

Distributive and non-distributive conjunction: Formal semantics meets typology *

Enrico Flor, Nina Haslinger, Eva Rosina,
Magdalena Roszkowski, Viola Schmitt

November 7, 2017

Abstract

Our point of departure is a basic semantic question: What is the meaning of elements like English *and* ('COORD') in conjunctions with individual-denoting conjuncts and how do they interact with material inside or outside of the coordinate structure to derive 'distributive' and 'non-distributive' meanings? In this paper, we link this question to the preliminary results of a typological study we are currently conducting. Based on these data, as well as data from the literature, we present three cross-linguistic generalizations, which, broadly speaking, concern the relation between the form of conjunctions (or larger structures in which they occur) and their interpretation ('distributive' vs. 'non-distributive'). We show that if these generalizations should turn out to be universal, they would strongly support a number of cross-linguistic claims about the meaning of functional elements and their structural interaction: First, the lexical meaning of COORD is non-distributive. Second, conjunction patterns lacking a non-distributive interpretation are structurally more complex than conjunction patterns that allow for a non-distributive interpretation (in the sense that the former contain the latter). Third, predicate level distributivity operators must be available in all languages that exhibit the conjunction patterns considered in this paper.

keywords: coordination, conjunction, distributivity, non-distributivity, typology

1 Introduction

This paper presents a cross-linguistic study of sentences like (1), in which a conjunction of individual-denoting (type *e*) conjuncts (boldfaced in (1)) combines with a predicate containing an indefinite plural DP or a measure phrase. The main question is how binary coordinators like *and* interact with other logical operators to yield the meaning of such sentences, and the way these operators are expressed in different languages.

*We would like to thank Hagen Blix, Moreno Mitrović and Uli Sauerland for comments and discussion, as well as Nikolaos Angelopoulos, Paul Roger Bassong, Zhuo Chen, Jovana Gajic, Christina Guardiano, Emily Hanink, Soohwan Jung, Travis Major, Pam Munro, Edgar Onea, Sozen Ozkan, Augustina Owusu, Zixian Qiu, Yasu Sudo and Marcin Wagiel for their contributions to the Terraling-group 'Conjunction and Disjunction'. Our research would not have been possible without the immense help (in all respects) by Hilda Koopman – but all errors are, of course, our own. The research was funded by the Austrian Science Fund (FWF), project P 29240-G23, 'Conjunction and disjunction from a typological perspective'.

- (1) **John, Mary and Sue** read exactly five books.

We use the term **conjunction** for coordinate structures that either have the semantic spectrum of English *and* or a more specific one, i.e. that cover some or all of the possible interpretations of English *and*. Among the structures that semantically count as conjunction, we will only deal with a certain subtype defined by syntactic criteria, namely structures in which conjunction is expressed by so-called ‘iterative coordination’ (cf. (12) below).

1.1 Background

Many semantic studies of conjunction assume that binary conjunctive coordinators like *and* (henceforth COORD) have a cross-categorical lexical meaning that is based on the truth-functional conjunction operation \wedge of classical propositional logic (Gazdar 1980, Partee & Rooth 1983). This approach can be extended to examples like (1) by shifting the conjuncts to a denotation of type $\langle\langle e, t \rangle, t\rangle$, so that the coordinate structure as a whole has the denotation in (2-b) (cf. Montague 1973 and for a recent discussion Winter 2001).

- (2) a. $\llbracket \text{COORD}_{\langle\langle e, t \rangle, t\rangle} \rrbracket = \lambda \mathbf{P}_{\langle\langle e, t \rangle, t\rangle} \cdot \lambda \mathbf{Q}_{\langle\langle e, t \rangle, t\rangle} \cdot \lambda R_{\langle e, t \rangle} \cdot \mathbf{P}(R) \wedge \mathbf{Q}(R)$
 b. $\llbracket A_e \text{ COORD}_{\langle\langle e, t \rangle, t\rangle} B_e \rrbracket = \llbracket \text{COORD}_{\langle\langle e, t \rangle, t\rangle} \rrbracket (\lambda R_{\langle e, t \rangle} \cdot R(\llbracket A \rrbracket)) (\lambda R_{\langle e, t \rangle} \cdot R(\llbracket B \rrbracket))$
 $= \lambda R_{\langle e, t \rangle} \cdot R(\llbracket A \rrbracket) \wedge R(\llbracket B \rrbracket)$
 c. $\llbracket [A_e \text{ COORD}_{\langle\langle e, t \rangle, t\rangle} B_e] P \rrbracket = \llbracket P \rrbracket (\llbracket A \rrbracket) \wedge \llbracket P \rrbracket (\llbracket B \rrbracket)$

However, type *e* conjunction in English and many other languages has a number of semantic properties that are not straightforwardly predicted by (2). The problem we will focus on in this paper is that conjunctions of individual-denoting expressions are compatible with **non-distributive predicates** – i.e. predicates for which (3-a) and (3-b) are not logically equivalent (see e.g. Link 1983, Winter 2001 a.o.).

- (3) a. $[A \text{ COORD } B] P$
 b. $[A P] \text{ COORD } [B P]$

Two types of predicates with this behavior should be distinguished: **collective predicates** (4), which cannot combine with expressions denoting singular individuals, and predicates with **cumulative interpretations** (5). Cumulative interpretations are triggered by a class of “semantically plural” expressions that includes plural definites, plural indefinites and measure phrases. For instance, (5-a) is ambiguous between a cumulative interpretation, which makes it true in scenario (6-a) and false in scenario (6-b), and a distributive interpretation, which is false in scenario (6-a) and true in scenario (6-b). This paper mainly concentrates on distributive and cumulative interpretations of predicates containing an indefinite semantically plural DP or a measure phrase, such as *earned exactly 100 euros* in (5). We will call such predicates ‘**C-predicates**’.

- (4) a. John and Mary met.
 b. #John met and Mary met.
- (5) a. John and Mary earned exactly 100 euros.
 b. John earned exactly 100 euros and Mary earned exactly 100 euros.
- (6) a. SCENARIO 1: John earned exactly 60 euros and Mary earned exactly 40 euros. They did not earn any money jointly. \rightarrow (5-a) true, (5-b) false

- b. SCENARIO 2: John and Mary earned exactly 100 euros each. → (5-a) true, (5-b) true

Non-distributivity can potentially be derived in different ways: Without any additional assumptions, the approach in (2) evidently only generates the distributive interpretation and cannot account for collective predicates or non-distributive interpretations of C-predicates. However, non-distributive interpretations of conjunctive coordinate structures can be derived from the meaning in (2-b) by type-shifts (cf. e.g. Van der Does 1992, Winter 2001). Alternatively, one could discard the approach in (2) and postulate a non-distributive lexical meaning for type *e* conjunction that differs from (2-a) (cf. Link 1983, Hoeksema 1987, Landman 1989). One of the core questions we will address, is how cross-linguistic data can help us decide between these two approaches.

A number of observations suggest that English is not the only language for which (2) is insufficient. One that is particularly relevant for our present purposes is that the assumption that the binary operator COORD is the only functional morpheme in conjunctive coordination is incompatible with the fact that many languages have forms of conjunctive coordinate structures that involve **conjunction particles** – markers that (can) appear on each conjunct in a coordinate structure, like μ in the schema (7-a). If we want to interpret all occurrences of the conjunction particle μ , its meaning clearly cannot be the binary operation COORD. The semantics of such structures has recently been investigated by Mitrović & Sauerland (2014) and Szabolcsi (2015) (cf. Slade (2011) for analogous data involving disjunction).

- (7) Conjunction patterns (modulo linear ordering of COORD/ μ and conjuncts)
- a. A- μ (COORD) B- μ (COORD) C- μ
 - b. A (COORD) B (COORD) C

This raises the question whether the semantic difference between distributive and non-distributive interpretations correlates cross-linguistically in any way with the distinction between the two structures in (7). In other words: Are there **universal constraints on form-meaning correspondences** in the domain of conjunctive coordination (cf. von Stechow & Matthewson 2008 for a survey of universals research in other domains of formal semantics)? For instance, one could hypothesize that there are no structures of the form (7-a) that allow for a non-distributive interpretation. While this specific claim is false (cf. Szabolcsi 2015), we might still find a weaker connection between the pattern in (7-a) and distributivity.

Ultimately, the goal is to determine the semantic contribution of COORD. In order to address this issue cross-linguistically, however, we have to consider the interpretative options of larger structures that COORD occurs in. First, even if the formal realization of COORD is held constant, there are different ways of expressing the entire coordinate structure – e.g. with or without additional conjunction particles. In this case, we will speak of different **coordination patterns**: The two Serbo-Croatian examples in (8-a) and (8-b) involve the same marker, *i*, but exemplify different conjunctive coordination patterns because the occurrences of this marker within the coordinate structure are distributed differently.

- (8) a. [I Jana i Ivan i Milan] su zaradili tačno
and Jana.NOM and Ivan.NOM and Milan.NOM AUX.3PL earn.PART.PL.M exactly
sto evra.
hundred euros.GEN
'Jana, Ivan and Milan earned exactly 100 euros each.'
- b. [Jana (i) Ivan i Milan] su zaradili tačno
Jana.NOM (and) Ivan.NOM and Milan.NOM AUX.3PL earn.PART.PL.M exactly

sto evra.

hundred euros.GEN

‘Jana, Ivan and Milan earned exactly 100 euros.’

(Serbo-Croatian, examples contributed by Jovana Gajić on TerraLing¹)

Second, sentences with conjunctive coordinate structures may involve additional markers that occur *outside* the coordinate structure, but affect its interpretation. We refer to larger structures containing the coordinate structure and such additional markers as **coordination strategies**: The two Basa’a examples in (9) exemplify the same coordination pattern because the coordinate structure itself (the bracketed constituent) is realized in exactly the same way in (9-a) and (9-b). However, they exemplify different coordination strategies because the marker *híkíí mut* ‘each person’ is present in (9-b), but absent in (9-a).

- (9) a. [johánes, maaríja ni pêtro] fá-bí-kosná dikóó dísamal
1.John 1.Mary COORD 1.Peter 2.SM-PST2-receive 13.thousands 13.six
‘John, Mary and Peter received six thousand francs.’ (non-distributive only)
- b. [johánes, maaríja ni pêtro] fá-bí-kosná dikóó dísamal, híkíí
1.John 1.Mary COORD 1.Peter 2.SM-PST2-receive 13.thousand 13.six each
mut
1.person
‘John, Mary and Peter received six thousand francs each.’ (distributive only)
Basa’a (Equatorial Bantu; examples contributed by Paul Roger Bassong on TerraLing²)

We will state our empirical generalizations at the level of coordination strategies or coordination patterns. From these generalizations, we will try to derive the meaning of the coordinator itself.

1.2 Contributions of this paper

We will present three empirical generalizations – summarized in (10)– that concern the cross-linguistic relation between formal marking of conjunction strategies and conjunction patterns on the one hand and the availability of distributive and non-distributive interpretations on the other. They are arguably implicit in some of the earlier literature (e.g. Szabolcsi 2015), but (to our knowledge) have not been formulated as explicit typological hypotheses and their status as potential universals is unclear.

- (10) a. **Empirical hypothesis A:** For any pair of iterative coordination patterns within a language that have a conjunctive meaning and apply to proper names, where one pattern can be obtained from the other by adding “additional markers” (e.g. conjunction particles or repetition of the coordinator):
- If the **marked** pattern allows for a **non-distributive** interpretation, so does the unmarked pattern.
 - If the **unmarked** pattern allows for a **distributive** interpretation, so does the marked pattern.

¹<http://test.terraling.com/groups/8/examples/16182>, <http://test.terraling.com/groups/8/examples/16177>

²<http://test.terraling.com/groups/8/examples/16284>; <http://test.terraling.com/groups/8/examples/16285>

- b. **Empirical hypothesis B:** There are no iterative non-distributive-only patterns, i.e. there are no conjunctive coordination patterns that allow for more than two conjuncts and are limited to a non-distributive interpretation.
- c. **Empirical hypothesis C:** There are no non-distributivity markers that are “obligatory” in the sense that for some iterative coordination pattern with a conjunctive meaning, the non-distributive interpretation is available with the marker, but unavailable if the marker is omitted.

It is important to note that Hypothesis A and Hypothesis C are distinct, despite their superficial similarity: While both claim that there is a correlation between additional formal marking and the *absence of a non-distributive interpretation*, Hypothesis A relates to coordination *patterns* (which may be further restricted by the predicate the coordinate structure combines with), whereas Hypothesis C concerns coordination *strategies* (which may differ in the formal realization of the C-predicate).

We argue that these generalizations reveal certain cross-linguistic properties of the functional lexicon and the structural configurations it can occur in: First, Hypothesis A supports a non-distributive lexical meaning for COORD, in contrast to the traditional ‘Boolean’ approach in (2-a). Second, Hypothesis A can be (partially) derived from the assumption that conjunction patterns lacking a non-distributive reading are always structurally more complex than conjunction patterns that allow for such a reading. Third, the generalizations strongly suggest two distinct sources for distributive interpretations in sentences with C-predicates: Operators on the coordinate structure itself, but also predicate-level distributivity operators. In fact, Hypotheses B and C lead us to propose that the latter must be available cross-linguistically.

Hypotheses A–C are based both on data from the literature as well as on preliminary results of a cross-linguistic survey we are currently conducting via the Terraling database (see Section 5).³ This survey, at the present stage, concentrates on a special case of type *e* conjunction: We only considered sentences in which the conjuncts are singular, non-collective proper names and where the coordinate structure occurs in subject position. We looked at three subclasses of non-distributive predicates: predicates containing measure phrases (11-a), predicates containing semantically plural indefinites (11-b), and collective predicates (11-c). Note that not all conjunction patterns interact in the same way with cumulative and collective predication. As indicated above, the current paper concentrates on C-predicates, i.e. the example types in (11-a) and (11-b).

- (11)
- a. John, Mary and Sue earned exactly 100 euros.
 - b. John, Mary and Sue read exactly five books.
 - c. John, Mary and Sue met in the park.

Further, we limited our survey to a subclass of coordinate structures which we called “iterative coordination”: For our purposes, a structure in a given language counts as iterative coordination if it satisfies all of the syntactic and semantic criteria given in (12) that can be tested in the language.⁴ Therefore all the generalizations we are proposing here are implicational and only make predictions

³We are using a new version of the database at <http://test.terraling.com>. An older version is accessible at <http://sswl.railsplayground.net>.

⁴We did not include criteria related to overt morphological marking. E.g. it does not matter for our definition of iterative coordination whether there is an overt coordinator, whether the overt markers found in the structure also have other uses, whether there are case asymmetries between conjuncts and whether the putative coordinate structure as a whole triggers plural agreement. Nevertheless, many languages have structures that fulfil the semantic function of conjunction and do not conform to (11)– for instance comitative conjunction (McNally 1993) or conjunctive verbs (Gil 1991).

for languages that have iterative coordination of proper names in the first place.⁵

- (12) Properties of “**iterative coordination**” – slightly simplified
- a. The two conjuncts and the coordinator(s) can form a constituent to the exclusion of any other material.
 - b. To the extent this can be determined, the two conjuncts must have the same grammatical function.
 - c. If the language has overt, island-sensitive wh-movement in questions or in relative clauses, the structure should show Coordinate Structure Constraint effects.
 - d. Coordination of more than two conjuncts is possible.

Reliable conclusions about the universality of our generalizations can of course only be drawn on the basis of a larger data set. Nevertheless, we want to point to the analytical possibilities that arise from correlating form and function cross-linguistically and will thus discuss the theoretical predictions our tentative generalizations would make.

