

HENRIËTTE DE SWART

SCOPE AMBIGUITIES WITH NEGATIVE QUANTIFIERS*

Jacobs (1980, 1991) and Rullmann (1995) claim that lexical decomposition of the German determiner *kein* ‘no’ and its Dutch counterpart *geen* ‘no’ is necessary to account for readings in which a scope-bearing operator such as an intensional verb or a universal quantifier intervenes between the negation and the existential quantifier part of the determiner. In this paper, I argue that lexical decomposition is not only undesirable, but empirically incorrect. As an alternative, I develop a higher-order interpretation of negative quantifiers in terms of quantification over properties. The analysis is built on the observation that split readings are restricted to monotone decreasing NPs in predicative positions.

1 NEGATION AND SCOPE

Quantificational NPs give rise to scope ambiguities when they interact with other quantifiers, or when they are embedded under intensional verbs. In these contexts, we find the so-called ‘split’ readings of negative quantifiers.

1.1 Intensional contexts

An indefinite NP gets a specific reading if it takes wide scope over the intensional operator (1a), and a non-specific reading if it is interpreted within the scope of the intensional operator (1b):

- (1) Anne wants to marry a Norwegian
- a. There is a Norwegian Anne wants to marry (de re)
 - b. Anne wants to marry a(n arbitrary) Norwegian (de dicto)

(1b) can be true in a situation in which Anne does not even know any Norwegians. The reading in (1a) is false in those circumstances. The way linguists analyze such scope ambiguities depends on the grammatical theory they adopt. One can use quantifying-in (in a classical Montague-grammar perspective), Cooper storage (as a generalization of quantifying-in in Montague grammar, cf. Cooper 1983, or in HPSG, cf. Pollard & Sag 1994), quantifier-raising at LF (in generative grammar), or type-shifting operations (in a flexible Montague grammar, cf. Hendriks 1993) to derive wide and narrow scope readings. Negative quantifiers such as *no* allow similar ambiguities. But in

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certain languages, and certain contexts, these quantifiers allow a third interpretation in addition to the regular wide and narrow scope readings. In this reading, the intensional verb scopes in between the negation part and the existential part of the determiner. For the German example in (2) (adapted from Jacobs 1991), this is the reading paraphrased in (2c). For Rullmann's (1995) Dutch example in (3), this is the reading paraphrased in (3c):

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|-----|---|------------|
| (2) | Hanna sucht kein Buch
Hanna seeks no book | [German] |
| a. | There is no book x such that Hanna seeks x | (de re) |
| b. | The object of Hanna's seeking is no book | (de dicto) |
| c. | It is not the case that Hanna is seeking a book | (split) |
| (3) | Ze mogen geen eenhoorn zoeken
They are allowed no unicorn seek | [Dutch] |
| a. | There is no unicorn x such that they are allowed to seek it | (de re) |
| b. | What they are allowed to do is to seek no unicorn | (de dicto) |
| c. | They are not allowed to seek a unicorn | (split) |

The (a)- and (b)-readings of (2) and (3) are derived in the same way as those in (1a) and (1b). As Jacobs points out, (2a) and (2b) are not very natural interpretations. It is unlikely that there is no book that Hanna might want to try and find (2a), and it is not so clear what it means to say that the object of Hanna's search is no book (2b). In general, de dicto readings with negative quantifiers are easier to get when the complement of the intensional verb is not just an NP, but is for instance a VP-complement as in (3). According to Rullmann, the de re and de dicto readings are just as unlikely in these cases, but at least it is easier to observe truth-conditional differences. The truth conditions of (3a) and (3b) are rather weak. (3a) already becomes true in circumstances in which no unicorns exist, whether or not they have permission to seek unicorns. (3b) claims that it is permissible to seek no unicorn, so there is no obligation to search for a unicorn. (3c) makes the stronger claim that they do not have permission to seek a unicorn. Under this interpretation, it is forbidden to seek a unicorn. In the paraphrases of the (c)-reading of both (2) and (3), the modal operator is semantically in between the negation \neg and the existential quantifier \exists . Because this type of interpretation seems to split up the meaning components of the negative quantifier into its two composing parts, the (c)-reading is descriptively referred to as the 'split' reading.

Rullmann provides an example which further supports the need for the negation operator to take wide scope with respect to the intensional verb. It involves the verb *hoeven* 'need' in Dutch, which is the negative polarity counterpart to *moeten* 'must'. The narrow scope reading (4b) is excluded, because the verb is not properly licensed. Only the wide scope interpretation for the negative quantifier (4a), or the split reading (4c) is available:

- | | | |
|-----|--|---------|
| (4) | Ze hoeven geen verpleegkundigen te ontslaan
They need no nurses to fire | [Dutch] |
| a. | For no nurse x it is the case that it is necessary to fire x | (de re) |

- b. #It is necessary that they fire no nurses¹ (de dicto)
 c. It is not necessary for them to fire a nurse (split)

A situation in which the split reading in (4c) is false, but (4a) is true would be a context in which it is necessary to fire some nurse or other, without there being a particular nurse for whom it is necessary that (s)he be fired.

1.2 Universal quantifiers

Jacobs and Rullmann make similar observations with respect to examples like (5) and (6), which involve scope relations between negative and universal quantifiers:

- (5) Alle Ärzte haben kein Auto [German]
 All doctors have no car
 a. There is no car x , such that all doctors have x (wide scope *kein*)
 b. For all doctors x , it is the case that x has no car (narrow scope *kein*)
 c. Not every doctor has a car (split)
- (6) Iedereen is geen genie [Dutch]
 Everyone is no genius
 a. There is no genius x such that every individual is identical to x
 (wide scope *geen*)
 b. For every individual x it is the case that x is not a genius
 (narrow scope *geen*)
 c. It is not the case that for every individual x it is true that x is a genius
 (split)

The truth conditions of (5a) are rather weak, because in the world as we know it, not many people share cars. The wide scope reading for the universal quantifier in (5b) is very strong, because it excludes car-ownership for all doctors. The most likely interpretation of the sentence is (5c), in which the universal quantifier is scoped in between the negation and the existential quantifier. The distribution of readings in (6) is similar. (6b) is the strong interpretation of the sentence; (6a) is so weak it does not even make sense. The most likely reading is (6c), in which the universal quantifier intervenes between negation and the existential quantifier. In German as well as in Dutch, the split reading requires a special intonation pattern in which stress on the subject is followed by a rise-fall intonation. This reduces the amount of ambiguity we find in actual spoken language.

1.3 Lexical decomposition

The observations made in sections 1.1 and 1.2 show that the split reading is truth-conditionally distinct from the regular de re and de dicto readings. This raises the question how to derive the split reading. As pointed out in section 1.1, linguists have developed various mechanisms to generate multiple semantic representations for one and the same (surface) syntactic configuration. However, none of these proposals

derives the split reading, as pointed out by Jacobs (1980) (for quantifying-in), Rullmann (1995) (for quantifier-raising) and Hendriks (1993, thesis 2) (for type-shifting operations).² If regular mechanisms governing scope ambiguities are unable to derive the split reading, something else must be responsible for this interpretation.

