text{Bill}, \text{piano}), \lambda w.\neg\text{play}_w(\text{Bill}, \text{piano}), \\ \lambda w[\neg\text{play}_w(\text{Bill}, \text{piano}) \wedge \text{play}_w(\text{Ann}, \text{piano})] \end{Bmatrix}$$

Consequently, the discourse of (Q of A) and B's *no* reply denotes the two-membered set in (215).

(215) $$[\![\text{(Q of A)} - no_{(\text{Q of A})}]\!] = \\ = \begin{Bmatrix} \lambda w.\neg\text{play}_w(\text{Bill}, \text{piano}), \\ \lambda w[\neg\lambda w.\text{play}_w(\text{Bill}, \text{piano}) \wedge \text{play}_w(\text{Ann}, \text{piano})] \end{Bmatrix}$$

Now let us consider the semantic contribution of the declarative part of A's utterances. First, (212-D of A) entails that Ann does not play the piano. Consequently, (212-D of A) eliminates the second possibility from the set in (215):[95]

(216) $$\begin{aligned} &[\![\text{(212-D of A). (Q of A)} - no_{(\text{Q of A})}]\!] = \\ &= ([\![\text{(212-D of A)}]\!] \wedge [\![\text{(Q of A)}]\!]) \wedge [\![no_{(\text{Q of A})}]\!] \\ &= [\![\text{(212-D of A)}]\!] \wedge \{\lambda w.\neg\text{play}_w(\text{Bill}, \text{piano})\} \end{aligned}$$

Thus B's *no* reply is a settling answer to the information request expressed by A in (212).

[95] Below I interpret the full stop as conjunction. Furthermore, recall that the discourse value of a *no* reply is identical to its denotation since it is not a highlighted answer (see definition (131) in section 4.3.5).

Second, (213-D of A) entails that Ann plays the piano. Hence, on the ground of (213-D of A) the two propositions in the set in (215) are logically equivalent. This is made explicit in (217).

(217) $[\![\text{(213-D of A). (Q of A)} - no_{\text{(Q of A)}}]\!] =$
$= ([\![\text{(213-D of A)}]\!] \wedge [\![\text{(Q of A)}]\!]) \wedge [\![no_{\text{(Q of A)}}]\!]$
$= [\![\text{(213-D of A)}]\!] \wedge \{\lambda w[\neg \text{play}_w(\text{Bill}, \text{piano}) \wedge \text{play}_w(\text{Ann}, \text{piano})\}$

Thus again we find that B's simple *no* reply is a settling answer. This means that in both discourses the declarative part of A's utterance answers the subject question evoked by (Q of A) for the proper alternative Ann to the focused expression *Bill*. This phenomenon is not restricted to the case of a single proper alternative, but occurs with any number of alternatives if the preceding declarative discourse or the common ground answers the evoked question for these alternatives.

The discourse in (218) illustrates the case that there is no contextually relevant alternative to the focused expression in a *yes/no*-question.[96]

(218) Context: *At a party, there is a beautiful, athletic, tall lady from Croatia among the other guests that do not fit this description. As she leaves the party, the following dialogue takes place.*
Q: Is SHE the Croatian high jumper that everyone has a crush on?
A: No.

Again we observe that a simple *no* reply settles the issue raised by a *yes/no*-question with subject-focus structure. The specified context and discourse suggests that the referent of *she* (= the beautiful, athletic, tall Croatian lady at the party) is the only contextually relevant individual for the interpretation of (218-Q): the other guests at the party do not have the appearance of a Croatian high jumper that everyone has a crush on, and the actual Croatian high jumper that everyone has a crush on is not at the party. Now, if the referent of *she* is the only individual that is to be considered, I assume that the space of alternatives of the focused pronoun is empty. Put differently, I assume that the alternative space must contain at least two individuals; otherwise it is empty. Thus, in the context of (218-Q) $c(\mathcal{D}_e) = \varnothing$. This means that the F-set of the TP of (218-Q) is the singleton set of the tautological proposition. This is shown in (219), where for simplicity I translate the definite description in (218-Q) as $\iota x.\text{blanka}_w(x)$.[97] Below I indicate the variable assignment function g, which serves to interpret the subject pronoun.[98]

[96] I'm grateful to Angelika Kratzer for making me aware of examples like (218).