1.3 Structure of the paper

The semantic literature contains different proposals for deriving distributive and non-distributive interpretations of conjunctive coordinate structures wrt. C-predicates. In Section 2, we briefly summarize some of these proposals. In Section 3, we explain our empirical hypotheses A-C in detail and argue that they are relevant for the theoretical choice between the different approaches discussed in Section 2, since these approaches make different predictions wrt. which logical operations are lexicalized. In Section 4, we discuss some of the issues involved in implementing our theoretical claims. While we will not give a formal syntax and semantics, we try to show how our morphosyntactic claims can be combined with certain previous analyses of conjunctive coordination. Finally, in Section 5, we describe some preliminary results of our Terraling survey as well as our methodology.

2 Theoretical options for the lexical meaning of COORD

In the following, we first observe that iterative conjunction patterns differ wrt. the availability of non-distributive interpretations for C-predicates. We then summarize three existing proposals for deriving distributive and non-distributive interpretations, which rely on different assumptions about the meaning of COORD. We show that in principle, if we do not take morphosyntactic properties of the conjunction patterns into account, two of these proposals are capable of deriving the attested semantic variation.

2.1 Conjunction patterns and distributivity

As illustrated in (4) and (5), *and*-coordination in English is ambiguous between distributive and non-distributive interpretations. Previous work has shown that while this situation is cross-linguistically widespread, it is not the only semantic option. Even if we exclude coordination patterns that do

⁵It appears that individual-level iterative coordination is not universally available. For instance, Pam Munro (p.c.) reports that Chickasaw (Muskogean) lacks iterative coordination of proper names, but has conjunctive verbs.

not count as conjunction in our sense because they also have other (e.g. disjunctive) uses, there are three logically possible types we may expect:

- (13) a. **‘D/ND-patterns’**: distributive and non-distributive interpretation available
 b. **‘D-only patterns’**: only distributive interpretation available
 c. **‘ND-only patterns’**: only non-distributive interpretation available

Note that we are not talking about ‘D-languages’ or ‘ND-languages’ since a language may have more than one conjunction strategy and even more than one conjunction pattern (in fact, if Drellichak’s (2004) surface-oriented survey is to be believed, this is very common across language families) and the conjunction patterns and conjunction strategies may differ w.r.t. the availability of distributive and non-distributive interpretations.

Of these three theoretical possibilities, only two actually occur in our data set and in the literature. We have already seen that the English pattern *A, B and C* counts as a D/ND-pattern. D-only patterns are also commonly attested in the literature, and often appear to involve conjunction particles, as in the Serbo-Croatian example (8-a) above, repeated here as (14-a). The sentence (14-a), where the marker *i* modifies each of the three conjuncts, is true in scenario (15-a), but according to our consultant Jovana Gajić, it does not adequately describe scenarios like (15-b): The pattern *i A i B i C* is therefore a D-only pattern. (14-b) (repeated from (8-b)), on the other hand, in which *i* does not modify each of the conjuncts, adequately describes both scenario (15-a) and scenario (15-b): *A i B i C* and *A, B i C* are thus D/ND-patterns.

- (14) a. [I Jana i Ivan i Milan] su zaradili tačno
 and Jana.NOM and Ivan.NOM and Milan.NOM AUX.3PL earn.PART.PL.M exactly
 sto evra.
 hundred euros.GEN
 ‘Jana, Ivan and Milan earned exactly 100 euros each.’
 b. [Jana (i) Ivan i Milan] su zaradili tačno
 Jana.NOM (and) Ivan.NOM and Milan.NOM AUX.3PL earn.PART.PL.M exactly
 sto evra.
 hundred euros.GEN
 ‘Jana, Ivan and Milan earned exactly 100 euros.’

- (15) a. SCENARIO 1: Jana earned exactly 100 euros, Ivan earned exactly 100 euros and Milan earned exactly 100 euros.
 b. SCENARIO 2: Jana earned exactly 30 euros, Ivan earned exactly 30 euros and Milan earned exactly 40 euros.

Convincing examples of iterative ND-only patterns, however – i.e. examples of conjunction patterns that lack a distributive interpretation in sentences with C-predicates – neither occur in our preliminary Terraling data set, nor in the literature. One might hold against this examples like comitative conjunction in Polish (16-a) and Russian (cf. McNally 1993), which displays an ND-only behavior. Yet, as (16-b) shows that this is not a case of *iterative* coordination as defined in (12), such cases are excluded from the present study – after all, the limitation on the number of conjuncts may correlate with differences concerning the semantic operators that apply inside the coordinate structure.

- (16) Polish

- a. Marta z Karolem poszli do biura.
Marta.NOM COORD Karol.INSTR go.PAST.PL to office
'Marta and Karol went to the office.'
- b. *Marta z Karolem z Adamem poszli do biura.
Marta.NOM COORD Karol.INSTR COORD Adam.INSTR go.PAST.PL to office
'Marta, Karol and Adam went to the office.'

The attested semantic possibilities for conjunction patterns are summarized in (17). Accordingly, an adequate cross-linguistic theory of conjunction patterns expressed by *iterative* coordination must be able to derive at least (17-a) and (17-b).

- (17) a. **'D/ND-patterns'**: English *A, B and C*, Hungarian *A, B és C* (Szabolcsi 2015), Serbo-Croatian *A (i) B i C*
- b. **'D-only patterns'**: Hungarian *A is B is (és) C is* (Szabolcsi 2015), Serbo-Croatian *i A i B i C*
- c. **'ND-only patterns'**: unclear if *iterative* examples exist; not attested in our current data set

Crucially, for the purposes of the typology in (17), we did not limit our attention to morphosyntactically 'unmarked' predicates. For instance, in many languages distributivity markers that appear on the predicate and semantically correspond to English *each* are necessary to get a distributive interpretation of a coordinate structure wrt. certain predicates. In these languages, if the predicate appears without the distributivity marker, only the non-distributive interpretation is present: In the Basa'a examples presented above ((9-a), (9-b)), the two conjunction strategies in (9-a) and (9-b) – with and without the predicate-level marker – are both relevant for the classification of the conjunction pattern. So *A, B ni C* in Basa'a would count as a D/ND-pattern although neither of the specific examples (9-a) and (9-b) is ambiguous between a distributive and a non-distributive interpretation, as the interpretation depends on the specific *strategy* (with or without the marker).

2.2 Lexical and derived meanings of conjunctive iterative coordination

The semantic variation between conjunctive iterative coordination patterns does not necessarily require more than one lexical meaning for the binary operator COORD, because (non-)distributivity can also be determined by other operators that apply within the coordinate structure, or by the predicate. At the level of a single language, if the language has conjunctive iterative coordination of individual-denoting expressions at all, there are three logical possibilities for the analysis of COORD.

- (18) a. **The non-distributive interpretation reflects the single lexical meaning of COORD.** The distributive interpretation is derived using additional operations, such as μ -particles or distributivity operators applying to the predicate.
- b. **The distributive interpretation reflects the single lexical meaning of COORD.** The non-distributive interpretation is derived using additional operations, such as the type-shifts proposed in Winter (2001).
- c. **The distributive and the non-distributive interpretation reflect different lexical meanings for COORD.**

Before we turn to our cross-linguistic claims, we briefly review how these theoretical options can

be implemented.

A non-distributive analysis (\rightarrow (18-a)) : The most common way of implementing (18-a) is to assume that COORD denotes a sum operation in the individual domain ((20-a), Link 1983).⁶ This raises the question how the distributive reading of (19) should be accounted for. (19) can be judged true in a scenario in which John, Mary and Sue earned 100 euros each, but in this scenario the sum John \oplus Mary \oplus Sue will presumably not be in the extension of *earned exactly 100 euros*, since their earnings add up to 300 euros. One potential solution would be to introduce a **distributivity operator** that shifts the type e denotation of the subject to a distributive quantifier denotation, as in (20-b).⁷ The result of applying D_1 after COORD is equivalent to the output of the ‘Boolean’ analysis in (2). Another way of deriving the distributive interpretation, adopted by Link (1987), Roberts (1987), Schwarzschild (1996) among others, is to introduce a distributivity operator that modifies the predicate rather than the subject, like D_2 in (20-c). For example (19), the two approaches yield the same result, but as we will see below, they are not fully equivalent and also make different cross-linguistic predictions. The intermediate semantic composition steps for these two potential structures of (19) are shown in (21) and (22) below.

(19) John, Mary and Sue earned exactly 100 euros.

(20) potential implementation of (18-a)

- a. $\llbracket \text{COORD}_e \rrbracket = \lambda x_e. \lambda y_e. x \oplus y$
- b. $\llbracket D_1 \rrbracket = \lambda x_e. \lambda P_{\langle e,t \rangle}. \forall y \leq_a x. P(y) = 1$
- c. $\llbracket D_2 \rrbracket = \lambda P_{\langle e,t \rangle}. \lambda x_e. \forall y \leq_a x. P(y) = 1$

- (21)
- a. $\llbracket [D_1 [\text{John COORD}_e [\text{Mary COORD}_e \text{Sue}]] [\text{earned 100 euros}] \rrbracket$
 - b. $\llbracket [\text{John COORD}_e [\text{Mary COORD}_e \text{Sue}]] \rrbracket = j \oplus m \oplus s$
 - c. $\llbracket [D_1 [\text{John COORD}_e [\text{Mary COORD}_e \text{Sue}]] \rrbracket = \lambda P_{\langle e,t \rangle}. \forall y \leq_a j \oplus m \oplus s. P(y) = 1$
 - d. $\llbracket [(21\text{-a})] \rrbracket = 1 \text{ iff } \forall y \leq_a j \oplus m \oplus s. \llbracket [\text{earned 100 euros}] \rrbracket (y) = 1$

- (22)
- a. $\llbracket [[\text{John COORD} [\text{Mary COORD} \text{Sue}]] [D_2 [\text{earned 100 euros}]] \rrbracket$
 - b. $\llbracket [\text{John COORD} [\text{Mary COORD} \text{Sue}]] \rrbracket = j \oplus m \oplus s$
 - c. $\llbracket [D_2 [\text{earned 100 euros}]] \rrbracket = \lambda x_e. \forall y \leq_a x. \llbracket [\text{earned 100 euros}] \rrbracket (y) = 1$

⁶In this type of analysis, the semantic domain D_e , i.e. the set of possible denotations for constituents of type e , contains not only “atomic individuals” such as John or Mary, but also “plural individuals” such as the plural individual consisting of John, Mary and Sue. Plural individuals are formed by a sum operation defined on D_e , which we write as \oplus . More formally, we assume that there is a set $A \subseteq D_e$ of atomic individuals, a binary operation \oplus on D_e and a function $f : (\mathcal{P}(A) \setminus \{\emptyset\}) \rightarrow D_e$ such that: 1) $f(\{a\}) = a$ for any $a \in A$ and 2) f is an isomorphism between the structures $(\mathcal{P}(A) \setminus \{\emptyset\}, \cup)$ and (D_e, \oplus) . This means that there is a one-to-one correspondence between plural individuals and nonempty sets of atomic individuals. In addition, we will use the notions in (i), following much of the literature on plural semantics.

- (i) For any $a, b \in D_e, S \subseteq D_e$:
- a. $a \leq b \Leftrightarrow a \oplus b = b$ (“ a is a part of b ”)
 - b. $a \leq_a b \Leftrightarrow a \leq b \wedge a \in A$ (“ a is an atomic part of b ”)
 - c. $\oplus S = f(\cup\{f^{-1}(x) \mid x \in S\})$ (the sum of all individuals in S)

For our purposes, it is not crucial whether the denotations of semantically plural expressions are identified with sets of individuals, cf. Van der Does 1992, Schwarzschild 1996, Winter 2001 for discussion.

⁷We assume that the extension of a predicate modified by a distributivity operator can also include atomic individuals.

- d. $\llbracket(22\text{-a})\rrbracket = 1$ iff $\forall y \leq_a j \oplus m \oplus s. \llbracket\text{earned 100 euros}\rrbracket(y) = 1$

A distributive analysis (\rightarrow (18-b)) Under an analysis of the type (18-b), the distributive interpretation of (19) falls out from the lexical meaning of the coordinator. Following Partee & Rooth (1983), we can assume that this meaning is defined in a unified way for all types that “end in t ”, thus accounting for the cross-categorial applicability of conjunction.

- (23) t -conjoinable type (cf. Partee & Rooth 1983:(4))
 The set TC of t -conjoinable types is the smallest set of semantic types such that:
- $t \in TC$.
 - If $b \in TC$, then for all a , $\langle a, b \rangle \in TC$.

In order to account for conjunctions of individual-denoting expressions, we need an operation that shifts the denotations of these expressions to a t -conjoinable type (24-c). Given this operation, we can easily derive the distributive reading of (19) by assigning it the structure in (25-a) and using the meaning given in (2-a) above for quantifier conjunction, which is a special case of Partee & Rooth’s (1983) cross-categorial meaning.

- (24) a. $\llbracket\text{COORD}_t\rrbracket = \lambda p_t. \lambda q_t. p \wedge q$, where \wedge is the truth-functional conjunction operation of classical propositional logic.
 b. For every type $b \in TC$ and every type a :
 $\llbracket\text{COORD}_{\langle a, b \rangle}\rrbracket = \lambda P_{\langle a, b \rangle}. \lambda Q_{\langle a, b \rangle}. \lambda x_a. \llbracket\text{COORD}_a\rrbracket(P(x))(Q(x))$ (cf. Partee & Rooth 1983)
 c. $\llbracket\uparrow\rrbracket = \lambda x_e. \lambda P_{\langle e, t \rangle}. P(x)$ (cf. Montague 1973)
- (25) a. $\llbracket[\uparrow \text{John}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Sue}]] \llbracket\text{earned 100 euros}\rrbracket\rrbracket$
 b. $\llbracket\uparrow \text{John}\rrbracket = \lambda P_{\langle e, t \rangle}. P(j)$, $\llbracket\uparrow \text{Mary}\rrbracket = \lambda P_{\langle e, t \rangle}. P(m)$, $\llbracket\uparrow \text{Sue}\rrbracket = \lambda P_{\langle e, t \rangle}. P(s)$
 c. $\llbracket[\uparrow \text{John}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Sue}]] = \lambda P_{\langle e, t \rangle}. P(j) \wedge P(m) \wedge P(s)\rrbracket$
 d. $\llbracket(25\text{-a})\rrbracket = 1$ iff $\llbracket\text{earned 100 euros}\rrbracket(j) \wedge \llbracket\text{earned 100 euros}\rrbracket(m) \wedge \llbracket\text{earned 100 euros}\rrbracket(s)$

In this case, it is the non-distributive interpretation of (19) that requires some additional effort. Winter (2001) proposes a solution to this problem by positing two (independently motivated) additional semantic operations, which we will call MIN and \exists . (We present a slightly modified version of his analysis that treats pluralities as individuals (type e) rather than predicates (type $\langle e, t \rangle$), in order to maintain consistency with the rest of this paper.⁸)

First, MIN maps the quantifier (26-b), which is derived in the usual way, to a set that contains the sums of all minimal elements of the quantifier denotation. A minimal element of a quantifier denotation is a set S such that S itself is an element of the quantifier denotation but no proper subset $S' \subset S$ is. In the case of our example (19), which does not involve disjunction or indefinites inside the coordinate structure, this set is a singleton as the only such minimal element is $\{j, m, s\}$. Unlike Winter, we map this set to the plurality $j \oplus m \oplus s$ – while this is not crucial for our arguments, it allows us to maintain a uniform semantic type, $\langle e, t \rangle$, for distributive and non-distributive predicates. In order to combine the predicate with the set in (26-d), which is also of type $\langle e, t \rangle$, Winter introduces a silent existential quantifier \exists .

