

On Shared Indefinite NPs in Coordinative Structures

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Abstract

Indefinite NPs in shared constituents of coordinative structures in German exhibit different referential options with respect to scope and specificity. These options are restricted by the informational status of the indefinite: A focused indefinite NP can receive all referential options, while a non-focused one can only get the narrow scope non-specific reading. Our analysis assumes that the information structure of the coordination determines the syntactic representation of the construction in terms of deletion or right-node-raising. Dependent on the syntactic structure, indefinite NPs exhibit different referential properties. Thus the particular properties of indefinite NPs in shared constituents can only be accounted for in a theory that combines information structure, the syntax of coordination, and the semantics of indefinites.

1 INTRODUCTION

As is commonly known, indefinites found in the context of a quantifier like *every* may have either a narrow scope or a wide scope reading. The wide scope reading of the indefinite NP *a painting by Picasso* is indicated by the singular anaphoric pronoun in the continuation (1a), while the plural anaphoric expression *the paintings* in (1b) indicates a narrow scope reading. The plural definite description *the paintings* refers to the sum of particular pictures each of which is admired by an artist.

- (1) Every artist admires a painting by Picasso.
- a. It is the ‘Blue Harlequin’, which was painted in 1901.
(= wide scope)
 - b. The paintings must be famous.
(= narrow scope)

Similarly, indefinites which are involved as shared constituents in coordination as in (2) can be interpreted in this twofold way.¹

- (2) Hans hat Anna und Paul hat Frieda ein Bild gezeigt
 Hans AUX Anna and Paul AUX Frieda a picture shown
 ‘Hans showed Anna, and Paul Frieda, a picture.’

This sentence can be interpreted either as ‘There is a picture and Hans has shown it to Anna and Paul has shown it to Frieda’ with the possible continuation (1a), or ‘Hans has shown Anna a picture and Paul has shown Frieda a picture’, with the possible continuation (1b). Both interpretations are only possible if the shared constituent is focused as in (3) or contains a focused element as in (4).²

- (3) *Hans and Anna, and Paul and Frieda did something in the gallery, but I don’t know what.*

HANS hat ANNA und PAUL hat FRIEDA
 Hans AUX Anna and Paul AUX Frieda
 [ein BILD gezeigt]_F
 a picture shown
 ‘Hans showed Anna, and Paul Frieda, a picture.’

- (4) *Hans showed Anna, and Paul showed Frieda something, but I don’t know what.*

HANS hat ANNA und PAUL hat FRIEDA
 Hans AUX Anna and Paul AUX Frieda
 [ein BILD]_F gezeigt
 a picture shown
 ‘Hans showed Anna, and Paul Frieda, a picture.’

If, on the other hand, the shared constituent is not focused or does not contain a focused constituent, only the narrow scope reading is possible

¹ Pretheoretically, ‘shared constituents’ are to be understood as constituents that are present in all conjuncts. As we will see below, they are either extraposed or deaccented. Extraposition is necessary if they are focused and deaccentuation or even deletion is possible if they are non-focused.

² Constituents carrying a pitch accent are written in capitals. The pitch accent can either indicate list-readings, like the pitch accent on the proper names *HANS hat ANNA und PAUL hat FRIEDA* in (3) and (4) or the new information focus—and more generally the information structure of a sentence. Independently of the pitch accent, information structure is assumed to correspond to a question or an appropriate context, as illustrated in (3) and (4). The two information structures motivated by the context in (3) and (4) are realized by the same intonation pattern, with pitch accent on the direct object *ein Bild*. A focused VP in German generally places the pitch accent on the direct object (cf. Féry 1993). In the following we concentrate on cases where the indefinite NP receives the pitch accent—expressing narrow focus on the indefinite as in (4) or wider focus on the whole VP as in (3).

as in (5). This is illustrated by the incoherent continuation (5a), while the continuation (5b) is coherent. The anaphoric definite NP *die Bilder* refers to the group of pictures in question.

- (5) *There are different pieces of art to be seen in the museum. Who showed whom a picture?*

HANS_F hat ANNA_F und PAUL_F hat FRIEDA_F [ein Bild gezeigt]
 Hans AUX Anna and Paul AUX Frieda a picture shown
 |Focus|———|Focus|———|Focus|———|Focus| |——Background——|

- a. *Es/*das Bild ist der ‘Blaue Harlekin’ von Picasso.
 *It/*the picture is the ‘Blue Harlequin’ of Picasso.
 b. Die Bilder hängen in dem neuen Museum.
 ‘The pictures are located in the new museum.’

Indefinite NPs can not only express different scope relations with respect to other operators, but they can also exhibit different readings with respect to specificity. We assume specificity to be a referential property of indefinite NPs that is independent of their scopal behavior. Even though specific indefinite NPs often have wide scope (as in (1a) and (6a)), and non-specific indefinite NPs tend to have narrow scope, as in (5), we also find other combinations, like the narrow scope specific indefinite in (6b). We informally describe specific indefinites by the lexical insertion of *ein bestimmtes* (*a certain*).³

- (6) Every artist_i admires a certain painting by Picasso. (specific)
 a. It is the ‘Blue Harlequin’, which was painted 1901. (+ wide scope)
 b. —the painting that was painted in her_i year of birth. (+ narrow scope).

The narrow scope reading of specific indefinites was first discussed by Hintikka (1986: 332), who illustrated the reading with example (7). Example (8) has a similar structure. In both examples, the choice of the referent of the indefinite is dependent on the choice of the referent for *man* or *artist* (in the course of the interpretation of the universal quantifier). In Section 3.1 we will introduce the term ‘referential anchoring’ for this kind of dependency.

- (7) Each husband has forgotten a certain date—his wife’s birthday.

³ There are other indicators for specific readings of indefinite NPs, such as a long description ‘a painting that was painted in 1901 in Paris during the first night of May’ or a descriptive content that contains an indexical expression as an anchor (‘a painting that I recommended’). See Fodor & Sag (1982), Enç (1991), Farkas (1995), von Heusinger (2001) for a more comprehensive discussion of specificity.

- (8) Every artist presents a certain picture at the exhibition—her favorite one.

Now the question arises whether we may find a specific interpretation for focused shared indefinites with narrow scope. As in (7) and (8), where the interpretation of the indefinite depends on the choice of the referent of *man* or *artist*, we can also establish such a dependency with respect to coordination structures with shared indefinite expressions, as in (9). The narrow scope specific reading of the indefinite is motivated by the following observation: First, we can utter the sentence in a situation where Hans and Paul show different pictures, as illustrated in the continuation (9a). This means the indefinite does not have wide scope. Second, there is a determined choice from each individual to a picture, namely each individual chooses his or her favorite picture. Third, the indefinite NP can be anaphorically linked to the paycheque-pronoun *es* in (9b). We assume here that paycheque-pronouns cannot be linked with non-specific indefinite NPs:⁴

- (9) HANS_i hat ANNA und PAUL_j hat FRIEDA
 Hans AUX Anna and Paul AUX Frieda
 [ein bestimmtes BILD gezeigt]_F [—ihr_{i⊕j} (*sein) LIEBLINGSBILD]_F
 a certain picture shown —their (*his) favourite picture
 ‘Hans showed Anna, and Paul Frieda, a picture—their favourite picture.’
- a. Hans hat Anna den Blauen Harlekin, und Paul hat Frieda
 Hans AUX Anna the Blue Harlequin and Paul AUX Frieda
 die Schwimmer gezeigt
 the Swimmers shown
- b. Paul hat *es* auch Berta gezeigt
 Karl has it also Berta shown (it: *the favourite picture of x*)

What is interesting to note here is that we cannot use a singular pronoun to refer to either *Hans* or *Paul*. We will keep this observation in mind and come back to it in the subsequent section.

