Splitting Germanic n-words

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1   Roadmap

- Introduction to the phenomenon of split scope

- Outline of the class of elements giving rise to split scope

- Overview of existing analyses

- Arguing for two types of n-indefinites in Germanic

- A degree analysis of the *geen*-class of n-indefinites

- **Goal:** Reduce split scope phenomena to the degree domain

situation		(1-a)	(1-b)	(1-a)
S1	Wearing a tie is fine, but not necessary	1	1	0
S2	A tie is mandatory, but no specific tie is required	0	1	0
S3	Ties are prohibited	0	0	1

Table 1: truth values of the three LFs for (1) in three different situations

2 Split scope

Negative indefinites in Dutch and German are known to give rise to so-called **split scope readings** – the meaning of the negative indefinite seems to be split in two pieces by another scope-bearing element (Jacobs, 1980; Kratzer, 1995; Geurts, 1996; de Swart, 2000; Penka and Zeijlstra, 2005; Abels and Martí, 2010; Penka, 2011):

(1)   Je   hoeft   **geen** stropdas te dragen.   DUTCH
       you must-NPI GEEN tie   to wear.
   a.   **You do <u>not</u> have to wear <u>a</u> tie.**   ¬ > hoeft > ∃
   b.   For no tie x it is the case that you have to wear x.   ??¬ > ∃ > hoeft
   c.   What you have to do is to wear no tie.   *hoeft > ¬ > ∃

Note 1: (1-a) entails (1-b), and so there is no guarantee that (1-a) is an actual reading. However, (1) appears false in S2, which suggests reading (1-b) is unavailable. In turn, this means that (1-a) will have to be a proper reading.

Note 2: (1-c) is unavailable for (1), since *hoeft* is an NPI.

The same in Germann:

(2)   Zu dieser Feier musst du **keine**   Krawatte anziehen.   GERMAN
       to   this   party must you KEIN.fem tie   wear
   a.   **You do <u>not</u> have to wear <u>a</u> tie to the party.**   ¬ > musst > ∃
   b.   For no tie x it is the case that you have to wear x to the party.   ??¬ > ∃ > musst
   c.   What you have to do is to wear no tie to the party.   musst > ¬ > ∃

(3)   Henk mag **geen** toetje   eten.   DUTCH
         you   may GEEN dessert eat
         a.   **It's forbidden for Henk to eat a dessert.**   ¬ > mogen > ∃
         b.   There is no dessert Henk is allowed to eat.   ¬ > ∃ > mogen
         c.   It's fine to not eat a dessert.   mogen > ¬ > ∃

To distinguish (3-a) and (3-b), imagine a scenario in which Henk is gluten-intolerant and, currently, the restaurant does not have any gluten-free desserts. In that scenario, (3-b) is true and (3-a) is false. Once more, it is questionable whether (3) is true in a scenario like that.

<center>⋆</center>

The main question: *What* is *split scope?*

The standard semantics for n-words, does not straightforwardly split.

(4) $[\![\text{geen}]\!] = [\![\text{no}]\!] = \lambda P_{\langle et \rangle} \lambda Q_{\langle et \rangle}.P \cap Q = \varnothing$

Our analysis will rest on three observations:

1. Split scope with n-words is not generally available cross-linguistically

2. Split scope with degree expressions *is* generally available cross-linguistically

3. Split scope is constrained by a scope constraint observed for degree expressions

3   Properties of split scope

3.1   Not universal?

Most studies of split scope with n-words concern Dutch or German. Yet, split scope is sometimes discussed for English 'no' (Potts, 2000; von Fintel and Iatridou, 2007; Iatridou and Sichel, 2011; Kennedy and Alrenga, 2014):

(5)   The company need fire **no** employees.
         a.   **It is <u>not</u> the case that the co. is obligated to fire <u>an</u> employee.**   ¬ > need > ∃
         b.   There is no employee x s.t. the company is obligated to fire x.   ??¬ > ∃ > need
         c.   The company is obligated to fire no employees.   *need > ¬ > ∃

<center>3</center>

The phenomenon is much more restricted in English than in Dutch/German (see (2)):

(6)   The company has to fire **no** employee.
    a.   **#It's <u>not</u> the case that the company has to fire <u>an</u> employee.**   ¬ > must > ∃
    b.   There is no employee x such that the company has to fire x.   ¬ > ∃ > must
    c.   It's necessary that the company fires no employee.   must > ¬ > ∃

(7)   At this party, you have to wear no tie.   ??¬ > □ > ∃ / □ > ¬ > ∃

This discrepancy will play a large role in our story below.