[97] For readers who are not into sports: in the actual world, the definite description refers to Blanka Vlašić.

[98] Strictly speaking, the assignment function is only necessary later, since the focus interpretation of the focused subject pronoun is independent of the variable assignemt.

(219) $[\![(218\text{-Q-TP})]\!]^{g,c}_{\mathrm{F}} = [\![she^{[+\mathrm{Foc}]}]\!]^{g,c}_{\mathrm{F}} \bullet \{\lambda x \lambda w[x = \iota y.\mathrm{blanka}_w(y)]\}$
$= \{\lambda P \lambda w.\forall x \in A : P(x)(w) = 1 \mid A \subseteq \varnothing\} \bullet$
$\bullet \{\lambda x \lambda w[x = \iota y.\mathrm{blanka}_w(y)]\}$
$= \{\lambda w.\forall x \in \varnothing : [x = \iota y.\mathrm{blanka}_w(y)] = 1\}$
$= \{\lambda w.w = w\}$

Consequently, (218-Q) has the following denotation, where I assume that the referent of *she* is the individual Ivana (i.e., if the subject pronoun *she* is assigned the index 1, $g(1) = \mathrm{Ivana}$).

(220) $[\![(218\text{-Q})]\!]^g =$
$= [\![(218\text{-Q-TP})]\!]^g \vee (\neg[\![(218\text{-Q-TP})]\!]^g \wedge [\![(218\text{-Q-TP})]\!]^{g,c}_{\mathrm{F}})$
$= [\![(218\text{-Q-TP})]\!]^g \vee (\neg[\![(218\text{-Q-TP})]\!]^g \wedge \{\lambda w.w = w\})$
$= [\![(218\text{-Q-TP})]\!]^g \vee \neg[\![(218\text{-Q-TP})]\!]^g$
$= \{\lambda w[\mathrm{Ivana} = \iota y.\mathrm{blanka}_w(y)], \lambda w.\neg[\mathrm{Ivana} = \iota y.\mathrm{blanka}_w(y)]\}$

Thus a *yes/no*-question with subject-focus structure does not give rise to a subject question if there is no contextually relevant alternative to the focused expression. This explains why the simple *no* answer in (218-A) settles the issue raised by (218-Q).

6.4.4 *Yes/no*-questions with sentence-focus structure

In this section, I discuss *yes/no*-questions with sentence-focus structure such as the question in (221) with the CP and TP structure given in the lines underneath.

(221) Is Ann in Paris?
$[_{\mathrm{CP}}\ \mathrm{C}^{[+\mathrm{Q}]}\text{-is}\ [_{\mathrm{TP}}\ \mathrm{Ann}\ t_{\mathrm{is}}\ \mathrm{in\ Paris}]^{[+\mathrm{Foc}]}]$
$[_{\mathrm{TP}}\ \mathrm{Ann\ is\ in\ Paris}]^{[+\mathrm{Foc}]}$

The focus in (221) evokes propositional focus alternatives, e.g., the propositions 'that Bill was praised by his boss' and 'that a new Roth novel came out'. Therefore, the analysis proposed in section 6.4 predicts that there are utterance contexts in which, e.g., (222) is not an overinformative response but a complete and settling answer to (222-Q):

(221′) Context: "..."
Is $[\mathrm{Ann\ in\ Paris}]^{[+\mathrm{Foc}]}$?

(222) No, Bill was praised by his boss.

This in turn means that in the same contexts a simple *no* reply does not satisfy the information request expressed by (221). In these contexts, (223) is predicted not to be an adequate reply in the sense that it is not a settling answer.

(221′) Context: "..."
Is [Ann in Paris]$^{[+\text{Foc}]}$?

(223) #No.

I think that these predictions are correct. Consider, for example, the discourse below.

(221′) The only times you see Bill smiling is when Ann is in Paris, he was praised by his Boss, or a new Roth novel came out. Today he was in a very good mood.
Is [Ann in Paris]$^{[+\text{Foc}]}$?

