Title: A modal ambiguity in *for*-infinitival relative clauses

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A modal ambiguity in *for*-infinitival relative clauses

Martin Hackl and Jon Nissenbaum

Abstract

This paper proposes a compositional syntax and semantics for *For*-Infinitival Relative clauses (FIRs). A typical FIR such as *many problems for John to work on* displays two distinct interpretations that can be paraphrased by finite relative clauses employing the modals *should* and *could*: *many books that John should/could work on.* As suggested by these paraphrases, the paper argues that the salient difference in the two interpretations lies in the quantificational force of a modal operator (*should* vs. *could*). The core empirical fact to be explained is that the distribution of these two readings is syntactically determined first and foremost by the choice of determiner whose complement NP is modified by the relative clause (the Determiner Modal Generalization or DMG). The DMG states that "strong" determiners require the FIR to be interpreted as a *should*-relative while "weak" determiners allow both interpretations. This generalization provides a serious challenge for compositional semantics since determiners and NP-modifiers do not directly interact, seemingly revealing a non-local dependency. The paper addresses the challenge by arguing that the interpretational demands of the two kinds of determiners affects the properties of the head NP of the relative clause, which in turn constrains the interpretation of the relative clause. The mediating role of the head NP is supported by the fact that the two interpretations correlate with a different internal syntax for the infinitival relative: *could*-relatives require the relative clause to be internally headed while *should*-relatives are compatible with both internally and externally headed structures.

1. The problem to solve

1.1 There are two readings

For-Infinitival Relative clauses (FIRs) like those in (1) seem to have in principle two distinct

readings, which can be paraphrased by finite relatives employing *should* and *could*.[1]

(1)   Mrs. Schaden has come up with many problems for us to work on

    a. …so we'd better keep at it until they're all solved.   *(=many problems that we **should** work on)*

    b. ...if we want to work on a problem.   *(=many problems that we **could** work on)*

To bring out the *should*-interpretation in the FIR, imagine that Mrs. Schaden is a heartless slave

driver who wants us to have a perfect paper before we present it. We have to work on *all* of the

many problems that she came up with to achieve the salient goal (i.e. satisfy the desire that we

present only a perfect paper). In a scenario that favors the *could*-interpretation, on the other hand,

she is a helpful advisor who wanted only to save us from being bored over the summer. She

came up with many problems that seem worthwhile to work on. We could work on one of them

or all of them, or even find something entirely different to do.

1.2 A correlation between modal force and determiner strength

The main fact to be discussed in this paper concerns the distribution of these two interpretations.

On closer examination, the availability of the two readings turns out to interact in a quite

surprising way with the semantic properties of the determiner of the DP whose complement NP

the infinitival relative modifies. Specifically, we will show that the generalization stated in (2)
(which we will refer to as the "Determiner-Modal Generalization") holds.

(2) DETERMINER MODAL GENERALIZATION (DMG):

Strong determiners (and strong interpretations of weak determiners) always induce a
should-reading in for-infinitival relative clauses. Weak interpretations of weak
determiners allow both *should-* and *could*-readings.[2]

To illustrate, notice that the examples in (3a), with strong determiners, have only the *should*
reading; in all of these examples John *has* to play against the men if he wants to achieve some
goal that is salient in the discourse (e.g. prove himself as a good player). On the other hand FIRs
with weak determiners like those in (3b) allow both a *could-* and *should*-interpretation.

(3) a. the/neither/every man (for John) to play against is in the next room   *should*

both/three of the/most men (for John) to play against are in the next room   *should*

b. a man (for John) to play against is in the next room   *should, could*

many/few/three/sm men (for John) to play against are in the next room   *should, could*

One can create particularly striking instances of the DMG if a given context or world knowledge
is compatible only with one reading and induces oddness under the other. Since the differences
between the two readings can be rather subtle — in particular, *could*-readings are often subject to
a kind of pragmatic strengthening that makes them seem similar to *should*-readings — we will

use such a setup throughout the paper. Consider the sentences in (4) as an instructive example of this "pragmatically-induced disambiguation" technique.

