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# NEGATION AND NEGATIVE CONCORD IN ROMANCE*

ABSTRACT. This paper addresses the two interpretations that a combination of negative indefinites can get in concord languages like French: a concord reading, which amounts to a single negation, and a double negation reading. We develop an analysis within a polyadic framework, where a sequence of negative indefinites can be interpreted as an iteration of quantifiers or via resumption. The first option leads to a scopal relation, interpreted as double negation. The second option leads to the construction of a polyadic negative quantifier corresponding to the concord reading. Given that sentential negation participates in negative concord, we develop an extension of the polyadic approach which can deal with non-variable binding operators, treating the contribution of negation in a concord context as semantically empty. Our semantic analysis, incorporated into a grammatical analysis formulated in HPSG, crucially relies on the assumption that quantifiers can be combined in more than one way upon retrieval from the quantifier store. We also consider cross-linguistic variation regarding the participation of sentential negation in negative concord.

KEY WORDS: Negation, concord, polarity, quantification, HPSG, French, syntax-semantics interface

## 1. APPROACHES TO NEGATIVE CONCORD

Negative concord is the general term for cases where multiple occurrences of phonologically negative constituents express a single negation. The phenomenon is illustrated by the French example in (1):[1]

(1) Personne (n')a rien fait.
No one NE-has nothing done
a. No one has done nothing (i.e., everyone did something). [DN]
$\neg\exists x\neg\exists y$ Do$(x, y)$
b. No one has done anything. [NC]
$\neg\exists x\exists y$ Do$(x, y)$

(1) contains two negative quantifiers, and can be interpreted as expressing double negation (1a) or single negation (1b). The single negation reading

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[1] In spoken French, the $n(e)$-marking on the verb is optional; it is obligatory in written (formal) varieties. We return to the matter of *ne*-marking in section 6 below.

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is the concord interpretation in which two negative quantifiers 'merge' into one. We also find negative concord in other Romance languages (Spanish, Catalan, Italian), in West Flemish, African American Vernacular English, Polish, etc. This paper mainly discusses negative concord and double negation in French, but establishes some comparisons with other Romance languages. Extensions to other languages may be envisaged, but will not be worked out here.

The double negation reading of (la) is easy to derive in a compositional way. Although the double negation is logically equivalent to an affirmative sentence, it is conceptually complex (cf. Horn 1984: 296–308). It is an instance of the well-known style figure 'litotes', a form of understatement in which an affirmative is expressed by the negative of the contrary. As such, Horn argues, it is more constrained in use than its affirmative counterpart. In many cases, a double negation carries an extra value. For instance, (1) would be felicitous in a context in which someone supposes that there might be people who did nothing, which is contested by the speaker. Such meaning effects belong to pragmatics, rather than to the semantics of the sentence, though, as extensively argued by Horn.[2]

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[2] In so-called concord languages (such as French), the negative concord reading is often preferred over the double negation reading. Moreover, concord items vary as to how easily they allow a double negation reading. It has been suggested that such an interpretation is easier to obtain with NPs that have a lexical head (such as *aucun étudiant* 'no student') than with NPs like *personne* ('no one') or *rien* ('nothing'). One of our reviewers points out that for some speakers (not all) the DN reading requires the presence of *ne*. We have not found evidence to support this claim, but if it is true, it is not explained by our analysis. The reviewer suggests a comparison with other Romance languages. This might be helpful, but one must bear in mind that the status of preverbal *ne* in French is very different from the preverbal markers of negation in Italian, Spanish, and Catalan. In particular, *ne* is not the bearer of sentential negation anymore (compare section 6.1 below).

The other side of the coin is that not all concord items freely combine with all other concord items to derive the single negation reading. NPs like *personne* ('no one'), *rien* ('nothing') and *aucun N* are free to combine with themselves and with each other in any order, but other concord items (e.g. *nullement* 'not at all') have more restricted combinatoric properties. Similar observations have been made for other Romance languages (cf. Déprez 2000 and references therein). The distribution of these items might be partly governed by idiosyncratic properties of the lexical expression in question, rather than by general semantic considerations. Similar observations have been made in the area of the distribution of negative polarity items (cf. Van der Wouden 1997, for discussion). Although this language-internal variation does not fall out of the analysis that we develop here (because we develop one general absorption rule for all expressions that have the semantic property of anti-additivity), it is not in principle incompatible with our lexically driven approach. However, determining the correct constraints for each concord item is clearly beyond the scope of the present paper. (See Muller 1991 for some insightful remarks.) We are grateful to two of our reviewers for reminding us of these problems.

The single negation that the negative concord reading (1b) expresses is conceptually simple, but raises problems for the principle of compositionality of meaning, which says that the meaning of a complex whole is a function of the meaning of its parts and the way they are put together. If we interpret the negative quantifiers in (1) in terms of first-order logic with negation and universal/existential quantification, we can derive the double negation reading, but this leaves the single negation reading (the 'concord' reading) unaccounted for. In order to deal with this problem, two types of analysis of negative concord have been proposed in the literature, which we may loosely call 'local' and 'global'.

The global approach preserves the negative character of both quantifiers, and translates them as negative indefinites. Zanuttini (1991) and Haegeman and Zanuttini (1996) define an operation of factorization which reinterprets a sequence of quantifiers $\forall x_1 \neg \ldots \forall x_n \neg$ as a new sequence $\forall x_1 \ldots x_n \neg$. According to May (1989), factorization fails to preserve compositionality, because part of the semantic contribution of the composing elements is simply erased. As an alternative, he defines an absorption operation which interprets a sequence of negative indefinites $\mathrm{NO}_{x_1} \ldots \mathrm{NO}_{x_n}$ as a polyadic quantifier complex $\mathrm{NO}_{x_1 \ldots x_n}$ (cf. also Van Benthem 1989; Keenan and Westerstahl 1997). May's analysis has also been criticized for its lack of compositionality (e.g. Corblin 1996). Note that absorption requires a mode of composition different from function application. If the only mode of composition we allow is function application, the only interpretation for a sequence of negative indefinites we obtain is an iteration of the monadic quantifiers $\mathrm{NO}_1 \ldots \mathrm{NO}_n$.

The local approach (e.g. Laka 1990; Ladusaw 1992) preserves strict compositionality by reinterpreting the concord item in such a way that function application yields the desired single negation interpretation. Typically, this is achieved by treating negative concord as a variety of negative polarity, which allows us to take the negative concord item to denote an existentially quantified NP, rather than a negative NP. According to Laka (1990), concord items are licensed by a possibly implicit negation operator.

However, this assumption makes it impossible to explain why (2b) is a felicitous answer to the question in (2a), but (2c) cannot be used in this context:

(2)a. Qu'est-ce que tu as vu?
What have you seen?

b. Rien.
Nothing.

c. *Quoi que ce soit.
   Anything.

Ladusaw (1992) overcomes the problems associated with Laka's analysis by assuming that negative concord items are negative polarity items that license themselves. Thus, in the absence of a trigger, *rien* licenses itself (as in (2b)), but *quoi que ce soit* does not (cf. (2c)). As pointed out by Corblin (1996), Ladusaw's analysis still suffers from too close an identification of concord items with negative polarity items. The [neg] feature contributed by each concord item is viewed as an agreement phenomenon: it is present multiple times, but only interpreted once. As a result, we only obtain the concord reading.

An important problem for an approach like Ladusaw's is the observation that a sentence like (1) is actually ambiguous between a double negation reading and a concord reading, but that the polarity approach to concord only derives the single negation reading. The reason that most researchers (including Ladusaw (1992), Haegeman (1995), Déprez (1997) and others) have ignored the double negation reading in Romance is that sentences like (1) strongly prefer a concord reading. But examples which provide a better illustration of the double negation reading are provided by Corblin (1996), and given here in (3a) and (b):

(3)a. Personne n'est le fils de personne. [ambiguous]
   No one NE-is the son of no one
   = No one is the son of anyone. [NC]
   = Everyone is the son of someone. [DN]

b. Personne n'aime personne. [ambiguous]
   No one NE-loves no one
   = No one loves anyone. [NC]
   = Everyone loves someone. [DN]

c. Il ne va pas nulle part;
   il va à son travail/*il reste toujours chez lui. [DN only]
   He NE-goes not nowhere; he goes to his work/*he stays always home.
   = He doesn't go nowhere, he goes to work.
   = *He doesn't go anywhere, he always stays home.

French speakers agree that sentences like (3a,b) have a double negation reading as well as a concord reading. But for (3c) (adapted from Muller

1991: 259), double negation is the only option. The existence of double negation readings have led people to defend an analysis in terms of contextual ambiguity. Van der Wouden (1997) argues that contextual ambiguity nicely reflects the two faces of concord items: they are negative if they are unembedded, but within the scope of a negative quantifier they shift towards existential quantifiers. Corblin (1996) adopts a similar approach, and formulates a construction rule for negative quantifiers in a DRT framework, which introduces a negation, and an indefinite in the scope of negation. If a new negative quantifier shows up when the construction rule has already applied, we can optionally just apply the second half of the rule. This is equivalent to a shift of the concord item to an existential quantifier.

But there are two problems with the approach in terms of contextual ambiguity. One is that the ambiguity is not well motivated; the other is that it does not seem appropriate to treat an ambiguity which clearly arises from the construction as a lexical ambiguity.

We are aware of only one argument that has been advanced in favor of the interpretation of expressions like *rien*, *personne*, *jamais* in terms of existential quantification. This involves modification by *presque* ('almost'), an adverb which combines with universal (4a), but not with existential quantifiers (4b):

(4)a. J'ai invité presque tous les étudiants.
I have invited almost all the students.
b. *J'ai invité presque quelques étudiants.
I have invited almost some students.

Accordingly, van der Wouden and Zwarts (1993) take the contrast between (5a) and (5b) to indicate that the lower items in a concord chain are to be interpreted in terms of an existential quantifier, rather than a universal quantifier:

(5)a. Presque personne n'a rien dit. [ambiguous]
Almost no one NE-has nothing said
= Almost no one said anything. [NC]
= Nearly everyone said something. [DN]
b. Personne n'a presque rien dit. [DN only]
No one NE-has almost nothing said.
= No one said almost nothing
= *No one said almost anything

However, it seems that the data are too weak to support this conclusion. As Vallduví (1994) and Déprez (2000) point out, this leaves the felicity of the concord reading of the counterpart of (5b) in Catalan and Haitian Creole unaccounted for. Moreover, it turns out that modification of the lower concord item by *presque* is not always impossible in standard French, as examples like (6) demonstrate.[3]

(6)a. Un vieil écrivain nous a quittés sur la pointe des pieds sans que presque personne y prête attention.
An old writer has left us quietly without that almost no one paid attention to it.
= hardly without any attention

b. Je n'ai plus trouvé presque rien ridicule.
I have no more found almost nothing ridiculous
= There was hardly anything I found ridiculous anymore.

According to Muller (1991: 319), *presque* can modify an embedded concord item as long as we interpret the adverb as taking wide scope over the concord chain as a whole.[4]

The second problem the contextual ambiguity approach faces is that it is difficult to formulate the conditions under which the negative and the indefinite interpretation show up as part of the lexical entry of the concord item. Consider in particular the problems which arise when we embed concord items under the sentential negation *pas*. The contrast between (7a) and (7b) suggests that *pas* is outside the concord system and provides the prime context to distinguish negative polarity items from concord items in French (cf. Corblin 1996; Haegeman and Zanuttini 1996; de Swart 2001):

[3] (6a) is from Grevisse *Le bon usage*, section 726. (6b) is from S. de Beauvoir. *Mémoires d'une jeune fille rangée*, Poche p. 355, and is quoted by Muller (1991: 319).