(224) No #(, Bill was praised by his boss).

The declarative statements in (221′) make explicit that the propositions 'that Bill was praised by his boss' and 'a new Roth novel came out' are contextually relevant alternatives to the highlighted answer to (221). Therefore, the information request expressed by (221) cannot be completely satisfied with a simple *no* reply but must be supplemented, for example, by the sentence in (224). This means that any *no* reply with a supplement can be a settling answer to a *yes*/*no*-question with sentence focus structure but – importantly – only in the appropriate contexts. In other contexts, the same response can be overinformative. Especially, if (221) is uttered "out of the blue" it does not express an information request over and above the request that is satisfied by a simple *no* reply, hence the inadequacy of the added sentence in (225).

(221) Is [Ann in Paris]$^{[+\text{Foc}]}$?

(225) No (, #Bill was praised by his boss).

We account for this fact in the same way that we accounted for the fact that constituent focus in a *yes*/*no*-question does not always evoke a constituent question. An out-of-the-blue context does not specify propositional alternatives for the focused TP of (221). Therefore, the space of alternatives of the focused TP is empty, i.e., $c(\mathcal{D}_{\langle s,t\rangle}) = \varnothing$. Like in the case considered in section 6.4.3, this leads to a *yes*/*no*-question denotation that is left unaltered by the focus value of the complement of $\text{C}^{[+\text{Q}]}$. That is, if $c(\mathcal{D}_{\langle s,t\rangle}) = \varnothing$ then the *no*-remnant of (221) is

identical to $\neg[\![(221\text{-TP}^{[+\text{Foc}]})]\!]$:

(226) NoRem(221) =

$$
\begin{aligned}
&= \neg[\![(221\text{-TP}^{[+\text{Foc}]})]\!] \wedge [\![(221\text{-TP}^{[+\text{Foc}]})]\!]^{c}_{\text{F}} = \\
&= \{\lambda w.\neg \text{in}_w(\text{Ann}, \text{Paris})\} \sqcap \{\lambda w.\forall p \in A : p(w) = 1 \mid A \subseteq c(\mathcal{D}_{\langle s,t\rangle})\} \\
&= \{\lambda w.\neg \text{in}_w(\text{Ann}, \text{Paris})\} \sqcap \{\lambda w.\forall p \in A : p(w) = 1 \mid A \subseteq \varnothing\} \\
&= \{\lambda w.\neg \text{in}_w(\text{Ann}, \text{Paris})\} \sqcap \{\lambda w.w = w\} \\
&= \{\lambda w.\neg \text{in}_w(\text{Ann}, \text{Paris})\}
\end{aligned}
$$

Consequently, the denotation of (221) in an out-of-the-blue context and in other contexts that do not specify propositional alternatives is the set of the propositions 'that Ann is in Paris' and 'that Ann is not in Paris'. This explains the fact that only in certain contexts (221) evokes the question 'What is the case if Ann is not in Paris?'. This concludes the discussion of focus in *yes*/*no*-questions.

6.5 Focus in alternative questions and the falling accent

6.5.1 The third answer problem is still a problem

In section 4.2.4 and 5.1, I discussed two facts that still need to be explained. First, there is the empirical fact that alternative questions can be realized with two different intonation patterns which correspond to different meanings. The minimal pair in (227) is a relevant example.

(227) Q_r: Did you fail the /MATH or the /SCIENCE exam?
Q_f: Did you fail the /MATH or the \SCIENCE exam?

In (227-Q_r), the second (or rather final) pitch accent is realized by a rising pitch movement and in (227-Q_f) by a falling pitch movement. The most important difference in meaning between the two variants is the presupposition of (227-Q_f): (227-Q_f), but not (Q_r), presupposes that the addressee failed one of the two exams mentioned. That is, (228-A_3) has a different answer status in response to (227-Q_r) than in response to (Q_f). Below I use the index 3 because (228-A_3) is the problematic "third answer" discussed in 5.1.

(228) A_3: I failed neither the math nor the science exam.

(228-A_3) is a complete and settling answer to (227-Q_r) (at least in contexts in which the exams mentioned are the only contextually relevant exams), but it is a presupposition protest in response to (227-Q_f).