Both Jacobs and Rullmann start from the observation that the scope bearing operator (the modal verb or the universal quantifier) intervenes between the negation part \neg and the existential quantifier part \exists of the determiner. Following Beck (1955/57), they suggest an analysis in terms of lexical decomposition. Dahl (1993) provides a similar analysis of negative quantifiers in Swedish. Jacobs and Rullmann are well aware of the problems their proposal raises for the principle of lexical integrity. Most theories of grammar (including generative grammar, Montague Grammar, HPSG, LFG) treat lexemes as the atoms of meaning. As pointed out by Geurts (1996), the adoption of a lexicalist hypothesis implies that we should treat a negative determiner as a lexical unit, and not split it up into two abstract meaning components. However, both Jacobs and Rullmann argue that the only plausible way to analyze the split reading is to suppose that the determiners *kein* and *geen* do not constitute a lexical unit, but are semantically built up from two parts: a negation operator plus an indefinite determiner. At the surface structure, the two parts melt into one lexeme if they are not separated by lexical material. Jacobs (1980) uses an abstract negation element NEG which amalgamates with an indefinite to build *kein*. Rullmann (1995) assumes an incorporation rule in the style of Klima (1964):

$$(7) \text{ niet Det}_{indef} \Rightarrow \text{geen where Det}_{indef} \text{ is een 'a' or } \emptyset$$

An argument Rullmann brings up in favor of a transformational account is that lexical material at the surface can block incorporation of negation. (8) provides a minimal pair:

- (8) a. Anne trouwt geen Noor [Dutch]
 Anne marries no Norwegian
 b. Anne trouwt niet met een Noor
 Anne marries not with a Norwegian

The verb *trouwen* 'to marry' can be optionally construed with the preposition *met* 'with'. If the preposition separates the negation and the indefinite in the surface structure, incorporation is blocked. Sentences (8a) and (8b) convey the same meaning, though. Rullmann takes this to support his view that incorporation is a purely superficial syntactico-morphological operation which does not have any semantic consequences.

In Dutch and German, incorporation seems to be obligatory whenever possible. Dahl (1993) suggests that the transformation is optional in Swedish:

- (9) a. Jag köpte inte någonting "I did not buy anything" [Swedish]
 b. Jag köpte ingenting "I bought nothing"

According to Dahl, *ingenting* is only allowed if *inte någonting* is possible in the same position.

- b. For every muslim x , it is permitted that x marry each individual y element of a group Y consisting of at most four women (de dicto)
- c. For every muslim x , it is not permitted to marry more than four women (split)

The only readings I am interested in concern generalizations over muslims. I take it that the modal verb *can* has a deontic interpretation here, and is interpreted in terms of permission. The wide scope (de re) interpretation for the monotone decreasing quantifier in (12a) is too weak, because it comes out true in a domain where, for every muslim, there are less than four women in the domain of discourse he can even think of marrying. This is like an accidental generalization, because it may very well come out true, independently of the question whether, by law, he does or does not have permission to marry more than four women. The narrow scope (de dicto) interpretation in (12b) states that a muslim has permission to marry four women or less, so it is not obligatory for a muslim to marry more than four women. The split reading in (12c) states the relevant rule for marriage according to the muslim religion. It claims that the number of women a muslim has permission to marry is four at the most. In other words, a muslim is not allowed to marry more than four women.

Similar examples can be given for languages like Dutch, German, etc. Take for instance *weinig* ‘few’ embedded under *hoeven* ‘need’ in (13):

- (13) Ze hoeven weinig verpleegkundigen te ontslaan [Dutch]
 They need few nurses to fire
- a. For a group Y consisting of few nurses y , it is the case that it is necessary for them to fire each individual y member of Y (de re)
 - b. #It is necessary for them to fire few nurses (de dicto)
 - c. It is not necessary for them to fire more than a small number of nurses (split)

As expected, the (b)-reading is excluded, because the negative polarity verb *hoeven* is not appropriately licensed if it takes wide scope over the monotone decreasing quantifier (compare (4) above). The difference between the (a)- and the (c)-reading comes out in a context in which it is necessary to fire a certain, rather large number of nurses (so that (13c) is false), but there are only one or two nurses in particular for whom it is necessary that (s)he be fired (so that (13a) is true).

The problem these examples raise is obvious: if *no* has to be decomposed into \neg plus \exists in order to account for split readings, then the observations made with respect to (11)–(13) suggest that *at most n* has to be decomposed into \neg and *more than n*, *few* has to be decomposed into \neg and *more than a small number of*, etc. This leads to a proliferation of decomposition rules. Note that it is not impossible to come up with a systematic procedure by means of which the components are specified. Given that *some* requires the intersection of the sets denoted by the two arguments of the determiner to be non-empty, whereas it has to be empty for *no*, it is clear that any context in which *some*(A,B) comes out false, *no*(A,B) is made true. So a sentence

involving *no* can be interpreted in terms of the negation of a sentence involving *some*. Similarly, any context which makes *more than five*(A,B) come out false, makes *at most five*(A,B) true. So a sentence involving *at most five* can be interpreted as the negation of a sentence involving *more than five*. And so on. The generalization is that the monotone decreasing quantifier is decomposed by reformulating the condition on the cardinality of the intersection as the negation of some other condition. The increasing quantifier that condition is the denotation of is then the expression which, together with negation, composes the decreasing quantifier.

But even though there is a systematic correlation on the semantic side, a surface-level rule of amalgamation or incorporation looks less attractive here. In particular, the question arises why lexical decomposition is restricted to monotone decreasing quantifiers. It is just as easy to state the interpretation of a (weak) monotone increasing quantifier *at least five* in terms of the negation of the condition specified by *less than five*. We can then argue that *at least five* is to be decomposed into negation and *less than five*. If semantic equivalence is all that counts, there is no reason not to expect split readings with monotone increasing quantifiers such as *some* or *at least n*. However, examples like (14) have only two readings, which correspond with the regular wide and narrow scope interpretations for the NP with respect to the intensional verb:

- (14) Tom needs at least two blankets
- a. At least two blankets are such that Tom needs to have them (de re)
 - b. What Tom needs to have is at least two blankets (de dicto)

Unlike (11), (14) does not have a third reading in which Tom does not need less than two blankets. If there is no split reading for monotone increasing quantifiers, semantic equivalence cannot be the trigger of a surface-level process of amalgamation or incorporation. The reason this problem does not surface in the literature on lexical decomposition is that authors like Jacobs and Rullmann treat *kein* and *geen* in German and Dutch as a special case. What this section shows is that, at least in intensional contexts, split readings arise with all monotone decreasing quantifiers. Moreover, the phenomenon is not restricted to Dutch and German, but shows up in English as well. The general contrast between monotone increasing and decreasing quantifiers suggests that split readings require a semantic rather than a morpho-syntactic treatment.