[4] We are grateful to a reviewer for pointing out that the phenomenon in question here is not restricted to negative chains, but also manifests itself in the resumptive reading of (i):

(i) Tous ont presque tout vu.
Everyone has almost everything seen.

That is, when *presque* modifies the resumptive universal quantifier, we obtain a reading we can paraphrase as 'With few exceptions everyone saw everything'. This suggests that it is possible to interpret the data in (5) and (6) in such a way that they are compatible with a polyadic quantifier analysis. Thus, modification of negative indefinites by *presque* does not provide evidence in favor of an interpretation of concord items in terms of existential quantifiers.

(7)a. Je n'ai pas vu quoi que ce soit. [NPI: $\neg\exists$]
= I have not seen anything.

b. Ce n'est pas rien. [DN only]
It is not nothing
= It is quite something.

c. Les enqueteurs n'ont pas fait le voyage pour rien. [DN only]
The interviewers did not make the trip for nothing.

(7a) has a single negation reading as expected, but (7b) and (c) only have a double negation reading.

Note however that *pas* does trigger negative concord in other cases:

(8)a. Il ne veut pas que personne soit lésé. [restricted varieties][NC]
He NE wants not that no one be-SUBJ wronged.
= He does not want anyone to be wronged.

b. S'il y a quelque chose, il fera pas d'cadeau à personne.
[restricted varieties][NC]
If there is something, he will not give a present to no one
= If there is something, he will not grant anyone a favor

c. Je n'ai pas donné le moindre renseignement à personne. [NC]
I NE have not given the least information to no one
= I have not given the least information to anyone

d. Il y a pas personne en ville. [Québécois] [NC]
There is not no one in town
= There is no one/not anyone in town

e. Jan pa we pèsòn [Haitian creole][NC]
Jan not see no one
= Jan does not see anyone

The examples in (8a,b) are from Muller (1991: 261, 263), who points out that a concord item can be embedded under *pas* if it is in an indirect argument or in an embedded clause. The felicity of the concord reading of these sentences is subject to dialectal variation. However, as pointed out by Richter and Sailer (1999), speakers of standard French accept the concord reading of (8c), an example they attribute to F. Corblin (p.c.). We will come back to this issue in section 6.1 below.

These observations suggest that we do not want to rule out the embedding of concord items under negation. Rather, what we want is to impose syntactic antilocality restrictions on the relation between *pas* and the concord item. The claim that the relation between negation and negative concord is subject to syntactic, in addition to semantic constraints receives further support from the fact that in older stages of the language (e.g. middle French) concord items were easily licensed by *pas*. This is still the case in certain dialects for (8a), in modern Québécois French for (8d) (from Muller 1991: 262) and in the French-based Haitian creole for (8e) (from Déprez 1997).

The interaction with the syntax suggests that we should treat the constraints on the interpretation of the concord item in the syntax-semantics interface, rather than in the lexical semantics of the concord item. If a 'local' approach is not well equipped to deal with ambiguities which clearly arise from the construction as a whole, then we might be better off with a 'global' approach after all.

As pointed out above, May (1989) and Van Benthem (1989) develop a polyadic quantifier approach in which a sequence of negative indefinites is interpreted as a complex negative quantifier. However, May and Van Benthem only treat a few isolated examples of English. The aim of this paper is to use the polyadic approach to develop a serious model for the interpretation of negation and the treatment of negative concord in Romance.

## 2. A POLYADIC ANALYSIS OF NEGATIVE CONCORD

The polyadic quantifier approach has been developed as an extension of the generalized quantifier framework (as developed by Lindström (1966), Barwise and Cooper (1981), Van Benthem (1986) and others) to sentences involving multiple quantifiers. In the generalized quantifier framework, NPs are analyzed as expressions of type $\langle\langle e, t\rangle, t\rangle$, and determiners are expressions of type $\langle\langle e, t\rangle, \langle\langle e, t\rangle, t\rangle\rangle$, which denote relations between sets. These type assignments correspond with the Lindström characterization of NPs as quantifiers of type $\langle 1\rangle$ and determiners as quantifiers of type $\langle 1, 1\rangle$. As Keenan and Westerståhl (1997) point out, the type assignment $\langle\langle e, t\rangle, t\rangle$ is too specific, as it focuses on NPs in subject position which combine with a VP of type $\langle e, t\rangle$ to produce a proposition of type $t$. In a more general perspective, NPs should be regarded as argument reducing expressions: they reduce the number of argument positions of the verb by one. Thus NPs map intransitive verbs onto propositions, transitive verbs onto intransitive verbs, ditransitive verbs onto transitive verbs, etc. This does not affect their Lindström type: NPs and determiners remain monadic quantifiers of type $\langle 1\rangle$ and type $\langle 1, 1\rangle$ respectively. In this more general perspective, the question arises how a sequence of NPs in a transitive, ditransitive, etc. sentence is interpreted in the generalized quantifier framework.

Assume we have a sentence with a sequence of (two or more) NPs. If we just combine expressions by function application, we obtain an iteration of NPs, corresponding to a scopal order of the NPs:

- Function application allows for a sequence of NPs $\langle NP_1 \ldots NP_n \rangle$ to be interpreted as Iteration ($NP_1 \ldots NP_n$), that is, the iteration of the monadic quantifiers $NP_1 \ldots NP_n$ applied to the $n$-ary relation $R_n$.

For a sentence like (9a), iteration of the monadic quantifiers leads to the quantificational structure in (9b), which gets the interpretation in (9c):

(9)a. Some student read no book.
b. SOME (STUDENT, $\{x|$ NO (BOOK, $\{y|x$ X READ $y\})\}$)
c. STUDENT $\cap$ $\{x|$ BOOK $\cap$ $\{y|x$ READ $y\} = \emptyset\} \neq \emptyset$
d. [SOME$^{STUDENT}$, NO$^{BOOK}$](READ)

In other words: there is a nonempty intersection between the set of students and the set of individuals whose reading accomplishments doesn't overlap with the set of books. But instead of using the structure in (9b), we could also represent the sentence by means of the structure in (9d), which reflects the insight from generalized quantifier theory that the determiner complex denotes a relation between two common nouns and a two-place predicate. The Lindström type of the quantifier complex [SOME, NO] that participates in (9d) is $\langle 1, 1, 2 \rangle$: it maps two one-place predicates and a two-place predicate onto a proposition.

Although the polyadic notation is insightful, it is not essential in this case, because the quantifier [SOME, NO] is reducible to an iteration of monadic quantifiers. However, in the polyadic quantifier framework we can ask questions like:

- How many polyadic quantifiers are there?
- Are they all reducible to an iteration of monadic quantifiers (as in (9)) or not?
- Which ways of putting together sequences of NPs do we find in natural language?

Some examples of combinations of quantifiers which are not reducible to an iteration of monadic quantifiers are given in (10):

(10)a. Every student likes himself.
[EVERY$^{STUDENT}$, SELF] (LIKE)
$\forall x$ Like$(x, x)$

b. Every student bought a different book.
$[\text{EVERY}^{STUDENT}, \text{DIFFERENT}^{BOOK}]$ (BUY)
$\text{BOOK} \cap \text{BUY}_a \neq \text{BOOK} \cap \text{BUY}_b$
for all $a, b \in$ STUDENT such that $a \neq b$

c. Five hundred companies own three thousand computers.
$[\text{FIVE HUNDRED}^{COMPANIES}$, THREE-
$\text{THOUSAND}^{COMPUTERS}]$ (OWN)
$\|\text{COMPANY} \cap \text{OWN}^{Computer}{}_y\| = 500 \wedge$
$\|\text{COMPUTER} \cap \text{OWN}^{Company}{}_x\| = 3000$

d. Who loves who?
[WHO, WHO](LOVE)
$\text{WH}^{ONE,ONE}$(LOVE)
Which pairs of individuals $\langle x, y\rangle$ are members of the love relation?

The reflexive pronoun *himself* in (10a) is crucially dependent on the quantificational NP *every student*, because it is bound to the subject. The dependency relation makes it impossible to reduce the quantifier complex to an iteration of monadic quantifiers (Keenan 1987). Similar considerations apply to (10b): we have to match the pairs of students and books in order to verify that the book *x* bought is different from the book *y* bought (Keenan 1987). In (10c) it is the cumulative reading of the sentence in which a total of five hundred companies owns a total of three thousand computers which is unreducible, because the two NPs are mutually dependent (Keenan and Westerståhl 1997). Higginbotham and May (1981) and May (1989) treat the multiple *wh*-question in (10d) as a case of resumptive quantification. Although the question word occurs twice, it is interpreted only once – as a *wh*-complex that binds two variables. This leads to the so-called pair-list reading (Groenendijk and Stokhof 1984), in which the answer to the question is a set of pairs of individuals standing in the love relation.[5]

May (1989) and Van Benthem (1989) extend the resumptive quantifier approach to the reading of (11) in which the love relation is empty (the 'no love world'):

(11)a. No one loves no one.
$\neg\exists x \exists y$ Love$(x, y)$

[5] Other analyses of pair-list readings of questions exist. For example, Ginzburg and Sag (2000) present arguments against the widely held view that *wh*-expressions are generalized quantifiers. But, addressing these issues here, would take us too far afield.

Although the negative quantifier occurs twice, it is interpreted only once, as a negative quantifier complex that ranges over the set of pairs denoted by the transitive verb *love*. In English, resumptive quantification with negative NPs is the exception, rather than the rule. But we can use this approach to account for negative concord in languages like French.[6]

If we treat (11) as an example of resumption, we need to formulate a rule for absorption of two (or more) quantifiers into one bigger quantifier complex. According to Keenan and Westerståhl (1997), examples such as (11) suggest that the binary resumption of a type $\langle 1, 1\rangle$ quantifier $Q$ should be the quantifier $Q'$ given by:

- binary resumption

  $$Q'^{A,B}_{E}(R) = Q^{A\times B}_{E^2}(R)$$

  where $A$ and $B$ are subsets of the universe of discourse $E$, and $A \times B$ and $R$ are subsets of $E^2$.