The second fact that needs to be addressed is, of course, that our analysis of alternative questions so far incorrectly predicts that (228-A_3) is a complete and settling answer also in response to (227-Q_f). It can be easily seen that the meaning contribution of focus alone is not enough to rule out the problematic

third answer since focus does not eliminate (228-A_3). Rather focus leads to a more fine-grained answer space with respect to the possibility expressed by this answer. I will now show that the problematic third answer is ruled out once the falling pitch movement in (227-Q_f) is properly interpreted.

6.5.2 The meaning of the falling pitch movement

I follow Zimmermann (2001); Roelofsen and van Gool (2009) in the assumption that the falling pitch movement expresses a [+Cl(osed)] feature of the disjunctive phrase (or list, in the case of Zimmermann's proposal). That is, I assume the following structure for (227-Q_f).

(229) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\text{-did}\ [_{\text{TP}}\ \text{you fail}\ [_{\text{DisjP}}\ [_{\text{DP}}\ \text{the}\ /\text{MATH}\ \sout{\text{exam}}]^{[+\text{Foc}]}\ \text{or}\ [_{\text{DP}}\ \text{the}\ \backslash\text{SCIENCE exam}]^{[+\text{Foc}]}]^{[+\text{Cl}]}]]$

Furthermore, I follow Zimmermann (2001) in the assumption that the [+Cl] feature brings about that the disjunctive "list" of alternatives is to be taken as an exhaustive list. Before I come to my specific implementation of the meaning of the [+Cl] feature, I present a modification of what I proposed as the focus-semantic import of inquisitive *or* (see definition (164) in section 5.3). The modification is given in (230).

(230) **The focus value induced by** *or*
For any type τ, if $[\![\alpha]\!], [\![\beta]\!] \subseteq \mathcal{D}_\tau$
then $[\![\,[\alpha\ \textit{or}\ \beta]\,]\!]_{\text{F}} = ([\![\alpha]\!]_{\text{F}} \vee [\![\beta]\!]_{\text{F}}) \setminus \Pi_\tau(\{\varnothing\})$.

By (230), the F-set induced by inquisitive *or* does not contain the principle filter of the empty set. Recall that this object gives rise to the tautological proposition in the F-set of a sentential expression. In the previous sections, we saw that the tautological proposition in the F-set of the argument of the Q operator leads to welcome results for our analysis of *yes*/*no*-questions. However, for the analysis of alternative questions it has undesirable consequences (see fn. 100 below). Therefore, the principle filter of the empty set is removed from the F-set of a disjunctive phrase (which does not change anything for *yes*/*no*-questions). Unfortunately, I cannot provide independent motivation for this stipulation and have to leave it for future research to provide such motivation.

The meaning contribution of the [+Cl] feature is given in (231).

(231) **The meaning of the** [+Cl] **feature**

$$[\![\alpha^{[+\text{Cl}]}]\!] = \begin{cases} [\![\alpha]\!] & \text{if } [\![\alpha]\!]^{\text{c}}_{\text{F}} \vdash [\![\alpha]\!] \\ \textit{undefined} & \text{otherwise.} \end{cases}$$

According to (231), a phrase α with the [+Cl] feature has the same denotation as the phrase without the [+Cl] feature, but its denotation is defined only if the denotation of α is entailed by the F-set of α in the interpretation context c (see definition (73) and (74) in section 3.5 for the entailment relation of p-set inquisitive logic). To simplify the discussion, consider the structure in (232) instead of (229) for an illustration of the effect of the presupposition imposed by (231).

(232) $[_{\text{CP}}\ \text{C}^{[+\text{Q}]}\ [_{\text{DisjP}}\ [_{\text{TP}}\ /\text{ANN}^{[+\text{Foc}]}\ \text{play}]\ \text{or}\ [_{\text{TP}}\ \backslash\text{BILL}^{[+\text{Foc}]}\ \text{play}]]^{[+\text{Cl}]}]$

Let us first consider the interpretation of the disjunctive phrase without the [+Cl] feature, see (233a) and (b) for the denotation and F-set, respectively.