⁴ Paycheque pronouns, as in (i), were first discussed by Karttunen (1969). It is a pronoun that is anaphorically linked to a definite NP that expresses a function whose argument is in the local environment, like *a man* in (i):

- (i) A man who gives his paycheque to his wife is wiser than a man who gives *it* to his girlfriend.
 (it: the paycheck of *x*)

Similar pronouns, but with indefinite NPs as antecedents are discussed by Hintikka & Kulas (1985), as in (ii):

- (ii) Every tourist was offered a free souvenir. One young man refused it.
 (it: the free souvenir that was offered to *x*)

To summarize: We have shown so far that shared indefinite NPs in coordination constructions may have a wide and a narrow scope reading and that they can get a specific as well as a non-specific interpretation. And we have seen that these referential properties of indefinite NPs depend on the information-structural status of the shared indefinite expression. We have two information structures: (10) and (11). The accents on the proper names in (10) and (11) indicate the list reading of the examples, rather than the information structuring into focus and background. It is the pitch accent on the indefinite *ein Bild* in the shared constituent or the lack of a pitch accent there that indicates the information structure of the sentence:

- (10) *Hans, Paul, Anna and Frieda visited the museum. What did they do there?*
 HANS_F hat ANNA und PAUL hat FRIEDA [ein BILD gezeigt]_F
 Hans AUX Anna and Paul AUX Frieda a picture shown
 |————— Background —————| |—— Focus ——|,
- (11) *There are different pieces of art to be seen in the museum. Who showed whom a picture?*
 HANS_F hat ANNA_F und PAUL_F hat FRIEDA_F [ein Bild gezeigt]
 Hans AUX Anna and Paul AUX Frieda a picture shown
 |Focus|———|Focus|———|Focus|———|Focus| |——Background——|

Shared indefinite NPs that are focused allow for all four referential options, while shared indefinite non-focused NPs allow only for one: the non-specific and narrow scope reading.

(12)	focused indefinite (= (10))	non-focused indefinite (= (11))
narrow scope, non-specific	+	+
narrow scope, specific	+	—
wide scope, specific	+	—
wide scope, non-specific	+	—

Given these observations, we want a semantic theory that accounts for the information-structural properties of coordinative structures with shared constituents, for the narrow- and wide-scope reading of indefinite expressions in them, and for the notion of specificity we have used so far pretheoretically. Furthermore, we need a syntactic theory that enables us to derive the needed semantic representations.

We will start in Section 2 with the syntax of coordinative constructions with shared indefinite expressions and base our considerations on the focus theory of Rooth (1992, 1996). From this theory it follows that focused shared constituents must be outside the coordination whereas non-focused shared constituents may stay *in situ*. In this section we will

also encounter some obstacles, so when we arrive at the point where we have a structure with an extraposed predicate with a subject and an object variable, we will need an instantiation of these variables out of the coordination. We will overcome this obstacle by using Kamp & Reyle's (1993) Summation, an operation that forms plural sets out of contextually given parts. This independently needed operation also gives a nice explanation for the occurrence of plural pronouns and plural morphology in the focused shared constituent.

In Section 3, we will see that the syntactic representation with extraposition fits well with the wide-scope interpretation. In this section, we take von Heusinger's (1997, 2000) theory on indexed epsilon terms as a starting point and will see that it gives us the appropriate semantic representations for our constructions with shared indefinite expressions. Section 3 will also give us the opportunity to tackle the notion of specificity and non-specificity.

2 SHARED CONSTITUENTS AND FOCUS THEORY

In this section, we will set the preliminaries for an explanation for the variations in referential behavior seen in focused and non-focused shared indefinites in coordinative structures. We need three ingredients for an adequate treatment: first, a formal theory of representing coordination and shared constituents. Here we will compare the deletion approach with the Right-Node-Raising (RNR) approach. Second, we need a semantic theory that is sensitive to information structure. Here we will employ Rooth's Alternative Semantics because it explicitly states the connection with the syntactic representation at LF. Third, we need a theory that accounts for plural pronouns that refer to a sum of different discourse referents, as in *Hans and Mary ... they ...*. The operation of Summation developed by Kamp & Reyle (1993) will give us the satisfactory means to describe the semantics of plural anaphoric expressions. These three modules allow us to describe the data and analyze their structure. However, the referential behavior of the shared indefinites cannot be accounted for before we introduce a semantic representation of indefinite NPs in Section 3.

As for the syntactic representation of our constructions with shared constituents, two approaches suggest themselves. In the first, the deletion approach, missing elements are actually present in the syntactic structure of each conjunct, only that they do not have a phonological realization (cf. Wilder 1994; Winkler 1997; Hartmann 2000).

(13) [Mary loves ~~beer~~] and [Paul hates beer]

In the second, the RNR–approach, the shared constituents are extracted out of the coordination phrase (Williams 1978).

(14) [Mary loves e_i] and [Paul hates e_i] [beer] _{i}

Common to both approaches is that only constituents at the right edge of the conjuncts can be affected by deletion or extraction, respectively. We will see in the following that the deletion approach accounts for constructions with non-focused shared constituents and that the RNR–approach gives the appropriate syntactic representation for constructions with focused shared constituents. That we need both approaches is a consequence of coordination as well as focus theory. A principle of coordination says that conjuncts must have something in common (see Lang 1984). Thus, they are either alternative answers to a contextually given question or the first conjunct allows the derivation of the alternative for the subsequent conjunct (see Schwabe 2000). Our constructions with the shared constituent at the right edge belong to the former type to a certain extent.

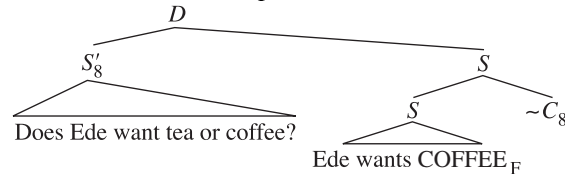
That the conjuncts are related to contextually given questions and/or to each other is mirrored in their information structure. If the conjuncts are alternative answers to a contextually given question, they match with respect to their background information as well as the number of their focused constituents. Each focused constituent in one conjunct correlates to a focused alternative in another. This parallelism can be explained with the help of Rooth’s (1992, 1996) theory.

Semantic theories of information structure always start with the analysis of focus particles like *only* that exhibit truth-conditional effects. Rooth abstracts from the use of focus particles to derive the meaning of plain focus which generates a set of alternatives similar to questions. If we use focus, then we imply that there are alternatives to a focused expression ϕ_F . These alternatives are collected in the set of all alternatives (or alternative meaning) $\llbracket \phi_F \rrbracket^{A_j}$.⁵ This set is derived by substituting the focused expressions with variables. The set of alternatives is further restricted to the context alternative set C by linguistic and non-linguistic material, such as explicit or implicit questions. In (15), the context alternative set is restricted by the explicit question S' , while the focus is translated into the \sim -operator that introduces C for the context alternative set as a new variable into the

⁵ Rooth (1992, 1996) uses $\llbracket \phi_F \rrbracket^f$ for the focal alternative value and $\llbracket \phi_F \rrbracket^0$ for the ordinary meaning. Following Krifka (1996) we use $\llbracket \phi_F \rrbracket^{A_j}$ for the alternative meaning and $\llbracket \phi_F \rrbracket^0$ for the ordinary meaning. In this way, no confusion concerning the use of f or F as a syntactic feature for focus or as a kind of denotation can arise.

logical form. The context variable C is coindexed with the question, indicating that they are coreferential:

- (15) *Does Ede want tea or coffee?*
Ede wants COFFEE_F.



Rooth (1996) defines the relation between the expression ϕ , its alternative meaning $\llbracket \phi_F \rrbracket^A$, the context alternative set C , and the ordinary meaning $\llbracket \phi \rrbracket^O$ in the following way:

- (16) Where ϕ is a syntactic phrase and C is a syntactically covert semantic variable, $\phi \sim C$ introduces the presupposition that C is a subset of $\llbracket \phi \rrbracket^A$ containing $\llbracket \phi \rrbracket^O$ and at least one other element.