- (26) a. $\llbracket[\exists [\text{MIN} [\uparrow \text{John}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e, t \rangle, t \rangle} [\uparrow \text{Sue}]]]] \llbracket\text{earned 100 euros}\rrbracket\rrbracket$

⁸We also gloss over some details of Winter’s system, such as his use of choice function variables within the individual conjuncts, since they do not affect the cross-linguistic argument to be made below.

- b. $\llbracket [\uparrow \text{John}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} \llbracket [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} [\uparrow \text{Sue}] \rrbracket \rrbracket = \lambda P_{\langle e,t \rangle}. P(j) \wedge P(m) \wedge P(s)$
- c. $\llbracket \text{MIN} \rrbracket = \lambda \mathcal{P}_{\langle \langle e,t \rangle, t \rangle}. \lambda x_e. \exists Q_{\langle e,t \rangle}. [\mathcal{P}(Q) \wedge \forall Q'_{\langle e,t \rangle} [Q' \subseteq Q \wedge \mathcal{P}(Q') \rightarrow Q' = Q] \wedge x = \oplus Q]$
- d. $\llbracket \text{MIN} \llbracket [\uparrow \text{John}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} \llbracket [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} [\uparrow \text{Sue}] \rrbracket \rrbracket$
 $= \lambda x_e. \exists Q_{\langle e,t \rangle}. [Q(j) \wedge Q(m) \wedge Q(s) \wedge \forall Q'_{\langle e,t \rangle} [Q' \subseteq Q \wedge Q'(j) \wedge Q'(m) \wedge Q'(s) \rightarrow Q' = Q] \wedge x = \oplus Q]$
 $= \lambda x_e. \exists Q_{\langle e,t \rangle}. [Q = \{j, m, s\} \wedge x = \oplus Q]$
 $= \lambda x_e. x = j \oplus m \oplus s$
- e. $\llbracket \exists \rrbracket = \lambda P_{\langle e,t \rangle}. \lambda Q_{\langle e,t \rangle}. \exists x_e [P(x) \wedge Q(x)]$
- f. $\llbracket \exists \llbracket \text{MIN} \llbracket [\uparrow \text{John}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} \llbracket [\uparrow \text{Mary}] \text{COORD}_{\langle \langle e,t \rangle, t \rangle} [\uparrow \text{Sue}] \rrbracket \rrbracket \rrbracket$
 $= \lambda Q_{\langle e,t \rangle}. \exists x_e [x = j \oplus m \oplus s \wedge Q(x)] = \lambda Q_{\langle e,t \rangle}. Q(j \oplus m \oplus s)$

An ambiguity-based analysis (\rightarrow (18-c)) : Finally, we could also try to account for D/ND-patterns without any additional operators, by simply positing a non-distributive lexical entry for COORD (27-a) in addition to a distributive one (27-c). The semantic variation between D-only strategies and D/ND-strategies could be accounted for by stipulating that some conjunction patterns lack a lexical entry corresponding to (27-a).⁹

(27) potential implementation of (18-c)

- a. $\llbracket \text{COORD}_1 \rrbracket = \lambda x_e. \lambda y_e. x \oplus y$
- b. $\llbracket \uparrow \rrbracket = \lambda x_e. \lambda P_{\langle e,t \rangle}. P(x)$
- c. $\llbracket \text{COORD}_2 \rrbracket = \lambda P_{\langle \langle e,t \rangle, t \rangle}. \lambda Q_{\langle \langle e,t \rangle, t \rangle}. \lambda R_{\langle e,t \rangle}. P(R) \wedge Q(R)$
- d. $\llbracket [A \text{COORD}_1 B] P \rrbracket = \llbracket P \rrbracket (\llbracket A \rrbracket \oplus \llbracket B \rrbracket)$
- e. $\llbracket [[\uparrow A] \text{COORD}_2 [\uparrow B]] P \rrbracket = 1$ iff $\llbracket P \rrbracket (A) = 1$ and $\llbracket P \rrbracket (B) = 1$, 0 otherwise

So, could any of the three analyses in (18) hold **universally** (among languages that have conjunctive iterative coordination of individual-level expressions)? The ambiguity theory (18-c) is unlikely to be universally correct since Dowty (1987) provides independent evidence that at least for some D/ND-patterns, the ambiguity is due to the predicate rather than the subject (and thus the coordinator): The English sentence (28) is ambiguous between a distributive and a non-distributive reading of the predicate *had exactly one glass of wine*. It can therefore be true in a scenario where Mary and John drank exactly one glass each. Assuming a simple implementation of the ambiguity thesis like (27) above, this reading requires the use of COORD₂ to account for the distributive interpretation of the coordinate structure wrt. the predicate *had exactly one glass of wine*. However, this conflicts with the requirement that COORD₁ is needed to license the collective predicate *met in the bar*.

(28) Mary and John met in the bar and had exactly one glass of wine.

Examples like (28) show that for ambiguous predicates like *had exactly one glass of wine*, one of the two readings must be derivable from the other using a predicate-level operation. This is compatible with the non-distributive analysis, where the operation D₂ was needed for independent reasons, but also with the distributive analysis, where nothing prevents us from positing D₂ in addition to MIN and \exists . But if a predicate-level operation of this kind is available anyway, there is no need for the lexical ambiguity posited in (27). Strictly speaking, this does not show that the ambiguity hypothesis is incorrect, as there could be a lexical ambiguity of conjunction *in addition* to the predicate-level shift. But, all else being equal, a more parsimonious account that assumes

⁹This analysis has recently been revived on the basis of a cross-linguistic argument by Sudo (2015) for predicate (but not for type *e*) conjunction.

only one mechanism for deriving distributive and non-distributive readings is to be preferred. In the remainder of this article, we will therefore focus on analyses that do not assume a lexical ambiguity of COORD.

This leaves us with two hypotheses: The ‘distributive’ hypothesis in (18-b) and the ‘non-distributive’ hypothesis in (18-a). Above, we showed that both approaches can account for D/ND-patterns. Two assumptions were implicit in our discussion: First, we did not impose any syntactic restrictions on the operators D_1 and D_2 (for the non-distributive analysis) or the operators MIN and \exists (for the distributive analysis). Second, we assumed that one of the two readings can be derived without any additional operators, i.e. the type or category shifts we assumed were not needed to ensure interpretability of a coordinate structure. If these assumptions were universally valid for iterative conjunction, we would not expect to find D-only patterns such as Hungarian *A is B is (és) C is* or Serbo-Croatian *i A i B i C* (cf. Section 2.1 above). Rather, all iterative conjunction patterns would be predicted to be ambiguous. In order to accommodate D-only patterns, we therefore need to assume certain constraints on the distribution of these operators, which could either be implemented in the syntax or made to follow from a different semantic analysis of the coordinate structures. Under the non-distributive analysis, we would have to assume that certain conjunction patterns always co-occur with a distributivity operator such as D_1 . The distributive analysis requires us to say that certain conjunction patterns cannot co-occur with MIN and \exists in the way shown above. In the absence of additional empirical evidence, the existence of D-only patterns does not support either of the two approaches since neither of the two potential syntactic constraints receives independent motivation from what we have said so far. So the obvious question is: Are the two hypotheses – (18-b) and (18-a) – when interpreted as cross-linguistic claims about iterative conjunction, actually empirically distinguishable?

2.3 Interim summary

We just outlined three semantic positions on the lexical meaning of COORD and discussed how they derive the observed semantic variation. Even though the three positions are superficially similar in this respect, we ruled out one of them – lexical ambiguity, following Dowty (1987). This leaves us with the ‘distributive’ and the ‘non-distributive’ analysis, which can both account for D/ND-patterns when combined with certain additional semantic operations. Both are also compatible with the D-only patterns, provided certain restrictions on these additional operations apply. The question that we are facing now is how to distinguish the two positions empirically. Our discussion has so far focused on the meaning of coordinate structures and largely ignored their formal properties, as well as any correlation between the two. One promising way of finding additional evidence is to look at the overt morphosyntactic markers found in coordinate structures in addition to their meanings. Cross-linguistic correlations between distributivity and morphosyntactic properties could provide independent evidence for one of the two analyses.

3 (Non-)distributivity and formal markedness

In this section, we motivate our main empirical claims and argue that they support a certain cross-linguistic approach to distributivity. We show that the markedness patterns within the coordinate structure itself support a non-distributive lexical meaning for COORD. We then address the question why we did not find any ND-only strategies, and argue that the predicate-level distributivity operator D_2 is available cross-linguistically, at least in languages having iterative type *e* conjunction. Additional support for this theoretical claim comes from the markedness relations between

the C-predicates in distributive and non-distributive sentences. We formulate an empirical generalization about C-predicates which, if it is cross-linguistically valid, reveals the derived nature of the distributive interpretation.

3.1 Markedness relations between conjunction patterns

The obvious question, given the empirical situation presented so far, is whether there are any morphosyntactic properties of coordinate structures that are either limited to D-only patterns, or to D/ND-patterns. In particular, are there *semantic* subclasses of conjunctive coordination patterns that are reliably associated with one of the two morphosyntactic subclasses discussed above (and repeated in (29))?

- (29) (= (7)) Conjunction patterns (modulo linear ordering of COORD/ μ and conjuncts)
- a. A- μ (COORD) B- μ (COORD) C- μ
 - b. A (COORD) B (COORD) C

As mentioned in Section 2.1, some languages have D-only patterns involving conjunction particles, which might suggest that the presence of conjunction particles always implies a D-only interpretation. However, this is not the case: Szabolcsi (2015) points out that the Japanese conjunction marker *-to* behaves like a conjunction particle, but is not limited to the distributive reading and hence a D/ND-pattern.

- (30) Japanese (Szabolcsi 2015:182, (48))
 A-to B(-to) de 100 kg ni naru.
 ‘A and B weigh 100 kg’
- a. distributive: ‘A weighs 100 kg and B weighs 100 kg.’
 - b. non-distributive: ‘A and B weigh 100 kg together.’

This observation indicates that even if the binary coordinator makes the same semantic contribution cross-linguistically, conjunction particles do not. In particular, analyses like Mitrović & Sauerland (2014) and Szabolcsi (2015), which derive a distributive, but no non-distributive interpretation for structures with conjunction particles, cannot be extended to all such structures that we find cross-linguistically. This does not invalidate these analyses¹⁰, but shows that they will have to be supplemented with an account of conjunction particles that do not enforce distributivity.

There is also no strict implication in the other direction, since D-only patterns do not always involve conjunction particles (in the formal sense that each conjunct is marked). One example of this pattern is given in (31), from Modern Greek. While (31-a) is a D/ND-pattern¹¹, (31-b) with the additional marker *ala* (glossed by our consultant as ‘but’) is a D-only pattern at least for some speakers.

¹⁰We should point out that these works do not make any strong claims about the relation between conjunction particles and distributivity. Mitrović & Sauerland (2014) assume that type *e* conjunction always involves (possibly null) conjunction particles and do not discuss non-distributive interpretations. However, one could combine their analysis of (29-a) with an account of (29-b) that generates both interpretations, and thus predict a straightforward correlation between D-only patterns and conjunction particles. Szabolcsi (2015) explicitly notes that her analysis is not intended to apply to all structures that involve conjunction particles in our purely formal sense (as the case of Japanese *-to* shows).

¹¹While example (31-a) lacks a distributive interpretation according to our consultant, this interpretation can be obtained by adding a distributivity marker to the predicate. Since this manipulation leaves the coordinate structure unchanged, the conjunction pattern itself counts as ambiguous.

- (31) a. O Janis, i Maria ce o Kostas cerdisan ekato evro
 the John.NOM the Maria.NOM COORD the Kostas.NOM won a hundred euros
 akrivos
 exactly
 ‘John, Maria and Kostas won exactly a hundred euros.’ (non-distributive interpretation)
- b. O Janis, o Kostas ala ce i Maria kerdisan ekato euro
 the John.NOM the Kostas.NOM but COORD the Maria.NOM won a hundred euros
- ‘John, Kostas and Maria won a hundred euros.’ (only distributive interpretation)
 (Modern Greek, examples contributed by Nikolaos Angelopoulos on TerraLing¹²)

Although (31-b) is formally marked relative to (31-a), the additional marker *ala* does not count as a conjunction particle in our sense since it only appears once in the coordinate structure (although it might of course share more abstract syntactic/semantic properties with conjunction particles). This suggests that there is no strict implicational relation (in either direction) between distributivity and the presence of conjunction particles. However, following Szabolcsi (2015), we think that there *are* form-meaning correlations to be found in this domain – but that they concern the markedness relations between different conjunction patterns within a language, rather than ‘absolute’ formal properties of a single conjunction pattern, such as the presence of conjunction particles. In particular, Szabolcsi (2015) draws attention to the fact that several languages have conjunction patterns that exhibit one of the properties in (32):

- (32) a. A COORD B is a D/ND-pattern, but A- μ (COORD) B- μ is a D-only pattern.
 b. For some marker M appearing in coordinate structures, A M B is a D/ND-pattern, but A-M B-M is a D-only pattern.

(32-a) suggests that one common function of conjunction particles is to “remove” the non-distributive interpretation of a coordinate structure that, by itself, allows both interpretations. Szabolcsi provides examples of the pattern (32-a) from Hungarian (33).

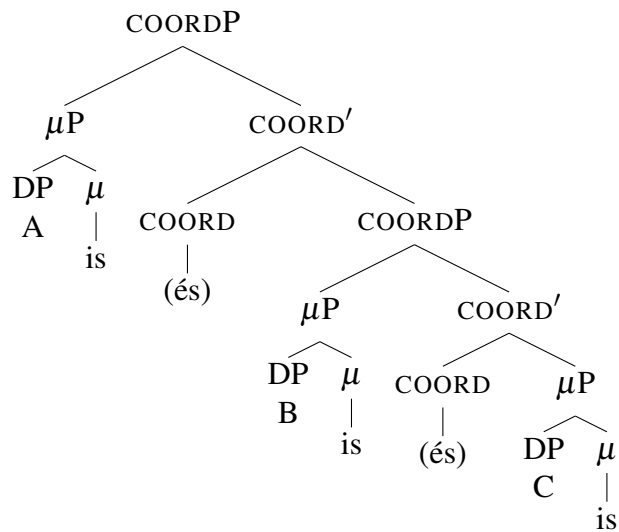
- (33) Hungarian (Szabolcsi 2015:180f., (44), (45))
- a. Kati is (és) Mari is 100 kilót nyomott.
 Kate too COORD Mary too 100 kg weighed
 ‘Kate as well as Mary weighed 100 kg.’ (distributive only)
- b. Kati és Mari 100 kilót nyomott.
 Kate COORD Mary 100 kg weighed
 ‘Kate and Mary weighed 100 kg.’ (distributive or non-distributive)

Taking the formal pattern in (33) at face value, it seems that (33-a) involves additional syntactic structure in addition to the binary coordinator COORD, which is also present in (33-b). This additional structure can have a semantics that combines with the meaning of COORD to yield a distributive interpretation of the entire coordinate structure (although, as the Japanese data in (36) show, this is not universally the case). One simple way of implementing this intuition would be that (33-a) has a syntactic structure along the lines of (34-a), with an additional head spelled out as the conjunction particle, while (33-b) has a structure like (34-b) where the additional heads are absent

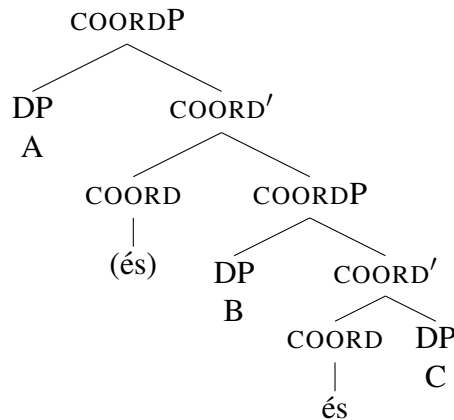
¹²<http://test.terraling.com/groups/8/examples/16097>, <http://test.terraling.com/groups/8/examples/16119>

(cf. Mitrović & Sauerland 2014, Szabolcsi 2015).¹³

(34) a.



b.