Typically, the sets $A$ and $B$ are provided by two common noun denotations, and $R$ is the denotation of a transitive verb (cf. example (11) above). This definition assigns the resumptive quantifier the type $\langle\langle 1, 1\rangle, 2\rangle$. The application of the definition of binary resumption to (11), repeated in (12a), creates the resumptive negative quantifier in (12b), which is interpreted in terms of quantification over pairs, as indicated in (12c). This formula is equivalent to the first-order formulation in (12d), so the interpretation we obtain is correct:

(12)a. No one loves no one.
b. $\mathrm{NO}'^{ONE,ONE}_{E}$ (LOVE)
c. $\mathrm{NO}^{ONE\times ONE}_{E^2}$ (LOVE)
d. $\neg\exists x\exists y$ Love$(x, y)$

In the polyadic quantifier framework, we thus have more than one mode of composition. Good old function application leads to iteration, but other ways of interpreting a sequence of quantifiers are available. We can exploit the polyadic framework to give an account of the ambiguities with negative quantifiers we find in a language like French. If two negative quantifiers enter a scopal relation as an iteration of monadic quantifiers, we end up

[6] Giannakidou (1998) and others have argued that there are significant differences between multiple *wh* questions and negative concord. This has been taken as an argument to dismiss the analysis of negative concord in terms of resumption. However, we can turn this argument around if we follow Ginzburg and Sag's (2000) analysis of *wh*-expressions, and reserve the resumption analysis for negative concord, rather than for multiple *wh* questions.

with a double negation reading (13). If two negative quantifiers build a resumptive polyadic quantifier, we obtain the concord reading (14):

(13)a. Personne n'aime personne. [DN]
No one is such that they love no one
b. $[\mathrm{NO}_E^{HUMAN}, \mathrm{NO}_E^{HUMAN}]$ (LOVE)
c. NO (HUMAN, $\{x|$ NO (HUMAN, $\{y|x$ LOVE $y\}$)$\}$)
d. HUMAN $\cap$ $\{x|$ HUMAN $\cap$ $\{y|x$ LOVE $y\} = \emptyset\} = \emptyset$
e. $\neg\exists x \neg\exists y$ Love$(x, y)$

(14)a. Personne n'aime personne. [NC]
No one loves anyone
b. $[\mathrm{NO}_E'^{HUMAN,\ HUMAN}]$ (LOVE)
c. $\mathrm{NO}_{E^2}^{HUMAN \times HUMAN}$ (Love)
d. $\neg\exists x \exists y$ Love$(x, y)$

Both interpretations build a type $\langle\langle 1, 1\rangle, 2\rangle$ quantifier from the two negative NPs (13b, 14b). With the iterative quantifier in (13), we obtain the interpretation in (13c,d), which leads to the double negation reading (13d). The resumptive quantifier in (14b) is interpreted as quantification over pairs (14c), and leads to the single negation reading (the concord interpretation) in (14d). Note again that (13) does not require a polyadic interpretation per se, because the quantifier in (13a) reduces to an iteration of monadic quantifiers. However, the appeal to polyadic quantification is essential in (14) (see section 3 below on reducibility).

The phenomenon of negative concord that we find in Romance languages and elsewhere can be viewed as a generalization of the resumption interpretation illustrated in (14). The generalization requires both a semantic characterization of the quantifiers that participate in resumption (the so-called 'concord items') and also a definition that covers not only binary resumption, but resumption of 2, 3, … $k$ concord items in a sequence.

May (1989) already observed that the construction of a resumptive quantifier requires a sequence of the 'same' quantifiers. The same intuition underlies the definition of resumption provided by Keenan and Westerståhl (1997). As observed by Muller (1991), Ladusaw (1992) and others, negative concord is strictly restricted to anti-additive expressions like *personne*, 'no one', *rien* 'nothing', *jamais* 'never', to the exclusion of simply downward entailing expressions like *peu* 'few', *rarement* 'seldom', etc. Anti-additive functions are defined as follows (cf. Zwarts 1986; van der Wouden 1997):

- Anti-additive functions
  A function is anti-additive iff $f(X \cup Y) \Leftrightarrow f(X) \cap f(Y)$

The set of anti-additive NPs (determiners) is thus a subset of the set of (right) monotone decreasing NPs (determiners). Negative concord can then be analyzed as resumption of a sequence of anti-additive quantifiers.

The extension of the definition of binary resumption to $k$-ary resumption of a quantifier $Q$ is a type $\langle 1^k, k\rangle$ quantifier $Q'$ with the following interpretation:[7]

- $k$-ary resumption

  $$Q'^{A_1, A_2, \ldots A_k}_E(R) = Q^{A_1 \times A_2 \times \ldots A_k}_{E^K}(R)$$

  where $A_1 \ldots A_k$ are subsets of the universe of discourse $E$, and $A_1 \times A_2 \times \ldots A_k$ and $R$ are subsets of $E^K$.

Typically, the sets $A_1$ through $A_k$ are provided by $k$ common noun denotations, and $R$ is the denotation of a transitive, ditransitive … verb. Negative concord can then be analyzed in terms of the $k$-ary resumption of an anti-additive quantifier:

- Double negation readings of two concord items are analyzed in terms of iteration of two anti-additive quantifiers.[8]

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[7] This definition is not the same as the one proposed by Keenan and Westerståhl (1997). For the $k$-ary resumption of a quantifier, Keenan and Westerståhl define a type $\langle k, k\rangle$ resumptive quantifier, rather than a type $\langle 1^k, k\rangle$ quantifier. They argue that this type is needed in order to capture cases such as (i):

(i) Most lovers will eventually hate each other.

In (i), *most* denotes a type $\langle 2, 2\rangle$ quantifier, namely the old MOST applied to pairs: the CN *lovers* and the predicate both denote binary relations. Negative concord in Romance typically does not apply to cases like (i), though. The French determiner *aucun* 'no' only applies to singular nouns, and thus the counterpart of (i) in French is hard to construct with a negative quantifier. Resumption as we find it in negative concord is crucially a phenomenon where we find several occurrences of the same quantifier in different syntactic positions, much like in (12) and (14). This is obviously not the case in (i). We conclude that the analysis of negative concord requires a generalization of the original definition of binary resumption proposed by Keenan and Westerståhl (1997) along the lines sketched here, rather than the definition of a type $\langle k, k\rangle$ quantifier. This is not to say that the analysis cannot be extended to cases like (i). In section 6 below, we will provide a further generalization of the definition of resumption that will allow us to build resumptive quantifiers with quantifiers of differing types.

[8] See section 5 below for constraints on $k$-ary iteration of negative quantifiers.

- The single negation reading of a sequence of $k$ concord items is interpreted in terms of the $k$-ary resumption of an anti-additive quantifier.

Examples which involve more than two concord items are provided in (15) and (16):

(15)a. Personne ne dit rien à personne.
No one NE says nothing to no one
b. $[\mathrm{NO}'^{\mathit{HUMAN,THING,HUMAN}}_{E}]$ (SAY)
c. $\mathrm{NO}^{\mathit{HUMAN}\times\mathit{THING}\times\mathit{HUMAN}}_{E^3}$ (SAY)
d. $\neg\exists x\exists y\exists z$ Say$(x, y, z)$

(16)a. Personne ne dit jamais rien à personne.
No one NE says never nothing to no one
b. $[\mathrm{NO}'^{\mathit{HUMAN,TIME,THING,HUMAN}}]$ (SAY)
c. $\mathrm{NO}^{\mathit{HUMAN}\times\mathit{TIME}\times\mathit{THING}\times\mathit{HUMAN}}_{E^4}$ (SAY)
d. $\neg\exists x\exists t\exists y\exists z$ Say $(x, y, z, t)$

The sequence of concord items leads to the construction of a resumptive polyadic quantifier ((15b), (16b)), which is interpreted in terms of quantification over tuples ((15c), (16c)). The first-order representation in (15d, 16d) shows that the resumptive interpretation corresponds with the single negation reading.

Although examples with negative chains longer than three or four concord items are hard to find, the examples in (15) and (16) show that resumption is in principle a productive way of interpreting polyadic quantifiers in a concord language like French.

## 3. Reducibility and the Jespersen Cycle

It is somewhat less obvious if a negative resumptive quantifier is reducible to an iteration of monadic quantifiers. Obviously, the resumptive polyadic quantifier in (14) above is equivalent to the iteration of monadic quantifiers in (17):

(17)a. $[\mathrm{NO}^{\mathit{HUMAN}}, \mathrm{SOME}^{\mathit{HUMAN}}]$ (LOVE)
b. NO (HUMAN, $\{x|$ SOME (HUMAN, $\{y|x$ LOVE $y\})\})$
c. HUMAN $\cap$ $\{x|$ HUMAN $\cap$ $\{y|x$ LOVE $y\} \neq \emptyset\} = \emptyset$
d. $\neg\exists x\exists y$ Love $(x, y)$

Likewise, the resumptive interpretations in (15) and (16) are equivalent to the iterative interpretations of (18a) and (18b):

(18)a. [NO$^{HUMAN}$, SOME$^{THING}$, SOME$^{HUMAN}$] (SAY)
b. [NO$^{HUMAN}$, SOME$^{TIME}$, SOME$^{THING}$, SOME$^{HUMAN}$] (SAY)

The equivalence between a resumptive negative quantifier and the iteration of one negative quantifier with a sequence of existential quantifiers need not come as a surprise given the observation that the sentences in (19a,b) have the same truth conditions (under the negative concord interpretation of the sequence of negative quantifiers of course). Similarly, (20a) can be paraphrased by sentences involving negative polarity items in different positions:[9]

(19)a. Personne n'aime personne. ⇔
No one likes no one.
b. Personne n'aime qui que ce soit.
No one likes anyone.

(20)a. Personne ne dit rien à personne. ⇔
No one says nothing to no one.
b. Personne ne dit quoi que ce soit à personne. ⇔
No one says anything to no one.
c. Personne ne dit rien à qui que ce soit. ⇔
No one says nothing to anyone.
d. Personne ne dit quoi que ce soit à qui que ce soit.
No one says anything to anyone.

The observation that a concord interpretation of a sequence of negative quantifiers leads to the same interpretation as a negative quantifier followed by one or more existential quantifiers inspired the treatment of concord items as negative polarity items in the first place (cf. section 1 above). The fact that the truth conditions of negative sentences in concord languages can be captured in terms of iteration of monadic quantifiers can be construed as an argument against the polyadic analysis of negative concord

[9] Compare Muller (1991: 316–317) for the data. According to Richter and Sailer (1999), not everyone finds (20b) fully grammatical. This might be due to the choice of the negative polarity item: speakers who find (20b) somewhat less felicitous accept an example like (8c) above, which has the exact same structure.

and in favor of the local approach. However, it is unclear how strong this argument is in view of the following observations. First, there are other unreducible polyadic constructions which can be translated into first-order logic, such as constructions in which reflexive pronouns are bound to a quantificational subject (compare (10a) above). So first-order definability is not (always) decisive.

Furthermore, it has been argued more generally that language does go beyond the Frege boundary, and polyadic quantification is taken to be at issue in other complex constructions. (See May 1989; Van Benthem 1989; Westerståhl 1989; Keenan 1987, 1992; Moltmann 1995, 1996; and Keenan and Westerståhl 1997, for discussion.) This means that the notion of resumptive quantification has independent motivation in the sense that it is embedded in a larger framework, and is not introduced as an ad hoc mechanism to account for a small set of data (compare the rejection of neg-factorization in section 1 above).

Note also that an approach in terms of iteration of monadic quantifiers is only possible if we interpret embedded concord items in terms of existential quantification, an analysis for which we have not found independent evidence, as we saw in section 1. To this we can add the observation that we also find resumptive readings in languages like (Standard American) English, which is not a concord language. May (1989) argues that the assumption that *no one* translates as an existential quantifier is an unacceptable solution for English negative quantifiers, because it does not respect the lexical semantics of the quantifier. A treatment of negative concord as resumptive quantification makes it possible to develop a unified analysis of the English and Romance examples.

Finally, the observation that exception phrases can modify a polyadic negative quantifier provides a further argument in favor of the analysis developed here.[10] Consider a sentence like (21):

(21) Personne n'a parlé à personne, sauf Marie à son frère. [NC only]
No one NE-has talked to no one, except Marie to her brother.

(21) is not equivalent to a sentence in which a simple exception phrase associates with a simple NP. That is, it is not enough to treat Marie as the exception to the subject NP, and her brother as the exception to the object NP. Instead, we need to treat the pair Marie-her brother as an exception to the general statement that there is no pair of people talking to each other. As pointed out by Moltmann (1995, 1996), this indicates that (21) is an

[10] We are grateful to one of our reviewers for this suggestion.

example of a truly polyadic quantifier. This is confirmed by the observation that the exception phrase *sauf Marie à son frère* is only compatible with the concord interpretation, not with the double negation reading.