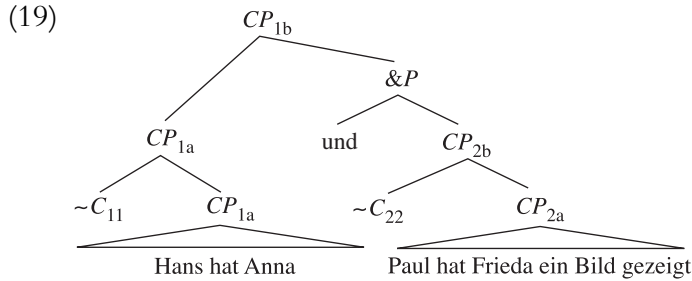
For (15) the condition (16) is fulfilled: C is restricted by the (explicit) question to a set (17a) that is a subset of the alternative set (17b). And the alternative set includes the ordinary meaning of the phrase, as in (17c).

- (17) a. $C = \{\text{Ede wants coffee, Ede wants tea}\}$
 b. $C \subseteq \llbracket \text{Ede wants coffee}_F \rrbracket^A = \{\text{Ede wants coffee, Ede wants tea, Ede wants a hamburger, Ede wants a new car, Ede wants a unicorn, dots}\}$
 c. $\llbracket \text{Ede wants coffee}_F \rrbracket^O \subseteq \llbracket \text{Ede wants coffee}_F \rrbracket^A$

For the time being, we neglect the wide-scope or narrow-scope interpretation of shared indefinite expressions and look at how coordination structures with shared constituents should be represented syntactically without violating condition (16). Let us first turn to constructions like (5) repeated here as (18) with non-focused shared constituents and assume that they consist of two conjuncts with the first containing the deleted part and the second the non-deleted one, as seen in (19):⁶

- (18) *There are different pieces of art to be seen in the museum. Who showed whom a picture?*
 HANS_F hat ANNA_F und PAUL_F hat FRIEDA_F [ein Bild gezeigt]
 Hans AUX Anna and Paul AUX Frieda a picture shown
 |Focus|———|Focus|———|Focus|———|Focus| |——Background——|

⁶ The coordination format here follows the ideas of Grootveld (1994) and te Velde (1996). Like Büring & Hartmann (1998) and te Velde, we adjoin the coordination Phrase &P to a constituent of the first conjunct. Here the coordination Phrase &P is adjoined to CP_{1a} and thus creates CP_{1b} .



This syntactic representation corresponds to the deletion approach mentioned at the beginning of this section. That this representation does not lead to the violation of condition (16) is due to the fact that the shared constituents are not focused. If we suppose a question like (20a) *Who showed whom a picture?* and take it as the instantiation of the context variable C_{11} of the first as well as of C_{22} of the second conjunct in (19), we see that the focus interpretation condition is met in that the question is a subset of the alternative meaning of the first conjunct (20b) as well as of the second conjunct (20c). Since both conjuncts share the same alternative meaning and are distinct with respect to their focused constituents, they are mutual alternatives.

- (20) a. $C_{11}/C_{22} = \{\text{Hans showed Anna a picture, Hans showed Paul a picture, Hans showed Frieda a picture, ...}\}$
 $= \{p \mid p = \exists x, y [\text{Show}(x)(y)(\text{a pic.})]\}$
 b. $C_{11} \subseteq \llbracket \text{Hans}_F \text{ showed Anna}_F \text{ a picture} \rrbracket^A$
 $= \{p \mid p = \exists x, y [\text{Show}(x)(y)(\text{a pic.})]\}$
 c. $C_{22} \subseteq \llbracket \text{Paul}_F \text{ showed Frieda}_F \text{ a picture} \rrbracket^A$
 $= \{p \mid p = \exists x, y [\text{Show}(x)(y)(\text{a pic.})]\}$

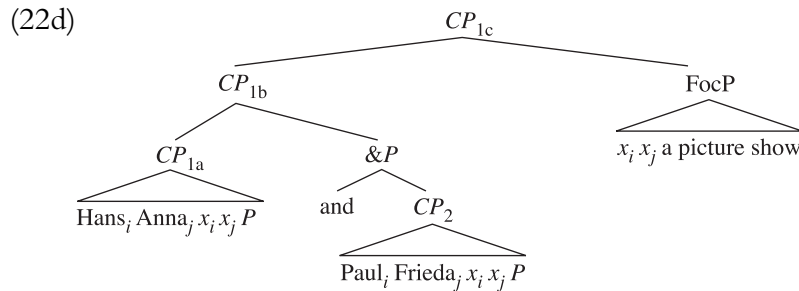
If, on the other hand, the shared constituent is focused, as in (21), we have basically three different options for representing the LF: (a) a focused copy in the first conjunct is deleted; (b) a non-focused copy in the first conjunct is deleted; and (c) the conjuncts are joint, while the focused constituent is represented by a raised phrase. The first option is not tenable since focused constituents cannot be deleted (Rooth 1992, Merchant 1999). The second option is also not feasible since conjunction does not allow for a different status of the shared constituent: Here it would be non-focused in one conjunct, while focused in the other. This point is confirmed by the observation in the all-focused sentence (22) below. Therefore, the third option is the only available one: The focused constituent forms a raised node that is applied to the conjunction as a whole.

- (21) *Hans, Paul, Anna and Frieda visited the museum. What did they do there?*
 HANS hat ANNA und PAUL hat FRIEDA [ein BILD gezeigt]_F
 Hans AUX Anna and Paul AUX Frieda a picture shown
 |----- Background -----| |----- Focus -----|,
 a. HANS hat ANNA [~~ein BILD gezeigt~~]_F und PAUL hat FRIEDA [ein BILD gezeigt]_F
 b. HANS hat ANNA [~~ein Bild gezeigt~~] und PAUL hat FRIEDA [ein BILD gezeigt]_F
 c. [HANS hat ANNA und PAUL hat FRIEDA]_{CP} [ein BILD gezeigt]_{FocP}

The all-focused sentence (22) corresponds to the discourse question *Who did what with whom?* Like in (21), the question meaning *C* cannot be a subset of the alternative meaning of the first conjunct if this conjunct contained a deleted, i.e. non-focused, constituent as represented in (22).

- (22) HANS_F hat ANNA_F ~~ein Bild gezeigt~~ und PAUL_F hat FRIEDA_F
 Hans AUX Anna and Paul AUX Frieda
 [ein BILD gezeigt]_F
 a picture shown
 a. $C = \{ \text{Hans showed Anna a picture, Hans showed Anna a photograph, Hans showed Paul a picture, Paul met Anna, Fritz called Berta, ...} \}$
 $= \{ p \mid p = \exists x, y, P[P(x)(y)] \}$
 b. $C \not\subseteq \llbracket \text{Hans}_F \text{ showed Anna}_F \text{ a picture} \rrbracket^A$
 $= \{ p \mid p = \exists x, y [\text{Show.a.pic}(x)(y)] \}$
 c. $C \subseteq \llbracket \text{Paul}_F \text{ showed Frieda}_F \text{ a picture}_F \rrbracket^A$
 $= \{ p \mid p = \exists x, y, P[P(x)(y)] \}$

Because both conjuncts differ with respect to their alternative meanings (cf. (22b) and (22c)), such configurations should be ruled out.⁷ But these constructions are fully acceptable. It is therefore necessary to find a syntactic representation that fits the focus semantic theory. This can be achieved if we imagine the focused shared VP *ein Bild gezeigt* as being outside the coordination.



⁷ It is not difficult to show that structures like (21) cannot be explained in Schwarzschild's (1999) focus theory either. There the existential focus closure of the first conjunct cannot be entailed by the question.