The pattern in (32-b) is found in several Slavic languages and illustrated by the Serbo-Croatian ex-

¹³We follow previous work on conjunction particles (den Dikken 2006, Mitrović & Sauerland 2014, Szabolcsi 2015) in assuming an X-bar structure for coordination in which COORD projects a phrase COORDP and the conjuncts are in its specifier and complement. Still, the syntactic structure of coordination – i.e. (34) – raises many unsolved problems within the P&P framework (cf. Progovac 1998 for an overview). First, the Coordinate Structure Constraint and the exceptional properties of ATB-movement (cf. Ross 1967, Williams 1978) remain unexplained given this structure – even if we can somehow ban movement from the specifier, movement from the complement, but not the specifier should be possible, contrary to fact. Second, problems arise wrt. scope and binding in coordinate structures: While semantic binding data like (i) support a c-command asymmetry between conjuncts, Principle A and B effects do not and the relevance of Principle C data is disputed (Progovac 1998).

(i) German

- a. [Jeder Teilnehmer]_i und seine_{i/j} Partnerin haben sich getroffen.
'Every [male] participant and his [female] partner met.'
- b. Seine_{*i/j} Partnerin und [jeder Teilnehmer]_i haben sich getroffen.
'His [female] partner and every [male] participant met.'

Third, if COORD and μ have head-status, the notion of syntactic category must be revised: Conjunctions with conjuncts of the same category X have a distribution that is almost identical to the distribution of a single constituent of category X. In the literature it has been proposed that COORD agrees in its categorial features with its specifier, or with both of its arguments (cf. Progovac 1998 for discussion). While this is plausible, we are not aware of any detailed implementation within a mainstream theory of projection (although implementations of different approaches to this distributional pattern exist in non-transformational frameworks, e.g. GPSG (Gazdar et al. 1985)). In addition, the notion that all coordinate structures have a common syntactic category COORDP falsely predicts that it should be possible for other syntactic heads to select for a COORDP, but disregard the exact syntactic categories of the conjuncts.

amples discussed in (8)/(14) above and repeated in (35): (35-a) is ambiguous between a distributive and a non-distributive interpretation, (35-b) seems to be limited to a distributive interpretation.¹⁴

- (35) a. Jana (i) Ivan i Milan su zaradili tačno sto evra.
b. I Jana i Ivan i Milan su zaradili tačno sto evra.

Mitrović & Sauerland (2014) and Szabolcsi (2015) propose to analyze the pattern in (35-b) in exactly the same way as (33-b), i.e they assume that *i* in (35-b) spells out an additional syntactic head on each of the conjuncts, just like *is* in Hungarian. In (35-a), on the other hand, *i* has the function of COORD and the additional head is not present on any of the conjuncts. To make this account work for Serbo-Croatian, we need to assume that one and the same marker, *i*, can be ambiguous between the functions of coordinators and conjunction particles, and that COORD has to be null in the presence of conjunction particles (cf. Mitrović & Sauerland 2014 for a cross-linguistic argument supporting this analysis). But even if one does not want to assign the same syntactic structure to the two formally ‘marked’ patterns in Hungarian and Serbo-Croatian, there is an interesting parallel in that the formally marked pattern is a D-only pattern while the unmarked one is a D/ND-pattern.

This raises the question whether we ever find the reverse situation, i.e. a D/ND-pattern that is marked by additional morphosyntactic material relative to a D-only pattern. There are no examples of this in the literature or in our Terraling data set. That is, it seems that additional morphological marking within the coordinate structure never “adds” a non-distributive interpretation to a D-only pattern. Further, additional marking never seems to “remove” the distributive interpretation of an iterative conjunction pattern, although this constraint might follow from a more general lack of iterative ND-only patterns. The formal patterns discussed by Mitrović & Sauerland (2014) and Szabolcsi (2015), as well as our own data set, therefore lead us to the following generalization:

Empirical hypothesis A: For any pair of iterative coordination patterns within a language that have a conjunctive meaning and apply to proper names, where one pattern can be obtained from the other by adding “additional markers” (e.g. conjunction particles or repetition of the coordinator):

- a) If the **marked** pattern allows for a **non-distributive** interpretation, so does the unmarked pattern.
b) If the **unmarked** pattern allows for a **distributive** interpretation, so does the marked pattern.

At present, we do not know whether our empirical hypothesis A reflects a universal property of iterative type *e* conjunction patterns or merely a tendency. If it turned out to be universal, it could be the starting point for a new argument in favor of a *non-distributive* lexical meaning of COORD; therefore, we consider the theoretical consequences of this putative universal worth exploring.

3.2 Consequences for the analysis of COORD

Informally speaking, our point is that the apparent formal markedness of D-only patterns relative to D/ND-patterns is easier to derive if a non-distributive lexical meaning of COORD is assumed.

In order to make this argument more precise, we have to consider several additional parameters that interact with the lexical meaning of COORD to produce the range of interpretations actually

¹⁴Jovana Gajić (p.c.) states she is not 100% sure about this.

available for a certain lexical choice of COORD in a given language. For the purposes of this comparison, we will make two simplifying assumptions: First, we assume that the operators *inside* the coordinate structure that give rise to the derived reading, i.e. D_1 for the non-distributive analysis and MIN/\exists for the distributive analysis, are available in every language that has iterative conjunction of proper names. Hence, for the time being, we ignore the possibility that a language could have iterative conjunction of proper names, but lack these operators. Second, we ignore the possibility that a language could have two formally unrelated conjunction patterns, or a formally marked and a formally unmarked pattern that are semantically equivalent. The latter in particular is really just a simplification, not a prediction regarding which languages exist: As the examples in (36) and (37) show, both formally unrelated patterns (German) and formally related but semantically equivalent patterns (Japanese) are attested.¹⁵ We will show how our argument extends to such cases in Section 4, but ignore them for the moment.

(36) Japanese (Szabolcsi 2015:182, (48))

A-to B(-to) de 100 kg ni naru.

‘A and B weigh 100 kg’

a. distributive: ‘A weighs 100 kg and B weighs 100 kg.’

b. non-distributive: ‘A and B weigh 100 kg together.’

(37) German

a. Sowohl die Anna als auch die Maria als auch die Eva hat/haben genau 100 Euro
as.well the Anna as also the Maria as also the Eva has/have exactly 100 euros
gewonnen.

won

‘Anna, Maria and Eva won exactly 100 euros (each).’ (distributive only)

b. Die Anna (und) die Maria und die Eva haben genau 100 Euro gewonnen.

the Anna and the Maria and the Eva have exactly 100 euros won

‘Anna, Maria and Eva won exactly 100 euros.’ (ambiguous between distributive and non-distributive)

With these simplifications in place, let us look at the additional parameters we have to take into account when evaluating theories of COORD. First, we must consider the possibility that the C-predicate itself has only one interpretation – the non-distributive one – and distributivity is determined exclusively by the coordinate structure. If so, the predictions depend on the lexical meaning of COORD as well as the way the coordinate structure is spelled out (cf. Table 1). The additional operators inside the coordinate structure can be spelled out overtly, in which case we generate two formally distinct patterns, but they can also be null, in which case we generate one pattern that has both interpretations. If the additional operators *have* to be spelled out overtly whenever they are present, the pattern with the operators only has the derived interpretation, and the pattern without the operators only has the basic interpretation. Regardless of the question which interpretation is the basic one, this situation is unattested in our sample because we do not have any clear examples of iterative ND-only patterns. Another possibility, which is empirically more plausible, is that it could be *optional* for the additional operators to be overt. If so, we generate a formally unmarked D/ND-pattern and a marked pattern that only has the derived interpretation. Under the assumption that the lexical meaning of COORD is non-distributive and the distributive interpretation is derived, this corresponds exactly to the situation discussed in Section 3.1, with an unmarked D/ND-pattern and a marked D-only pattern. A distributive lexical meaning, however, would not lead us to expect

¹⁵Examples with more than two conjuncts for the *sowohl ... als auch* pattern are accepted by some, but not all speakers.

meaning of COORD	(non-)distributivity markers in coordination	predicted pattern	attested
non-distributive	always null	only one D/ND-pattern	yes
non-distributive	null and overt	marked D-only pattern, unmarked D/ND-pattern	yes
non-distributive	always overt	marked D-only pattern, unmarked ND-only pattern	no
distributive	always null	only one D/ND-pattern	yes
distributive	null and overt	marked ND-only pattern, unmarked D/ND-pattern	no
distributive	always overt	marked ND-only pattern, unmarked D-only pattern	no

Table 1: Predictions for conjunction strategies *without* a predicate-level distributivity operator

this situation, and would instead predict the existence of D/ND-patterns that are unmarked relative to an ND-only pattern – a pattern unattested in our sample. We conclude that the non-distributive lexical meaning is empirically more adequate. This argument is summarized in Table 1.

Recall that we also observed the lack of ND-only patterns in our sample. We do not know whether it generalizes to a larger data set, so we formulate it an additional hypothesis for our cross-linguistic study.

Empirical hypothesis B: There are no iterative ND-only patterns, i.e. there are no conjunctive coordination patterns that allow for more than two conjuncts and are limited to a non-distributive interpretation.

Now, under the assumption that C-predicates are unambiguous, hypothesis B remains unexplained. In order to derive it, we would have to stipulate that distributivity operators inside the coordinate structure must always have a null realization (possibly in addition to an overt one). However, this problem does not arise if we posit predicate-level distributivity operators like D_2 . As we saw in Section 2, in connection with Dowty’s (1987) argument against the ambiguity theory, such operators are needed at least in some languages. If D_2 can apply optionally and freely, without any syntactic dependencies between D_2 and the coordinate structure, *any* coordinate structure should allow for a distributive interpretation regardless of its internal semantics. Therefore, if hypothesis B turned out to be correct, it would seem plausible to assume that D_2 is universally available. In other words, we submit that ND-only patterns do not exist because C-predicates can receive a distributive interpretation via a mechanism that is unrelated to the coordinate structure: The availability of predicate-level distributivity operators (see below for their morphological realization). Under this assumption, the predictions of the two lexical analyses of COORD change (cf. Table 2): The non-distributive analysis no longer predicts the existence of ND-only patterns that are unmarked relative to a D-only pattern. Rather, even in a language where D_1 is overt whenever it is present, the unmarked pattern without D_1 allows for distributive interpretations due to the possibility of adding D_2 to the predicate. The distributive lexical meaning, however, would still predict an unattested markedness relation, namely D/ND-patterns that are formally marked relative to a D-only pattern.

Accordingly, the following set of theoretical assumptions makes the most adequate predictions given our current data set.

meaning of COORD	(non-)distributivity markers in coordination	predicted pattern	attested
non-distributive	always null	only one D/ND-pattern	yes
non-distributive	null and overt	marked D-only pattern, unmarked D/ND-pattern	yes
non-distributive	always overt	marked D-only pattern, unmarked D/ND-pattern	yes
distributive	always null	only one D/ND-pattern	yes
distributive	null and overt	one marked and one unmarked D/ND-pattern	yes
distributive	always overt	marked D/ND-pattern, unmarked D-only pattern	no

Table 2: Predictions for conjunction strategies *with* a predicate-level distributivity operator

Theoretical hypothesis I: The lexical meaning of COORD is non-distributive across languages. D-patterns – i.e. conjunction patterns that lack a non-distributive interpretation – contain COORD plus some additional abstract element(s) that is/are responsible for the lack of a non-distributive reading.

Theoretical hypothesis II: Predicate-level distributivity operators are always available in languages that have iterative conjunction of proper names.

Hypothesis II makes another prediction that goes beyond the question whether ND-only patterns exist. Above we discussed examples of the type (38-a), which Dowty (1987) used to argue against the ambiguity theory. Under our assumptions, the reading of (38) in which the second conjunct has a distributive interpretation – i.e. Mary and John had one glass each – requires the operator D_2 .

- (38) a. Mary and John met in the bar and had exactly one glass of wine.
 b. [Mary COORD John] [[met in the bar] and [D_2 [had exactly one glass of wine]]].

If D_2 is indeed universally available (at least in those languages that allow for iterative type *e* conjunction), we should be able to replicate Dowty’s argument for other languages. More precisely, we predict that if a language has an iterative D/ND-pattern and examples like (38-a) can be constructed, it should generally allow for the ‘mixed’ collective/distributive reading expressed by the structure (38-b).¹⁶ We do not know whether this prediction holds. If it turns out to be false, this would suggest that Hypothesis II is too strong and that languages may vary as to whether they have distributivity operators on the predicate, even though every language has some way of deriving distributive interpretations of conjunction.

¹⁶‘can be constructed’ means that the language would have to have VP conjunction that is similar in meaning to English VP-conjunction and that no language-specific syntactic factors restrict the occurrence of D_2 in predicate conjunction.

3.3 (Non-)distributivity marking on the predicate

In addition to the semantic predictions just discussed, our hypothesis II – that every language that has iterative type *e* conjunction also has predicate-level distributivity operators – also makes morphosyntactic predictions: We should expect there to be languages in which D_2 can be expressed overtly, and also languages in which it *has to* be expressed overtly. The first part of this prediction seems to be roughly correct. For instance, English *each*, or German *jeweils* in (39-a), could be analyzed as overt realizations of D_2 (cf. Link 1987, Roberts 1987, Champollion 2016 for *each*, but cf. Zimmermann (2002) for *jeweils*).¹⁷ Under our assumptions, these languages have to be analyzed as possessing an overt and a null lexical entry for D_2 , since the distributive interpretation is also available without an overt marker, even for C-predicates (e.g. (39-b)).

- (39) German
- a. Die Anna (und) die Maria und die Eva haben jeweils genau 100 Euro gewonnen.
the Anna and the Maria and the Eva have each exactly 100 euros won
'Anna, Maria and Eva won exactly 100 euros each.' (distributive only)
 - b. Die Anna (und) die Maria und die Eva haben genau 100 Euro gewonnen.
the Anna and the Maria and the Eva have exactly 100 euros won
'Anna, Maria and Eva won exactly 100 euros.' (= (37-b); ambiguous between distributive and non-distributive)

If languages like German or English possess two lexical entries for D_2 , we should also find languages that lack the null entry and always have to spell it out overtly. This is exactly what we observe in Basa'a (9-a),(9-b) or Greek. Such languages seem to have distributivity markers that are obligatory in the sense that without the marker, only non-distributive interpretations are available. For instance, according to data provided by Nikolaos Angelopoulos on Terraling, some speakers of Greek accept a distributive reading for (40-b), but not for (40-a).

- (40) a. O Janis, i Maria ce o Kostas cerdisan ekato evro akrivos
the John the Maria and the Kostas won a hundred euros exactly
'John, Maria and Kostas won exactly 100 euros.' (for some speakers: non-distributive only)
- b. O Janis, o Kostas ce i Maria kerdisan o kathenas ekato evro
the John the Kostas and the Maria won the each a hundred euros
'John, Kostas and Maria each won 100 euros.' (distributive only)
Modern Greek (Examples contributed by Nikolaos Angelopoulos on TerraLing)¹⁸)

Like markers appearing inside the coordinate structure, predicate-level markers also show an interesting asymmetry between distributivity and non-distributivity. Many languages have overt markers that force a non-distributive interpretation (41).