2.2 Missing readings

The central claim of the lexical decomposition approach is that the split readings require an analysis in which *no* decomposes into a negation operator \neg and an existential quantifier \exists , which can scope at different levels. Theoretically, this should allow negation and the existential quantifier to be completely independent. That prediction turns out to be empirically incorrect, because the lexical decomposition approach generates readings that are missing from the natural language sentence. The first observation we make is that the existential quantifier never outscopes negation. A sentence like (15) has the readings spelled out in (15a–c), but not the one in (15d). Compare this with (16), which has all the readings that (15) has plus the wide scope reading (15d):

- (15) Anne wil geen Noor trouwen
Anne wants no Norwegian marry
- a. There is no Norwegian x such that Anne wants to marry x
(wide scope *geen*)
 - b. Anne wants for no Norwegian x to marry x (narrow scope *geen*)
 - c. It is not the case that Anne wants to marry a Norwegian (split)
 - d. # There is a Norwegian Anne does not want to marry (wide scope *een*)
- (16) Anne wil niet met een Noor trouwen
Anne wants not with a Norwegian marry

In view of the lexical decomposition hypothesis, it is rather surprising that (16) allows the (d)-reading, but (15) does not. According to Rullmann, the presence of a preposition blocks the incorporation of negation at the surface level (compare the examples in (8) above). Under his analysis, the differences between (15) and (16) should be purely morpho-syntactical, and should not affect the meaning of the sentences. That the wide scope reading for the existential quantifier is not accidentally missing from (15) becomes clear when we change the example in such a way that the wide scope, specific reading is highly prominent. Compare (17) and (18):

- (17) a. *Anne wil geen Noorse collega trouwen die zij vorig jaar op een congres heeft ontmoet
Anne wants no Norwegian colleague marry whom she last year at a conference has met
- b. Anne wil niet met een Noorse collega trouwen die zij vorig jaar op een congres heeft ontmoet
Anne wants not with a Norwegian colleague marry whom she last year at a conference has met
- (18) a. # Anne_i wil geen Noorse collega_j van haar trouwen. Zij_i zegt dat hij_j gewoon een goede vriend is³
Anne_i wants no Norwegian colleague_j of her marry. She_i says that he_j just a good friend is
- b. Anne_i wil niet met een Noorse collega_j van haar trouwen. Zij_i zegt dat hij_j gewoon een goede vriend is
Anne_i wants not with a Norwegian colleague_j of her marry. She_i says that he_j just a good friend is

(17) shows that a richer descriptive content, which strongly supports a specific reading is acceptable for *niet . . . een*, but infelicitous with *geen*. In (18), we see that *een Noorse collega van haar* can be the antecedent of a discourse anaphor, but not *geen Noorse collega van haar*. The standard traditional Dutch grammar ANS (= Algemene Nederlands Spraakkunst) argues that incorporation is impossible for ‘specific’ indefinites. The examples the ANS gives to illustrate the notion of specific indefinites suggest that it refers to indefinites that take wide scope over negation.

It may not be impossible to come up with a solution to this problem, and block incorporation in cases in which the indefinite gets a ‘specific’ interpretation in the sense of Fodor & Sag (1982). If specific readings are ‘strong’ in the sense of de Hoop (1992), and strong NPs are outside of the VP (in the Spec of IP) following Diesing (1992), we could try to restrict lexical decomposition to VP-internal, non-specific, weak negative quantifiers. This is essentially the solution adopted by Kratzer (1995).

Even if this analysis can be made to work, overgeneration remains a problem, because there are also missing readings which do not involve wide scope of the existential quantifier over negation. This version of the problem of overgeneration arises in contexts with more than one scope bearing expression besides the negative quantifier. Compare the examples in (19):

- (19) a. Iedereen zoekt geen boek van Chomsky [Dutch]
 Everyone seeks no book by Chomsky
 b. Iedereen zoekt niet naar een boek van Chomsky
 Everyone seeks not for a book by Chomsky

The intensional verb *zoeken* can be optionally construed with the preposition *naar*. According to Rullmann (1995), the intervening lexical material at the surface blocks incorporation, but this is a superficial morpho-syntactic process which does not affect the semantics. A closer look at these sentences reveals that there is at least one interpretation (19b) does not share with (19a). This is the interpretation in which it is not the case that everyone is seeking a particular book by Chomsky:

- (20) $\neg \forall x \exists y (\text{Book}(y) \wedge \text{Seek}(x, y))$

For (19b) this reading is easily derived by giving the negation operator wide scope over the sentence as a whole, and interpreting the indefinite object *de re* with respect to the intensional verb. As argued by Ruys (1993), Abusch (1994) and Farkas (1995), these intermediate readings are a problem for Fodor & Sag’s (1982) analysis of specificity, because the indefinite NP is scopally dependent on some other quantifier. There is not one specific book by Chomsky which everyone fails to seek: Bill may have seen *Syntactic Structures* in the library, and decide not to try and find it now, for Sue that may be true of *Lectures on Government and Binding*, for Emma it may be *Language and Problems of Knowledge*, etc. The indefinite NP in such intermediate readings is not specific in the ‘absolute’ sense, so Ruys (1993) and Farkas (1995) argue that we need a notion of relative specificity, which Farkas calls ‘scopal’ specificity. Both Abusch and Farkas argue that there is no clearcut correlation between Fodor & Sag’s notion of specificity and scope.⁴ If we take intermediate readings seriously, the problem of split readings cannot be solved by appealing to the specific-non-specific or the weak-strong distinction. Accordingly, a syntactic constraint which restricts amalgamation or incorporation to the VP-internal domain loses its explanatory force. The missing reading (20) for (19a) suggests that sentences involving negative quantifiers do not allow \neg and \exists to take scope independently, even if the existential quantifier remains within the scope of negation, and there is no referential interpretation. The lexical decomposition approach does not explain how a surface rule of incorporation

can be sensitive to the relative order of the underlying quantifiers in complex scope configurations like those illustrated in (19a) and (19b).

In sum, the problem of the lexical decomposition approach is that it is both too strong and too weak. It is too strong, because not all readings the analysis predicts are available. It is too weak, because it does not explain the difference in the availability of split readings between monotone increasing and decreasing quantifiers. On top of the more general problem this analysis creates in terms of a violation of the principle of lexical integrity, these issues are serious enough to encourage us to seek other solutions.

3 THE TREATMENT OF NON-SPECIFIC READINGS

Although the implementation of the restrictions on split readings along the lines of the VP-internal-external distinction is problematic, the observation that split readings correlate with a weak interpretation of the negative quantifier is a step in the right direction. This also fits in with the rule stated by the ANS that incorporation is limited to non-specific readings of indefinites. Instead of tying this insight to constraints on the syntactic configuration in which the NP occurs, or introducing abstract individuals (cf. Geurts 1996), I will defend the view that weak readings arise from the fact that the NP is used in a predicative construction. Weak NPs in predicative positions are appropriately interpreted as properties. Split readings arise when negative NPs express quantification over properties.

The examples Jacobs and Rullmann give typically illustrate split readings in intensional or predicative contexts. We can generalize over these two types of contexts if we follow Zimmermann's (1993) proposal to interpret intensional verbs as a relation between an individual and a property, rather than a relation between an individual and the intension of a generalized quantifier. In this perspective, non-specific readings are restricted to NPs which can be interpreted as being of type $\langle e, t \rangle$ when they are under the scope of the intensional operator. In this section, I will show how we can analyze monotone increasing quantifiers in predicative positions along the lines of Zimmermann (1993).⁵ In section 4, the framework will be extended to negative quantifiers like *no*.