Here we may note that CP_{1b} constitutes the coordination. In each conjunct, the focused constituents are replaced by a variable that stands for the focused predicate plus the direct object. Given that it contains the variable P for the predicate, each conjunct can be thought metaphorically to be like a question asking for the predicate. To meet the focus interpretation condition, the meaning of the question *Who did what with whom?* (23a) should be a subset of the alternative meaning of each conjunct. We can see that the condition is fulfilled in (23b, c):

- (23) a. $C = \llbracket \text{[who did what with whom]} \rrbracket^O$
 $= \{\text{Hans showed Anna a picture, Hans showed Anna a photography, Hans showed Paul a picture, Paul met Anna, Fritz called Berta, ...}\}$
 $= \{p \mid p = \exists x, \gamma, P[P(x)(\gamma)]\}$
 b. $C \subseteq \llbracket \text{[Hans}_F \text{ Anna}_F \text{ P}_F] \rrbracket^A$
 $= \{p \mid p = \exists x, \gamma, P[P(x)(\gamma)]\}$
 c. $C \subseteq \llbracket \text{[Paul}_F \text{ Frieda}_F \text{ P}] \rrbracket^A$
 $= \{p \mid p = \exists x, \gamma, P[P(x)(\gamma)]\}$

Having processed the coordination CP_{1b} , we may proceed to the focus interpretation of the whole construction. It should become clear that the coordination phrase CP_{1b} can be seen as the background to the extraposed Focus Phrase (FocP). This background status enables the subjects of both conjuncts to be summed up to the set {hans, paul} and the indirect objects to form the set {anna, frieda}. Summation in turn enables the former one to instantiate the subject variable x_i and the latter the indirect object variable x_j of the extraposed constituent. Thus, we may regard (24) to be the semantic representation of the whole construction.

$$(24) \llbracket CP_{1c} \rrbracket^O = \text{Show}(\{\text{hans, paul}\})(\{\text{anna, frieda}\})(\text{a pic.})$$

The focus interpretation condition is met with regard to (24) because the coordination (25a) is a subset of the alternative meaning of the whole construction (25b):

- (25) a. $\llbracket CP_{1b} \rrbracket^O = \{\text{Hans and Paul showed Anna and Frieda a picture, Hans and Paul invited Anna and Frieda to the café, dots}\}$
 $= \{p \mid p = \exists P [P(\{\text{hans, paul}\})(\{\text{anna, frieda}\})]\}$
 b. $\llbracket CP_{1b} \rrbracket^O \subseteq \llbracket \text{[Hans and Paul showed Anna and Frieda a picture]} \rrbracket^A$
 $= \{p \mid p = \exists P [P(\{\text{hans, paul}\})(\{\text{anna, frieda}\})(\text{a pic})]\}$

Before we continue in our discussion of indefinites in shared constituents, we first make a short digression and introduce Kamp & Reyle's (1993) operations on plural anaphoric expressions. Kamp & Reyle (1993: 308ff) introduce three operations: Summation, Abstraction, and Distribution.

The operation of Summation collects already introduced discourse referents and forms a new set. This is necessary for the interpretation of the plural pronoun *they* in (26).

- (26) John took Mary to Acapulco. They had a lousy time.
they: {john, mary}

The plural pronoun refers to a set Z that is formed by Summation of the two discourse referents for John and Mary ($u \oplus v$). In other words, it refers to the set of John and Mary. Abstraction is a similar operation, but applies to discourse referents in the scope of an operator, as in (27). The discourse referent for *book* refers to different objects. The plural pronoun *they* refers to the set of objects that are books that Bill needs.

- (27) Susan has found some books Bill needs. They are on his desk.
they: the sum of books that Bill needs

Another case of Abstraction is constituted in (28), where the plural pronouns *they* and *them* refer to sets that are constituted by children that got a present, and presents that were given to a child, respectively:

- (28) Every director gave a present to a child from the orphanage. They opened them right away.
they: the sum of the children that got a present from a director
them: the sum of the presents that were given to a child

In order to interpret the predicate *open* in the second sentence in (28), we have to distribute over the sets formed by abstraction. A simple distribution is to say that each element of the set holds for the predicate. We informally represent this as in (29a), where the operator *Dist* takes a set and distributes over it.⁸ Here we need some additional requirement that each child opened the present that was given to the child. A simple set creating and distribution operation would give us random presents to particular children.⁹ We informally assume a parallelism

⁸ This describes the distributive reading, according to which each child opens one present. There is also a collective reading available, according to which the children together open the presents together. However, we are not discussing collective readings.

⁹ Kamp & Reyle (1993: 377ff) discuss this problem without offering a clear solution: 'In a DRS representing either of these readings the discourse referent introduced by **them** must be able to pick up different presents as values *in relation to* the corresponding children.'

constraint that survives the set-creating operation of abstraction as well as the distribution. Informally, this parallelism-constraint can be seen as an ordering of the elements in the set operation of Summation or Abstraction, as in (29b), or indexing the pairs, as in (29c).

- (29) They opened them right away.
- a. Dist(set of children): x Dist(set of presents): y [x opens y]
 - b. Dist({child₁, (child₂, (child₃, ...))}): x Dist({pr₁, (pr₂, (pr₃, ...))}): y [x opens y]
 - c. Dist({child₁, child₂, child₃, ... }): x_i Dist({pr₁, pr₂, pr₃, ... }): y_i [x_i opens y_i]

That the subjects as well as the objects of each conjunct are summed up to a set each can be tested by the occurrence of plural anaphoric pronouns and plural verb morphology in the extraposed FocP. As we can see in (30) and (31), the plural pronouns in the extraposed constituents refer to sets that are summed up out of elements given by each conjunct in the coordination.

- (30) Hans_{*i*} hat Anna und Paul_{*j*} hat Frieda [_{FocP} ihr_{*i*⊕*j*} BILD gezeigt]
 Hans AUX Anna and Paul AUX Frieda their picture shown
 ‘Hans showed Anna, and Paul Frieda, their picture.’
- (31) Hans hat Anna_{*i*} und Paul hat Frieda_{*j*} überredet, [dass sie_{*i*⊕*j*} mit
 Hans AUX Anna and Paul AUX Frieda persuaded that they along
 ins KINO gehen]
 to the movies go
 ‘Hans has persuaded Anna, and Paul Frieda, that they should go along to the movies.’

Set Summation prevents a singular pronoun to have access to a single element in one of the conjuncts:

- (32) Hans_{*j*} hat Anna und Paul_{*i*} hat Frieda [_{FocP} *sein_{*j*} BILD gezeigt]
 Hans AUX Anna and Paul AUX Frieda his picture shown
 ‘Hans showed Anna, and Paul Frieda, their picture.’

Note, on the other hand, that if the shared constituents are non-focused, there is no problem for the singular pronoun to corefer with the subject:

- (33) HANS_{*i*} hat ANNA sein_{*i*} Bild gezeigt und PAUL_{*j*} hat FRIEDA sein_{*j*}
 Hans AUX Anna and Paul AUX Frieda his
 Bild gezeigt
 picture shown
 ‘Hans showed Anna, and Paul Frieda, their picture.’

A further piece of evidence that supports the idea of Summation stems from plural verb agreement in German verb final clauses with focused shared constituents. As we can see in (34), the shared finite verb agrees in number with the plural set given by the Summation out of the subjects of the coordination.

- (34) A: Bist du sicher, dass HANS den SAFT und FRITZ den WEIN
 Are you sure that Hans the juice and Fritz the wine
 [_{FocP}GESTOHLLEN haben]
 stolen AUX-PL
 ‘Are you sure that Hans and Fritz stole the juice and the wine?’
 B: Ich bin sicher, dass HANS den SAFT und FRITZ den WEIN
 I am sure that Hans the juice and Fritz the wine
 [_{FocP}GEKAUFT haben]
 bought AUX-PL
 ‘I rather believe that Hans and Fritz bought the juice and the wine.’

The next example shows that Summation and thus plural verb agreement in coordination construction do not apply if the shared constituent is non-focused.

- (35) A: Bist du sicher, dass Hans BIER ~~gekauft hat~~ und Fritz WEIN
 are you sure that Hans beer and Fritz wine
 gekauft hat?
 bought AUX-SG
 ‘Are you sure that Hans bought beer and Fritz wine?’
 B: Ich glaube eher, dass Hans SAFT ~~gekauft hat~~ und Fritz
 I believe rather that Hans juice and Fritz
 MILCH gekauft hat.
 milk bought AUX-SG
 ‘I rather believe that Hans bought juice and Fritz milk.’