Our analysis of negative concord in terms of resumption fits in with the analysis of exception phrases in polyadic contexts developed by Moltmann (1995, 1996), so (21) is quite unproblematic in our framework. However, the interpretation of (21) is incompatible with a treatment of negative concord in terms of negative polarity. It is obvious that an analysis of the lower *personne* in terms of existential quantification (Ladusaw 1992) or zero-numerals (Déprez 1997) does not lead to the desired interpretation, for exception phrases do not normally modify quantifiers other than (negative) universal quantifiers, as pointed out by Moltmann, and illustrated by (22):

(22)a. *J'ai invité quelqu'un sauf Luc.
I have invited someone except Luc.
b. *J'ai invité quatre étudiants sauf Luc.
I have invited four students except Luc.

Giannakidou's (2000) analysis also seems to have difficulty accounting for sentences like (21). Even though she treats both concord items as universal quantifiers, she does not adopt a resumptive quantifier analysis. As a consequence, she does not obtain the interpretation of (21) in which the pair of Marie and her brother form the exception set to the resumption of the subject and the object NP. All in all, we think that the basis for a polyadic analysis of negative concord is quite strong, and there is even evidence that certain constructions can be better dealt with in this framework than in competing analyses.

We would like to explain the synchronic situation of negation and negative concord as a result of a coherent diachronic development. Concord items like *rien*, *personne*, and even the negation operator *pas* started out as indefinites indicating minimal amounts. They became polarity items when they were used as a reinforcement of the negation *ne*. Over the centuries, *ne* grew weaker and became incapable of being the sole expression of negation. As a result, the original indefinites ended up becoming real negatives, and *pas* became the negative marker. This type of diachronic development was first observed by Jespersen (1917), and is usually referred to as the 'Jespersen cycle'.

In modern French, the Jespersen cycle seems to be completed. Occasionally, we still find existential interpretations of concord items in non-negative contexts, such as comparative and superlative constructions or the antecedent of a conditional, but the examples are rare, and they are generally considered to be marginal and archaic (cf. Muller 1991).[11] With the exception of these remainders of older stages of the language, we claim that the occurrence of expressions like *personne* ('no one'), *rien* ('nothing'), etc. is restricted to strict negative concord contexts.

Because the iteration of monadic quantifiers in (22c) is equivalent to the polyadic quantifier (22b), it became possible to view each of the support items as negative items in and of themselves. Once the concord items were analyzed as real negative quantifiers, it became possible to combine them in ways other than just by resumption. This opened the way to the interpretation of a sequence of negative indefinites as an iteration of monadic quantifiers, which made it possible to derive a double negation reading. The role of *pas* is particularly striking in this respect. As pointed out in section 1, *pas* participated in the negative concord system up until the 17th century (middle French), and we still find this situation in certain dialects of French and in Québécois French. The position of *pas* in the current system of negation in standard French will be discussed in section 6.1 below.

If both resumption and iteration are available operations within each language, the question arises why French is a concord language, while English is not. This is really a question about the relation between language system and language use. In French, the interpretation of a sequence of negative indefinites in terms of resumption is preferred over iteration, whereas English has a preference for iteration over resumption of negative indefinites. Presumably, this preference is a result of the different diachronic developments of the two languages: the languages are wearing their history on their shirtsleeves, so to speak. And it really is just a matter of preference – in principle, both interpretations are available for both languages.

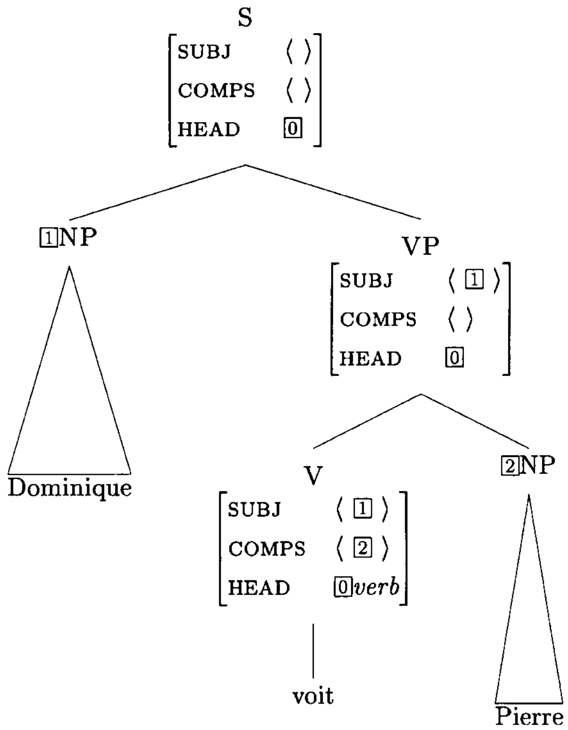
## 4. A Lexical Analysis

We incorporate the semantic analysis just sketched into a grammatical analysis formulated in Head-Driven Phrase Structure Grammar (HPSG; see Pollard and Sag 1994; Sag and Wasow 1999). We assume that the finite verb is the head of its clause, which is projected by 'cancelling' elements

[11] According to Muller (1991), the only productive context in which we find existential interpretations of concord items in modern standard French involves embedding under *sans* ('without'). In section 6.2 below, we will show that such examples can be integrated in our analysis of negative concord as resumptive negative quantification if we assume that *sans* is a type $\langle 0\rangle$ quantifier, just like negation.

(as in Categorial Grammar) from the values of its valence features, i.e., the COMPS and SUBJ lists sketched in (23):

(23)




The value for the feature HEAD (reflecting part of speech and related information) is percolated from verb to VP to S via a separate constraint: the Head Feature Principle, familiar from work in X-Bar Theory.

Recent work in HPSG (e.g. Manning and Sag, 1998; Davis 2001) has explained a variety of problems of linking and binding in terms of a further lexical feature-ARGUMENT STRUCTURE (ARG-ST), which, barring extraction, 'cliticization', or 'pro drop', is aligned with the valence features as shown in (24):

(24) $$\begin{bmatrix} \text{SUBJ} & \boxed{A} \\ \text{COMPS} & \boxed{B} \\ \text{ARG-ST} & \boxed{A} \oplus \boxed{B} \end{bmatrix}$$

Thus the subject and complements of a verb are included in its (syntactic) argument structure. The feature ARG-ST will provide the platform on which we will reconstruct the semantic analysis of the previous section.

In some versions of HPSG, quantifiers 'start out' in storage (Cooper 1983; Pollard and Sag 1994) and are passed up to a higher level of syntactic structure, where they are retrieved and scoped. However, this approach can redundantly allow multiple analyses of a single scope assignment (Pollard and Yoo 1998) and moreover seems inconsistent with the fact that in some languages, certain quantifiers may have 'sublexical' scope. For example, in languages with lexical causatives (e.g. Japanese, Korean, Bantu languages) quantified arguments of the verb may take narrow scope with respect to the cause relation specified in the verb's semantics. In short, in a strongly lexicalist theory like the one we presuppose here, there is no higher syntactic structure available for the appropriate scoping to be assigned by quantifier retrieval.

Issues such as these have motivated a slightly different approach to quantification in HPSG, one whose general properties may be summarized as follows:

- All quantifiers 'start out' in storage.
- Quantifiers are retrieved from storage at the lexical level, e.g. by verbs other than raising verbs (Manning et al. 1999).
- This retrieval is effected by a constraint that relates the STORE values of a verb's arguments and the verb's semantic content.

The implementation of these ideas proceeds in terms of a semantic content structured as shown in (25):

$$(25) \quad \begin{bmatrix} \text{CONTENT} \begin{bmatrix} \text{QUANTS} & \langle \ldots \rangle \\ \text{NUCLEUS} & [\ \ ] \end{bmatrix} \end{bmatrix}$$

Here the QUANT(IFIER)S feature takes a (possibly empty) list of generalized quantifiers as its value and NUCLEUS takes a (nonquantified) parametric expression (an open sentence) as its value. The meaning thus represented is the iteration of the generalized quantifiers applied to the nucleus (i.e., a classical scoping of the quantifiers).

The feature STORE takes as value a (possibly empty) set of generalized quantifiers. Thus every syntactic expression has some value for the feature STORE-the set of those quantifiers occurring within that expression that are not already retrieved. Given this, a verb's ARG-ST list includes information about all the unscoped quantifiers within all its syntactic arguments. The argument structure for (26a), for example, is as shown in (26b):

(26)a. Everyone loves someone.

b. $$\left[\text{ARG-ST}\ \left\langle \left[\text{STORE}\ \left\{\text{EVERY}^{\{\mathbf{person}(i)\}}_{\{i\}}\right\}\right], \left[\text{STORE}\ \left\{\text{SOME}^{\{\mathbf{person}(j)\}}_{\{j\}}\right\}\right]\right\rangle\right]$$

c. $$\left[\text{CONTENT}\ \begin{bmatrix}\text{QUANTS} & \left\langle \text{EVERY}^{\{\mathbf{person}(i)\}}_{\{i\}}, \text{SOME}^{\{\mathbf{person}(j)\}}_{\{j\}}\right\rangle \\ \text{NUCL} & \mathit{Love}(i,j)\end{bmatrix}\right]$$

d. $$\left[\text{CONTENT}\ \begin{bmatrix}\text{QUANTS} & \left\langle \text{SOME}^{\{\mathbf{person}(j)\}}_{\{j\}}, \text{EVERY}^{\{\mathbf{person}(i)\}}_{\{i\}}\right\rangle \\ \text{NUCL} & \mathit{Love}(i,j)\end{bmatrix}\right]$$

Lexical retrieval, as defined by Manning et al. (1999), allows both the scopings in (26c,d) as the semantic content of the verb. That is, the proper set of scopings is allowed if we constrain (non-raising) verbs as follows:

(27)a. Lexical Quantifier Retrieval (first formulation):

$$\mathit{verb} \Rightarrow \begin{bmatrix}\text{ARG-ST} & \left\langle \left[\text{STORE}\ \ \Sigma_1\right], \ldots, \left[\text{STORE}\ \ \Sigma_1\right]\right\rangle \\ \text{CONTENT} & \left[\text{QUANTS}\ \ \mathtt{iteration}(\Sigma_1 \cup \ldots \cup \Sigma_n)\right]\end{bmatrix}$$

This lexical retrieval approach to quantifier scoping, which differs in key respects from Cooper's treatment in terms of phrasal retrieval, may seem unfamiliar at first, but, as Manning et al. show (building on key insights of Pollard and Yoo (1998)), this kind of analysis provides a straightforward account of examples like (28a,b), where a subject quantifier may take narrow scope with respect to a syntactically lower element (the verb *appears* in (28a); the adverb in (28b)):

(28)a. A unicorn appears to be approaching.

b. A unicorn is always approaching.

The raising verbs *appears* and *is* identify their subject argument with that of their VP complement. Hence in both cases the verb *approaching* can retrieve the existential quantifier and incorporate it into its semantics (in accordance with Lexical Quantifier Retrieval in (27)). This produces the correct result that the subject quantifier, though syntactically superior, has narrow scope with respect to *appear* or *always* in (28).