In classical Montague grammar, a sentence like (21a) translates as in (21b):

- (21) a. Jane seeks a book
 b. $\text{Seek}(j, \wedge \lambda X \exists x (\text{Book}(x) \wedge \vee X(x)))$

Zimmermann (1993) suggests instead that weak NPs such as *a book* which occur in embedded positions under intensional verbs are not interpreted as generalized quantifiers, but as properties. In the theory of type-shifting developed by Partee (1987), weak NPs which undergo the type-shifting operation BE produce a felicitous property. Partee's BE-operator maps generalized quantifier denotations onto properties. Formally, BE is $\lambda P \lambda x (\vee P (\wedge \lambda y [y = x]))$, where P is a variable over properties of properties. Consider the derivation of (22a) in (22b):

- (22) Frans is een genie [Dutch]
 Frans is a genius
 a. $BE = \lambda P \lambda x (\forall P (\wedge \lambda y [y = x]))$
 b. BE(a genius)
 $= \lambda P \lambda x (\forall P (\wedge \lambda y [y = x])) (\wedge \lambda X \exists z (\text{Genius}(z) \wedge \forall X(z)))$
 $= \lambda x \exists z (\text{Genius}(z) \wedge [z = x])$
 $= \lambda x (\text{Genius}(x))$
 c. BE(a genius) (f)
 $= \lambda x (\text{Genius}(x)) (f) = \text{Genius}(f)$

BE is a total function, so it applies to all quantifiers. But its role is to find the singletons in a generalized quantifier. As a result, strong quantifiers do not have a non-empty denotation in the domain of type $\langle e, t \rangle$ -expressions.

Zimmermann exploits the interpretation of (weak) indefinites as properties to develop an analysis of attitude verbs as expressions of type $\langle \langle s, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle$, i.e. relations between individuals and properties. The predicative interpretation of *a book* picks out the book property, which allows us to analyze a sentence like (21a) as in (23b):

- (23) a. Jane seeks a book [de dicto]
 b. $\text{Seek}(j, \wedge \lambda y (\text{Book}(y)))$

The translation in (23b) captures the intuition that Jane is a book seeker. The analysis extends to plural NPs such as *five toy monsters*. Zimmermann treats groups of individuals (indicated with a variable γ) as entities, and numerals as predicates over groups of individuals. This leads to the interpretation of (24a) in (24b):

- (24) a. Tom needs at least five toy monsters [de dicto]
 b. $\text{Need}(t, \wedge \lambda \gamma (\text{Toy monster}(\gamma) \wedge \text{At-least-five}(\gamma)))$
 where numerals such as *one, two three, ... n* are interpreted as predicates specifying the cardinality of a collection of individuals. *At-least-five*(γ) is interpreted as: $\exists \gamma' (\gamma' \leq \gamma \wedge \text{Five}(\gamma'))$, where \leq denotes the part-of relation

The representation in (24b) captures the intuition that what Tom needs to have is collections of toy monsters consisting of at least five members.

We can derive the de re interpretation of examples like (23) and (24) by translating NPs like *a book* or *at least five toy monsters* as genuine generalized quantifiers. They can then scope out of the domain of the intensional verb, which has a second translation as a relation between individuals:

- (25) a. Jane seeks a book [de re]
 b. $\exists x (\text{Book}(x) \wedge \text{Seek}(j, x))$

(25b) correctly claims that there is a (specific) book such that Jane is trying to find it. We can establish a straightforward relation between seeking of objects and seeking of properties if we adopt the meaning postulate in (26):

- (26) $\forall x \forall y \forall P ((P(y) \wedge \text{Seek}(x, y)) \rightarrow \text{Seek}(x, P))$

We can use this meaning postulate to account for the standard inference from de re readings to de dicto readings: thanks to (26), (25b) entails (23b) as desired.

As Zimmermann points out, there is evidence that we do not just refer to, but also quantify over properties in intensional contexts. Some well-known examples are in (27):

- (27) a. Geach is seeking something Quine is not seeking
b. A working-class hero is something to be

The preferred reading of (27a) is that Geach is involved in some search, and either Quine is not, or the object of his search is different. Neither the de re (28a), nor the de dicto (28b) interpretation of the sentence gives us this reading:

- (28) Geach is seeking something Quine is not seeking
a. $\exists x(\text{Seek}(g, x) \wedge \neg \text{Seek}(q, x))$ (de re)
b. $\text{Seek}(g, \wedge \lambda x(\neg \text{Seek}(q, x)))$ (de dicto)

The de re reading tells us that there is something (say a particular book) that Geach is looking for, but Quine is not. The de dicto reading tells us that the object of Geach's search is the kind of things Quine is not looking for. In order to derive the intended interpretation we need to be able to refer to the property that Geach is seeking, but Quine is not. Zimmermann proposes to handle this by giving *something Quine is not seeking* a higher-order interpretation in terms of existential quantification over properties as in (29a), with P a variable over expressions of type $\langle s, \langle \langle e, t \rangle, t \rangle \rangle$. This allows us to derive the preferred reading of (28) as in (29b–e):

- (29) Geach is seeking something Quine is not seeking
a. something = $\lambda P \exists P (\vee P(P))$
b. something Quine is not seeking
= $\lambda P \exists P (\vee P(P) \wedge \neg \text{Seek}(q, P))$
c. something Quine is not seeking(seek)
= $\lambda P \exists P (\vee P(P) \wedge \neg \text{Seek}(q, P)) (\wedge \lambda P' \text{Seek}(P'))$
d. is seeking something Quine is not seeking
= $\lambda x \exists P (\text{Seek}(x, P) \wedge \neg \text{Seek}(q, P))$
e. Geach is seeking something Quine is not seeking
= $\exists P (\text{Seek}(g, P) \wedge \neg \text{Seek}(q, P))$

The relative clause in (29b) specifies a further property of the property P that is being quantified over. Because we analyze the intensional verb as denoting a relation between individuals and properties, *seek* is of the right type to be taken as the argument of the higher-order quantifier (29c). After lambda conversion, we end up with (29d), which describes the property of seeking the kind of things Quine is not seeking. Application of this property to Geach completes the derivation (29e).

If we assume that a higher-order translation of the NP is generally available, we do not need to come up with extra machinery to explain the possibility of reference to and quantification over properties, for all the necessary tools are already in place. At first sight, the assumption of a general ambiguity between quantification over individuals

and quantification over properties looks like a major complication of the semantics of NPs. It is certainly useful for the interpretation of sentences like (27), but we might worry that it is too powerful a mechanism. In fact, the move to higher-order interpretations turns out to have only limited effects. In many cases, the higher-order translation does not generate any readings different from the ones we already had. For instance, the interpretation of *a book* as a generalized quantifier over properties suggests a paraphrase of (23a) as saying that there is a property Jane is seeking, and that is the book property. Accordingly, we can propose (30a) as the higher-order translation of the NP *a book*, and translate (23a) as in (30b):

- (30) Jane seeks a book [properties]
- a. a book
 $= \lambda P \exists P (P = \wedge \lambda y (\text{Book}(y)) \wedge \vee P(P))$
- b. Jane seeks a book
 $= \exists P (P = \wedge \lambda y (\text{Book}(y)) \wedge \text{Seek}(j, P))$
- c. $\text{Seek}(j, \wedge \lambda y \text{Book}(y))$

The combination of *seek* with the higher-order translation of *a book* in (30a) and the subject Jane reduces to the formula in (30b). (30b) is of course equivalent to the regular de dicto reading in (24b), repeated here as (30c): if there is a property identified with the book property which Jane seeks, then Jane is a book-seeker.

