Resumption of negative quantifiers: compositional or not?

Introduction The interpretation of several negative expressions as a single negation (Negative Concord, NC, e.g. (1a)) is a well-known challenge to the Principle of Compositionality (PC). Two theoretical solutions are available: 1) a semantic absorption mechanism by which several negative quantifiers contribute one negation (cf. e.g. Zanuttini 1991), or 2) assuming that n-words (e.g. *nobody, nothing*) are NPIs like *any*, semantically licensed by an abstract negative operator (cf. e.g. Ladusaw 1992).

de Swart & Sag (2002) apply the first solution and argue that *resumption*, respectively *iteration* (Keenan & Westerståhl 1997, a.o.) – two ways of *lifting* monadic quantifiers to polyadic ones in the Generalized Quantifiers Theory (GQT) – can uniformly account for the two interpretations of two co-occurring negative quantifiers in French: NC and double negation (DN, e.g. (1b)). While iteration is the GQT equivalent of *functional application*, the traditional mode of composition with PC, de Swart and Sag argue that resumption as deriving NC should get a similar compositional status as iteration.

Focusing on Romanian, where two n-words trigger both NC and DN, like in French, I show that resumption is the desired mechanism to describe NC. But since resumption fails to meet compositionality in the traditional understanding of PC in Montague's `Universal Grammar' (Hendriks 1993), I offer an account of NC as resumption within the constraint-based framework of Lexical Resource Semantics (LRS, Richter & Sailer 2004).

Romanian n-words as negative quantifiers I concentrate here on constructions with two n-words like in (1). Although an n-word obligatorily requires the presence of the negative marker (NM) *nu* in a finite sentence, I argue that n-words are negative quantifiers and not NPIs, so the NM is just a syntactic licenser.

(1) **Niciun student** *(**nu**) a citit **nicio carte**.
No student NM has read no book
a. 'No student read any book.' (NC)
b. 'No student read no book. (Every student read some book.)' (DN)

In the constraint-based formalism of HPSG which I adopt here, only the NM could license the n-words, if they were NPIs. But as I will show, the NM cannot semantically license the n-words, because they are negative. The availability (in special contexts: e.g. (2a)) of the DN reading is already an indicator of their negative semantics, if we consider that the NM alone cannot yield DN with an n-word (2b).

(2) a. Speaker A: <u>One</u> student read **no book**.
Speaker B: **NICIun** student nu a citit **nicio carte**.
'No student read no book.' (DN/#NC)

b. A: <u>One</u> student **didn't** read the book.
B: **NICIun student nu** a citit cartea.
'No student read the book.' (NC/#DN)

N-words have anti-additive semantics even in contexts where they appear without a NM (3), a possibility unavailable for NPIs. Other tests, like the negativity of n-words in fragmentary answers and *almost*-modification support the negative status of n-words as opposed to NPIs. Moreover, NM displays anti-additivity over NPIs, but not over n-words. This indicates that the NM is actually a syntactic licenser in (1), so it has no semantic influence. Thus, I further focus on the two negative quantifiers in (1).

(3) articol **de nimeni** citit <u>sau</u> citat = articol **de nimeni** citit <u>şi</u> **de nimeni** citat
article by nobody read or cited article by nobody read and by nobody cited
'article which nobody read <u>or</u> cited = article which nobody read <u>and</u> nobody cited'

Resumption and NC Binary resumption is a polyadic lift by which a monadic quantifier (i.e. taking a unary relation as the restriction and another unary relation as the nuclear scope) turns into a (polyadic) binary quantifier which takes a Cartesian product of two unary relations as the restriction and a binary relation as the nuclear scope. The operator being the same, its semantics is contributed only once:

(4) For a monadic quantifier Q, given a domain E, A, B, subsets of E, and R, a subset of E^2*, we define* binary resumption *of Q as:* $Res^2(Q)(A, B)(R) = Q^2(A \times B)(R)$.