- (41) Die Anna (und) die Maria und die Eva haben gemeinsam/zusammen genau 100 Euro
the Anna and the Maria and the Eva have together exactly 100 euros

¹⁷The picture is probably more complex – for instance, the semantic behaviour of German *jeweils* and English *each* does not appear to be exactly the same (Zimmermann 2002). We gloss over these differences as they are orthogonal to the main point.

¹⁸<http://test.terraling.com/groups/8/examples/16097>; <http://test.terraling.com/groups/8/examples/16103>

gewonnen.

won

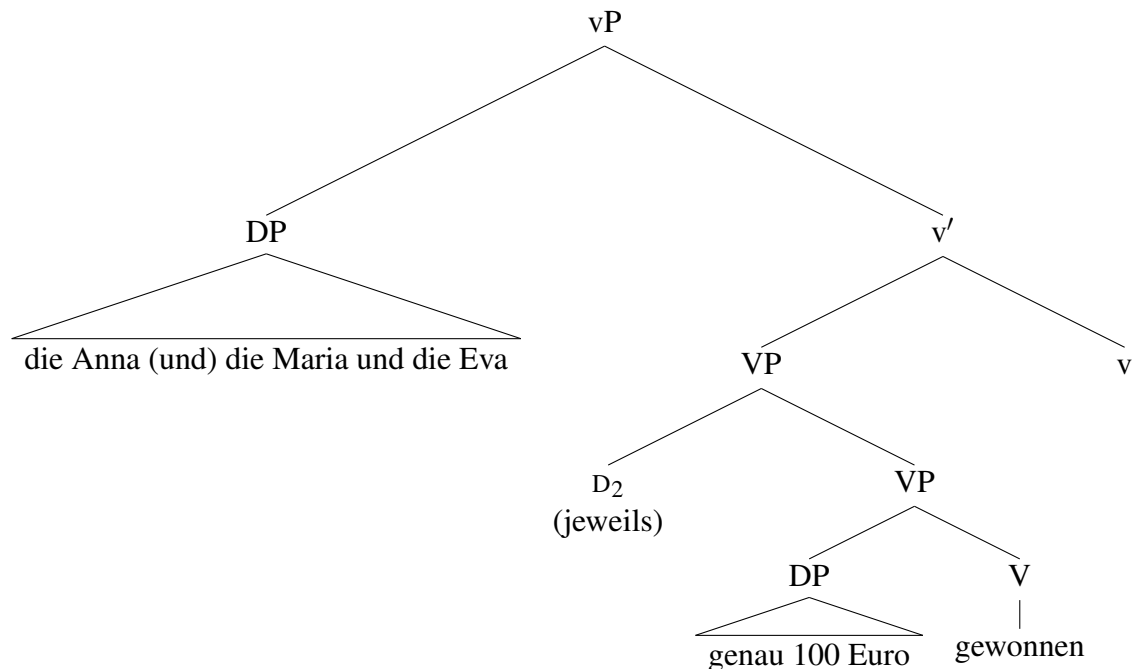
‘Anna, Maria and Eva won exactly 100 euros together.’ (German; non-distributive only)

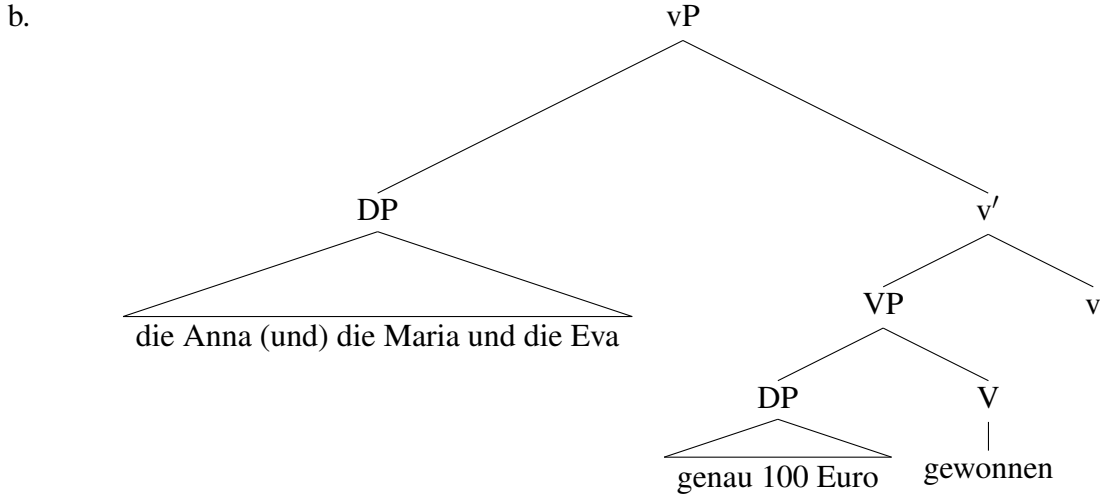
Crucially, however, our data set involves no cases where the non-distributive interpretation of a predicate *has* to be marked overtly, i.e. we have not seen any languages where a certain predicate-level marker is *required* to get a non-distributive interpretation of a C-predicate. This suggests the following empirical hypothesis:

Empirical hypothesis C: There are no predicate-level markers for non-distributivity with the property that for some iterative coordination pattern with a conjunctive meaning, the non-distributive interpretation of a C-predicate is only available if the marker is present.

In a sense, hypothesis C is analogous to hypothesis A above in that distributivity is associated with a type of formal marking that is not attested for non-distributivity. Yet, since predicate-level distributivity markers are not part of the coordinate structure itself, the theoretical implications for our initial question – the cross-linguistic semantics of COORD – are less clear in this case. Unlike hypothesis A, hypothesis C is not a claim about the formal realization of conjunctive coordination, but a claim about the formal realization of C-predicates. One way of deriving hypothesis C would be to say that cross-linguistically the distributive interpretation of such predicates always involves an additional operator in the syntactic structure, which is not present in the case of a non-distributive interpretation. For a language like German in which sentences like (39-b) without overt distributivity marking are ambiguous, this means that (39-a) must have a structure along the lines of (42-a), with an overt realization of D_2 , while (39-b) can correspond to either of the two structures in (42).

(42) a.





Languages like Greek and Basa'a, on the other hand, lack a null lexical entry for D_2 and therefore have to realize it overtly whenever it is present. This entails that, if a sentence with a C-predicate lacks an overt distributivity marker, its structure has to correspond to (42-b) rather than (42-a), which makes it unambiguously non-distributive (assuming a non-distributive interpretation of the coordinate structure itself). In summary, the cross-linguistic pattern suggests that:

Theoretical hypothesis III: The distributive interpretation of C-predicates is universally derived from the non-distributive interpretation by means of distributivity operators along the lines of D_2 (although the exact semantics of these operators may differ across languages).

Further, as discussed above in connection with Dowty's (1987) argument, the fact that D/ND-patterns for iterative conjunction generally allow for a distributive interpretation with C-predicates can be derived from the presence of D_2 . D-only patterns, on the other hand, involve additional syntactic material within the coordinate structure that precludes a non-distributive interpretation. Our theoretical hypothesis III is expected given the empirical hypothesis C, which basically says that if one of the two interpretations is obligatorily marked relative to the other, it is the distributive one. So the empirical hypothesis C provides a new argument for the cross-linguistic availability of operators like D_2 . However, it is logically independent of our assumptions about the semantics of coordinate structures, particularly the claim that the lexical meaning of COORD is universally non-distributive. For instance, Winter's (2001) analysis with a distributive lexical entry for COORD, in the slightly modified version presented here, yields the meaning in (43-b) for the LF in (43-a). This meaning could easily combine with predicates involving D_2 , which would create a distributive/non-distributive ambiguity for the structure (43-a).

- (43) a. $[\exists [\text{MIN} [[\uparrow \text{John}] \text{COORD}_{\langle\langle e,t \rangle, t \rangle} [[\uparrow \text{Mary}] \text{COORD}_{\langle\langle e,t \rangle, t \rangle} [\uparrow \text{Sue}]]]]]$
 b. $\lambda Q_{\langle e,t \rangle}.Q(j \oplus m \oplus s)$

As a final point, we point out that hypothesis III is not a necessary consequence of the semantics of C-predicates, although our previous discussion of such predicates might suggest otherwise. Our lexical entry for D_2 has the consequence that, for a C-predicate P , $[[D_2 P]]$ will only contain individuals x with the property that all atomic parts of x are in $[[P]]$. This means that $[[D_2 P]]$ does not depend at all on the non-atomic individuals in $[[P]]$, as illustrated with a concrete example in (44).

- (44) If a, b, c, d, e, f are pairwise distinct atomic individuals:

- a. $\llbracket \text{earned 100 euros} \rrbracket^w = \{a, b, c \oplus d\}$
- b. $\llbracket \text{earned 100 euros} \rrbracket^{w'} = \{a, b, e \oplus f\}$
- c. $\llbracket D_2 \text{ earned 100 euros} \rrbracket^w = \llbracket D_2 \text{ earned 100 euros} \rrbracket^{w'} = \{a, b, a \oplus b\}$

This would seem to entail that the set $\llbracket P \rrbracket^w$ cannot always be reconstructed from $\llbracket D_2 P \rrbracket^w$, and therefore the possibility that the non-distributive interpretation is the derived one is excluded by the semantics of distributive C-predicates. Nevertheless, there is good reason to assume that (44-c) is not an adequate extension for the distributive version of the C-predicate. The evidence comes from examples of partially distributive readings, which pre-theoretically involve quantification over “subgroups” of a plurality (cf. Link 1984, Landman 1989, Schwarzschild 1996 a.o.): Despite the presence of an overt distributivity operator, (45) is true in the scenario in (46) where no individual person received 100 euros.

- (45) Die Männer und die Frauen haben jeweils 100 Euro bekommen.
the men and the women have each 100 euros received
‘The men and the women each received 100 euros.’ (German)
- (46) SCENARIO: There were five men who received 20 euros each, and ten women who received 10 euros each.

This suggests that the extension of $\llbracket D_2 \text{ 100 Euro bekommen} \rrbracket$ in scenario (46) should contain the sum of $\llbracket \text{die Männer} \rrbracket$ and $\llbracket \text{die Frauen} \rrbracket$, and the sentence is true on its distributive reading if the predicate applies to each of these two subgroups. This intuition can be implemented in different ways – and crucially for our purposes, *some* of them allow us to reconstruct the extension of a non-distributive C-predicate from that of its distributive counterpart. Link (1984) and Landman (1989), for instance, propose an analysis where in addition to the usual atomic individuals and their sums, there are so-called **groups**, i.e. atomic individuals which stand in a one-to-one correspondence with certain sums. E.g. in addition to the sum $j \oplus m \oplus s$, there is an individual $\text{GROUP}(j \oplus m \oplus s)$, which counts as atomic and can itself be part of a sum. Such a system allows us to say that the distributivity operators quantify over the minimal parts of an individual wrt. a certain part-of relation, without requiring that this part-of relation has to go “all the way down” to the atomic individuals in the usual sense. More concretely, Link’s (1984) system permits the following assumptions:¹⁹

- (47) a. The operation GROUP (cf. \uparrow in Landman 1989) maps (certain) sums of individuals to group individuals that count as atomic.

¹⁹Following Link, the internal structure of the individual domain D_e can be formally described as follows (cf. also Landman 1989):

- (i) a. There are nonempty sets A (the set of atomic individuals in the usual sense) and G (the set of all atomic individuals, including groups) such that $A \subseteq G$ and $A \cup G \subseteq D_e$.
- b. A binary operation \oplus is defined on D_e .
- c. There is a function $f : \mathcal{P}(A \cup G) \setminus \{\emptyset\} \rightarrow D_e$ such that i) $f(\{a\}) = a$ for any $a \in A \cup G$ and ii) f is an isomorphism between the structures $(\mathcal{P}(A \cup G) \setminus \{\emptyset\}, \cup)$ and (D_e, \oplus) .
- d. We write PL_A for the set $\{f(S) \mid S \in \mathcal{P}(A) \setminus \{\emptyset\}\}$, i.e. for the set of sums of elements of A (Landman’s ‘pure sums’). Then GROUP is an injective function from PL_A to G such that $\text{GROUP}(a) = a$ for all $a \in A$. Intuitively, GROUP maps each plurality of elements of A to a group such that no two pluralities are mapped to the same group.
- e. SUM is a function from G to PL_A such that $\text{SUM}(a) = a$ for all $a \in A$. Intuitively SUM maps each group to a sum of elements of A (but there may be different groups corresponding to the same sum).
- f. $\forall x \in \text{PL}_A : \text{SUM}(\text{GROUP}(x)) = x$.
- g. The relation \leq_a is defined in terms of \oplus as in footnote 6.

- b. The operation SUM (cf. ↓ in Landman 1989) maps any group to the sum of its members, which is a non-atomic individual unless the group has only one member.
- c. The extensions of non-distributive C-predicates do not contain any proper sums of individuals, but may contain groups. The distributive predicate extension is the closure of the non-distributive predicate extension under sum.

(47) not only allows for a straightforward analysis of (45), but also yields a semantics for distributive C-predicates that enables us to reconstruct the extension of the non-distributive predicate from the distributive one. (48-a) is mapped to the distributive extension (48-c), but we can also define the reverse mapping: (48-a) simply contains the minimal elements of (48-c) wrt. \leq_a , and (48-b) can be reconstructed from (48-d) in the same way.

- (48) If a, b, c, d, e, f are pairwise distinct atomic individuals:
- a. $\llbracket \text{earned 100 euros} \rrbracket^w = \{a, b, \text{GROUP}(c \oplus d)\}$
 - b. $\llbracket \text{earned 100 euros} \rrbracket^{w'} = \{a, b, \text{GROUP}(e \oplus f)\}$
 - c. $\llbracket \text{D}_2 \text{ earned 100 euros} \rrbracket^w = \{a, b, \text{GROUP}(c \oplus d), a \oplus b, a \oplus \text{GROUP}(c \oplus d), b \oplus \text{GROUP}(c \oplus d), a \oplus b \oplus \text{GROUP}(c \oplus d)\}$
 - d. $\llbracket \text{D}_2 \text{ earned 100 euros} \rrbracket^{w'} = \{a, b, \text{GROUP}(e \oplus f), a \oplus b, a \oplus \text{GROUP}(e \oplus f), b \oplus \text{GROUP}(e \oplus f), a \oplus b \oplus \text{GROUP}(e \oplus f)\}$

With this more complex semantics – motivated independently by examples like (45) – we are no longer forced to derive the distributive interpretation from the non-distributive one. In principle, the distributive interpretation could be the basic one and there could be “non-distributivity operators” along the lines of (49), which would predict the reverse morphosyntactic markedness pattern.

- (49) $\llbracket \text{ND} \rrbracket = \lambda P_{\langle e, t \rangle} . \lambda x_e . x \text{ is atomic and } P(x) = 1$

It is therefore a contingent empirical fact that natural languages – at least the ones in our sample – do not work that way.

3.4 Interim summary

Our empirical hypotheses A and C were shown to be logically independent. Informally speaking, however, they point in a similar direction: Cross-linguistically, if there is a morphosyntactic “containment” relation between purely distributive expressions and expressions that allow for a non-distributive interpretation, the purely distributive expression is the formally more complex one. We saw that this holds for two types of expressions: 1) coordinate structures of a certain type with a conjunctive interpretation, and 2) C-predicates. Further, in the latter case, some languages have purely non-distributive C-predicates, while we are not aware of any examples of purely non-distributive iterative conjunction patterns. We proposed to derive these generalizations from certain putative universals concerning the meaning of COORD and the role of distributivity operators. In the next section, we will address some of the morphosyntactic and semantic issues involved in specifying these ideas.