The introduction of higher-order translations creates spurious ambiguities in (30), but it does not create any non-existent readings. Although the higher-order interpretation does not do any harm, one might start wondering whether the sentences in (27) really warrant the introduction of a general mechanism of quantification over properties, if it does so little work for us in other examples. However, if we start looking at monotone decreasing NPs, we find that quantification over properties is exactly what allows us to derive the split readings without lexical decomposition.⁶

4 MONOTONE DECREASING NPS IN PREDICATIVE POSITIONS

4.1 Intensional contexts

Zimmermann's observation that only NPs that have an interpretation as expressions of type $\langle e, t \rangle$ can be embedded under intensional verbs extends to monotone decreasing NPs. As Partee (1987) points out, BE (no genius) = not (BE (a genius)). We can see this by deriving the meaning of the Dutch sentence (31) as in (31a–b):

- (31) Frans is geen genie [Dutch]
 Frans is no genius 'Frans is not a genius'
- a. BE (no genius)
 $= \lambda P \lambda x (\vee P (\wedge \lambda y [y = x])) (\wedge \lambda X \neg \exists z (\text{Genius}(z) \wedge \vee X(z)))$
 $= \lambda x \neg \exists z (\text{Genius}(z) \wedge [z = x])$
 $= \lambda x (\neg \text{Genius}(x))$
- b. BE (no genius)(frans)
 $= \lambda x (\neg \text{Genius}(x))(f) = \neg \text{Genius}(f)$

This is an interesting result, because it means that Dutch and German differ from English in their preference to use *no* or *not . . . a* in predicative contexts, but that this does not have any semantic consequences. We can exploit the predicative interpretation of *no* to give an interpretation of the de dicto reading of (2), repeated here as (32):

- (32) Hanna sucht kein Buch [German]
 Hanna seeks no book
 a. $\neg \exists x (\text{Book}(x) \wedge \text{Seek}(h, x))$ (de re)
 b. $\text{Seek}(h, \wedge \lambda x \neg \text{Book}(x))$ (de dicto)

In the de re reading, there is no particular book for which it is true that Hanna is seeking it. The translation in (32b) represents the de dicto reading of the sentence as saying that Hanna is a not-book seeker, which can be paraphrased as saying that she tries to find things which are not books. However, neither (32a), nor (32b) captures the preferred interpretation of the sentence, which is the split reading paraphrased as ‘Hanna is not seeking a book’. But remember that we introduced a general ambiguity in the interpretation of weak NPs in predicative positions, and said that they could express either quantification over individuals, or quantification over properties. The interpretation of *nothing* in terms of quantification over properties is given in (33):

$$(33) \text{ nothing} = \lambda P \neg \exists P (\vee P(P))$$

If we give the NP a higher-order translation in terms of quantification over properties, we obtain the split reading in which Hanna is not a book-seeker:

- (34) Hanna sucht kein Buch [German]
 Hanna seeks no book (split)
 a. no book
 $= \lambda P \neg \exists P (P = \wedge \lambda y (\text{Book}(y)) \wedge \vee P(P))$
 b. no book(seek)
 $= \lambda x \neg \exists P (P = \wedge \lambda y (\text{Book}(y)) \wedge \text{Seek}(x, P))$
 c. no book(seek)(hanna)
 $= \neg \exists P (P = \wedge \lambda y (\text{Book}(y)) \wedge \text{Seek}(h, P))$
 d. $\neg \text{Seek}(h, \wedge \lambda y (\text{Book}(y)))$

Because the intensional verb is of the type of P , it can be the argument of *no book*. The higher-order translation automatically gives the NP wide scope over the intensional verb (34b). The combination with the subject results in there being no property which is identified with the book property and which is such that Hanna seeks it (34c). This reduces to the claim that Hanna is not a book seeker (34d), which is an adequate representation of the split reading. Under this analysis, the split reading is truth-conditionally distinct from both the de re and the de dicto interpretation, as desired. (32a) automatically comes true in a world with no books, but (32b), and (34d) do not. (34d) comes out true if Hanna is not involved in a search at all, but (32b) does not.

We noticed above that the differences between the de re, the de dicto and the split reading are easier to grasp in sentences which involve modal verbs embedding a VP with a negative NP in object position, rather than just an NP. This means that it is useful to extend our analysis to sentences like (35):

- (35) Ze hoeven geen verpleegkundige te ontslaan [Dutch]
 They need no nurse to fire
 a. $\text{Hoeven} = \lambda P \lambda x \text{ Must}(x, \wedge \lambda y ([y = x] \wedge \vee P(y)))$

We can interpret a modal verb controlling a VP complement as a relation between individuals and properties (cf. Chierchia 1984). The subject position of the intransitive verb phrase embedded under *hoeven* in (35) is controlled by the subject of the matrix predicate (35a). The transitive VP embedded under *hoeven* builds a complex property out of the combination of *geen verpleegkundigen* and *ontslaan*. Note that the object of a verb like *ontslaan* is an individual rather than a property: one does not fire the nurse property, but individuals that have the property of being a nurse. However, the existence of a split reading suggests that we need to assign the object a higher-order translation in terms of quantification over properties. Following ideas by Carlson (1977) and van Geenhoven (1998), I propose that in cases where property denoting NPs are the object of a predicate that essentially applies to individuals, the NP restricts the application of that predicate to individuals which have the property denoted by the NP. This implies that the quantificational force of the variable does not come from the NP, but from the predicate. Carlson and van Geenhoven focus on monotone increasing NPs. Their property interpretation introduces a ‘minimality’ condition, which triggers existential closure over the relevant variable: there has to be some individual (group) which participates in the event, and which satisfies the denotation of the common noun. As argued by de Swart (1997), the interpretation of a monotone decreasing NP involves a ‘maximality condition’, which introduces universal closure over the variable: all groups that participate in the action contain less than so many individuals which have the property denoted by the common noun. The two typical cases are spelled out in (36):

- (36) For R a predicate of type $\langle s, \langle e, \langle e, t \rangle \rangle \rangle$, that is, a two-place relation between individuals:
 a. If R combines with an expression which denotes a minimal property derived from a monotone increasing NP, then:
 $\lambda y \lambda x \vee R(x, y) (P_{min}) = \lambda x \exists y (\vee R(x, y) \wedge \vee P(y))$
 b. If R combines with an expression which denotes a maximal property derived from a monotone decreasing NP, then:
 $\lambda y \lambda x \vee R(x, y) (P_{max}) = \lambda x \forall y (\vee R(x, y) \rightarrow \vee P(y))$

As a monotone increasing NP, the indefinite *een verpleegkundige* ‘a nurse’ translates as a property which involves a minimality condition. Existential closure leads to the translation in (37a). The monotone decreasing NP *geen verpleegkundige* ‘no nurse’ introduces a maximality condition. After universal closure, we obtain the translation in (37b):

- (37) a. een verpleegkundige ontslaan
 a nurse fire
 $= \lambda y \lambda x \text{ Fire}(x, y) (\wedge \lambda z \text{ Nurse}(z))$
 $= \lambda x \exists y (\text{Fire}(x, y) \wedge \text{Nurse}(y))$