3.2   Not just n-words

Apart from n-words, *degree expressions* tend to split their scope (e.g. Hackl (2000)):

(8)   Tom has to bring <u>at most two</u> blankets.
        'Tom does not have to bring more than two blankets'   ¬ > has to > >2

(9)   Tom has to publish <u>fewer than three</u> books to get tenure.
        'Tom doesn't have to publish as many as three books to get tenure'   ¬ > has to > ⩾ 3

(10)   They are allowed to write <u>few</u> letters.
        'It is not the case that they are allowed to write many letters'   ¬ > allowed > many

(11)   You have to read <u>exactly three</u> papers.
        'It's not the case that you have to read more than or fewer than three papers'
        ¬ > have to > (> 3 & < 3)

Three things to note:

1. The quantifiers in these examples are all **degree quantifiers**.

2. Degree quantifiers do not seem to form a natural class with *geen*-type expressions (or with *no*, for that matter).

3. Split scope with degree quantifiers in English (and other Germanic) seems unlimited, in contrast to split scope with *no*.

Split scope comes naturally with degree quantifiers

Quantifiers like *at most n*, *fewer than n* and *few* are not type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle$ quantifiers, rather they are type $\langle\langle d,t\rangle,t\rangle$ (Hackl, 2000; Nouwen, 2008, 2010; Kennedy, 2015).

(12)   a. $[\![\text{at most 2}]\!] = \lambda P_{\langle dt\rangle}.max(P) \leq 2$
            b. $[\![\text{Tom has to bring at most two MANY towels}]\!] =$
                $[\![\text{at most two}]\!](\lambda n. \Box \exists x[\textbf{*bring}(\textbf{Tom}, x)\ \&\ \textbf{*towel}(x)\ \&\ \#x = n]) =$
                $max(\{n \mid \Box \exists x[\textbf{*bring}(\textbf{Tom}, x)\ \&\ \textbf{*towel}(x)\ \&\ \#x = n]\}) \leq 2$

(13)   a. $[\![\text{fewer than 3}]\!] = \lambda P_{\langle dt\rangle}.max(P) < 3$
            b. $[\![\text{Tom has to publish fewer than three MANY books}]\!] =$
                $[\![\text{fewer than three}]\!](\lambda n. \Box \exists x[\textbf{*publish}(\textbf{Tom}, x)\ \&\ \textbf{*book}(x)\ \&\ \#x = n]) =$
                $max(\{n \mid \Box \exists x[\textbf{*publish}(\textbf{Tom}, x)\ \&\ \textbf{*book}(x)\ \&\ \#x = n]\}) < 3$

(14)   a. $[\![\text{few}]\!] = \lambda P_{\langle dt\rangle}.max(P) < d_{st}$
            b. $[\![\text{They are allowed to write few MANY letters}]\!] =$
                $[\![\text{few}]\!](\lambda n. \Diamond \exists x[\textbf{*write}(\textbf{they}, x)\ \&\ \textbf{*letter}(x)\ \&\ \#x = n]) =$
                $max(\{n \mid \Diamond \exists x[\textbf{*write}(\textbf{they}, x)\ \&\ \textbf{*letter}(x)\ \&\ \#x = n]\}) < d_{st}$

(15)   a. $[\![\text{exactly 3}]\!] = \lambda P_{\langle dt\rangle}.max(P) = 3$
            b. $[\![\text{You have to read exactly three MANY papers}]\!] =$
                $[\![\text{exactly three}]\!](\lambda n. \Box \exists x[\textbf{*read}(\textbf{you}, x)\ \&\ \textbf{*paper}(x)\ \&\ \#x = n]) =$
                $max(\{n \mid \Box \exists x[\textbf{*read}(\textbf{you}, x)\ \&\ \textbf{*paper}(x)\ \&\ \#x = n]\}) = 3$

3.3   Just with intensional verbs

We've seen modal verbs (*must*, *need*, *can*, *may*) split scope of *geen*-indefinites. Are modals the only scope-splitters? Non-modal quantifiers generally don't split scope of *geen*-indefinites:

(16)   Genau ein Arzt   hat kein Auto   GERMAN
          exactly one doctor has KEIN car
          #'It's not the case that exactly one doctor has a car'
          'Exactly one doctor has no car'

The distribution of split scope is reminiscent of the Heim-Kennedy generalization (Kennedy, 1997; Heim, 2000; Nouwen and Dotlačil, 2017): degree quantifiers can scope above (at least some) intensional verbs, but nominal quantifiers can never intervene between a degree quantifier and its trace.