4 Deriving the marked status of D-only patterns

We argued that cross-linguistic data support a specific approach to the semantic variation found in sentences with conjunction and C-predicates. While it is not the goal of this paper to give a syntactic and semantic analysis of all the attested conjunction patterns, we would like to discuss informally what a grammatical account of the markedness generalization could look like. We will show how our theoretical hypothesis I – that D-only patterns involve additional operators compared to D/ND-patterns – could be implemented in terms of a morphosyntactic containment relation, and how this assumption could be used to derive at least some effects of our Hypothesis A. This idea gives rise to several problems, which, however, either arise independently in other morphosyntactic domains, or relate to the fact that the syntax of coordinate structures is not well understood.

4.1 More than one structure for conjunction particles?

4.1.1 Structures for iterative conjunction

If we want to derive correlations between distributivity and morphosyntactic properties, we need to assume that the semantic operations responsible for distributive interpretations of C-predicates – such as D_2 , but also distributivity markers inside the coordinate structure – correspond to operators in the syntax. Simplifying slightly, we take overt predicate-level distributivity markers to realize the operator D_2 . Further, whenever some conjunction particle appears in a D-only strategy, but does not appear in the corresponding D/ND-strategy, we assume that distributivity is due to the semantics of that particle. Importantly, we will not ascribe the lack of a non-distributive interpretation to a single distributivity operator D_1 modifying the entire coordinate structure, because the simplest overt realization of a structure with D_1 – a single overt distributivity marker occupying a peripheral position within the coordinate structure – is not attested in our sample: Either conjunction particles appear on all conjuncts (cf. (iii)-(vi) in Table 3) or there is a single additional marker which occurs next to the coordinator (cf. (vii),(viii) in Table 3). The fact that the additional markers often occur more than once or in non-peripheral positions indicates that cross-linguistically, D-only patterns involve markers modifying the individual conjuncts.²⁰

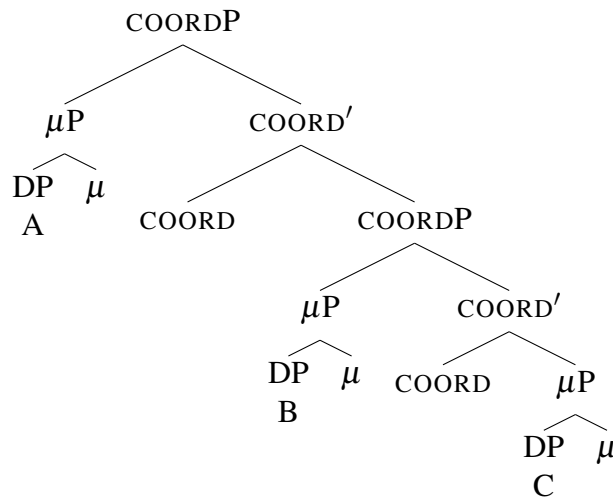
This assumption is shared by previous approaches to conjunction particles such as Mitrović & Sauerland 2014 and Szabolcsi 2015, which posit the structure in (50) and derive a D-only semantics for this structure.

²⁰It is not obvious how to interpret such a structure without additional unary operators applying on top of the coordination. Szabolcsi (2015) requires such an operator in her analysis. Mitrović & Sauerland (2014) do not assume such an operator, but it is not clear how to combine their ideas with a non-distributive lexical meaning for COORD. This issue is addressed in Haslinger & Schmitt (2017).

	abstract pattern	interpretation	example
(i)	A, B COORD C	D/ND	English <i>A, B and C</i>
(ii)	A COORD B COORD C	D/ND	English <i>A and B and C</i>
(iii)	A- μ B- μ C- μ	D/ND	Japanese <i>A-to B-to</i>
(iv)	A- μ B- μ C- μ	D-only	Hungarian <i>A is B is C is</i>
(v)	μ -A μ -B μ -C	D-only	Serbo-Croatian <i>i A i B i C</i>
(vi)	A- μ B- μ COORD C- μ	D-only	Hungarian <i>A is B is és C is</i>
(vii)	A, B μ COORD C	D-only	Modern Greek <i>A, B ala ce C</i>
(viii)	A, B COORD μ C	D-only	Dutch <i>A, B en ook C</i>

Table 3: Subclasses of overtly marked conjunction patterns in our sample

(50)



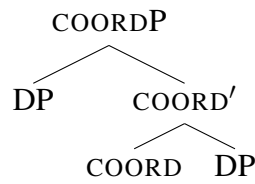
In the following, we will refine this basic structure in two ways. First, Table 3 shows that there is some variation wrt. the number and position of overt markers inside the coordinate structure.²¹ We want to account for at least some of this variation in a unified way and also derive the semantic variation between D-only strategies and D/ND-strategies from a structural property. Accordingly, there must be more than one possible structure for iterative type *e* conjunction (contrary to the claim of Mitrović & Sauerland (2014) that conjunction particles are always present, but may be realized as null). Second, we want to derive the fact that this markedness relation is not morphologically transparent in every language.

The variation found in Table 3 motivates two basic structural assumptions. We assume, following Szabolcsi (2015), that patterns (iii)-(viii) differ from the patterns in (i) and (ii) in that they involve additional heads modifying the individual conjuncts. Furthermore, in order to reconcile the existence of the subclass (iii), which contains conjunction particles but allows for a non-distributive interpretation, with the idea that D-only strategies involve ‘more structure’ than D/ND-strategies, we have to assume that conjunction particles can realize structures of varying syntactic complexity. The simplest way of implementing these informal ideas would be to say that there are at least three possible structures for the conjuncts within a coordinate structure, and that the structure assumed for the conjuncts in D-only strategies ‘contains’ the structures assumed for the conjuncts in D/ND-strategies. This is illustrated in (51). (51-a) necessarily results in a conjunction pattern without particles, while (51-b) and (51-c) can be realized as patterns with particles. In order to derive part

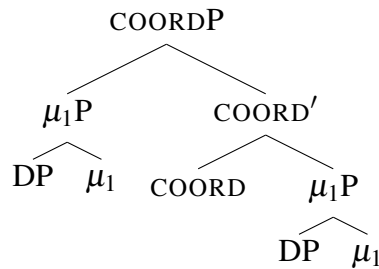
²¹As Table 3 shows, conjunction patterns also differ in the relative linear order of the conjuncts and the “additional markers” (μ). We do not know whether this variation corresponds to any semantically relevant structural property, and will not analyze it further in this paper.

of the form-function correlation observed in Section 3, we can then assume that the semantics of μ_2 is responsible for the lack of a non-distributive interpretation in D-only patterns. This leaves (51-a) and (51-b) as possible structures for a D/ND-pattern.

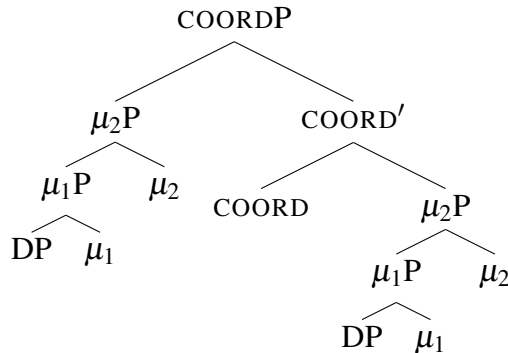
(51) a.



b.



c.



In summary, the idea is that the D/ND-patterns in (i) and (ii), with only one marker that could be analyzed as a binary operator, have the structure in (51-a). Structure (51-b) accounts for the D/ND-pattern in (iii) and the D-only patterns (iv)-(viii) have the structure in (51-c).

4.1.2 Simple examples

These assumptions account straightforwardly for a subset of the attested patterns. The English pattern, which lacks conjunction particles, corresponds to structure (51-a). The heads μ_1 and μ_2 either do not exist or are simply spelled out as \emptyset .

(52) English

- a. COORD \leftrightarrow *and*
- b. [A COORD B] \rightarrow A *and* B

Languages like Hungarian, in which the presence of conjunction particles leads to a D-only strategy, but there is no D/ND-strategy with particles, can be derived by assuming that μ_2 is overtly realized and μ_1 is null:

(53) Hungarian

- a. COORD \leftrightarrow *és*
- b. $\mu_1 \leftrightarrow \emptyset$
- c. $\mu_2 \leftrightarrow$ *is*

- d. [A COORD B] → A *és* B
- e. [[A μ_1] COORD [B μ_1]] → A *és* B
- f. [[[A μ_1] μ_2] COORD [[B μ_1] μ_2]] → A *is és* B *is*

Finally, the Japanese *-to* strategy can be accounted for by assuming that *-to* realizes μ_1 , with a zero spell-out of COORD.

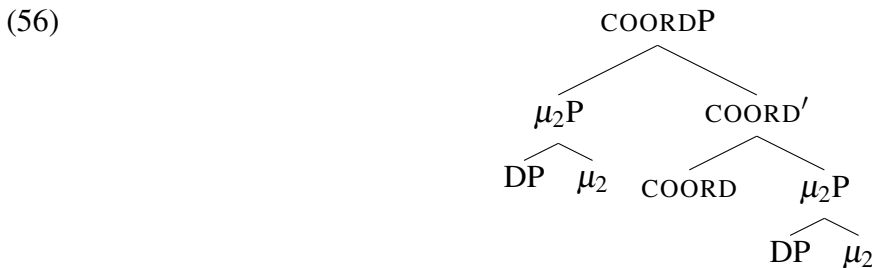
- (54) Japanese (to be revised)
 - a. COORD ↔ \emptyset
 - b. μ_1 ↔ *to*
 - c. [[A μ_1] COORD [B μ_1]] → A *to* B *to*

4.1.3 Excluded markedness relations

The idea that D-only patterns always involve additional structure compared to D/ND-patterns helps us derive some of the effects of Hypothesis A. To see the point, consider the situation in (55), which is ruled out by Hypothesis A.

- (55) a. A-X COORD B-X is a D/ND-strategy, for some overt marker X.
- b. A COORD B is a D-only strategy.

If there were no containment relation between the structures of D-only strategies and D/ND-strategies – i.e. if (56) were possible – nothing would prevent the derivation of (55). But if the structures in (51) are the only ones available, then the exponence rules in (57) will produce the output in (58) – and this is just a more complex way of deriving a single D/ND conjunction pattern.



- (57) a. μ_1 ↔ X
- b. μ_2 ↔ \emptyset
- c. [[A μ_1] COORD [B μ_1]] ↔ A-X COORD B-X
- d. [[A μ_2] COORD [B μ_2]] ↔ A COORD B
- (58) a. [[A μ_1] COORD [B μ_1]] ↔ A-X COORD B-X
- b. [[[A μ_1] μ_2] COORD [[B μ_1] μ_2]] ↔ A-X COORD B-X

Accordingly, we propose to derive this special case of Hypothesis A from the assumption that D-only patterns always involve an additional abstract element that is not present in D/ND-patterns, while there is no such element that occurs only in D/ND-patterns. Analogous explanations have been proposed in other morphosyntactic domains: Bobaljik (2012) argues that superlatives (of a certain subtype) universally have the structure in (59-b), which contains the syntactic structure of comparatives, given in (59-a), while (59-c) is ungrammatical.

- (59) Bobaljik (2012)
- a. [CMPRP [ADJP ADJ] CMPR]
 - b. [SPRLP [CMPRP [ADJP ADJ] CMPR] SPRL]
 - c. *[SPRLP [ADJP ADJ] SPRL]

This assumption is partly motivated by a markedness generalization analogous to our Hypothesis A: “superlatives are often derived from comparatives, but comparatives are never derived from superlatives” (Bobaljik 2012:50f.; the original source of this generalization is Ultan 1972). In the case of adjective gradation, this structure can be motivated by suppletion patterns. For instance, the generalization in (60) states that root suppletion in the comparative, like *good – better* (pattern AB), implies root suppletion in the superlative, i.e. *good – better – best* (pattern ABB), which means that ABA-patterns, i.e. *good – better – *goodest*, are ruled out. This is derived from the assumption that root suppletion is conditioned by the presence of the COMP head, which is present in both (59-a) and (59-b).

- (60) The Comparative-Superlative Generalization, part 1 (Bobaljik 2012:2, (1))
 If the comparative degree of an adjective is suppletive, then the superlative is also suppletive (i.e. with respect to the positive).

While there are no corresponding suppletion phenomena in the domain of conjunction, there is a weak analogy between Bobaljik’s explanation for the lack of ABA patterns and our proposal for ruling out the unattested pattern in (55). (55) would involve a D-only structure in which the individual conjuncts are marked in the same way as in a particle-less structure (namely by zero), while the D/ND-strategy involves overt particles. This is superficially similar to an ABA pattern if the entire coordinate structure is considered. Our way of ruling out the pattern (55) is analogous to existing accounts of *ABA constraints because it relies on the fact that if a rule of exponence is conditioned by the presence of some head, it also matches more complex structures containing this head. However, in comparison to well-known *ABA generalizations in the morphosyntactic literature, we currently lack independent evidence for the syntactic structures proposed.

4.2 Problems for the structural account

As mentioned in Section 3, there are languages, such as German, (37), in which there is *no* transparent markedness relation between the different conjunction patterns. Once we generalize this idea to such languages, our syntactic assumptions seem to make incorrect or insufficient predictions. We argue that these problems should be solved using mechanisms that receive independent motivation from other morphosyntactic domains.

4.2.1 Lack of transparency

The first problem is exemplified by Japanese. In addition to the *to* pattern described above, Japanese has a conjunction pattern with the particle *mo*, which also has several other uses corresponding to those of Hungarian *is* (Mitrović & Sauerland 2014, Szabolcsi 2015, Mitrović & Sauerland 2016). There are no examples with *mo* in our Terraling data set, but the previous literature strongly suggests that *A-mo B-mo* is a D-only pattern. (E.g. Mitrović & Sauerland (2016) show that this pattern is incompatible with collective predicates, although they do not provide examples with C-predicates.) Our analysis thus forces us to say that this pattern realizes a structure with both μ_1 and μ_2 – but then we saw above that μ_1 is usually spelled out as *-to* in Japanese. These assumptions can only

be reconciled if we assume a more abstract correspondence between morphological markers and syntactic heads: We would have to say either that *mo* realizes a substructure containing both μ_1 and μ_2 , or that μ_1 is spelled out as \emptyset in the context of μ_2 . Both approaches force us to assume a realizational theory of morphology in which a morphological component of the grammar ‘interprets’ abstract syntactic elements, which can be realized in different ways depending on the context they occur in. Using the terminology and formal devices of Distributed Morphology (Halle & Marantz 1993, Harley & Noyer 1999, Bobaljik 2012), we could say that a structure without μ_2 is spelled out as *to* due to the rule of exponence in (61-b), but in the presence of μ_2 , this is blocked by rule (61-c), which has a more specific context. Alternatively, we could assume that morphological markers can directly spell out non-terminal nodes, as assumed by work in Nanosyntax (62) (cf. Caha 2013). For our purposes, the choice does not matter much.