Iteration as a polyadic lift has the effects of function composition and in terms of lambda-calculus, those of functional application: see the definition below:

(5) For two monadic quantifiers Q_1, Q_2, *a domain E, A, B subsets of E and R subset of* E^2, *It(eration)(*Q_1, Q_2*) and It(*Q_2, Q_1*) are the binary quantifiers defined as:*

$It(Q_1, Q_2)(A, B)(R) = Q_1(A, \{x \in E \mid Q_2(B, \{y \in E \mid (x, y) \in R\}) = 1\})$
$It(Q_2, Q_1)(B, A)(R) = Q_2(B, \{y \in E \mid Q_1(A, \{x \in E \mid (x, y) \in R\}) = 1\})$

Note that an important difference between (4) and (5) is that no scope interaction comes into discussion with respect to resumptive quantifiers, while this is always available for iterations. The scope interaction between two n-words and a non-negative quantifier and the competition between NC and DN indicate a similarity between the NC reading of two negative quantifiers and the *cumulative* reading of cardinal quantifiers. In GQT, unlike iteration, *cumulation* and *resumption* are intrinsically polyadic lifts. Both lifts require that the two quantifiers are scope-adjacent (e.g. (5b) and (6b)). If another quantifier intervenes, iteration applies and yields DN/scopal interaction between the cardinal quantifiers: (5a), (6a).

(6) **Niciun student** nu a citit *frecvent* **nicio carte**.
no student NM has read frequently no book
a. NO (student)>FREQ>NO (book): #NC/DN
b. NO (student)>NO (book)>FREQ: NC/#DN

(7) **Patruzeci de colaboratori** au scris *frecvent* **treizeci şi două de articole**.
forty of contributors have written frequently thirty-two of articles
a. 40 >FREQ> 32: # cumulation/iteration (up to 1280 contributors/articles)
b. FREQ> 40 > 32: cumulation (total of 40 contributors and 32 articles)/?? iteration

In view of the empirical generalization that Romanian n-words are negative quantifiers and the similarity between NC and resumption, I follow de Swart & Sag 2002 and propose resumption as accounting for NC and iteration for DN. The two readings in (1) will be obtained as below:

(8) a. NC: $NO^2(STUDENT \times BOOK)(READ)$
b. DN: $NO(STUDENT, \{y \in E \mid NO(BOOK, \{x \in E \mid (x, y) \in READ\}) = 1\})$

(Non-)Compositionality A close examination of the compositional status of resumption and iteration in the (algebraic) compositional fragment of Hendriks 1993 indicates that neither of them is compositional. To this end, I define resumption and iteration as syntactic higher-order functions taking several arguments (two monadic quantifiers, two unary relations and one binary relation, cf. (4-5)) to a truth value. Defining then a homomorphic semantic function for resumption fails, since the semantics of NO^2 cannot be directly composed of the two monadic NO's. The semantic function for iteration can be defined, but I eventually show that the syntax-semantics homomorphism holds for the logical algebras, but fails at the interaction with the natural language algebra, for the simple fact that the syntax assumed for polyadic lifts (as taking two monadic quantifiers as arguments, cf. Keenan and Westerståhl) does not correspond to any phrase structure rule of the natural language syntax. In order to be able to make polyadic lifts compositional, natural language syntax should allow a constituent to be formed out of two determiners/NPs.

Given this negative result which indicates that a strictly compositional grammar would not be able to accommodate polyadic quantifiers, I propose an implementation of resumption in the framework of LRS, a constraint-based semantic formalism with solid formal foundations in HPSG. While keeping logical semantic representations, LRS replaces the limitative combinatorics of λ-calculus with a combinatorics controled by the interaction between phrase structure rules and the well-typing of the semantic objects. As I will show, this innovation together with the underspecified mechanisms of LRS allow us to integrate resumptive quantifiers. DN readings are obtained by functional application, always available in LRS.

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