(17)   *[D$_{dtt}$ ... Q$_{ett}$ ... t$_d$]

(18)   Tom needs at most two blankets.
         Tom does not need more than three blankets.   ¬ > need > >2

(19)   Every student has at most three books.
         #Not every student has more than three books.   ¬ > ∀ > >2

Note that n-words behave in a parallel fashion:

(20)   Iedere student heeft geen   oplossing gevonden.
         every   student has   GEEN solution   found
         #'Not every student found a solution'

Why does split scope with *geen* obey the generalization concerning degree quantifiers if it's not a degree quantifier?

4   Existing analyses of split scope with *geen*

- Decompositional analyses (Rullmann, 1995; Penka and Zeijlstra, 2005; Penka, 2011)

(21)   niet Det$_{indef}$ ⇒ geen

         Other versions of the decompositional analysis (Penka and Zeijlstra, 2005; Penka, 2011): *geen* is like positive indefinites with an additional constraint – it has to be licensed by sentential negation.

- Quantification over properties (de Swart, 2000): split scope readings arise when a negative DP QRs, and then a type lifting operation takes place, so that the quantifier quantifies over properties rather than over individuals[1]

- Quantification over choice functions (Abels and Martí, 2010): Natural language determiners are quantifiers over choice functions. After the negative DP QRs, selective deletion takes place: in *no tie*, *tie* is deleted upstairs and *no* is deleted downstairs.

> None of these analyses systematically account for the discrepancy between *geen/kein* and degree quantifiers on the one hand – and *no* on the other hand.

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[1]Empirical note: de Swart (2000) takes *geen/kein* to not obey Heim-Kennedy generalization – examples like (16) are reported as allowing for split scope. We take a different position with respect to the data.

5   Analysis

5.1   *Geen* vs. *no*

We relate two differences between *geen* and *no*:

- Restricted split scope with *no* vs. systematic split scope with *geen*

(22)   a.   The company has to fire **no** employee. $??\neg > \square > \exists / \square > \neg > \exists$
        b.   At this party, you have to wear **no** tie. $??\neg > \square > \exists / \square > \neg > \exists$

- Distributional differences between *no* and *geen* – namely, combination with numerals

(23)   Nigella heeft geen   20 taarten gebakken.
        Nigella has   GEEN 20 cakes   baked.
        'Nigella has not baked 20 cakes.'

(24)   *Nigella baked no 20 cakes.

We suggest that these differences are not accidental and can help us point in the direction of an analysis of split scope readings of *geen* and the lack of such readings with *no*.

- 'Geen'/'kein' is a degree quantifier, quite like other expressions subject to split scope

- Let's first analyse 'geen' in combination with numerals, and then move on to the bare cases

5.2   *Geen* **with numerals**

We propose that *geen* in construction with numerals can have one of two meanings – we call them 'geen$_{exactly}$' and 'geen$_{at.least}$':

(25)   a. $[\![\text{geen}_{exactly}]\!] = \lambda n_d \lambda P_{\langle dt \rangle}.\neg max(P) = n$
        b. $[\![\text{geen}_{at.least}]\!] = \lambda n_d \lambda P_{\langle dt \rangle}.\neg P(n)$

Both combine with a numeral of type d (degree) and a degree predicate – but with a somewhat different result.

(26) a. $[\![$N. baked $\mathbf{geen}_{exactly}$ 20 cakes$]\!] = \neg max\{n|\exists x[\mathbf{*baked}(\mathbf{N},x)\ \&\ \mathbf{*cake}(x)\ \&\ \#x = n]\} = 20$