(61) Japanese (to be revised)

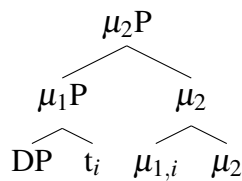
- a. COORD $\leftrightarrow \emptyset$
- b. $\mu_1 \leftrightarrow to$
- c. $\mu_1 \leftrightarrow \emptyset / _] \mu_2$
- d. $\mu_2 \leftrightarrow mo$

(62) Japanese (alternative analysis)

- a. COORD $\leftrightarrow \emptyset$
- b. $\mu_1 \leftrightarrow to$
- c. $[\mu_2 \mu_1] \leftrightarrow mo$

This raises the question under which structural conditions the exponence rule in (61-c) (or (62-c)) can be used, i.e. what has to be the case for μ_1 to appear “in the context of” μ_2 , or for the lexical entry (62-c) to be applicable. This is an open question in morphosyntax, with some authors arguing that rules of exponence are insensitive to syntactic elements outside the complex head that is being spelled out (see e.g. Bobaljik 2012 for discussion). It would mean that μ_2 is not local enough to condition allomorphy of μ_1 – or, in the context of (62), that the relation between μ_1 and μ_2 is not local enough for (62-c) to apply. This issue could be addressed either by having μ_1 move to μ_2 , as in (63), or by base-generating a single head μ_1 , with an additional feature $[\mu_2]$ responsible for the D-only semantics, instead of two distinct heads.

(63)



The structure in (63) correctly predicts the following patterns with conjunction particles.

- (64) a. $[[A \mu_1] \text{COORD} [B \mu_1]] \rightarrow A \textit{to} B \textit{to}$
 b. $[[A [\mu_1 \mu_2]] \text{COORD} [B [\mu_1 \mu_2]]] \rightarrow A \textit{mo} B \textit{mo}$

In the morphosyntactic literature, the devices exemplified in (61) and (62) have been used to account for other cases in which proposed containment relations are not morphologically transparent. We therefore predict that it should be possible to realize both μ_1 and μ_2 overtly, without any dependency between the realization of μ_1 and that of μ_2 , which would make the containment relation transparent.

- (65) a. A COORD B D/ND
 b. A-X COORD B-X D/ND
 c. A-X-Y COORD B-X-Y D-only

We do not know whether this prediction is borne out, as our data set is too small to provide even a speculative answer. Nevertheless Mitrović & Sauerland (2014), Mitrović (2017) provide data involving *disjunction* that involves morphologically complex disjunction particles, (66), which they decompose into a conjunction marker μ , corresponding to our μ_2 , and a disjunction particle κ .

- (66) a. i-li otca i-li mater'
 μ - κ father.ACC μ - κ mother.ACC
 'either father or mother' (Old Church Slavonic; Mitrović 2017:2, (5))
 b. ya gi Sasha ya gi Vanya
 κ μ Sasha κ μ Vanya
 'either Sasha or Vanya' (Avar; Mitrović 2017:4, (13))

Under an account assuming distinct heads μ_1 and μ_2 , we would expect there to be counterparts of the pattern in (66) involving distributive and non-distributive conjunction.²²

4.2.2 Overgeneration with null entries

As discussed above, most syntax-driven morphological theories allow us to derive the surface pattern in (67):

- (67) a. [[A μ_1] COORD [B μ_1]] \leftrightarrow A-X COORD B-X (D/ND)
 b. [[[A μ_1] μ_2] COORD [[B μ_1] μ_2]] \leftrightarrow A-Y COORD B-Y (D-only)

This possibility, however, creates a new loophole for deriving the unattested markedness relation, since nothing precludes us from positing a null exponent for Y. Together with the assumption that all three of our possible structures exist in the language, and that the spell-out of COORD depends on the presence of conjunction particles (an assumption that is independently motivated, as we will see below), this would yield the following surface pattern:

- (68) a. [[A μ_1] COORD [B μ_1]] \leftrightarrow A-X COORD₁ B-X
 b. [[[A μ_1] μ_2] COORD [[B μ_1] μ_2]] \leftrightarrow A COORD₁ B
 c. [A COORD B] \leftrightarrow A COORD₂ B

This pattern clearly violates Hypothesis A, but the problem here might be an instance of the more general issue arising in morphosyntactic work on markedness patterns that are not always morphologically transparent, and also in work on *ABA patterns. For instance, Bobaljik (2012) needs to allow 'non-local' rules of exponence – or some other mechanism – to derive an ABC pattern like *bonus – melior – optimus*, (69), but points out that nothing in the morphological theory prevents us from choosing the exponents as in (70), which generates a (surface) ABA pattern (*good – better – *goodest*).

- (69) a. ADJ \leftrightarrow A

²²If they turn out not to exist, it might be empirically more adequate to posit a single head μ_1 for all conjunction particles, which can optionally have a (privative) distributivity feature.

- b. ADJ ↔ B / _] CMPR]
 - c. ADJ ↔ C / _] CMPR] SPRL]
- (70)
- a. ADJ ↔ A
 - b. ADJ ↔ B / _] CMPR]
 - c. ADJ ↔ A / _] CMPR] SPRL]

In our case there is an analogous loophole. (68-a) is marked relative to (68-b), although the structure of the conjuncts in (68-b) contains the structure of the conjuncts in (68-a). While we are obviously not dealing with suppletion, the case that we want to exclude, namely a null exponent for μ_1 conditioned by μ_2 , parallels the pattern in (70). This potential overgeneration is a more general problem that might be accounted for if we stipulate a learnability restriction (as proposed in Bobaljik 2012), e.g. that learners do not posit μ_2 in their language unless it has a non-null exponent.

4.2.3 Dependencies between μ and COORD

Some D-only conjunction patterns, such as Hungarian *A is (és) B is*, correspond to a D/ND-pattern with the same realization of COORD. However, this is not generally the case: Several languages have conjunction patterns that force us to assume that COORD is spelled out in different ways depending on the presence or absence of conjunction particles. This situation occurs in German, where we find the two conjunction patterns in (71) (cf. the examples in (37)). (72) shows two potential ways of integrating the pattern (71-b) into our syntactic analysis. While these proposals are probably too simplistic for independent reasons²³ they both give rise to an issue that a more complex analysis would also face: The realization of COORD differs from the ‘default’ realization *und*, found in (71-a). Importantly, it is not generally possible to realize COORD as *als* or \emptyset in the absence of conjunction particles, as shown in (73).

- (71)
- a. *A (und) B und C* (‘A, B and C’, D/ND)
 - b. *sowohl A als auch B als auch C* (‘A as well as B as well as C’, D-only)
- (72)
- a. [_{COORDP} [_{μ_2 P} [_{μ_2} *sowohl*] [_{μ_1 P} A]] [_{COORD} *als*] [_{COORDP} [_{μ_2 P} [_{μ_2} *auch*] [_{μ_1 P} B]]] [_{COORD} *als*] [_{μ_2 P} [_{μ_2} *auch*] [_{μ_1 P} C]]]]
 - b. [_{COORDP} [_{μ_2 P} [_{μ_2} *sowohl*] [_{μ_1 P} A]] [_{COORD} \emptyset] [_{COORDP} [_{μ_2 P} [_{μ_2} *als auch*] [_{μ_1 P} B]]] [_{COORD} \emptyset] [_{μ_2 P} [_{μ_2} *als auch*] [_{μ_1 P} C]]]]
- (73)
- a. *Die Anna als die Eva haben genau 100 Euro gewonnen.
cannot mean: ‘Anna and Eva won exactly 100 euros.’
 - b. ??Die Anna, die Eva haben genau 100 Euro gewonnen.
‘Anna and Eva won exactly 100 euros.’ (marginally acceptable with a ‘list’ interpretation)

Accordingly, if we want to integrate the pattern (71-b) into our analysis, COORD must be spelled out differently if and only if the conjuncts involve conjunction particles. This in itself is unproblematic: Whatever the correct account of the categorial features of coordinate structures is, it is clear that at least some categorial features of the first conjunct need to percolate to COORDP. Further, we have

²³(72-a) seems more attractive because *auch* occurs independently as a focus particle meaning roughly ‘also’, a property shared by μ_2 particles in several other languages (Mitrović & Sauerland 2014, Szabolcsi 2015) – hence, a semantic analysis that accounts for the semantic connection between focus particles and conjunction could be extended to German. However, this proposal has the problem that non-final occurrences of COORD can be null in the *und* pattern, but not in the *sowohl... als auch* pattern, e.g. **sowohl A auch B als auch C*.

to say that at least one of the percolating features is contributed by the conjunction particle, and absent if the conjunct is not modified by a particle.²⁴ If COORDP shares such a feature (which we will here call [μ_2]) with its head, we can assume that this feature provides the context for a different exponent of COORD.

- (74) German
- a. COORD \leftrightarrow *als* / [$_$, μ_2]
 - b. COORD \leftrightarrow *und*

Mitrović & Sauerland (2014) propose to derive the two patterns in (75), found for example in Serbo-Croatian, in an analogous way (76). It should be noted that under this analysis, it is a coincidence that the default realization of both COORD and μ_2 is *i*, and so the surface containment relation between (75-a) and (75-b) is not actually represented in the structure. If this situation should turn out to be common cross-linguistically, the categorial and semantic distinction between COORD and μ that we have assumed, following other recent work on this topic, would need to be reevaluated.

- (75) a. *i A i B i C* ('A, B and C', D-only)
 b. *A (i) B i C* ('A, B and C', D/ND)
- (76) Serbo-Croatian
- a. COORD \leftrightarrow *i*
 - b. μ_2 \leftrightarrow *i*
 - c. COORD \leftrightarrow \emptyset / [$_$, μ_2]

In summary, we have seen that the presence of conjunction particles can affect the realization of COORD. This gives rise to two questions related to our generalizations A and B that need to be addressed in future work.

Do coordinators count as “additional markers”? We formulated generalizations A and B in such a way that they do not distinguish between “additional markers” appearing on the conjuncts and “additional markers” corresponding to a non-null realization of COORD. In other words, Hypothesis A in its current form predicts that in a language with two conjunction patterns of the type (77), it cannot be the case that (77-a) is a D-only pattern while (77-b) is a D/ND-pattern. Since we do not know of any clear case in which conjunction patterns of the form (77-a) and (77-b) (with the same conjunction particle X) differ in their semantics, it is unclear whether this prediction is borne out. If it isn't, Hypothesis A has to be weakened such that it only applies to additional markers appearing on the individual conjuncts, regardless of the realization of COORD.

- (77) a. A-X B-X C-X
 b. A-X B-X COORD C-X

²⁴Even if we ignore the distributional parallels between coordinate structures and their conjuncts, which the COORDP account cannot explain anyway, these assumptions are independently motivated. First, at least in some cases (e.g. German *sowohl... als auch*) it is ungrammatical for conjunction particles to appear on one conjunct, but not the other. The easiest way to derive this via mainstream syntactic assumptions would be to let COORD stand in a feature-checking relation with each of its two arguments. Second, unless we allow for multiple specifiers in a COORDP, coordination of more than two conjuncts requires a structure in which COORD takes another COORDP as an argument. In order to disallow coordinations of arbitrary categories in such cases, at least some categorial features of the conjuncts must percolate to COORDP.

Locality We derived Hypothesis B – the lack of ND-only strategies – from the assumption that every conjunction pattern can combine with the distributivity operator D_2 . However, this only holds if there is no syntactic dependency between the presence of D_2 and the realization of COORD: If there were such a dependency, we would expect it to be possible for the presence of D_2 to affect the form of COORD. Accordingly, we wouldn't exclude particular realizations of COORD that are linked to the presence of D_2 and thus also 'elsewhere'-realizations that would then be tied to a non-distributive interpretation. If Hypothesis B proves to be robust cross-linguistically, we must explain why this is excluded. One potential reason might be the lack of locality between D_2 and COORD.

4.3 Interim summary

In section 3 we sketched how we could derive Hypotheses B and C based on the assumption that D_2 is available cross-linguistically. In the current section, we focussed on Hypothesis A and addressed some of the morpho-syntactic issues in deriving the the markedness relation. We followed earlier proposals in assuming that conjunction particles are indicative of additional structure, and added to this the claim that D-only conjunction patterns have 'more structure' than D/ND-patterns, even if this structural difference is not morpho-syntactically transparent. This idea was faced with a number of problems, which nevertheless are found quite generally in proposals that derived markedness form (morpho-)syntactic containment relations.

5 Typological research with the Terraling database

The empirical research presented in this paper is partly based on our own data pool consisting of 16 languages from 8 language families. This data pool resulted from our work with **Terraling**, an open-ended online platform that allows linguists to submit queries that are then answered by **language experts** for various languages (see Koopman (2016) for an introduction to the database). The language experts have training in linguistics, and in most cases are native speaker linguists or linguists with access to a native speaker. The possibility to directly contact linguistically trained consultants allows us to overcome a limitation faced by earlier typological work on conjunction, namely that descriptive grammars are often uninformative on questions relating to truth-conditional semantics. Since our project is the first systematic attempt to investigate the semantics of logical expressions using Terraling, we were also faced with new methodological issues, in particular when compared to traditional fieldwork. The following briefly describes our survey and then addresses some of the problems.

Queries or **properties** in Terraling must be written in a fixed format with three possible answers ("yes"/"no"/"not applicable"). In addition to an abstract description of the binary property and its preconditions (e.g. if a language lacks any kind of coordination of proper names, the property value for iterative coordination of proper names with a distributive interpretation was "not applicable") each query should contain examples of the kind of sentence the consultants should construct in their language. These examples are given in English or other well-studied languages, which means one also has to point out which formal properties of the English examples are irrelevant for the property in question. In the case of semantic properties, which require the consultant to judge the appropriateness and truth value of the test sentence in a given situation, it is also necessary to explicitly provide a scenario. Finally, since the abstract property descriptions may be confusing for consultants not familiar with the topic, one should provide examples of languages for which the property value is known. If there were no known examples of a given property value, we illustrated the property using "fictional languages" that differed in some minimal way from English.

Design of the survey As mentioned before, we limited the survey to sentences where an iterative coordination of proper names with a conjunctive interpretation occurs in subject position. We therefore had to ask consultants to construct such examples in their language. We provided a glossary with detailed explanations of any linguistic terms we used that were specific to our topic. We also explained syntactic and semantic tests for the language experts to use if they were unsure about the status of a certain construction in their language. However, since language experts are required to have linguistic training and our survey did not focus on subtle syntactic distinctions, we presumed informal knowledge of basic syntactic terms like “subject” and “constituent”.

Consultants were asked to combine the different conjunctive coordination patterns of their language with three different types of predicates: predicates containing measure phrases, predicates containing numeral-modified indefinite plurals, and collective predicates. Importantly, we avoided inherently distributive predicates such as *sleep*, in order to ensure that the two interpretations predicted by semantic theory can actually be dissociated using truth value judgments.

We formulated every property for each of the three predicate classes. E.g. in order to test the existence of iterative conjunction strategies with a non-distributive interpretation wrt. measure phrases, we asked consultants to construct a sentence like (78-a) and judge it in a scenario like (78-b). Consultants were free to use other predicates containing measure phrases, but we emphasized that the scenario should be such that none of the conjuncts individually satisfies the predicate, but all three individuals as a group do. Further, we stressed that measure phrases with a “lower bound” (e.g. *exactly n*, *at least n* as opposed to *less than n*) should be used as it is otherwise impossible to construct a scenario with the required semantic property.

- (78) a. John, Mary and Sue earned exactly 100 euros.
b. SCENARIO: John earned 30 euros, Mary earned 30 euros, and Sue earned 40 euros.

These test sentences were said to have a non-distributive interpretation if they were true in a scenario of the kind in (78-b). Similarly, we tested the availability of an iterative conjunction pattern with a distributive interpretation. Building on these properties, we asked for examples of D-only patterns, D/ND-patterns and ND-only patterns, if they existed in the language. We then asked whether the language has morphosyntactic markers that “force” one of the two interpretations. Two types of such markers were considered: markers appearing inside the coordinate structure, and markers on the predicate, if they are necessary to get the respective interpretation. Consultants could optionally provide comments and glossed examples property values: Table 4 shows our current sample of actual coordination patterns that were provided in correlation some interpretative properties wrt. C-predicates (‘SV’ indicates cases where we find speaker variation).