- b. geen verpleegkundige ontslaan
 no nurse fire
 $= \lambda y \lambda x \text{Fire}(x, y) (\wedge \neg \lambda z \text{Nurse}(z))$
 $= \lambda x \forall y (\text{Fire}(x, y) \rightarrow \neg \text{Nurse}(y))$

If we assume this much, we can develop the interpretations of (36) spelled out in (38a–c):

- (38) Ze hoeven geen verpleegkundige te ontslaan [Dutch]
 They need no nurse to fire
 a. For no nurse x it is the case that they must fire x (de re)
 $\neg \exists x (\text{Nurse}(x) \wedge \text{Must}(\text{they}, \wedge \text{Fire}(\text{they}, x)))$
 b. # It is necessary for them to fire no nurse (de dicto)
 $\text{Must}(\text{they}, \wedge \forall x (\text{Fire}(\text{they}, x) \rightarrow \neg \text{Nurse}(x)))$
 c. It is not necessary for them to fire a nurse (split)
 $\neg \exists P (P = \wedge \lambda y (\text{Nurse}(y)) \wedge \text{Must}(\text{they}, \wedge \exists x (\text{Fire}(\text{they}, x) \wedge P(x)))) = \neg \text{Must}(\text{they}, \wedge \exists x (\text{Fire}(\text{they}, x) \wedge \text{Nurse}(x)))$

The de re and de dicto readings arise in the usual way. The interpretation of the predicative NP as expressing quantification over properties derives the split reading. The existential quantification over the nurse variable is triggered by the minimality condition introduced by the property quantified over. Given that the object takes wide scope over *hoeven* and its controlled complement under this interpretation, the negative polarity verb is properly licensed, which shows the sharp distinction between a regular de dicto reading and the higher-order interpretation. The reader is referred to de Swart (1997) for a systematic treatment of the existential/universal quantification introduced by property denoting NPs in relation to the monotonicity properties of the underlying NP. This analysis is formulated in the framework of type-shifting operations developed by Partee (1987).

4.2 Quantificational contexts

The analysis extends to quantificational contexts. A sentence involving *to be* and a negative quantifier can be interpreted in various ways. If we interpret *to be* as the identity relation between individuals, we can derive the wide scope reading of *geen* as in (39a). This gives rise to the – almost trivial – reading in which no genius y is such that everyone is identical to y . If we interpret *to be* as a relation between individuals and generalized quantifiers, we can combine the interpretation of the predicative NP with a quantificational subject as spelled out in (31a) above, and derive the narrow scope reading of the negative NP (39b):

- (39) Iedereen is geen genie [Dutch]
 Everyone is no genius
 a. $\neg \exists y (\text{Genius}(y) \wedge \forall x [x = y])$ (wide scope *geen*, individuals)
 b. Everyone (be no genius) (narrow scope *geen*)
 $= \lambda Q (\forall x \forall Q(x)) (\wedge \lambda y (\neg \text{Genius}(y)))$
 $= \forall x \neg \text{Genius}(x)$

- c. Be no genius (everyone) (wide scope *geen*, properties)
 $= \lambda P \neg \exists P (P = \wedge \lambda y (\text{Genius}(y)) \wedge \vee P(P)) (\wedge \lambda Q \forall x \vee Q(x))$
 $= \neg \exists P (P = \wedge \lambda y (\text{Genius}(y)) \wedge \forall x \vee P(x))$
 $= \neg \forall x \text{Genius}(x)$

We obtain the split reading if we shift the property interpretation of (39b) to a higher-order translation. The interpretation of *be no genius* as a generalized quantifier over properties gives it wide scope over the subject as in (39c). The split reading in (39c) is truth-conditionally distinct from the narrow scope interpretation of *geen genie* in (39b). If we replace *geen genie* by the upward monotone *een genie*, the derivation in terms of quantification over properties collapses into the narrow scope interpretation, and no truth-conditional differences can be observed between the (b)- and the (c)-reading. Compare the three interpretations in (40a–c):

- (40) Iedereen is een genie [Dutch]
 Everyone is a genius
- a. $\exists y (\text{Genius}(y) \wedge \forall x [x = y])$ (wide scope *een*, individuals)
- b. Everyone (be a genius) (narrow scope *een*)
 $= \lambda Q (\forall x \vee Q(x)) (\wedge \lambda y (\text{Genius}(y)))$
 $= \forall x \text{Genius}(x)$
- c. Be a genius (everyone) (wide scope *een*, properties)
 $= \lambda P \exists P (P = \wedge \lambda y (\text{Genius}(y)) \wedge \vee P(P)) (\wedge \lambda Q \forall x \vee Q(x))$
 $= \exists P (P = \wedge \lambda y (\text{Genius}(y)) \wedge \forall x \vee P(x))$
 $= \forall x \text{Genius}(x)$

The following picture starts to develop. All weak NPs in predicative positions have three possible derivations: a wide scope interpretation in terms of quantification over individuals, a narrow scope interpretation as a property, and another wide scope interpretation in terms of quantification over properties. For negative quantifiers introduced by *geen* and *kein* in Dutch and German, these three derivations lead to three truth-conditionally distinct readings when there is some other scope bearing operator around. As far as intensional contexts are concerned, we have already seen in (26) above that for a monotone increasing NP like *a book*, the derivation in terms of quantification over properties collapses into the de dicto reading. That pattern is confirmed by the quantificational context in (40): quantification over properties is equivalent to a narrow scope interpretation of the monotone increasing NP *een genie*. This suggests that the number of readings does not have anything to do with a process such as lexical decomposition, which would be available for *no* N but not for *a* N. Instead, I argue that the three derivations are available for all NPs, and that the difference between *a* N and *no* N is rooted in a general semantic difference between monotone increasing and decreasing quantifiers. In order to provide further support for this view, we need to look at examples involving monotone decreasing quantifiers other than *no*.

5 GENERALIZATION OF THE ANALYSIS

5.1 Monotone decreasing quantifiers

So far, we have shown that the split readings which arise with negative quantifiers like *kein Buch, geen genie* in Germanic languages follow the same pattern in quantificational and intensional contexts. Split readings with other monotone decreasing quantifiers seem to be restricted to intensional contexts. In section 2.1, we observed that sentences like (41) are well-formed in English, Dutch and German, but they do not have a split reading:

- (41) a. Jeder Professor hat wenige Studenten [German]
 Every professor has few students
 b. Every student has at most three books

This fact remains unexplained under the lexical decomposition approach, even if we impose additional syntactic constraints as proposed by Kratzer (1995): the object NP of both (41a) and (41b) is in a VP-internal position, and gets a weak interpretation. If this is the environment in which split readings are expected to occur, the (constrained version of the) lexical decomposition approach does not yet explain the missing reading of sentences like (41). Under the analysis adopted here, the absence of a split reading is related to the absence of a wide scope interpretation. Note that even if we give *few students* a regular interpretation in terms of quantification over individuals, (41a) cannot mean that there are few students y such that every professor x has y . The universal quantifier must take wide scope. As a result, the sentence claims that for every professor x it is true that x has few students. As pointed out by Ben-Shalom (1993), quantifiers like *at most n N*, *few N* are generally reluctant to take wide scope over a universal quantifier. We can add to her observation that this is independent of the fact whether the NP is interpreted in terms of quantification over individuals or properties. We predict then that a split reading, which is essentially a wide scope reading in our analysis is prohibited whenever a regular wide scope reading is unavailable.