      b. $[\![$N. baked $\mathbf{geen}_{at.least}$ 20 cakes$]\!] = \neg\exists x[\mathbf{*baked}(\mathbf{N},x)\ \&\ \mathbf{*cake}(x)\ \&\ \#x = 20]$
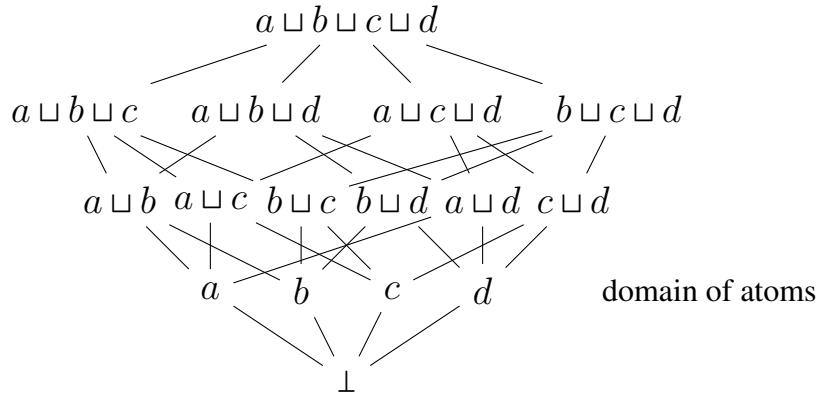
(26-a) is true when the quantity of cakes that Nigella made is not twenty (it could be five or fifty or, in fact, zero – see below). (26-b) is true when Nigella baked fewer than twenty cakes. We think that both readings can surface in different contexts.

Further compositional details:

- We assume that the numeral has semantic type d and forms a constituent with *geen* ('geen$_{exactly}$' and 'geen$_{at.least}$'). We also assume a silent MANY, as in (Hackl, 2000):[2]

(27) $[\![$MANY$]\!] = \lambda n_d \lambda P_{\langle e,t\rangle} \lambda Q_{\langle e,t\rangle}.\exists x[\#x = n\ \&\ \mathbf{*}P(x)\ \&\ \mathbf{*}Q(x)]$

- Following (Landman, 2011; Bylinina and Nouwen, Bylinina and Nouwen) a.o., we assume that singular nouns denote sets of atoms, while plural nouns denote a corresponding complete lattice (derived from the singular denotation with *-operation). Importantly, the bottom element $\bot$ is in the denotation of ***P**.

$$
\begin{array}{c}
a \sqcup b \sqcup c \sqcup d \\
\\
a \sqcup b \sqcup c \quad a \sqcup b \sqcup d \quad a \sqcup c \sqcup d \quad b \sqcup c \sqcup d \\
\\
a \sqcup b \quad a \sqcup c \quad b \sqcup c \quad b \sqcup d \quad a \sqcup d \quad c \sqcup d \\
\\
a \quad b \quad c \quad d \qquad \text{domain of atoms} \\
\\
\bot
\end{array}
$$

(28) a. **book** $= \{$'Anna Karenina', 'Eugene Onegin'$\}$

      b. ***book** $= \{\bot,$ 'Anna Karenina', 'Eugene Onegin', 'Anna Karenina'$\sqcup$'Eugene Onegin'$\}$

- 'Geen 20' QRs in order to resolve a type clash, leaving behind a trace of type d and creating the following degree predicate, with which 'geen 20' will combine:

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[2]Note that the $\langle e,t\rangle$ arguments of MANY are pluralised. The syntactic details of this are beyond immediate scope of this paper, but, we believe the differences between DPs like 'one book' and 'two books' do not reside in the semantics of the numeral or the silent MANY; although 'book' and 'books' here will have different meanings for us, as soon as they are fed as arguments to MANY these differences are gotten rid of, as pluralization is applied to both (vacuously to the latter, non-vacuously to the former).

(29)   ⟦Nigella baked n MANY cakes⟧ $= \lambda n_d.\exists x[\ast\mathbf{baked}(\mathbf{N}, x)\ \&\ \ast\mathbf{cake}(x)\ \&\ \#x = n]$

This set contains numbers such that it's true that Nigella baked this number of cakes.

- The 'exactly'-version of *geen* will then state that the maximal element of this set of degrees is not 20. Given our semantics of plurals, it is compatible with the situation when she baked zero cakes ($\#x = 0$). Similarly for 'at-least' reading.

- In a split-scope environment, the split scope reading is derived by 'geen 20' QRing over the modal verb:

(30)   Nigella hoeft   geen   20 taarten te bakken.
         Nigella must-NPI GEEN 20 cakes   to bake
         'Nigella doesn't have to bake 20 cakes.'