(233) a. $[\![(232\text{-DisjP})]\!] = \{\lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill})\}$

b. $[\![(232\text{-DisjP})]\!]^c_{\text{F}} =$

$$\begin{aligned} &= (\{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid A \subseteq c(\mathcal{D}_e)\} \cup \\ &\quad \cup \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid A \subseteq c(\mathcal{D}_e)\}) \backslash \omega_{\langle s,t\rangle} \\ &= \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid A \subseteq c(\mathcal{D}_e)\} \backslash \{\lambda w.w = w\} \\ &= \{\lambda w.\forall x \in A : \text{play}_w(x) = 1 \mid \varnothing \subset A \subseteq c(\mathcal{D}_e)\} \end{aligned}$$

First, assume that Ann and Bill are the only contextually relevant individuals so that $c(\mathcal{D}_e) = \{\text{Ann}, \text{Bill}\}$. Then the F-set of DisjP is the set in (234), where the modified context function $c[\mathcal{D}_e \mapsto \{\text{Ann}, \text{Bill}\}]$ makes our assumption concerning the context explicit.[99]

(234) $$[\![(232\text{-DisjP})]\!]^{c[\mathcal{D}_e \mapsto \{\text{Ann,Bill}\}]}_{\text{F}} = \left\{ \begin{matrix} \lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill}), \\ \lambda w[\text{play}_w(\text{Ann}) \wedge \text{play}_w(\text{Bill})] \end{matrix} \right\}$$

Note that $[\![(232\text{-DisjP})]\!]^{c[\mathcal{D}_e \mapsto \{\text{Ann,Bill}\}]}_{\text{F}}$ entails $[\![(232\text{-DisjP})]\!]$, since each proposition in the F-set entails a proposition in the denotation.[100] Next, assume that Ann, Bill, and Cesc are the contextually relevant individuals. Then the F-set of DisjP is the set indicated in (235).

(235) $$[\![(232\text{-DisjP})]\!]^{c[\mathcal{D}_e \mapsto \{\text{Ann,Bill,Cesc}\}]}_{\text{F}} = \left\{ \begin{matrix} \lambda w.\text{play}_w(\text{Ann}), \lambda w.\text{play}_w(\text{Bill}), \\ \lambda w.\text{play}_w(\text{Cesc}), \ldots \end{matrix} \right\}$$

This F-set does not entail $[\![(232\text{-DisjP})]\!]$, since the proposition $\lambda w.\text{play}_w(\text{Cesc})$ does not entail any proposition in the denotation. This means that the denotation of the disjunctive phrase with the [+Cl] feature is defined only if no other

[99] This is only for clarity in the presentation. However, we can easily think of grammatical elements that manipulate the context function.

[100] Note in this connection that the presupposition imposed by the [+Cl] feature could not be satisfied if the tautological proposition was an element of the F-set of DisjP: the tautological proposition does not entail any other proposition.

individuals than Ann and Bill are contextually relevant:

(236) $[\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!]^{c}_{\mathrm{F}}$ is defined only if $c(\mathcal{D}_e) \subseteq \{\mathrm{Ann}, \mathrm{Bill}\}$.

I assume that the inverse condition follows from independent discourse principles. Therefore, I ignore the case that $c(\mathcal{D}_e) = \varnothing \subset \{\mathrm{Ann}, \mathrm{Bill}\}$. Then let us consider the *no*-remnant of (232) for the case that the denotation of (232-DisjP$^{[+\mathrm{Cl}]}$) is defined, see (237).

(237) NoRem(232) =

$$\begin{aligned}
&= \neg[\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!] \wedge [\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!]^{c[\mathcal{D}_e \mapsto \{\mathrm{Ann},\mathrm{Bill}\}]}_{\mathrm{F}} \\
&= \{\lambda w.\neg[\mathrm{play}_w(\mathrm{Ann}) \vee \mathrm{play}_w(\mathrm{Bill})]\} \sqcap \\
&\qquad\qquad \sqcap \left\{ \begin{array}{l} \lambda w.\mathrm{play}_w(\mathrm{Ann}), \lambda w.\mathrm{play}_w(\mathrm{Bill}), \\ \lambda w[\mathrm{play}_w(\mathrm{Ann}) \wedge \mathrm{play}_w(\mathrm{Bill})] \end{array} \right\} \\
&= \varnothing
\end{aligned}$$

The *no*-remnant of (232) is empty, since $[\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!]^{c[\mathcal{D}_e \mapsto \{\mathrm{Ann},\mathrm{Bill}\}]}_{\mathrm{F}}$ is incompatible with the negation of $[\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!]$. Hence, (232) has the denotation in (238), if it is defined.