To sum up so far: With (22d), we have a syntactic representation for constructions with shared focused constituents that does not conflict with the focus interpretation condition. It actually consists of two conjoined structured open propositions with a predicate variable each and an extraposed open proposition. As we will see in Section 3.2, if the coordination is applied to the extraposed constituent, a new, structured proposition arises. This is only possible if the subjects and the objects of both conjuncts are summed up to a set each. The Summation in turn only seems to be possible if the coordination belongs to the

background. And it does because the information structure of the coordination is processed first. If, on the other hand, the shared constituent is not focused, we have ellipsis in the first conjunct. This means that we have two construction types: RNR-constructions and ellipsis.

We will see in the next section that the idea that the shared focused constituents are outside the coordination accounts for the wide as well as for the narrow-scope interpretation of shared indefinite expressions. Now we are at the point where we may return to the referential properties of shared indefinite expressions. What we want to know now is how we get the wide and narrow scope reading of the indefinite NP as well as its specific and non-specific interpretation if it is in the focused shared constituent and why indefinite expressions in ellipsis constructions are restricted to only the non-specific, narrow-scope reading.

3 INDEFINITES IN FOCUSED SHARED CONSTITUENTS AND IN NON-FOCUSED SHARED CONSTITUENTS

3.1 *Representation of indefinite NPs*

In Section 1, we have argued that indefinite NPs can vary in their referential properties along (at least) two dimensions: scope and specificity. We illustrated this in example (1), repeated as (36).

(36) Every artist admires a painting by Picasso.

- a. It is the ‘Blue Harlequin’, which was painted 1901.
(= wide-scope, specific)
- b. It must be a famous picture, but I do not know it.
(= wide-scope, non-specific)
- c. —their favorite one.
The paintings were painted between 1901 and 1920.
(= narrow-scope, specific)
- d. The paintings must be famous.
(= narrow-scope, non-specific)

Following von Heusinger (1997, 2000) we represent non-specific indefinite NPs as indexed epsilon terms, as illustrated in (37):

(37) a painting: $\varepsilon_i x$ [painting(x)]

The epsilon operator is interpreted as a choice function that assigns to each (non-empty) set one of its elements.¹⁰ In other words, the

¹⁰ Choice functions have recently become a fashionable tool for representing indefinites (cf. Reinhart 1992; Kratzer 1998; Winter 1997, 2000; von Stechow 2000; von Heusinger 2000, among others). We use the epsilon operator as the syntactic representation of the indefinite article, while the choice function is the corresponding semantic function.

referent of an indefinite NP is found by the operation of selecting one element out of the set that is described by the description. The selection depends on the context in which the indefinite is located. This treatment is similar to that of discourse representation theories (Heim 1982; Kamp 1981), where indefinites introduce new individual variables or discourse referents. One of the main advantages of using choice function variables instead is the following: Indefinites need not be moved or raised for expressing different dependencies. They remain *in situ*, whereas the choice function variable can be bound by different operations, e.g. adverbs of quantification, existential closure, etc. This induces different scope readings of the indefinites, as illustrated in (38), where the indefinite *a book he had recommended* is represented in (38a) as the complex epsilon term $\varepsilon_i z [\text{book}(z) \ \& \ \text{recom}(x, z)]$. The description in this term comprises a set of books that are recommended by a professor x . The indexed epsilon term is interpreted as a choice function that selects one element out of this set. The index of the epsilon term can be bound by an existential quantifier in the relative clause, as in (38b), yielding the narrow scope reading ('for each professor and each student there is a book'). The index can also be bound in the matrix sentence, as in (38c), yielding an intermediate reading ('for each professor there is a certain choice of a book'). Finally, the index can be bound by the context, as in (38d). This reading still yields an intermediate reading since the set of books is determined by the choice of the professor. However, in a case where two professors have the same set of recommended books, in (38d) the choice function would select the same book, while in (38c) there might be two different choices depending on the professor.¹¹

(38) Every professor rewarded every student who read a book he had recommended.

- a. $\forall x[\text{prof}(x) \rightarrow \forall y[\text{stud}(y) \ \& \ \text{read}(y, \varepsilon_i z[\text{book}(z) \ \& \ \text{rec}(x, z)]) \rightarrow \text{rew}(x, y)]]]$
- b. $\forall x[\text{prof}(x) \rightarrow \forall y[\text{stud}(y) \ \& \ \exists i \text{ read}(y, \varepsilon_i z[\text{book}(z) \ \& \ \text{rec}(x, z)]) \rightarrow \text{rew}(x, y)]]]$
- c. $\forall x[\text{prof}(x) \rightarrow \exists i \forall y[\text{stud}(y) \ \& \ \text{read}(y, \varepsilon_i z[\text{book}(z) \ \& \ \text{rec}(x, z)]) \rightarrow \text{rew}(x, y)]]]$
- d. $\exists i \forall x[\text{prof}(x) \rightarrow \forall y[\text{stud}(y) \ \& \ \text{read}(y, \varepsilon_i z[\text{book}(z) \ \& \ \text{rec}(x, z)]) \rightarrow \text{rew}(x, y)]]]$

¹¹ See also the discussion of this and similar examples in Kratzer (1998), the criticism in von Stechow (2000), and a different analysis in von Heusinger (2000).

Specificity is taken as an independent referential property of indefinite NPs (see Fodor & Sag 1982; Enç 1991; Farkas 1995). Following von Heusinger (2001) we assume that a specific indefinite NP is ‘referentially anchored’ to a discourse item. This can be the speaker or some other index of the utterance context, on the one hand, or some introduced referent, on the other. The anchor-relation is represented by a function f from that discourse item to a certain choice function. In other words, the function f links the choice of the indefinite to the value of the discourse item. This means that the indefinite receives the same scope as the discourse item it depends on.

Example (39) illustrates the different referential options of the indefinite. The example may be assigned a non-specific reading of the indefinite (‘There is some painting by Picasso or other such that John likes it’), as in (39a). The more prominent specific reading (39b) can be paraphrased as ‘I can identify a picture and this picture is such that John admires it’. There is another specific reading of (39), namely (39c) with the paraphrase ‘John has a particular picture of Picasso in mind, and he admires it; but I cannot tell which one’.¹²

(39) John admires a painting of Picasso.

- a. $\exists i$ [admire(john, $\varepsilon_i x$ [painting(x) & By(picasso(x))])] (non-specific)
- b. admire(john, $\varepsilon_{f(\text{speaker})} x$ [painting(x) & By(picasso(x))]) (specific: *speaker*-anchored)
- c. admire(john, $\varepsilon_{f(\text{john})} x$ [painting(x) & By(picasso(x))]) (specific: *subject*-anchored)

(39b and c) differ in that the indefinite is anchored to different discourse items. In this example, the difference is not easy to capture, but for (36) it makes a clear difference. We can give the representations (40a–d) for the four readings (36a–d), respectively:

- (40) a. Every(x): artist(x): x admires $\varepsilon_{f(\text{speaker})} z$ [painting(z) & By(picasso, z)] (= wide scope, specific)
- b. $\exists i$ [Every(x): artist(x): x admires $\varepsilon_i z$ [painting(z) & By(picasso, z)] (= wide scope, non-specific)
- c. Every(x): artist(x): x admires $\varepsilon_{f(x)} z$ [painting(z) & By(picasso, z)] (= narrow scope, specific)

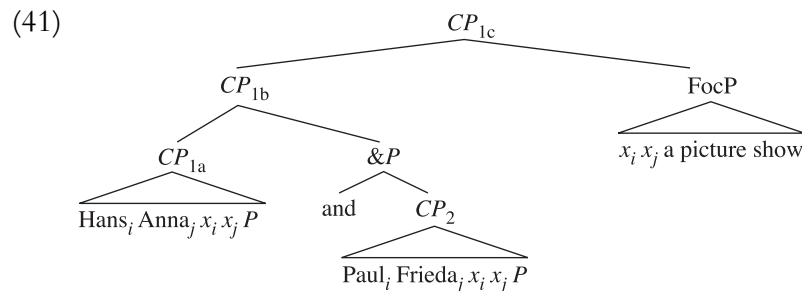
¹² The formulations ‘has in mind’ or ‘can identify’ should motivate the specific reading. However, such formulations are very informal, and in certain contexts even misleading (see von Heusinger 2001: for a detailed discussion).