Particulars of the survey, compared to traditional fieldwork Our method of data collection of course differs from semantic fieldwork of the kind discussed by Matthewson (2004), Bochnak (2013) in several respects.

Using Terraling is, of course, very convenient for the researcher: The restriction to linguistically trained consultants makes it possible to ask complex questions that would require many individual subquestions in a traditional fieldwork situation. Furthermore, since this method relies on the consultants’ ability to construct relevant examples in their language, it is possible to elicit data on many diverse languages using a single questionnaire. However, this also means that a significant part of the linguistic analysis is left to the consultant. Compared to traditional fieldwork, researchers therefore have little control over the way the consultants understand their queries and

²⁵Variation concerning the realization is conditioned by vowel harmony.

strategy	D-only	ND-only	D/ND	ext. Marker needed for D
A, B ne C (Akan, Twi (Niger-Congo, Kwa))			x	
A, B ni C (Basaa (Niger-Congo, Bantu))			x	x
A,B tung C (Cantonese, Guangzhou (Sino-Tibetan, Chinese))			x	
A, B en C A, B en ook C zowel A, B als ook B (Dutch (Indo-European, Germanic))	x x		x	
A, B und C sowohl A als auch B als auch C (German (Indo-European, Germanic))	x		x	
A, B ce C A, B ala ce C (Greek (Indo-European, Greek))	x [SV]		x	x [SV]
A, B e C (Italian (Indo-European, Italic))			x	
A-to B-to C (Japanese (Japonic))			x	
A-wa B-wa C (Korean (Koreanic))			x	
A, B e C (Nones (Indo-European, Italic))			x	
A, B i C i A i B i C (Polish (Indo-European, Balto-Slavic))	x		x [SV]	
A (i) B i C i A i B i C A, B ali i C (Serbo-Croatian (Indo-European, Balto-Slavic))	x x		x	
A, B ve C A dA, B dA ve C dA ²⁵ (Turkish (Turkic))	x x		x	x
A, B ha-you C (Wuhu Chinese (Sino-Tibetan, Chinese))			x	

Table 4: Current Terraling sample of Coordination patterns correlated with interpretative properties

the linguistic tests they actually apply to determine whether a certain construction in their language is relevant. Accordingly, we had to make sure to give very precise definitions and examples, and contacted individual consultants to double-check their responses.

As the “properties” (yes/no questions) encoded in the database are the same for all consultants on a given project, it is hard to ask follow-up questions relating to a specific example. While it is possible to insert comments on specific examples related to a property, such comments do not formally constitute properties of the language and hence are not easily searchable. Accordingly, it is difficult to ask consultants to construct a series of examples, and then select a subset of these examples that the consultant is asked to comment on in detail. Rather, one has to write a single explanation of the necessary example types for all consultants, although consultants have the option of providing additional examples to illustrate their judgments.

Since the platform is intended to collect properties of *languages*, rather than of specific syntactic structures, ‘constructions’ or lexical items within a language, complex properties relating to a

specific conjunction pattern or conjunction strategy cannot easily be deduced from the consultant’s answers to simpler queries on conjunction, unless the consultant happens to provide relevant examples. This means that our queries became quite complex, since if a language has a structure with property A and a structure with property B, it does not necessarily have a single structure with both of these properties and the question whether there is a structure that has both property A and property B had to be asked separately. Accordingly since we did not want to rule out the possibility that a language could have multiple formally unrelated conjunction patterns with distinct semantic properties, we phrased most of our properties as existential statements (“The language has at least one iterative conjunction pattern/strategy such that ...”). The current data set thus comprises a relatively high number – 36 – of individual properties.

6 Conclusion and outlook

The research presented in this paper was based on a very basic semantic question: What is the meaning of elements like English *and* (COORD) in type *e* conjunctions and how do such elements interact with other operators inside or outside of the coordinate structure to derive ‘distributive’ and ‘non-distributive’ meanings? We discussed how cross-linguistic data can help us answer these questions and tied them to the question of how the formal marking of conjunction strategies/patterns correlate cross-linguistically with the availability of distributive and non-distributive interpretations.

Based on our own preliminary Terraling data sample and data from the existing literature, we came up with the three hypotheses about implicational universals in (79).

- (79)
- a. **Empirical hypothesis A:** For any pair of iterative coordination patterns within a language that have a conjunctive meaning and apply to proper names, where one pattern can be obtained from the other by adding “additional markers” (e.g. conjunction particles or repetition of the coordinator):
 - a) If the **marked** pattern allows for a **non-distributive** interpretation, so does the unmarked pattern.
 - b) If the **unmarked** pattern allows for a **distributive** interpretation, so does the marked pattern.
 - b. **Empirical hypothesis B:** There are no iterative non-distributive-only patterns, i.e. there are no conjunctive coordination patterns that allow for more than two conjuncts and are limited to a non-distributive interpretation.
 - c. **Empirical hypothesis C:** There are no non-distributivity markers that are “obligatory” in the sense that for some iterative coordination pattern with a conjunctive meaning, the non-distributive interpretation is available with the marker, but unavailable if the marker is omitted.

We then argued that these empirical generalizations suggest the following cross-linguistic properties of the functional lexicon and the structural configurations it can occur in: (I) The lexical meaning of COORD is non-distributive. (II) Conjunction patterns lacking a non-distributive reading are always structurally more complex than conjunction patterns that allow for such a reading. (III) Distributive interpretations in sentences with C-predicates have two sources: Operators on the coordinate structure itself, but also predicate-level distributivity operators, which are available cross-linguistically.

Obviously, several questions are still unanswered: Apart from the ‘big’ question – are Hypotheses

A–C universal? – four of them seem particularly relevant for future research.

Question 1 Are the observations made here idiosyncratic to what we called ‘iterative’ coordination or do they extend to syntactically different structures with conjunctive meaning (like comitative conjunction)? If not, what are the differences and do we find the same differences cross-linguistically?

Question 2 Are the results wrt. C-predicates identical to those with collective predicates? Our current sample suggests a negative answer, which warrants further theoretical investigation of the semantic relation between C-predicates and collective predicates.

Question 3 Our current sample only includes conjunctions in subject positions – but do our claims about specific conjunction patterns also hold for conjunctions in object position? One reason to suspect that there might be subject/object asymmetries wrt. distributivity is the behavior of singular universal quantifiers like English *every* (cf. Schein 1993, Kratzer 2000, Champollion 2010). (80-a), where the *every* DP occurs in object position, can be true in a scenario where it is not the case that each of the three copy editors individually caught every mistake, which amounts to a non-distributive interpretation of *every mistake*. (80-b), on the other hand, is false if it is not the case that each of the three mistakes was caught by every copy editor, hence the non-distributive interpretation is not present if the *every* DP occurs in subject position.

- (80) a. The three copy editors caught every mistake in the manuscript. (adapted from Kratzer 2000)
b. Every copy editor caught the three mistakes in the manuscript.

At least for some speakers/dialects, conjunctions with *sowohl...als auch* ‘as well as’ in German display a similar asymmetry: In scenario (82), (81-a) can be judged true, while (81-b) is false.

- (81) German
a. Es ist auffällig, dass die zwei Lektorinnen sowohl den Fehler auf Seite 1 als auch
it is striking that the two copy.editors as.well the mistake on page 1 as also
den Fehler auf Seite 2 gefunden haben.
the mistake on page 2 found have
‘It is striking that the two copy editors found the mistake on page 1, as well as the
mistake on page 2.’
b. Es ist auffällig, dass sowohl die Anna als auch die Maria die zwei Fehler
it is striking that as.well the Anna as also the Maria the two mistakes
gefunden haben.
found have
‘It is striking that Anna as well as Maria found the two mistakes.’

- (82) SCENARIO: Copy editors Anna and Maria read the manuscript together. Anna caught the mistake on page 1 and Maria the mistake on page 2.

Question 4 Are the findings presented in this paper limited to type *e* conjunctions? Predicate conjunctions (like *smoke and drink* in languages like English) also seem to allow for both a distributive and a non-distributive interpretation (cf. Link 1984, Krifka 1990 a.o.). Is this also the

case in other languages? And, if so, do we find formal variation (within languages) of predicate conjunction and is this variation tied to interpretative properties in analogy to what we observed for type *e* conjunction?

We don't have an answer to any of these questions, yet, but we are currently expanding our survey to tackle at least question 4.

References

- Bobaljik, Jonathan D. 2012. *Universals in Comparative Morphology: Suppletion, superlatives and the structure of words*. Cambridge, Mass.: MIT Press.
- Bochnak, Ryan. 2013. *Cross-linguistic variation in the semantics of comparatives*. Chicago: University of Chicago dissertation.
- Caha, Pavel. 2013. Explaining the structure of case paradigms by the mechanisms of Nanosyntax: The Classical Armenian nominal declension. *Natural Language and Linguistic Theory* 31(4). 1015–1066.
- Champollion, Lucas. 2010. Cumulative readings of *every* do not provide evidence for events and thematic roles. Springer Berlin / Heidelberg, 2010. In M. Aloni, R. Bastiaanse, T. de Jager & K. Schulz (eds.), *Logic, Language and Meaning, Lecture Notes in Computer Science*, 213–222. Heidelberg: Springer.
- Champollion, Lucas. 2016. Overt distributivity in algebraic event semantics. *Semantics and Pragmatics* 9(16). 1–65.
- den Dikken, Marcel. 2006. Either-float and the syntax of co-ordination. *Natural Language and Linguistic Theory* 24. 689–749.
- Van der Does, Jaap. 1992. *Applied Quantifier Logics*: University of Amsterdam dissertation.
- Dowty, David. 1987. A note on Collective Predicates, Distributive Predicates and *All*. In *Proceedings of ESCOL 86*, 97–115.
- Drellishak, Scott. 2004. *A survey of coordination strategies in the world's languages*: University of Washington MA thesis.
- von Stechow, Kai & Lisa Matthewson. 2008. Universals in semantics. *The Linguistic Review* 25(1-2). 139–201.
- Gazdar, Gerald. 1980. A cross-categorial semantics for coordination. *Linguistics and Philosophy* 3. 407–409.
- Gazdar, Gerald, Ewan Klein, Geoffrey Pullum & Ivan Sag. 1985. *Generalized Phrase Structure Grammar*. Cambridge, Massachusetts: Harvard University Press.
- Gil, David. 1991. Aristotle goes to Arizona, and finds a language without “and”. In Dietmar Zaefferer (ed.), *Semantic Universals and Universal Semantics* (Groningen-Amsterdam Studies in Semantics 12), 96–130. Berlin/New York: Foris.
- Halle, Morris & Alec Marantz. 1993. Distributed morphology and the pieces of inflection. In Kenneth Hale & S. Jay Keyser (eds.), *The View from Building 20*, 111–176. Cambridge, Massachusetts: MIT Press.

- Harley, Heidi & Rolf Noyer. 1999. Distributed Morphology. *GLOT International* 4(4). 3–9.
- Haslinger, Nina & Viola Schmitt. 2017. Asymmetries in plural predication and quantification. Ms, University of Vienna.
- Hoeksema, Jack. 1987. The Semantics of Non-Boolean AND. *Journal of Semantics* (6). 19–40.
- Koopman, Hilda. 2016. Unifying Syntax and Morphology and the SSWL database project. Handout for a talk given at The 1st SynCart Workshop.
- Kratzer, Angelika. 2000. The event argument and the semantics of verbs. Ms., University of Massachusetts at Amherst.
- Krifka, Manfred. 1990. Boolean and non-Boolean ‘and’. In László Kálmán & László Pólos (eds.), *Papers from the Second Symposium on Logic and Language*, 161–188. Budapest: Akadémiai Kiadó.
- Landman, Fred. 1989. Groups I. *Linguistics and Philosophy* 12. 559–605.
- Link, Godehard. 1983. The Logical Analysis of Plurals and Mass Terms: A Lattice-Theoretical Approach. In R. Bäuerle, C. Schwarze & Arnim von Stechow (eds.), *Meaning, Use and Interpretation of Language*, 302–323. DeGruyter.
- Link, Godehard. 1984. Hydras. On the Logic of Relative Clause Constructions with Multiple Heads. In Fred Landman & Frank Veltman (eds.), *Varieties of Formal Semantics*, 245–257. Dordrecht: Foris.
- Link, Godehard. 1987. Generalized Quantifiers and Plurals. In P. Gärdenfors (ed.), *Generalized Quantifiers: Linguistic and Logical Approaches*, 151–180. Dordrecht: Reidel.
- Matthewson, Lisa. 2004. On the Methodology of Semantic Fieldwork. *International Journal of American Linguistics* 70(4). 369–415.
- McNally, Louise. 1993. Comitative Coordination: A Case Study in Group Formation. *Natural Language and Linguistic Theory* 11(2). 347–379.
- Mitrović, Moreno. 2017. Conjunctive markers in disjunctive expressions. Handout for a talk given at the University of Vienna.
- Mitrović, Moreno & Uli Sauerland. 2014. Decomposing coordination. In Jyoti Iyer & Leland Kusmer (eds.), *Proceedings of NELS 44*, vol. 2, 39–52. Amherst: GLSA.
- Mitrović, Moreno & Uli Sauerland. 2016. Two conjunctions are better than one. *Acta Linguistica Hungarica* 63(4). 471–494.
- Montague, Richard. 1973. The Proper Treatment of Quantification in Ordinary English. In Jaakko Hintikka, J. Moravczik & P. Suppes (eds.), *Approaches to Natural Language*, Dordrecht: Reidel. Reprinted in Montague (1974), *Selected Papers of Richard Montague*, R.Thomason (ed.).
- Partee, Barbara Hall & Mats Rooth. 1983. Generalized Conjunction and Type Ambiguity. In R. Bäuerle, C. Schwarze & Arnim von Stechow (eds.), *Meaning, Use and Interpretation of Language*, 362–383. de Gruyter.
- Progovac, Ljiljana. 1998. Structure for coordination. *GLOT* 3. 3–9.

- Roberts, Craige. 1987. *Modal Subordination, Anaphora and Distributivity*: University of Massachusetts, Amherst dissertation.
- Ross, John. 1967. *Constraints on variables in syntax*: Massachusetts Institute of Technology dissertation.
- Schein, Barry. 1993. *Plurals and events*. Cambridge, Massachusetts: MIT Press.
- Schwarzschild, Roger. 1996. *Pluralities*. Dordrecht ; Boston: Kluwer Academic.
- Slade, Benjamin. 2011. *Formal and philological inquiries into the nature of interrogatives, indefinites, disjunction, and focus in Sinhala and other languages*. Urbana: University of Illinois dissertation.
- Sudo, Yasutada. 2015. Japanese nominal conjunction only has the split reading. *Snippets* 30. 12–13.
- Szabolcsi, Anna. 2015. What do quantifier particles do? *Linguistics and Philosophy* 38. 159–204.
- Ulan, Russell. 1972. Some features of basic comparative constructions. *Working Papers on Language Universals* 9. 117–162.
- Williams, Edwin. 1978. Across-the-Board Rule Application. *Linguistic Inquiry* 9(1). 31–43.
- Winter, Yoad. 2001. *Flexibility Principles in Boolean Semantics*. Cambridge, Massachusetts: MIT Press.
- Zimmermann, Malte. 2002. *Boys Buying Two Sausages Each – On the Syntax and Semantics of Distance Distributivity*. Utrecht: LOT Dissertations 62.