(238)
$$\begin{aligned}
[\![(232\text{-CP})]\!] &= [\![(232\text{-DisjP}^{[+\mathrm{Cl}]})]\!] \vee \mathrm{NoRem}(232) \\
&= \{\lambda w.\mathrm{play}_w(\mathrm{Ann}), \lambda w.\mathrm{play}_w(\mathrm{Bill})\}
\end{aligned}$$

Thus the responses *Ann plays* and *Bill plays* are the only settling answers to (232). This means that the [+Cl] feature in the interplay with the semantic import of focus in non-*wh*-questions leads to the presupposition that Ann or Bill plays. This explains the empirical observation from the beginning of this section.

There is another prediction that needs to be considered: the proposed analysis predicts the following contrast – correctly, I think.

(239) I heard that Ann, Bill, and Cesc applied for a job in your lab,
and that all of them were prospective candidates.
Q_f: #Did /Ann get the job or \Bill?
Q_r: Did /Ann get the job or /Bill?

The declarative part of the utterance in (239) makes explicit that Ann, Bill, and Cesc are contextually relevant individuals. However, the [+Cl] feature expressed by the falling pitch movement of the alternative question in (239-Q_f) presupposes a context in which only Ann and Bill are relevant. This explains why (239-Q_f) is not an adequate continuation of the declarative statement. The alternative question with the rising intonation, in contrast, does not presuppose such a context. Hence, (239-Q_r) can be used in continuation of the declarative statement, e.g., if the speaker wants to express that she is only interested in the information 'that

Ann got the job' or the information 'that Bill got the job'.

Before concluding this section, let me point out without formal demonstration that the above analysis carries over to *yes/no*-question disjunctions. That is, the falling pitch movement in, the example, *Does /*Ann *play or does *Bill *play?* leads to the presupposition that Ann or Bill plays. However, this presupposition arises differently than in alternative questions since the presupposition of the [+Cl] feature is added only after the Q operators have applied to their arguments. Therefore, the denotation contains two highlighted answers, 'that Ann plays' and 'that Bill plays', and two non-highlighted answers, 'that Ann does not play and Bill plays' and 'that Bill does not play and Ann plays'. All four propositions entail that Ann or Bill plays. Note that we still account for the fact that, e.g., the negative response *Ann does not play* has a different status from the positive response *Bill plays*. The positive but not the negative response denotes a subset of the question denotation. Hence, the positive but not the negative response is a settling answer to the *yes/no*-question disjunction under consideration. This means that we now derive the contrast between the positive and the negative replies differently than in section 4.3.4. However, the concepts developed there to explain this contrast remain necessary, for example, the notion of a settling answer.

7 Concluding Remarks

7.1 Inquisitiveness and interrogativity

In section 3.2, we observed that according to the meaning hypothesis of inquisitive semantics the *yes/no*-question in (240a), the alternative question in (240b), and the declarative sentence in (240c) have the same denotation.

(240) a. Does Ann play the piano?
b. Does Ann play the piano or not?
c. Ann plays the piano or she doesn't play the piano.

Now we are in a position to make out a difference in meaning between (240a) on the one hand, and (240b) and (c) on the other. The former sentence highlights only the positive proposition 'that Ann plays' while the letter sentences highlight also the negative proposition 'that Ann does not play' (cf. Roelofsen and van Gool, 2009). However, we still cannot distinguish the (semantic and focus semantic) meaning of (240b) and (c). Therefore, we cannot explain the question character of (240a,b) and the non-question character of (240c) by refererence to their semantic or focus semantic meaning. Hence, if we want to maintain that *or* can be inquisitive in declarative sentences we have to ascribe the different character of these sentences to their illocutionary properties. According to Krifka (2001), speech acts are operations on commitment states, which are sets of social

commitments of the interlocutors of a conversation. An interrogative speech act of a speaker A puts a commitment on the hearer B to provide an answer to the question posed by A. That is, an interrogative speech act of A on a neutral commitment state s leads to a non-neutral commitment state s' that is turned into a neutral commitment state s'' by a declarative speech act of B. This is stated in a more formal way in (241) (cf. Krifka, 2001).