- d. $\text{Every}(x): \text{artist}(x): \exists i [x \text{ admires } \varepsilon_i z [\text{painting}(z) \ \& \ \text{By}(\text{picasso}, z)]]$
 (= narrow scope, non-specific)

In the representation (40a), the choice of the indefinite depends on the speaker, thereby yielding the specific wide scope reading. In (40b), the context index is bound by the text operator—thus we get some choice and therefore, some or other painting. The narrow specific reading of an indefinite is represented by the dependency of the choice function from the instantiation of a particular artist—each artist has her or his own choice of a particular painting of Picasso. Finally, in the representation of the narrow scope non-specific reading, the index is locally bound by an existential closure of the matrix verb or VP, respectively. The different referential properties of indefinite NPs are additionally dependent on the information structure (see Lenerz 2001) and on other constructions, such as coordination.

3.2 Indefinite NPs in coordination with focused shared constituents

Having outlined the fundamentals, we may now turn to the interpretation of shared indefinites. We will start with the focused shared indefinites and end up with the non-focused ones in the next subsection. As for the focused shared indefinite expressions, recall the example (22) repeated here as (41) where the shared indefinite expression is in the extraposed proposition.



We considered the coordination to be a conjunction of propositions each containing a predicate variable ‘ P ’:

$$(42) \llbracket CP_{1b} \rrbracket^O = P(\text{hans})(\text{anna}) \ \& \ P(\text{paul})(\text{frieda})$$

From the representation of the two conjuncts we derive a representation for the whole conjunction by applying the operation of Summation. It is applied to the subjects *Hans* and *Paul*, as well as to the objects *Anna* and *Frieda*. As discussed in Section 2, we need an

additional restriction that the two sets are formed in a parallel way. In the remainder we will tacitly assume such a requirement, rather than explicitly state it.

$$(43) P(\text{hans})(\text{anna}) \ \& \ P(\text{paul})(\text{frieda}) \Rightarrow P(\{h, p\})(\{f, a\})$$

The Summation operation is necessary because the subject variable as well as the object variable of the predicate *show* in the extraposed constituent must be instantiated—cf. (44).

$$(44) \llbracket \text{Foc} P \rrbracket^O = \text{Show}(x)(y)(\text{a pic})$$

As already mentioned in the previous section, the coordination as well as the extraposed constituent are related to each other. Thus, the coordination is a functor ‘ $\lambda P [P(\{h, p\})(\{f, a\})]$ ’ that takes the extraposed constituent ‘ $\lambda x, y [\text{Show}(x)(y)(\text{a pic})]$ ’ as its argument. In (45), the whole construction is represented with the coordination and the extraposed part:

$$(45) \langle \lambda P [P(\{h, p\})(\{f, a\})], \lambda x, y [\text{Show}(x)(y)(\text{a pic})] \rangle$$

We observe that this representation corresponds to the representation of a proposition that is structured with respect to information structure, where the background is represented as the main functor and the focus as its argument (Jacobs 1983; von Stechow 1990; Krifka 1991). Thus we can assign the following information structure and semantic representation to (22), repeated here as (46):

$$(46) \begin{array}{l} \text{Hans, Paul, Anna and Frieda visited the museum. What did they do there?} \\ \text{HANS hat ANNA und PAUL hat FRIEDA [ein BILD gezeigt]}_F \\ \text{Hans AUX Anna and Paul AUX Frieda a picture shown} \\ \hline \left| \text{Background} \right| \left| \text{Focus} \right| \\ \lambda P[P(\{h, p\})(\{a, f\})] \qquad \lambda x, y [\text{Show}(x)(y)(\text{a pic})] \end{array}$$

What is still missing and of interest here is how this representation accounts for the wide and narrow scope reading as well as for the specific and non-specific interpretation of our shared constituents.

Recall that we decided to represent indefinite expressions as indexed epsilon terms. If we insert such a term for the so far informally represented expression ‘a pic’ in (46), we obtain (47).

$$(47) \langle \lambda P [P(\{h, p\})(\{a, f\})], \lambda x, y [\text{Show}(x)(y)(\epsilon_i z [\text{picture}(z)])] \rangle$$

To yield the wide-scope, specific reading, the context index variable is substituted by the function *f* from the speaker to a certain choice function, as in (48). This means that the function *f* assigns to the speaker a particular choice function, and thus a particular element that is assigned to the given set.

$$(48) \langle \lambda P[P(\{h, p\})(\{a, f\})], \lambda x, \gamma [\text{Show } (x) (\gamma) (\varepsilon_{f(\text{speaker})} z [\text{picture}(z)])] \rangle$$

Notice that this representation gives an interpretation where the showing event is collective, this means where Hans and Paul show a picture to Anna and Frieda. But the predication can only be interpreted after applying the distributive operator to the plural sets. Therefore we take the *Dist*-operator, which we introduced in Section 2, that distributes a set. Within the following representation, which we gain by lambda conversion of (48), this operator is applied to both sets.

$$(49) \text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): \gamma [\text{Show } (x) (\gamma) (\varepsilon_{f(\text{speaker})} z [\text{picture}(z)])] \\ (= \text{specific, wide-scope})$$

The representation that mirrors the narrow-scope, specific reading we get if we substitute the context variable by the function f again only that this function relates now to a variable the instantiation of which is a particular individual involved in the events described by the sentence meaning. Here, we may suggest that these individuals are either Hans or Paul, the agents of the events. We get access to the members of this set since they can instantiate the variable given by the function f because of the *Dist*-operator.

$$(50) \text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): \gamma [\text{Show } (x) (\gamma) (\varepsilon_{f(x)} z [\text{picture}(z)])] \\ (= \text{specific, narrow-scope})$$

Given that the *Dist*-operator distributes the set consisting of Paul and Hans, each of them can now instantiate the variable x of the functor f . Thus, we yield the narrow-scope, specific interpretation that Hans and Paul each show a certain picture.¹³

Turning to the wide-scope, non-specific interpretation, recall that there the choice function does not select an element that is referentially anchored. Thus, the function that relates a linguistically given discourse referent to a certain choice function is not needed and the context index is existentially bound. We then get some other painting. If the existential closure is done by a text operator, this operator has wide scope. Thus we get the wide-scope, non-specific reading:

$$(51) \exists i \text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): \gamma [\text{Show } (x) (\gamma) (\varepsilon_i z [\text{picture}(z)])] \\ (= \text{non-specific, wide-scope})$$

¹³ This operator can be expressed linguistically, namely by *each* in English or *jeweils* in German.

(i). Hans hat Maria und Paul hat Anna jeweils ein Bild gezeigt.
Hans AUX Maria and Paul AUX Anna each a picture shown
'Hans showed Maria, and Paul Anna, a picture each.'

If, on the other hand, the existential operator is in the scope of the distributing operators, which implies that the index is locally bound by the existential closure of the matrix predicate, we obtain the narrow-scope, non-specific interpretation:

- (52) $\text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): y \exists i [\text{Show}(x)(y)(\varepsilon_i z [\text{picture}(z)])]$
 (= non-specific, narrow scope)

Let's recapitulate what we have so far: In the previous section we addressed the question whether the information-structurally motivated extraposition allows for all four interpretations for focused shared indefinite NPs (see (12)). Now we can state that the needed representations exist. The specific interpretation is mirrored by a function that relates a contextually anchored discourse referent to a certain choice function that assigns an element to the set given by the description of the indefinite NP. If this contextually anchored discourse referent is the speaker, the wide-scope interpretation results. The narrow-scope interpretation obtains if more than one contextually anchored discourse referent is given. If there is no contextually anchored discourse referent, the context variable is existentially bound, which mirrors the non-specific interpretation. If it is bound by a text operator, the wide-scope, non-specific reading results and if it is bound by the existential closure of nuclear scope, the narrow-scope, non-specific interpretation obtains.