It is straightforward to modify Lexical Quantifier Retrieval so as to allow resumption of quantifiers. Given that we limit ourselves in this paper to resumptive readings of negative quantifiers, we will only define resumption for sets of anti-additive quantifiers. Let us define a relation that maps a set of quantifiers to an iteration of quantifiers in such a way as to allow any subset of anti-additive quantifiers to undergo resumption. Note first that we have generalized our treatment of variables so that every generalized quantifier specifies not just its variable, but a set of variables. The `retrieve` relation can now be defined as follows:

(29) `Retrieve`:
Given a set of generalized quantifiers $\Sigma$ and a partition of $\Sigma$ into two sets $\Sigma_1$ and $\Sigma_2$, where $\Sigma_2$ is either empty or else $\Sigma_2 = \{NO^{R_1}_{\sigma_1}, \ldots NO^{R_n}_{\sigma_n}\}$, then $\texttt{retrieve}(\Sigma) =_{\text{def}} \texttt{iteration}(\Sigma_1 \cup \text{Res}(\Sigma_2))$

Here the $\Sigma_i$ are sets of variables bound by each quantifier. The quantifiers that undergo resumption are type $\langle 1, 1\rangle$ quantifiers, so the set of variables they bind is always a singleton set. But the resumptive quantifier obviously binds the sum of all the variables of the participating quantifiers. This relation then serves to constrain a verb's QUANTS value in the following revision of Lexical Quantifier Retrieval:

(30) Lexical Quantifier Retrieval (second formulation)

$$verb \;\Rightarrow\; \begin{bmatrix} \textsf{ARG-ST} & \left\langle \begin{bmatrix}\textsf{STORE} & \Sigma_1\end{bmatrix}, \ldots, \begin{bmatrix}\textsf{STORE} & \Sigma_n\end{bmatrix} \right\rangle \\ \textsf{CONTENT} & \begin{bmatrix}\textsf{QUANTS} & \texttt{retrieve}(\Sigma_1 \cup \ldots \cup \Sigma_n)\end{bmatrix} \end{bmatrix}$$

The analysis works as follows. The verb's arguments merge their stored quantifiers into a set, and the verb's QUANTS value is a list of quantifiers determined from this set by the relation `retrieve`.[12] `Retrieve` does not fix which subset of quantifiers will undergo resumption. It is always possible to let $\Sigma_2$ in (29) be the empty set, for example. In this case, the result will be an iteration of quantifiers, even if these are anti-additive, as in (31b), with the corresponding semantics in (31c):

(31)a. Personne n'aime personne. [DN]
No one is such that they love no one

[12] Note that the enumeration is meant to allow for the empty ARG-ST list, in which case the verb's QUANTS list is empty.

b. $$\begin{bmatrix} \text{PHONOLOGY} & \langle \textit{n'aime} \rangle \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{STORE} & \{NO^{\{Person(x)\}}_{\{x\}}\} \end{bmatrix}, \begin{bmatrix} \text{STORE} & \{NO^{\{Person(y)\}}_{\{y\}}\} \end{bmatrix} \right\rangle \\ \text{CONTENT} & \begin{bmatrix} \text{QUANTS} & \left\langle \mathrm{NO}^{\{Person(x)\}}_{\{x\}}, \mathrm{NO}^{\{Person(y)\}}_{\{y\}} \right\rangle \\ \text{NUCLEUS} & Love(x,y) \end{bmatrix} \end{bmatrix}$$

c. $\neg\exists x \neg\exists y$ Love$(x, y)$

Alternatively, if we let $\Sigma_2$ be the doubleton set containing both anti-additive quantifiers (and $\Sigma_1$ be the empty set), then `retrieve` allows the following resumptive interpretation for the verb, and hence for the same sentence:

(32)a. Personne n'aime personne. [NC]

b. $$\begin{bmatrix} \text{PHONOLOGY} & \langle \textit{n'aime} \rangle \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{STORE} & \{NO^{\{Person(x)\}}_{\{x\}}\} \end{bmatrix}, \begin{bmatrix} \text{STORE} & \{NO^{\{Person(y)\}}_{\{y\}}\} \end{bmatrix} \right\rangle \\ \text{CONTENT} & \begin{bmatrix} \text{QUANTS} & \left\langle \mathrm{NO}^{\{Person(x), Person(y)\}}_{\{x,y\}} \right\rangle \\ \text{NUCLEUS} & Love(x,y) \end{bmatrix} \end{bmatrix}$$

c. $\neg\exists x \exists y$ Love$(x, y)$

This analysis is quite general. For example, it extends to cases of the sort we saw earlier, where the stored quantifier is properly contained within an argument of the verb:

| | | |
|---|---|---|
| (33)a. | Personne ne dit ça [à personne] | [ambiguous] |
| | No one NE says that to no one | |
| | = No one says that to anyone | [NC] |
| | = No one says that to no one | [DN] |
| b. | Personne n'aime [le fils de personne] | [ambiguous] |
| | No one NE-loves the son of no one | |
| | = No one loves the son of anyone | [NC] |
| | = Everyone loves the son of someone | [DN] |

This follows if we simply assume that quantifiers are passed up from the STORE of nouns like *personne* to the STORE of NPs and PPs that contain them.

Many syntactic theories establish a distinction between arguments and adjuncts to explain certain binding phenomena. However, other phenomena seem to generalize over arguments and adjuncts, and treat them alike. Within HPSG, recent work by Przepiórkowski (1999) and Bouma et al. (2001) has shown that there is much to be gained (e.g. a general account of the case marking systems of languages like Korean, Finnish, Polish, etc. and a uniform treatment of *wh*-extraction phenomena) by extending ARG-ST lists to include various adverbials that are usually analyzed as modifiers. If we adopt this extended view of argument structure, negative adverbials such as *jamais* ('never'), *nulle part* ('nowhere'), *aucunement* ('not at all'), etc. contribute their stored quantifiers to the verb's content in exactly the same way that subjects and complements do. Thus, without introducing any further devices, our account immediately extends to cases like (34):

| | | |
|---|---|---|
| (34) | Personne n'a jamais dit ça. | |
| | No-one NE-has never said that | [ambiguous] |
| | = No one has ever said that | [NC] |
| | = No one has never said that | [DN] |

Finally, we can use our analysis to account for the examples involving *presque* ('almost'), such as (35):

| | | |
|---|---|---|
| (35)a. | Presque personne n'a rien dit. | [ambiguous] |
| | Almost no one NE-has nothing said. | |
| | = With few exceptions, no one said anything | [NC] |
| | = Nearly everyone said something | [DN] |
| b. | Personne n'a presque rien dit. | |
| | [DN or NC such that *presque* takes widest scope] | |
| | No one NE-has almost nothing said. | |
| | = No one said almost nothing | [DN] |
| | = With few exceptions, no one said anything | [NC] |
| | = *No one said almost anything | |

*Presque* is a modifier that can apply to verbs, NPs .... In the relevant cases (35), it is the modifier of an NP, which projects into a modified NP. Given that the modifier is syntactically in construction with the NP, we may assume that it must be interpreted as taking semantic scope over the NP. One possible interpretation is then that *presque* takes scope over the subject or the object NP only in (35a) and (35b) respectively. The local scope blocks a concord reading, and leads to an interpretation in terms of double negation, because the two quantifiers are no longer the same, and resumption does not apply. However, we need not limit the semantic scope of the modifier to (just) the NP. If we give *presque* wider scope than the NP itself, it can be interpreted as the modifier of the resumptive negative quantifier (which includes the quantifier that *presque* is in construction with). Under this interpretation, it is irrelevant whether *presque* modifies the higher or the lower NP. Thus the concord interpretations of (35a) and (35b) are the same, but their local scope interpretations are not. Note that this result is crucially dependent on the construction of a polyadic negative quantifier that *presque* takes scope over.[13]

## 5. Digression: Constraints on Lexical Retrieval

So far, we have concentrated on generating the relevant readings, rather than on constraining the retrieval mechanism. The main aim of the remaining sections is to demonstrate that an absorption mechanism can be developed that provides an appropriate semantics for negative concord, and to show that an adequate interface with syntax can be defined. However, a few remarks on constraining the system are in order here. Constraints come in two types, one linguistic, another cognitive. Let us start with the latter.

We demonstrated that resumption is in principle unbounded, and applies to sequences of two, three, . . . , *n* concord items. Iteration of negative quantifiers on the other hand is restricted to sequences of two quantifiers. Even if a sentence contains three concord items, we do not obtain a trinegative interpretation. As pointed out by Corblin (1996), there does not seem to be a semantic reason for this restriction, so it may in fact be a virtue that this restriction does not fall out from our analysis. Corblin (1996) and Corblin and Derzhansky (1997) argue that the restrictions on multiple negations are due to a processing constraint that allows only one level of embedding of a negative quantifier under another negation.

There are multiple linguistic constraints on the retrieval of negative quantifiers from the STORE. Interestingly, they fit in with general restrictions on the behavior of quantifiers that have been discussed in the

[13] Both Déprez (2000) and Giannakidou (2000) observe that modification of the lower concord item by *presque* is possible, but they do not spell out the interpretation of such sentences under their respective analyses. It seems to us that their proposals do not obtain the result that the presence of *presque* on the lower concord item leads to wide scope of the modifier over the negative chain as a whole, because their interpretation of negative concord gives each quantifier local scope. Thanks to an anonymous reviewer for pointing out a serious problem with our previous analysis of *presque*.

literature. For instance, it is now generally accepted that the scope of quantificational NPs other than indefinites is clause-bound (compare Reinhart 1997; Winter 1997 and others), with a set of well-defined exceptions that are usually analyzed in terms of restructuring or extended co-argument domains (Farkas and Giannakidou 1996). As pointed out by Déprez (1997) and Giannakidou (2000), the locality of negative concord is linked to the clause-boundedness of quantifier scope. This is supported by the observation that the same set of exceptional constructions that allows inverse scope out of embedded clauses allows the creation of a negative chain across clause boundaries. Crucially, as we will see in section 6 below, a main clause can build a negative chain with certain embedded subjunctive and nonfinite clauses, but not with other kinds of subjunctive clauses or with an indicative clause.

Liu (1990) observed that monotone decreasing quantifiers do not allow inverse scope readings. Not surprisingly, this is relevant for the possible readings of iterated negative quantifiers: double negation readings follow the left-right order of quantifiers, and inverse scope readings are not available. The overall conclusion is that the constraints on negative concord look like the constraints on quantifier combinations (inverse scope, scope islands, etc.), rather than like the constraints on negative polarity. This can be construed as an argument in favor of our analysis, because we consider iteration and absorption as different modes of composition of a polyadic quantifier, which correspond to different ways in which the quantifiers are retrieved from the STORE. Our question about constraints on the resumption and iteration of negative quantifiers can then be reformulated as the question of how to formulate constraints on quantifier retrieval in HPSG. These will have an effect roughly analogous to the syntactic constraints on quantifier raising found in the proposals of (*inter alia*) Szabolcsi (1997) and Beghelli and Stowell (1997). In the next section, we will propose a constraint that prevents the inheritance of stored quantifiers through indicative (as opposed to subjunctive or nonfinite) clauses.

## 6. The Role of Negation in Negative Concord

In the studies on resumption within the polyadic quantifier approach (May 1989; Van Benthem 1989; Keenan and Westerståhl 1997), there is not much discussion of constraints on the types of quantifiers that undergo resumption. For *wh*-expressions, resumption seems to be restricted to variable binding operators like *who*, *which N*, etc. (cf. May 1989). Non-variable binding operators like *if*, or *whether* do not participate in this process. Negative concord is different in that not only negative quantifiers, but also non-variable binding propositional operators such as sentential negation (section 6.1) and negative prepositions (section 6.2) participate in negative concord.

### 6.1. *Embedding under sentential negation*

In 'local' analyses that treat negative concord as a variant of negative polarity, sentential negation is viewed as a licensor, and concord items are either licensed by negation, or are self-licensing. Either way, they are treated as dependent elements. In the polyadic approach we adopt here, the negative concord reading of a sentence involving two or more negative NPs does not involve an asymmetry between licensor and dependent element. The creation of a resumptive negative quantifier as defined so far just requires a sequence of anti-additive NPs, and does not imply sentential negation. This raises the question how the polyadic approach treats negation in concord languages.