(241) $\text{Decl}_B(\text{Interr}_A(s)) = \text{Decl}_B(s') = s''$,
where s, s'' are neutral states and s' is a non-neutral state.

Now, we can be a bit more specific about the commitment that is imposed by an interrogative speech act on the hearer. If the interrogative act is performed by using the inquisitive (and interrogative) sentence β, the neutral state is only achieved by a declarative act such that the sentence α that is used to perform this act is a settling answer to β:[101]

(242) a. $\text{Decl}_{B,\alpha}(\text{Interr}_{A,\beta}(s)) = \text{Decl}_{B,\alpha}(s') = s''$
b. If s is a neutral state, then s'' is a neutral state iff α is a settling answer to β.

Thus the speech act $\text{Interr}_{A,\beta}$ puts the commitment on B to resolve the issue raised by β. In contrast to this, a declarartive speech act that is performed with an inquisitive (and declarative) sentence β does not put a commitment on the hearer to resolve the issue raised by β. I will not try to specify the commitment that $\text{Decl}_{A,\beta}$ puts on B (and/or A). For our purposes it is enough to say that it is a weaker commitment than the commitment imposed by $\text{Interr}_{A,\beta}$.

This means that the question character of (240a) and (b) is due to their interrogative form by which they can only be used in interrogative speech acts.

7.2 Intervention effects

As pointed out in Beck and Kim (2006), a disjunctive phrase cannot give rise to an alternative question if it is in the scope of certain operators. That is, the sentences in (243) can only be interpreted as *yes/no*-questions and not (or only very marginally) as alternative questions (see Beck and Kim, 2006, p. 172).

(243) a. Didn't Sue read 'Pluralities' or 'Barriers'?
b. Does even John like Mary or Susan?

That is, downward entailing operators such as sentence negation and focus operators such as *even* induce an intervention effect in the sense that the disjunctive

[101] This is not meant to say that the commitment imposed by an interrogative speech act cannot be rejected by the hearer. A rejection of the commitment also leads back to a neutral state, but not in a way relevant to us.

phrase cannot be associated with the question operator of the clause. In terms of inquisitive semantics, it is the inquisitive import of a disjunctive phrase that is blocked by downward entailing operators and focus operators. In inquisitive logic/semantics, the negation cancels inquisitiveness: $\neg\varphi$ is non-inquisitive for all sentences φ. Thus inquisitive semantics predicts the intervenor status of sentence negation and other operators defined by means of negation. However, inquisitive semantics does not predict the intervenor status of focus operators (unless their contribution to the ordinary semantic value is defined by means of negation, like in the case of *only*). The focus-sensitive question operator that I proposed in section 6.4 does not explain why focus operators induce an intervention effect either: the focus value of the complement of the interrogative complementizer or question particle has only an import on the negated denotation of the complement but not on the non-negated denotation. Therefore, the inquisitive import of a disjunctive phrase is not affected by focus in one of the disjuncts of the question denotation. Thus the intervention effect in (243b) suggests that focus also has an import on the non-negated denotation. I leave it for future research to work this out.

7.3 Conclusion

I have shown that inquisitive semantics explains a pervasive phenomenon of natural languages, the interrogative-disjunctive affinity. Semantic theories that do not have the logical structure of inquisitive semantics fail to explain this affinity since it is a reflex of the inquisitive character of disjunction. Furthermore, I have extended the framework of inquisitive semantics to the domain of focus. The resulting focus theory helps to explain the asymmetry of the answer space of *yes*/*no*-questions and *yes*/*no*-question disjunctions, the distribution of inquisitive and non-inquisitive *or*, and the direct impact of focus on the answerhood conditions of non-*wh*-questions.

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