Although these data are consistent with the general framework developed here, they do not help to show that the contrast between *a* and *no* is an instantiation of the general contrast between increasing and decreasing quantifiers. Let us therefore take a closer look at intensional contexts. An example is Zimmermann's (11), repeated as (42):

- (42) Tom needs at most two blankets

The predicative reading of *at most n* and *few* involves a claim about the maximal cardinality of groups of individuals. The translation of (predicative) *at most two blankets* can be spelled out as either (43a) or (43b):

- (43) at most two blankets
 a. $\lambda\gamma\neg(\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma))$
 where $\text{More-than-two}(\gamma) = \exists\gamma'(\gamma' < \gamma \wedge \text{Two}(\gamma'))$,
 $<$ is the proper sub-part relation, and *Two* is a predicate over groups specifying the cardinality of the group
 b. $\neg\exists P(P = \wedge\lambda\gamma(\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma)))$

Given that *at most two* excludes the possibility of there being more than two blankets, we need to build a maximality condition into the interpretation of the NP, whether it is interpreted in terms of quantification over individuals (43a) or over properties (43b). Negation of the existence of a set of more than two blankets is one way of formulating this maximality condition.⁷ This leads to the three interpretations of (42) spelled out in (44):

- (44) Tom needs at most two blankets
- a. $\neg \exists \gamma (\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma) \wedge \text{Need}(t, \gamma))$ (de re)
 - b. $\text{Need}(t, \wedge \lambda \gamma \neg (\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma)))$ (de dicto)
 - c. $\neg \exists P (P = \wedge \lambda \gamma (\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma)) \wedge \text{Need}(t, P))$
 $= \neg \text{Need}(t, \wedge \lambda \gamma (\text{Blanket}(\gamma) \wedge \text{More-than-two}(\gamma)))$ (split)

The de re reading of the sentence claims that there is a specific group consisting of no more than two blankets which is such that Tom does not need to have them. The de dicto reading of the sentence says that what Tom needs to have is a group consisting of at most two blankets. The preferred reading of the sentence is the split reading, paraphrased as ‘Tom does not need more than two blankets’. This reading is derived by giving the NP the higher-order interpretation in terms of quantification over properties (44c).

The restriction on the maximal cardinality of the group of blankets which is part of the semantic contribution of the determiner translates as the exclusion of groups of a larger size. The combination with quantification over properties leads to a wide scope negation over the intensional predicate. Given that the maximality requirement is a general property shared by all monotone decreasing quantifiers, we expect split readings for *at most n*, *few*, ... as well as for *no*. For monotone increasing NPs, the higher-order interpretation does not lead to split readings which are truth-conditionally distinct from the de dicto reading, because there is no maximality requirement. This is illustrated by the interpretation of (14), spelled out in (45):

- (45) Tom needs at least two blankets
- a. $\exists \gamma (\text{Blanket}(\gamma) \wedge \text{At-least-two}(\gamma) \wedge \text{Need}(t, \gamma))$ (de re)
 - b. $\text{Need}(t, \wedge \lambda \gamma (\text{Blanket}(\gamma) \wedge \text{At-least-two}(\gamma)))$ (de dicto)
 - c. $\exists P (P = \wedge \lambda \gamma (\text{Blanket}(\gamma) \wedge \text{At-least-two}(\gamma)) \wedge \text{Need}(t, P))$
 $= \text{Need}(t, \wedge \lambda \gamma (\text{Blanket}(\gamma) \wedge \text{At-least-two}(\gamma)))$ (split)

The split reading in (45c) reduces to the de dicto reading in (45b), so there is only a two-way ambiguity for sentences like (45). The higher-order interpretation thus overcomes the weakness of the lexical decomposition approach pointed out in section 2.1.

If we adopt the analysis of controlled VP complements developed in section 4.1, we can also give an account of the three readings of (12), repeated here as (46):

- (46) A muslim can marry at most four women
- a. For every muslim x , there is a group Y consisting of at most four women such that x has permission to marry Y ⁸ (de re)
 $\forall x (\text{Muslim}(x) \rightarrow \neg \exists \gamma (\text{Woman}(\gamma) \wedge \text{More-than-four}(\gamma) \wedge \text{Can}(x, \wedge \text{Marry}(x, \gamma))))$
- b. For every muslim x it is permitted that x marry a group Y consisting of at most four women (de dicto)
 $\forall x (\text{Muslim}(x) \rightarrow \text{Can}(x, \wedge \forall \gamma (\text{Marry}(x, \gamma) \rightarrow (\text{Woman}(\gamma) \wedge \text{At-most-four}(\gamma))))))$
- c. For every muslim x , it is not permitted to marry more than four women (split)
 $\forall x (\text{Muslim}(x) \rightarrow \neg \exists P (P = \wedge \lambda \gamma (\text{Woman}(\gamma) \wedge \text{More-than-four}(\gamma)) \wedge \text{Can}(x, \wedge \exists \gamma' (\text{Marry}(x, \gamma') \wedge P(\gamma')))))$
 $= \forall x (\text{Muslim}(x) \rightarrow \neg \text{Can}(x, \wedge \exists \gamma (\text{Marry}(x, \gamma) \wedge \text{Woman}(\gamma) \wedge \text{More-than-four}(\gamma))))$

The wide scope interpretation for the monotone decreasing quantifier in (46a) is like an accidental generalization over muslims. The narrow scope interpretation in (46b) states that it is not obligatory for a muslim to marry more than four women. The split reading in (46c) claims that the number of women a muslim has permission to marry is four at the most. This reading is obtained if we give the predicative NP an interpretation in terms of quantification over properties, which allows the NP to scope over the modal verb and its controlled complement. Existential quantification over the group of women is triggered by the fact that the property quantified over is a minimal property.

The generalization of the analysis developed in this section shows that the maximality condition that monotone decreasing quantifiers impose on the set of individuals denoted by the common noun is the source of the truth-conditional differences between the narrow scope predicative derivation and the wide scope derivation in terms of quantification over properties. Given that this is a well-established semantic difference between monotone increasing and decreasing quantifiers, our analysis provides a more insightful explanation of the restriction of split readings to monotone decreasing quantifiers than the lexical decomposition approach.