As far as French is concerned, we observed already that the combination of *pas* and a concord item usually leads to a double negation reading, compare (7b) above, repeated here as (36a). However, examples like (8a–c), repeated as (36b–d), illustrate that in certain varieties and certain constructions, concord readings are available as well:

(36)a. Il ne va pas nulle part, il va à son travail [DN only]
He does not go nowhere, he goes to work

b. Il ne veut pas que personne soit lésé. [restricted varieties][NC]
He NE wants not that no one be-SUBJ wronged.
= He does not want anyone to be wronged

c. S'il y a quelque chose,
il fera pas d'cadeau à personne. [restricted varieties][NC]
If there is something, he will not give a present to no one
= If there is something, he will not grant anyone a favor

d. Je n'ai pas donné le moindre renseignement à personne.
[NC only]
I NE have not given the least information to no one
= I have not given the least information to anyone

In order to treat a mixture of negation and negative quantifiers in a polyadic approach, we need to extend our definition of resumption. This should be based on the intuition that negation and negative quantifiers are somehow 'the same'. The formal underpinning of this intuition is the observation that negation shares the property of anti-additivity with negative quantifiers like *personne*, *jamais*, .... This need not come as a surprise, for the definition we gave for anti-additive functions in section 2 above is a generalization from the complement $\neg$ to arbitrary functions $f$ of one half of DeMorgan's laws from propositional logic (see Zwarts 1986,1995 and Van der Wouden 1997 for further discussion).

Given that negation is an anti-additive operator, we can preserve our claim that negative concord is based on the semantic feature of anti-additivity. However, we need to extend our definition of resumption in such a way that it can deal with a mixture of sentential operators such as negation and variable binding quantifiers such as *personne*, *aucun étudiant*, etc. The Lindström characterization of quantifiers is based on the kind of function they denote. Functions from Pow(E) to truth values are defined as type $\langle 1 \rangle$ quantifiers, functions from Pow(E) to a type $\langle 1 \rangle$ quantifier as type $\langle 1, 1 \rangle$ quantifiers. A sentential operator like negation is a function from propositional entities into truth-values. If we conceive of propositions as zero-place predicates, we can treat a non-variable binding operator such as negation as a quantifier with adicity zero, or a quantifier of type $\langle 0 \rangle$.

- Non-variable binding, propositional operators such as negation are treated as quantifiers of type $\langle 0 \rangle$.

We can now extend our definition to allow resumption of quantifiers of different types. Recall that a resumptive negative quantifier interprets a sequence of anti-additive quantifiers $Q^1 \dots Q^k$ of type $\langle 1, 1 \rangle$ as one complex negative quantifier $\mathrm{Res}_Q$ of type $\langle 1^k, k \rangle$. This means that the resumptive quantifier maps a series of $k$ one-place predicates and one $k$-ary predicate onto a proposition. As such, it binds the sum of all the variables of the composing quantifiers. Given that sentential negation does not bind any variables, it does not add any variables to the sum of variables bound. As a consequence, it does not change the type of the resumptive quantifier. An extension of the absorption rule to a sequence of negative quantifiers that involves a mixture of type $\langle 1, 1 \rangle$ and type $\langle 0 \rangle$ quantifiers can thus be defined as follows:

- Resumption of a sequence of $k$ type $\langle 1, 1 \rangle$ quantifiers $Q$ and $l$ type $\langle 0 \rangle$ quantifiers $Q'$ leads to the construction of a resumptive quantifier $Q''$ of type $\langle 1^k, k \rangle$ such that:

  $$Q''^{A_1 \dots A_k}_E(R) = Q^{A_1 \times A_2 \times \dots A_k}_{E^K}(R)$$

  where $A_1 \dots A_k$ are subsets of the universe of discourse $E$, and $A_1 \times A_2 \times \dots A_k$ and $R$ are subsets of $E^K$.

The result of combining negation and a sequence of negative quantifiers is that negation does not affect the type of the polyadic quantifier, which means that negation is semantically empty in a concord context.

This rule is an instance of an even more general rule that defines absorption of a sequence of quantifiers of mixed types (of any types) as follows:

- Resumption of a sequence of $k$ type $\langle n, n \rangle$ quantifiers and $l$ type $\langle m, m \rangle$ quantifiers from the STORE leads to the construction of a resumptive quantifier of type $\langle (n^k + m^l), (k \times n) + (l \times m) \rangle$.

The underlying motivation for a general mixed rule like this is that we should also be able to account for a mixture of quantifiers of type (1) and type (2) quantifiers for instance. An example would be the concord interpretation of a sentence like (37):

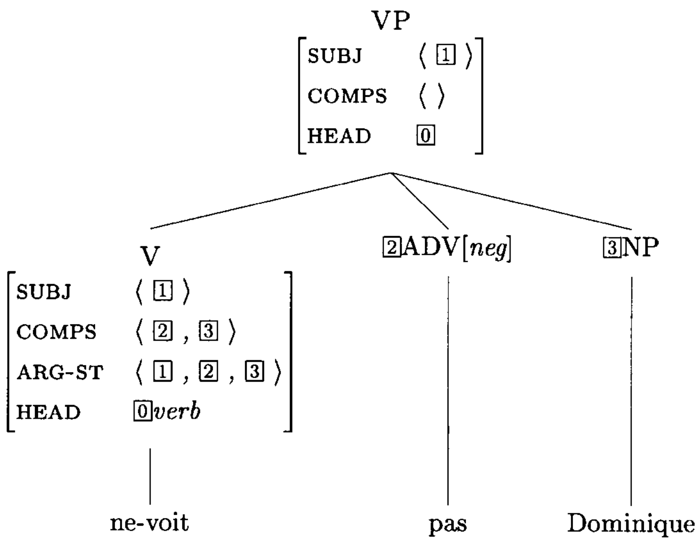
(37) No lovers never end up hating each other.

As explained in footnote 2 above, such constructions are not available in French, because *aucun* only applies to singular nouns. Although our paper does not deal with such cases for that reason, we do not want to exclude the possibility of accounting for such examples. This motivates the general rule.

At first, the semantic emptiness of negation in negative concord chains might seem like a somewhat odd result, given the familiar 'local' approaches to negative concord in which sentential negation plays an important role as the licensor of the concord item (cf. Laka 1990, Ladusaw 1992; Przepiórkowski and Kupść 1999; Giannakidou 2000 and others). However, as Ladusaw (1992: footnotes 10 and 11) admits, this is in fact a significant problem for the local approach to negative concord. The participation of sentential negation is subject to considerable cross-linguistic variation, which means that we have to assume that each language has its own set of licensing conditions on concord items. Given that licensing conditions on negative polarity are by and large the same across languages, and that variation only obtains within strict limits, this is not a very attractive result. The polyadic approach provides a more principled account of the cross-linguistic variation we find: given that negation is semantically empty in concord contexts, languages are free to include or exclude simple negation from the concord system. The examples in (36) illustrate this type of variation. In some variants of the French language, sentential negation is included in the concord system, even though in standard modern French spoken in French, *pas* is outside the concord system and typically leads to a double negation.

To accommodate such variation in our grammar we build on the work of Abeillé and Godard (1997), Kim and Sag (1995, in press) and Warner (1993, 2000), who argue that French *pas* and English *not* are not modifiers of the finite verb, but rather are selected as a complement. The *pas*-selecting finite verbal forms can either be derived by lexical rule (Abeillé and Godard) or else treated via lexical types (Warner). In either analysis, the argument structure of such verbs is augmented by a negative adverb in the second position. This allows finite verbs to project phrases like the following.

(38)




In this head-complement structure (like the one illustrated earlier), the non-head daughters correspond to the members of the head daughter's COMPS list and the mother's COMPS value is the empty list. The head daughter's HEAD value matches that of its mother, in keeping with the Head Feature Principle.

We will assume that *pas* is lexically represented as in (39).

(39)
$$\begin{bmatrix} \text{HEAD} & \textit{adv} \\ \text{CONT} & \boxed{1}\,NO^{\emptyset}_{\emptyset} \\ \text{STORE} & \{\boxed{1}\} \end{bmatrix}$$

Hence, because *pas* is part of the verb's ARG-ST list, its negative quantifier will automatically be included in the verb's QUANTS list by the Lexical

Quantifier Principle formulated earlier. Thus the independently motivated treatment of *pas* as complement provides the basis for treating the many Romance varieties where simple negation participates in resumption: because the verb amalgamates the stored 0-place quantifier of the negative adverb, this negative quantifier functions like any other – it may participate in resumption (giving the NC reading) or not (giving the DN reading).[14] This is how things work in Québéquois French, and in certain dialects of French as illustrated in (7a–c, e).

We assume that *pas* does not participate in the system of concord of standard French, because it is not needed semantically. Our treatment of standard French involves a parochial constraint requiring that *pas*'s stored quantifier must be in the verb's QUANTS list. This constraint can be incorporated into the lexical rule analysis (as a condition on the rule output) or simply added to the type constraint already required for *pas*-selecting finite verbs. Warner's (2000) system has a type *not-arg*, for example, whose French analog *pas-arg* could be constrained as follows.

(40)
$$\textit{pas-arg} \;\Rightarrow\; \begin{bmatrix} \text{CONT}|\text{QUANTS} & \langle \ldots, \boxed{1}, \ldots \rangle \\ \text{ARG-ST} & \left\langle \text{NP}, \begin{matrix} \text{ADV} \\ \begin{bmatrix} \text{CONT} & \boxed{1} \end{bmatrix} \end{matrix} \right\rangle \end{bmatrix}$$

The effect of (40) is that the 0-place quantifier that serves as the content of *pas* cannot participate in resumption, for it must be preserved intact in the QUANTS list of any verb that selects *pas* as a complement (this is precisely the class denoted by the type *pas-arg*). Note further that this constraint is independently motivated, as something must ensure that the negative quantifier introduced by *pas* never stays in STORE to be retrieved higher in the tree, a possibility that is available for other negative quantifiers, as we will see below.

A Romance variety might have this constraint or not. In the former case, e.g. in standard French, any number of negative quantifiers other than *pas* may be absorbed in the retrieval that determines a verb's QUANTS list. This predicts, for example, that double *personne* examples like (31) will be ambiguous, as analyzed above. But because simple negation cannot undergo resumption, only a double negation reading is possible for examples like (36a). This analysis also excludes NC-readings of examples like (36b–c) in standard French, as desired.

[14] This is not to say that our analysis of negative concord crucially depends on the 'adverb-as-complement' analysis of *pas*, but the uniformity of the analysis based on this proposal is striking.

We need to postulate one exception to the *pas*-rule for standard French in order to account for examples like (36d). The construction shows that *pas* is required in order to license the negative polarity item *le moindre renseignement*. Modulo the exceptions discussed in de Swart (1998), a negative polarity item needs to be licensed by a c-commanding licensor with the appropriate semantic licensing properties. We know that *personne* has the appropriate semantic properties to function as a licensor for *le moindre renseignement*. However, *personne* does not c-command the negative polarity item. The presence of *pas* in a concord chain is thus licensed in order to save the well-formedness of the construction by fulfilling the requirements of the negative polarity item.[15]

Of course there is considerable variation regarding negation systems, not only among varieties of French, but also across the Romance languages

[15] One of our reviewers points out that the concord reading of (36d) is not only available, it is in fact the only possible interpretation. We think that the double negation reading is blocked by the kind of constraints on double negation in French that are formulated by Corblin and Derzhansky (1997). For sentence with three concord items of the type in (ii), they argue that iteration must occur immediately after the verb is encountered, if it occurs at all. This means that we obtain the double negation reading in (ia), but not the one in (ib):

(i) Personne ne dit rien à personne.
No one NE says nothing to no one
a. $\neg\exists x \neg\exists z$ tell$(x, y, z)$
b. $^{*}\neg\exists x \exists y \neg\exists z$ tell $(x, y, z)$

The structure of (36d) is slightly different from the one in (i), because it involves the negation marker *pas* and a negative polarity item instead of a concord item in direct object position. However, the two sentences have in common that a double negation reading is blocked with a concord item in indirect object position. We assume that an extension of the approach Corblin and Derzhansky take towards sentences like (i) explains the unavailability of the double negation reading of (36d).