(31)   ⟦N. must bake $\mathbf{geen}_{at.least}$ 20 MANY cakes⟧ $=$
         ⟦$\mathbf{geen}_{at.least}$ 20⟧$(\lambda n.\ \Box\ \exists x[\ast\mathbf{bake}(\mathbf{N.}, x)\ \&\ \ast\mathbf{cake}(x)\ \&\ \#x = n]) =$
         $\neg\ \Box\ \exists x[\ast\mathbf{bake}(\mathbf{N.}, x)\ \&\ \ast\mathbf{cake}\ \&\ \#x = 20]$

(32)   ⟦N. must bake $\mathbf{geen}_{exactly}$ 20 MANY cakes⟧ $=$
         ⟦$\mathbf{geen}_{exactly}$ 20⟧$(\lambda n.\ \Box\ \exists x[\ast\mathbf{bake}(\mathbf{N.}, x)\ \&\ \ast\mathbf{cake}(x)\ \&\ \#x = n]) =$
         $\neg max\{n\ |\ \Box\ \exists x[\ast\mathbf{bake}(\mathbf{N.}, x)\ \&\ \ast\mathbf{cake}(x)\ \&\ \#x = n]\} = 20$

5.3   Bare *geen*

- We propose that occurrences of *geen* that are not followed by a numeral, as in (33) are derived from the numeral modifier *geen* by semantically incorporating the numeral 'one'.

- As before, *geen* gives rise to a split scope reading via degree quantifier movement above the modal verb.

- The split reading is achieved with an at-least semantics of *geen* incorporating 'one':

(33)   Je   hoeft   geen   stropdas te dragen.
         You must-NPI GEEN tie   to wear.
         'You do <u>not</u> have to wear <u>a</u> tie.

(34)   a.   ⟦$\mathrm{geen}^1_{at.least}$⟧ $= \lambda P_{\langle dt\rangle}.\neg P(1)$
         b.   ⟦You must wear $\mathbf{geen}$ tie⟧ $=$
              ⟦$\mathrm{geen}^1_{at.least}$⟧$(\lambda n.\ \Box\ \exists x[\ast\mathbf{wear}(\mathbf{you}, x)\ \&\ \ast\mathbf{tie}(x)\ \&\ \#x = n])$
              $= \neg\ \Box\ \exists x[\ast\mathbf{wear}(\mathbf{you}, x)\ \&\ \ast\mathbf{tie}(x)\ \&\ \#x = 1]$

(34-b) expresses the lack of obligation to wear a tie, as desired. Potentially, we could have the second version of *geen* with incorporated 'one', parallel to the prenumeral 'geen$_{exactly}$':

(35) $\left[\!\left[\text{geen}^1_{exactly}\right]\!\right] = \lambda P_{\langle dt \rangle}.max\{m|P(m)\} \neq 1$

However, bare 'geen' only has readings compatible with (34-a). To rule out (35), we appeal to convexity of lexical meanings (see Chemla 2017):

- (35) in (34) would amount to the lack of obligation to wear exactly one tie. This reading is not attested.

- Similarly, 'I have **geen** book(s)' with (35) would be a statement that is true in a situation where I have no books or two books, or three books, etc.

- Thus geen$^1_{exactly}$ denotes the complement of 1 – a discontinuous fragment of the quantity scale $< 0, 2, 3, .. >$.

- This meaning, we suggest, has a disadvantage on a lexicalization path.

- An indirect indication of this restriction: 'geen één' ('**geen** one'). With normal prosody, this combination does get the discontinuous interpretation. However, when 'one' is deaccented and forms a prosodic unit with *geen*, the 'exactly'-interpretation becomes unavailable. This suggests that lexicalization process indeed avoids gapped denotations, and 'geen$^1_{exactly}$' might be one of them.

(36)   a.   Marie heeft geen-één   boek gelezen, #maar twee.
              Mary has   GEEN-one book read   but   two
              'Mary didn't read one book, she read two'.
         b.   Marie heeft geen   één boek gelezen, #maar twee.
              Mary has   GEEN one book read   but   two
              'Mary didn't read one book, she read two'.

6   Conclusions

- We suggest that split scope as observed with *geen/kein* is an essentially degree phenomenon

- Our analysis of *geen/kein* makes it a degree quantifier, therefore split scope items form a natural class – degree quantifiers

- English *no* is not a degree quantifier, as seen in its inability to combine with numerals – unlike *geen/kein*

- The mechanism of split scope is that of degree quantifier raising

Open issues:

- What about cases when split readings of *geen*/*kein* occur with quantifiers over individuals under hat contour, breaking Heim-Kennedy generalization?

(37)   /JEDER Arzt   hat KEIN\ Auto   GERMAN
         every   doctor has no   car
         'Not every doctor has a car'

- What about the limited number of cases when English *no* does give rise to split scope readings?

(38)   a.   The company need fire no employees.
         b.   The company is required to fire no employees.   (Kennedy and Alrenga, 2014)
         c.   I have been able to find no support whatsoever.   (Abels and Martí, 2010)
         d.   There can be no doubt.
         e.   They require no guiding.

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