5.2 Differences between no and not a

The observation that the wide scope higher-order interpretation of indefinite NPs takes scope over both the intensional verb and its embedded complement is sufficient to explain the difference between (15) and (16), repeated here as (47a) and (47b). Remember that the crucial observation is that (47a), unlike (47b) does not have a reading in which there is a specific Norwegian Anne does not want to marry:

- (47) a. Anne wil geen Noor trouwen [Dutch]
 Anne wants no Norwegian marry
 b. Anne wil niet met een Noor trouwen
 Anne wants not with a Norwegian marry

Under the lexical decomposition approach, we need to formulate additional constraints on incorporation in order to explain why the existential quantifier can outscope the negation in (47b), but not in (47a). Under the approach we have adopted here, the difference falls out immediately. (47a) has the interpretations in (48a–c):

- (48) Anne wil geen Noor trouwen
Anne wants no Norwegian marry
- a. There is no Norwegian x such that Anne wants to marry x (de re)
 $\neg \exists x (\text{Norwegian}(x) \wedge \text{Want}(a, \wedge \text{Marry}(a, x)))$
 - b. Anne wants for no Norwegian x to marry x (de dicto)
 $\text{Want}(a, \wedge \forall x (\text{Marry}(a, x) \rightarrow \neg \text{Norwegian}(x)))$
 - c. It is not the case that Anne wants to marry a Norwegian (split)
 $\neg \exists P (P = \wedge \lambda y (\text{Norwegian}(y)) \wedge \text{Want}(a, \wedge \exists x (\text{Marry}(a, x) \wedge P(x)))) = \neg \text{Want}(a, \wedge \exists x (\text{Marry}(a, x) \wedge \text{Norwegian}(x)))$

None of these derivations generates a reading in which the existential quantification over Norwegians outscopes the negation operator. Of course this reading is available for (47b), which has (at least) the interpretations in (49a–c):

- (49) Anne wil niet met een Noor trouwen
Anne wants not with a Norwegian marry
- a. There is a Norwegian Anne does not want to marry (de re)
 $\exists x (\text{Norwegian}(x) \wedge \neg \text{Want}(a, \wedge \text{Marry}(a, x)))$
 - b. It is not the case that Anne wants to marry a Norwegian (de dicto)
 $\neg \text{Want}(a, \wedge \exists x (\text{Norwegian}(x) \wedge \text{Marry}(a, x)))$
 - c. It is not the case that Anne wants to marry a Norwegian (split)
 $\exists P (P = \wedge \lambda y (\text{Norwegian}(y)) \wedge \neg \text{Want}(a, \wedge \exists x (\text{Marry}(a, x) \wedge P(x)))) = \neg \text{Want}(a, \wedge \exists x (\text{Marry}(a, x) \wedge \text{Norwegian}(x)))$

The de dicto and the split reading are equivalent, as expected for the interpretation of monotone increasing NPs. The crucial observation is that the wide scope de re reading in (49a) allows the indefinite NP *een Noor* to scope over both the intensional verb and the negation operator. This gives us the relevant reading in which there is a specific Norwegian Anne does not want to marry. The contrast between (48a) and (49a) falls out naturally from our analysis of weak NPs in predicative positions, and we do not need to come up with special constraints to rule out (49a) as a reading of (48).

The analysis developed here also provides an explanation of the contrast between (15a) and (15b), repeated here as (50a) and (50b):

- (50) a. Iedereen zoekt geen boek van Chomsky [Dutch]
Everyone seeks no book by Chomsky
- b. Iedereen zoekt niet naar een boek van Chomsky
Everyone seeks not for a book by Chomsky

Remember that (50a), unlike (50b), lacks the interpretation in which it is not the case that everyone is seeking their own favorite book by Chomsky. The interpretations our framework generates for (50a) are spelled out in (51):

- (51) Iedereen zoekt geen boek van Chomsky
Everyone seeks no book by Chomsky
- a. There is no book by Chomsky everyone is seeking
 $\neg \exists y (\text{Book}(y) \wedge \forall x \text{Seek}(x, y))$ (wide scope *geen*, de re)
 - b. For every x there is no book by Chomsky x is seeking
 $\forall x \neg \exists y (\text{Book}(y) \wedge \text{Seek}(x, y))$ (narrow scope *geen*, de re)
 - c. What everyone seeks is no book by Chomsky
 $\forall x \text{Seek}(x, \lambda y \neg \text{Book}(y))$ (narrow scope *geen*, de dicto)
 - d. For every x it is the case that x does not seek a book by Chomsky
 $\forall x \neg \text{Seek}(x, \lambda y \text{Book}(y))$ (narrow scope *geen*, split)
 - e. It is not the case for every x that x seeks a book by Chomsky
 $\neg \forall x \text{Seek}(x, \lambda y \text{Book}(y))$ (wide scope *geen*, split)

These are all and only the readings of (51). In particular, our framework does not generate (52a) as one of the readings of (51), even though it is of course available for (52):

- (52) Iedereen zoekt niet naar een boek van Chomsky
Everyone seeks not for a book by Chomsky
- a. It is not the case that for every x there is a (particular) book by Chomsky x is seeking
 $\neg \forall x \exists y (\text{Book}(y) \wedge \text{Seek}(x, y))$ (wide scope negation, de re)

(52a) is available for (52), but not for (51), because the negation operator and the existential quantifier scope independently in (52), but not in (51). On the basis of the general strategy of the interpretation of weak NPs in predicative positions developed here, there is a reason to expect intermediate scope readings with *a* N, but not with *no* N. Quite in general, we do not need to solve the problem of overgeneration, because it simply does not arise in our framework.

6 CONCLUDING REMARKS

This paper started out with a set of data which involved negative quantifiers *geen* N in Dutch and *kein* N in German that give rise to split readings, in which a scope bearing operator such as a universal quantifier or an intensional predicate takes scope in between the negation and the existential quantifier part of the NP. I argued that a lexical decomposition approach is inadequate. Instead, I developed an analysis in which NPs are ambiguous. They can be interpreted in terms of quantification over individuals or over properties. Although higher-order interpretations are available for monotone increasing and decreasing quantifiers alike, they only lead to different truth-conditions with monotone decreasing quantifiers. Furthermore, they do not generate any readings that don't exist. I conclude that all and only the available interpretations of negative quantifiers are generated in a fully compositional analysis.

NOTES

¹ I use the #-sign to indicate that this reading is missing. We can logically construct it, but it is not a reading available for the sentence, because *hoeven* is not in the scope of an appropriate licenser such as negation or a negative quantifier.

² This is true for the type-shifting operations used by Hendriks, because his framework is set up to derive the classical scope ambiguities. Dekker (1993) proposes additional operations, which increase the number of readings generated for a sentence, compare also footnote 6 below.

³ There is no ungrammaticality here, but the sequence of sentences does not make a coherent discourse under the intended interpretation of the anaphoric pronoun indicated by the coindexing.

⁴ Compare de Swart (1995) for further discussion of the relation between scopal specificity and the weak-strong distinction, and an extension of the Farkas-Abusch line of argumentation to indefinite NPs in negative contexts.

⁵ I reformulate Zimmermann's Ty2-analysis in IL.

⁶ Readers who prefer to derive quantification over properties in a flexible type theory, rather than postulating higher-order translations directly can adopt Dekker's (1993, 68) dual operation. The application of the dual operation to the type $\langle e, t \rangle$ -denotation of monotone decreasing NPs generates exactly the higher-order translation we need. For lack of space, I will not explore these extended type-shifting operations in this paper.

⁷ The introduction of universal quantification over subgroups or properties would essentially achieve the same maximality effect (compare Zimmermann, 1993). I will use the formulation in terms of $\neg \exists$ rather than \forall , because it brings out the equivalence with the lexical decomposition approach more easily. Given that we do not actually do lexical decomposition, any member of the equivalence class of translations can be used to spell out the intended interpretation of the sentence.

⁸ A more precise interpretation would translate *marry* as a relation between individuals, rather than a relation between individuals and groups. Leaving this out of the translations in (a-d) has the advantage of keeping the formulas more readable.

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