The same reviewer reminds us of the well-formedness of an example like (ii), which is very close in structure to (36d), but does not contain *pas*:

(ii) Je n'ai donné quoi que ce soit à personne.
I have not given anything to no one

Muller (1991: 317) provides (ii) as a paraphrase of the sentence 'Je n'ai rien donné à personne'. This reviewer suggests that *le moindre renseignement* counts as a quantificational element blocking wide (inverse) scope for *personne* in (36d). The reviewer's report does not offer an explanation for the fact that *quoi que ce soit* in (ii) does not block inverse scope, but we might hypothesize that the indefinite is not a quantifier, and so can be licensed by inverse scope of *personne*. This is not in line with the claim (made by de Swart 1998) that licensing of negative polarity items under inverse scope is felicitous only if the wide scope interpretation of negation semantically entails a positive statement, or pragmatically carries quite generally. In Catalan, for example, the use of negation becomes optional in a concord context. So we don't have a constraint like (40). As a result, both (41a) and (41b) are grammatical, and they have the same meaning (from Vallduví 1994):

(41) Cap d'ells vindrà. [Catalan]
None of them comes.
b. Cap d'ells no vindrà pas.
None of them not comes
= None of them comes.

In other Romance languages, negation is required when the negative quantifier is in a postverbal position, but is excluded or leads to a double negation reading when the negative quantifier is in preverbal position, e.g. in Italian, Spanish or Sardinian. Example (44), quoted by Déprez (2000), is from Jones (1993):

(42)a. No funciona nada. [Spanish]
Not works nothing
= Nothing works.
b. Nada funciona.
Nothing works
= Nothing works.

(43)a. Gianni *(non) dice niente a nessuno. [Italian]
Gianni *(not) says nothing to no one
= Gianni does not tell anyone anything.

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a positive implicature. A generalization of the inverse scope explanation would wrongly predict the ungrammaticality of a sentence like (iii), also from Muller (1991: 316):

(iii) ?*Qui que ce soit n'a rien fait.
Whoever has nothing done.

A sentence like (iii) is expected to be ungrammatical under de Swart's (1998) analysis, because the NPI denotes the lowest element, the 'bottom' of some scale. This leads to a very strong negative statement, which prohibits the sentence from generating scalar implicatures. A full account of the licensing conditions on negative polarity items in French is beyond the scope of this paper, but as far as we can see, (ii) is the exceptional case, rather than (36d).

b. Nessuno (*non) legge niente.
No one (*not) reads nothing
= No one reads anything.

(44)a. Neune at mai peccatu. [Sardinian][NC]
Nobody has ever sinned.
b. Neune no' at mai peccatu. [DN]
Nobody has never sinned.

Ladusaw (1992) argues that negation functions as a scope marker in these languages. A VP-internal (i.e., postverbal) negative quantifier in Spanish or Italian cannot take sentential scope in the absence of a negation marker, but obviously, this problem vanishes for negative quantifiers in a VP-external (i.e., preverbal) position. Haegeman (1995) develops a similar account in a transformational framework, claiming that Italian and Spanish obey the so-called NEG-criterion at S-structure.

Evidence that *ne*-marking is reanalyzed as a scope marker can also be found in French. Kayne (1981) argues that the contrast between (45a) and (45b) involves the scope of the negation:

(45)a. Je ne demande qu'ils arrêtent personne.
I NE ask that they arrest no one
= I don't ask them to arrest anyone.
b. Je demande qu'ils n'arrêtent personne.
I ask that-they NE-arrest no one
= I ask that they arrest no one.

The occurrence of *ne* in the embedded clause indicates the upper limit of the semantic scope of negation. In order to give negation scope over the sentence as a whole, we can 'insert' *ne* in the main clause.

To accommodate these observations, we may assume a lexical constraint on French *ne*-forms:

(46) $\textit{ne-verb} \Rightarrow \left[\text{CONT}|\text{QUANTS}\ \langle\, \ldots, \textit{neg-quant}, \ldots \rangle\right]$

This guarantees that any *ne*-prefixed verb form in standard French must retrieve at least one negative quantifier into its QUANTS list. This constraint immediately accounts for contrasts like those in (45) and expresses a generalization true of all *ne*-verbs in our analysis. Although *ne* functioned originally as the marker of sentential negation, it has lost its negative force over time, and has in fact become optional in spoken French The real bearer of simple negation in modern French is *pas*.

In order to flesh out this analysis of examples like (45a), where a negative quantifier (*personne*) is scoped in the higher clause, we must revise our lexical retrieval constraint to permit a quantifier to remain in store, instead of being retrieved and scoped at the lowest level of structure. Again, this is independently motivated, as quantifiers in embedded subjunctive clauses are not strictly clause-bounded in their scope, as is well known (cf. Farkas and Giannikidou 1996 for instance). Hence we may reformulate our lexical retrieval constraint as follows:[16]

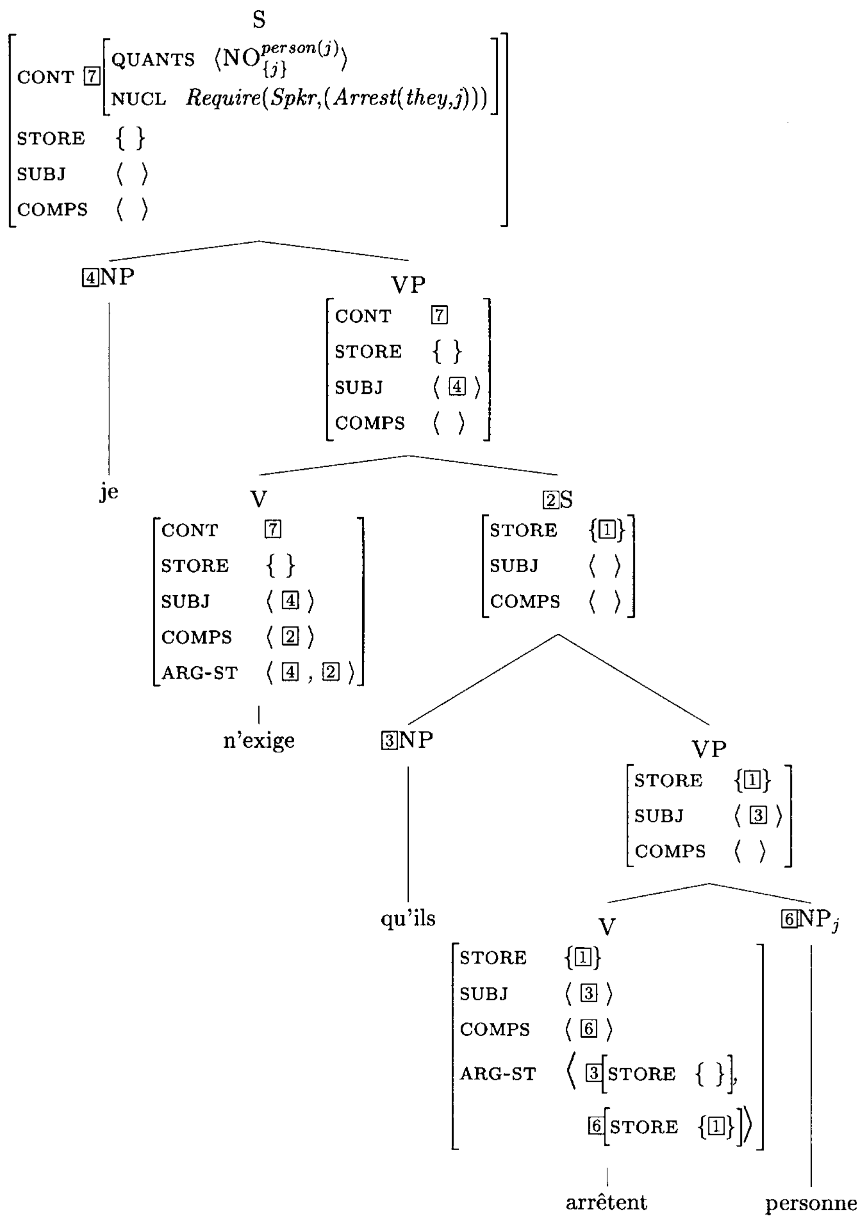
(47) Lexical Quantifier Retrieval (third formulation):

$$verb \Rightarrow \begin{bmatrix} \text{ARG-ST} & \left\langle \begin{bmatrix}\text{STORE} & \Sigma_1\end{bmatrix}, \ldots, \begin{bmatrix}\text{STORE} & \Sigma_n\end{bmatrix} \right\rangle \\ \text{CONTENT} & \begin{bmatrix}\text{QUANTS} & \mathbf{retrieve}((\Sigma_1 \cup \ldots \cup \Sigma_n) \dot{-} \Sigma)\end{bmatrix} \\ \text{STORE} & \Sigma \end{bmatrix}$$

What (47) does, is make retrieval optional. That is, the quantifiers stored in a verb's arguments may be retrieved into the verb's QUANTS list (possibly undergoing resumption), but the stored quantifiers that are not in the verb's QUANTS list are in the verb's STORE set. The verb's STORE value will then be passed up to the VP and the S that it projects, in accordance with the Head Feature Principle, if this is generalized in the fashion proposed by Ginzburg and Sag (2000). Alternatively, a separate STORE inheritance principle is required, as proposed by Pollard and Sag (1994). The resulting treatment of (45a) is sketched in (48):

[16] We use '$\dot{-}$' to designate a relation of contained set difference that is identical to the familiar notion of set difference ($\Sigma_1 - \Sigma_2$ = the set of all elements in $\Sigma_1$ that are not in $\Sigma_2$), except that $\Sigma_1 \dot{-} \Sigma_2$ is defined only if $\Sigma_2$ is a subset of $\Sigma_1$.

(48)

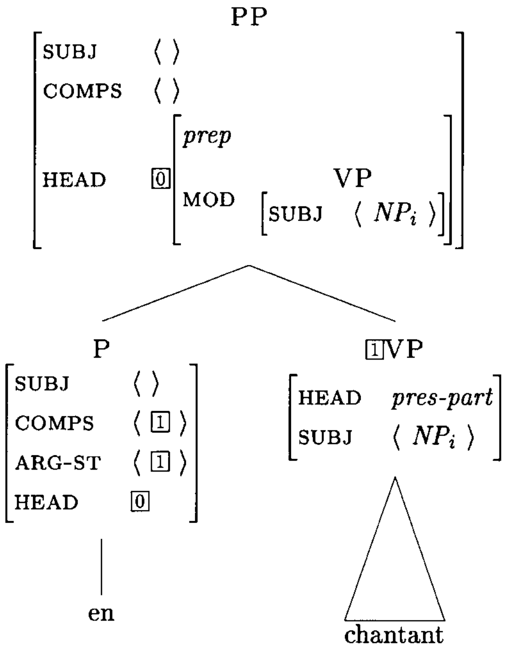



The inheritance of stored quantifiers is subject to a variety of constraints that we cannot do justice to here. For present purposes, it will suffice to assume that subjunctive verb forms freely allow negative quantifiers (other than the 0-place *pas*) to be passed up to a higher scope domain and that present indicative verb forms are constrained to have an empty STORE. This makes the (possibly too) strong claim that finite verbs are absolute scope islands, i.e., that quantifier scope is bounded by finite clauses. Intermediate positions, where the STORE value of a finite verb is restricted, but not required to be empty, are certainly possible.