3.3 *Indefinite NPs in coordination with non-focused shared indefinites*

The final problem we have to overcome is why we get only the narrow scope, non-specific reading for the non-focused shared indefinite NP. Recall that we have represented these constructions as a coordination with an elliptical first conjunct.

- (53) *Hans showed and Paul showed a picture to some girls, but I don't know to whom in particular.*
 HANS hat ANNA_F ~~ein Bild gezeigt~~ und PAUL hat
 Hans AUX Anna a pictshown and Paul AUX
 FRIEDA_F ein Bild gezeigt
 Frieda a picture shown
 'Hans showed Anna, and Paul Frieda, a picture.'

As we may see in (53), both conjuncts contain an indefinite NP and thus the LF has two indexed epsilon terms. These epsilon terms cannot have the same index as needed for the wide scope reading (specific or non-specific)—see (54a and b):

- (54) a. Show $(h)(a) \varepsilon_{f(\text{speaker})z} [\text{pic}(z)]$ & Show $(p)(f) \varepsilon_{f(\text{speaker})z} [\text{pic}(z)]$
 b. $\exists_i [\text{Show}(h)(a) \varepsilon_i z [\text{pic}(z)]]$ & $[\text{Show}(p)(f) \varepsilon_i z [\text{pic}(z)]]$

In (54a) the index is in both conjuncts a function that relates the speaker to the same choice function, corresponding to the specific wide scope reading. And in (54b), the identical indices are existentially bound by a text operator, corresponding to a non-specific, wide scope reading. Both representations in (54) are ruled out by the Novelty condition (Heim 1982) that says that each occurrence of an indefinite NP introduces a new index. In terms of DRT (Kamp 1981): each indefinite is represented by a new discourse referent. If there is another expression with the same descriptive material and the same index, it appears as a definite expression at the surface. Thus, if an epsilon term has the same index as its antecedent, it should be expressed by a definite anaphoric expression.

On the other hand, the indefinite NPs in (53) are deaccented which means that another expression of the same kind has been established in the discourse. And this is confirmed by the contextually given question in (53) that contains the expression *a picture*. Thus, the two indefinites are not new with respect to their descriptive content and thus deaccenting is possible. But they are new with respect to their index and this is the reason why anaphoric reference is not possible.¹⁴

For the narrow scope reading we have two possible representations, one for the specific and another one for the non-specific reading. In the specific narrow scope reading the epsilon term is indexed by a function $f(x)$ that makes the choice of the indefinite dependent on the value for the subject x , as in (55). Again, the Novelty condition rules out identity for the two indices. As we saw in (9b), such an indefinite NP can be anaphorically linked by a paycheque pronoun, rather than by another indefinite NP:

- (55) Show $(h)(a) \varepsilon_{f(x=h)z} [\text{pic}(z)]$ & Show $(p)(f) \varepsilon_{f(x=p)z} [\text{pic}(z)]$

Again, deaccented or elliptical indefinite NPs must have other indices than their antecedents. Thus, the only appropriate representation for

¹⁴ Krifka (2001) terms such occurrences of indefinite NPs as ‘non-novel indefinites’. He discusses such indefinites in the context of adverbial quantification and information structure, in examples like (i) and (ii). Acute accent marks the location of the main accent indicating focus. An indefinite NP in the background is marked as non-novel (=NN). The difference in information structure determines the domain of quantification as in the paraphrases illustrated:

- (i) [A freshman]_{NN} usually wears a baseball cap. ‘Most freshmen wear a baseball cap.’
 (ii) A fr eshman usually wears a [baseball]_{NN} cap. ‘Most baseball caps are worn by freshmen.’

non-focused shared indefinite NPs is the one where the epsilon terms have different indices. Independent of the location of the existential closure, they will always be assigned different choices out of the set of pictures.

(56) \exists_i [Show (*h*)(*a*) $\varepsilon_i z$ [pic (*z*))] & \exists_j [Show (*p*)(*f*) $\varepsilon_j z$ [pic (*z*)]]

With (56), we have the representation that mirrors the non-specific, narrow scope interpretation. The truth conditions are that there is some picture or other such that Hans shows it to Anna and that there is some painting or other such that Peter shows it to Frieda.

3.4 Indefinite NPs in the first conjunct

To complete the picture of shared indefinite NPs in coordination, let's have a short look at constructions where the indefinite is in the first conjunct.

Similarly to constructions like (53), the non-focused indefinite NP in the first conjunct must have a copy that is represented as an epsilon term with an index that differs from the index of its antecedent NP.

(57) *There are different pieces of art to be seen in the museum. Who showed whom a picture?*

HANS_F hat ANNA_F ein Bild gezeigt und PAUL_F ~~hat~~
 Hans AUX Anna a picture shown and Paul AUX
 FRIEDA_F ~~ein Bild gezeigt~~.
 Frieda a picture shown
 \exists_i [Show (*h*)(*a*) $\varepsilon_i z$ [pic (*z*))] & \exists_j [Show (*p*)(*f*) $\varepsilon_j z$ [pic (*z*)]]

If the indefinite NP in the first conjunct is focused, the second conjunct needs a corresponding focused constituent as expressed by the accented *auch* in (58), which is due to principles of focus semantics.

(58) *Hans, Paul, Anna and Frieda visited the museum. What did they do there?*

HANS hat ANNA [ein BILD gezeigt]_F und PAUL hat
 Hans AUX Anna a picture shown and Paul AUX
 FRIEDA [AUCH ein Bild gezeigt]_F
 Frieda also a picture shown
 'Hans showed a picture to Anna as did Paul to Frieda'

In such constructions, we only get the narrow-scope (specific or non-specific) interpretation.

- (59) Show (hans)(anna)($\varepsilon_{f(x=h)}z$ [picture(z)]) & (= narrow-scope, specific)
 Show (paul)(frieda)($\varepsilon_{f(x=p)}z$ [picture(z)])
- (60) \exists_i [Show (hans)(anna)($\varepsilon_i z$ [picture(z)])] & (= narrow-scope, non-specific)
 \exists_j [Show(paul)(frieda)($\varepsilon_j z$ [picture(z)])]

The reason is that the indefinite NP is not outside the coordination and thus must occur in the first as well as in the second conjunct. Due to the Novelty condition it introduces a new discourse referent in each conjunct. The so-called wide-scope reading would only obtain if the second conjunct contained an anaphoric NP, which had the same index as the NP in the first conjunct.

- (61) *Hans, Paul, Anna and Frieda visited the museum. What did they do there?*
 HANS hat ANNA [ein BILD gezeigt]_F und PAUL hat
 Hans AUX Anna a picture shown and Paul AUX
 FRIEDA [AUCH dieses Bild gezeigt]_F
 Frieda also this picture shown
 ‘Hans showed a picture to Anna and Paul showed it to Frieda as well.’

This anaphoric NP must be expressed, which means it cannot be deleted.

4 CONCLUSION

Let’s consider the main points of the analysis presented. We have seen that the syntactic representation of constructions with shared constituents is determined by principles of information structure and focus semantics. They are elliptical or deaccented if they are non-focused, and thus part of the background:

- (62) *There are different pieces of art to be seen in the museum. Who showed whom a picture?*
 |Focus|——|Focus|—|Background|——|Focus|——|Focus|—|Background|——|
 [[HANS hat ANNA ein Bild gezeigt] und [PAUL hat FRIEDA ein Bild gezeigt]]
 Hans has Anna a picture shown and Paul has Frieda a picture shown

If, on the other hand, they are focused, they must be outside the coordination:

- (63) *Hans, Paul, Anna and Frieda visited the museum. What did they do there?*
 |———| Background |———| |———| Focus |———|
 [HANS hat ANNA P_i und PAUL hat FRIEDA P_i] [ein BILD gezeigt]_i
 Hans AUX Anna and Paul AUX Frieda a picture shown

To apply the coordination to the extraposed constituent, we needed Summation, a semantic operation that forms sets out of linguistically given elements. In order to avoid a collective interpretation, we supplied the sets with the *Dist*-operator that takes a set and yields one element of the set. The different referential options of indefinites, which we represented as indexed epsilon terms, were the final ingredient for our theory of shared indefinite NPs in coordinative structures. The theory accounts for all four interpretations of shared indefinite NPs (see (12)).

- I. focused, narrow scope, specific
 $\text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): y [\text{Show}(x)(y)(\varepsilon_{f(x)z} [\text{picture}(z)])]$
- II. focused, wide scope, specific
 $\text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): [\text{Show}(x)(y)(\varepsilon_{f(\text{speaker})z} [\text{pic}(z)])]$
- III. focused, wide scope, non-specific
 $\exists_i \text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): y [\text{Show}(x)(y)(\varepsilon_i z [\text{picture}(z)])]$
- IVa. focused, narrow scope, non-specific
 $\text{Dist}(\{h, p\}): x \text{Dist}(\{f, a\}): y \exists_i [\text{Show}(x)(y)(\varepsilon_i z [\text{picture}(z)])]$
- IVb. non-focused, narrow scope, non-specific
 $\exists_i [\text{Show}(h)(a) \varepsilon_i z [\text{pic}(z)]] \& \exists_j [\text{Show}(p)(f) \varepsilon_j z [\text{pic}(z)]]$

It became clear that focused shared indefinite NPs allow for all four possible interpretations whereas non-focused ones can only be interpreted as narrow-scope and non-specific. This difference was explained by their different information-structural status.

We were able to show that in contrast to constructions where the indefinite NP is expressed in the first conjunct, constructions with the indefinite NP outside the coordination allow additionally for the wide scope interpretation.

The interface between information structure, the syntax of coordination and the semantics of indefinite NPs has given us a clear account for shared indefinite NPs in coordinative structures.

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REFERENCES

- Büring, D. & Hartmann, K. (1998) 'Asymmetrische Koordination'. *Linguistische Berichte* 174:172–201.
- Enç, M. (1991) 'The semantics of specificity'. *Linguistic Inquiry* 22:1–25.
- Farkas, D. (1995) 'Specificity and scope'. In L. Nash & G. Tsoulas (eds), *Actes du Premier Colloque Langues & Grammaire*. Paris. 119–137.
- Féry, C. (1993) *German Intonational Patterns*. Niemeyer. Tübingen.
- Fodor, J. & Sag, I. (1982) 'Referential and quantificational indefinites'. *Linguistics and Philosophy* 5:355–398.
- Grootveld, M. (1994) *Parsing Coordination Generatively*. HIL dissertations; 7. Leiden.
- Hartmann, K. (2000) *Right Node Raising and Gapping: Interface Conditions on Prosodic Deletion*. John Benjamins. Amsterdam/Philadelphia.
- Heim, I. (1982) 'The Semantics of Definite and Indefinite Noun Phrases', Ph.D. thesis, University of Massachusetts, Amherst, University Microfilms, Ann Arbor.
- von Heusinger, K. (1997) *Salienz und Referenz: Der Epsilonoperator in der Semantik der Nominalphrase und Anaphorischer Pronomen*. *Studia grammatica* 43, Akademie Verlag. Berlin.
- von Heusinger, K. (2000) 'The reference of indefinites'. In K. von Heusinger & U. Egli (eds), *Reference and Anaphoric Relations*. Kluwer. Dordrecht. 247–265.
- von Heusinger, K. (2001) 'Specificity and definiteness in sentence and discourse structure'. *Theoretical Linguistics*. Submitted.
- Hintikka, J. (1986) 'The semantics of 'a certain''. *Linguistic Inquiry* 17:331–336.
- Hintikka, J. & Kulas, J. (1985) *Anaphora and Definite Descriptions: Two Applications of Game-Theoretical Semantics*. Reidel. Dordrecht.
- Jacobs, J. (1983) *Fokus und Skalen: Zur Syntax und Semantik von Gradpartikeln im Deutschen*. Niemeyer. Tübingen.
- Kamp, H. (1981) 'A theory of truth and semantic interpretation'. In J. Groenendijk, T. Janssen & M. Stokhof (eds), *Formal Methods in the Study of Language*. Amsterdam Center. Amsterdam. 277–322.
- Kamp, H. & Reyle, U. (1993) *From Discourse to Logic. Introduction to Modeltheoretic Semantics of Natural Language, Formal Logic and Discourse Representation Theory*. Kluwer. Dordrecht.
- Karttunen, L. (1969) 'Pronouns and variables'. *Papers from the Fifth Regional*

- Meeting of the Chicago Linguistic Society*. University of Chicago Press. Chicago. 108–115.
- Kratzer, A. (1998) 'Scope or pseudo-scope? Are there wide-scope indefinites'. In S. Rothstein (ed.), *Events and Grammar*. Kluwer. Dordrecht. 163–196.
- Krifka, M. (1991) 'A compositional semantics for multiple focus constructions'. *SALT* 1:127–158.
- Krifka, M. (1996) Frameworks of the Representation of Focus, *ESSLI 96 Conference on Formal Grammar*. Prague.
- Krifka, M. (2001) 'Non-novel indefinites in adverbial quantification'. In C. Condoravdi & G. Renardel (eds), *Logical Perspectives on Language and Information*. CSLI Publications. Stanford.
- Lang, E. (1984) *The Semantics of Coordination*. John Benjamins. Amsterdam.
- Lenerz, J. (2001) 'Word order variation'. In G. Müller & W. Sternefeld (eds), *Competition in Syntax*. de Gruyter. Berlin. 249–281.
- Merchant, J. (1999) 'The Syntax of Silence: Sluicing, Islands, and Identity in Ellipsis', Ph.D. thesis, University of California Santa Cruz. Unpublished.
- Reinhart, T. (1992) 'Wh-in-situ: an apparent paradox'. In P. Dekker & M. Stokhof (eds), *Proceedings of the Eighth Amsterdam Colloquium*. ILLC, University of Amsterdam. 483–491.
- Rooth, M. (1992) 'A theory of focus interpretation'. *Natural Language Semantics* 1:75–116.
- Rooth, M. (1996) 'Focus'. In S. Lappin (ed.), *The Handbook of Contemporary Semantic Theory*. Blackwell. Oxford. 271–297.
- Schwabe, K. (2000) 'Coordinative ellipsis and information structure'. In K. Schwabe & N. Zhang (eds), *Ellipsis in Conjunction*. Niemeyer. Tübingen. 247–269.
- Schwarzschild, R. (1999) 'Givenness, avoid F and other constraints on the placement of accent'. *Natural Language Semantics* 7:141–177.
- von Stechow, A. (1990) 'Focusing and backgrounding operators'. In W. Abraham (ed.), *Discourse Particles*. John Benjamins. Amsterdam. 37–84.
- von Stechow, A. (2000) 'Some remarks on choice functions and LF-movements'. In K. von Heusinger & U. Egli (eds), *Reference and Anaphoric Relations*. Kluwer. Dordrecht. 193–228.
- te Velde, J. R. (1996) 'Coordination and antisymmetry theory: some evidence from germanic'. *American Journal of Germanic Linguistics & Literatures* 8(2):135–175.
- Wilder, C. (1994) 'Coordination, ATB and ellipsis'. *GAGL* 37:291–331.
- Williams, E. (1978) 'Across-the-board rule application'. *Linguistic Inquiry* 9:31–43.
- Winkler, S. (1997) *Ellipsis and Information Structure in English and German: the Phonological Reduction Hypothesis*. Arbeitspapiere des Sonderforschungsbereichs. 340.
- Winter, Y. (1997) 'Choice functions and the scopal semantics of indefinites'. *Linguistics and Philosophy* 20:399–467.
- Winter, Y. (2000) 'What makes choice natural?'. In K. von Heusinger & U. Egli (eds), *Reference and Anaphoric Relations*. Kluwer. Dordrecht. 229–245.