### 6.2. *Embedding under Negative Prepositions*

One advantage of the extension of our rule of resumption to include non-variable binding operators is that we can integrate embedding of NCIs under *sans* 'without' in our system. We take *sans* to be the negative counterpart of *en*, which combines with a present participle to build an intersective modifier, as shown in (49):

(49)




We will assume that there is an intersective modification construction (a head-adjunct structure) that combines PPs like (49) with VPs to produce VPs like the one bracketed in (50).[17]

(50) Anne [est partie *en chantant*].

[17] It is not essential that we adopt this analysis of intersective modification or the conjunctive semantics for it proposed below. Our proposal is compatible, for example, with the modification analysis proposed by Kasper (ms.), which distinguishes the internal and external content of the modifier.

If we assume, for simplicity, that the intersective modification construction simply conjoins the semantics of the modifier and the modified VP, then the lexical entry for the preposition *en* can be formulated as in (51).

(51) *en*

$$\left[\begin{array}{ll} \text{HEAD} & \left[\text{MOD} \quad \begin{array}{c}\text{VP}\\ \left[\text{SUBJ} \quad \langle NP_i \rangle\right]\end{array}\right] \\ \text{ARG-ST} & \left\langle \begin{array}{c}\text{VP}\\ \left[\begin{array}{ll}\text{SUBJ} & \langle NP_i\rangle \\ \text{HEAD} & \textit{pres-part} \\ \text{CONT} & \boxed{1}\end{array}\right]\end{array}\right\rangle \\ \text{CONT} & \boxed{1} \end{array}\right]$$

Note that this lexical entry (presumably derived by principles of more general scope) fixes the basic semantics properly by (1) identifying the preposition's content with that of the participial VP and (2) coindexing the SUBJ element of the participial VP with that of the VP that the projected PP will modify (its MOD value). The PP's semantics is identical to that of the participial VP. Hence assuming simple conjunction as the semantics of the intersective modifier construction, we have the following semantics (ignoring tense, among other things) for (50):

(52) *Leave(Anne) & Sing(Anne)*

Along similar lines, we treat *sans* as a preposition which combines with an infinitival VP complement to build an intersective modifier. The semantic contribution of *sans* then reduces to simple negation, allowing the interpretation of (53) to be analogous to (52):

(53)a. Anne est partie sans chanter.
Anne has left without singing.
b. *Leave(Anne) &* $NO^{\emptyset}_{\emptyset}$*(Sing(Anne))*

Note that in our earlier treatment of quantifiers and negation, the lexical head (always a verb until now) provides the locus for the stored quantifiers in the head's arguments to be assigned scope. What is unusual about *sans* is that it introduces a 0-place negative quantifier (simple negation) into the semantics – this is intrinsic, not inherited from any element within the argument of *sans*. To accommodate such lexical contribution to scope, we will have to revise lexical quantifier retrieval one last time. First, we introduce a feature LEXICAL-QUANTIFIER (LEX-QUANT), whose value will be empty for most words, but in the case of *sans* will be a singleton set containing the 0-place negative quantifier. *Sans* also acts as a scope island and hence its lexical entry will require an empty STORE, as shown in (54).

(54) *sans*

$$\left[\begin{array}{ll} \text{HEAD} & \left[\text{MOD}\ \begin{array}{l}\text{VP}\\ \left[\text{SUBJ}\ \ \langle NP_i \rangle\right]\end{array}\right] \\ \text{ARG-ST} & \left\langle \begin{array}{l}\text{VP}\\ \left[\begin{array}{ll}\text{SUBJ} & \langle NP_i \rangle\\ \text{HEAD} & \textit{infin}\\ \text{CONT} & \left[\begin{array}{ll}\text{QUANTS} & \langle\,\rangle \\ \text{NUCL} & \boxed{1}\end{array}\right]\end{array}\right]\end{array}\right\rangle \\ \text{LEX-QUANT} & \{NO^{\emptyset}_{\emptyset}\} \\ \text{CONT} & \left[\text{NUCL}\ \ \boxed{1}\right] \\ \text{STORE} & \emptyset \end{array}\right]$$

Two other properties of (54) are noteworthy: (1) the content of *sans* takes its nucleus from its infinitival VP argument and (2) that argument is required to have no quantifiers on its QUANTS list. The latter constraint prevents unwanted spurious ambiguity that would otherwise arise, given that *sans* allows quantifier retrieval.

We may now generalize lexical quantifier retrieval to apply to all words whose content is propositional (technically, a *state-of-affairs* (*soa*) in our system). We do this as follows:

(55) Lexical Quantifier Retrieval (final formulation):

$$\textit{soa-wd} \Rightarrow \left[\begin{array}{ll} \text{ARG-ST} & \left\langle \left[\text{STORE}\ \ \Sigma_1\right], \ldots, \left[\text{STORE}\ \ \Sigma_n\right] \right\rangle \\ \text{LEX-QUANT} & \Sigma_0 \\ \text{CONTENT} & \left[\text{QUANTS}\ \ \mathtt{retrieve}((\Sigma_0 \cup \ldots \cup \Sigma_n) \dot{-} \Sigma)\right] \\ \text{STORE} & \Sigma \end{array}\right]$$

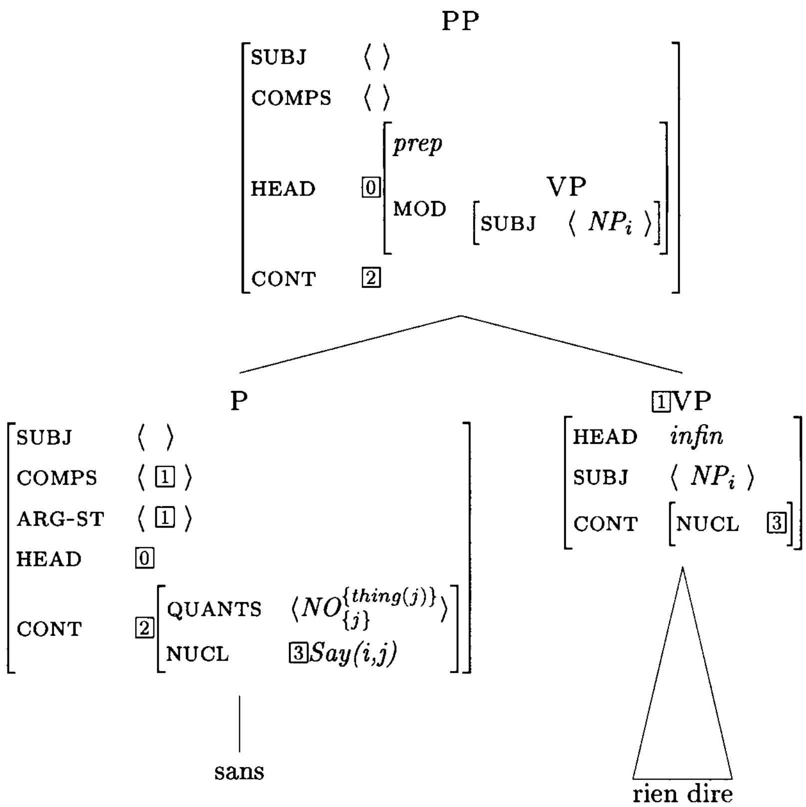
This is a minor revision that allows a word like *sans* to contribute its own quantification to the pool of quantifiers that can be retrieved into its QUANTS list. Note that since *sans* has an empty STORE value, its lexical quantifier cannot be passed up to be retrieved at a higher level of structure.

This analysis immediately predicts the possibility of a concord reading for examples like (56):

(56) Anne est partie sans rien dire.
Anne has left without nothing say
Anne has left without saying anything.

That is, given that *rien*'s quantifier can be in the store of the infinitival VP (in fact it must be, since *sans* requires that the QUANTS list of that VP be empty), the lexical 0-place quantifier of *sans* and *rien*'s quantifier can undergo resumption. The result is simply a monadic quantifier, as illustrated in (57):

(57)



This construction is productive, as is shown by the resumptive quantifiers built up in contexts like (58):

(58)a. Il est parti sans rien dire à personne.
He has left without nothing say to no one
= He left without saying anything to anyone.

b. Il part sans jamais rien dire à personne.
He leaves without never nothing say to no one
= He leaves without ever saying anything to anyone.

Our treatment of *sans* thus integrates all such cases into the general analysis of negative concord. We do not need to treat *sans* as illustrating a negative polarity use of concord items (as proposed, for example, by Muller (1991: 264–265)).

Our account of negative concord also explains certain other facts discussed in the literature, usually accounted for by appeal to '$\Sigma$-sequences' (May 1989). For example, concord items embedded under *sans* can participate in a 'negative chain' but embedding *sans* under concord items higher in the tree always leads to a double negation reading. Compare the previous examples with (59):

(59)a. Personne n'est parti sans rien dire [DN]
No one NE-has left without nothing say
= No one left without saying nothing

b. Je n'ai invité aucun étudiant qui n'a rien fait [DN]
I NE-have invited no student who NE has nothing done
= I haven't invited any student who did not do anything

In our analysis, the negation introduced by *sans* takes scope over the modifier only. From the empty store constraint in the lexical entry of *sans* it follows that this 0-place negative quantifier can never be in the STORE at the higher level of structure, where it would have to be, were it to be retrieved via resumption into the QUANTS list of the higher verb. The same is true of the relative clause in (59b), as the finite indicative verb within the relative clause must also have an empty STORE, as noted earlier.

## 7. Conclusion

The interpretation of negation and negative concord in a polyadic quantifier framework has a number of advantages over treatments of negative concord in terms of negative polarity. Within the framework developed in this paper, we can derive the double negation and the concord readings as different ways of building up the polyadic quantifier, rather than postulating a contextual ambiguity which lacks independent motivation. This approach has the additional advantage of reducing the difference between concord and non-concord languages to a preference for one mode of composition or the other. Furthermore, the extension of the resumptive polyadic approach to include non-variable binding operators allows us to treat negation as semantically empty in concord contexts. The observation that the negation marker can take up a syntactic function (e.g. as a scope marker) in the absence of a semantic role explains why languages vary in the participation of negation in negative concord.

The embedding of the polyadic quantifier analysis in an HPSG grammar makes it possible to treat iteration and resumption as two variants of the rule which governs retrieval of quantifiers from word's quantifier store. The lexical treatment of negative quantifiers allows us to formulate specific rules for type $\langle 0 \rangle$ quantifiers which capture the restrictions on the interpretation and the scope of *pas* and *sans* in standard French. Of course, these lexical rules are subject to dialectal and cross-linguistic variation, which circumvents an important problem the local approach faces, namely the observation that sentential negation does not behave in the same way across concord languages.

Finally, the HPSG implementation of the polyadic approach developed in this paper opens up new ways to talk about the famous Jespersen cycle, i.e., the observation that certain existential expressions become negative polarity items and finally shift entirely to negative quantifiers in the historical evolution of a language. This diachronic phenomenon can be captured in terms of changes in the interpretation of a sequence of quantifiers from iteration (of multiple existential quantifiers within the scope of negation) to resumption (of negative quantifiers) and back to iteration (of negative quantifiers).

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