(4) a. Norman's mother saw many/few/some/two women for him to marry at the party

   *'N.'s mother saw many (etc.) women that he **could** marry (while at the party)'*

   b. # Norman's mother saw every/most/two of the women for him to marry at the party

   *'N.'s mother saw every (etc.) woman that he **should** marry (while at the party).'*

The pragmatics of these examples are such that the *should*-reading induced by the strong determiners (4b) is sensible only in a polygamous society. Weak determiners as in (4a) do not give rise to this effect, because they permit a *could*-interpretation, which is pragmatically available: there is nothing odd about a desire for someone to consider marrying one among a list of candidates.[3]

1.2.1 Further illustration of the DMG

To further illustrate the correctness of the DMG we show below that environments that govern the distribution of strong and weak determiners also govern the availability of *could-* and *should-* readings of FIRs. Specifically, environments that are known to allow only strong readings of weak determiners also allow only *should*-readings, while environments that allow only weak interpretations of weak determiners allow both readings.

Strong readings of weak determiners allow only *should*-readings of FIRs:

Individual vs. Stage-level predicates: Indefinite subjects of individual-level predicates are known to receive only strong interpretations (Diesing 1992, Kratzer 1995). Accordingly, FIRs modifying such subjects are limited to *should*-readings.

(5) a. #Many women (for Norman) to marry know French / are tall.

      *"Many women that Norman ***could /#should** marry know French / are tall"*

    b. Many women (for Norman) to marry to are currently learning French / are sick

      "Many women that Norman **could /#should** marry are currently learning French/ are sick"

Positive-polarity *some*: Positive polarity items like *some* necessarily take scope over clausemate negation. On the assumption that this brings an indefinite out of the scope of existential closure (Diesing 1992), enforcing a strong interpretation, the DMG predicts that only a *should*-reading will be possible for a FIR. A simple, non-polarity indefinite however has both options.

(6) a. A person (for me) to marry isn't available

      *"A person that **I could / should** marry isn't available"*

    b. Someone (for me) to marry isn't available

      "Someone that I ***could / should** marry isn't available"

Reconstruction into infinitivals vs. small clauses: Williams (1983) observed that an infinitival complement of "seem" allows reconstruction, whereas a small clause complement doesn't.

Correspondingly, the *could* interpretation disappears in the latter case (7b) — yielding the bizarre interpretation that we *ought to* stay at three hotels each of which is pretty full.

(7) a. Three hotels (for us) to stay at seem to be pretty full

   *"Three hotels that we **could / should** stay at seem to be pretty full"*

 b. #Three hotels (for us) to stay at seem pretty full

   "Three hotels that we ****could / should** stay at seem pretty full"

Weak readings of weak determiners allow both *could-* and *should*-interpretations

<u>**There-construction:**</u> Weak interpretations of weak determiners are forced in the "*there*-construction" (Milsark 1974 and much subsequent work). Such constructions very easily allow both readings of FIRs.

(8)   There are many problems (for us) to write about

 a. ...and we're glad to have all the choices   *could*

 b. ...and we're stressed out by the obligation   *should*

<u>**Possessive *have*:**</u> Strong quantifiers are not allowed as complements of possessive *have*, as illustrated in (9a). Weak readings of indefinites are allowed (9b). A FIR modifying a weak indefinite in such an environment receives very natural *should-* and *could*-readings (10)

(9) a. #The deceased has every heir in my hometown

    b. The deceased has many heirs in my hometown

(10) a. The deceased has many heirs for us to console (so we'd better get started). *should*

    b. The deceased has many heirs for us to talk to about suing the tobacco company. *could*

1.2.2 Summary: infinitival relatives and *quantificational* vs. *non-quantificational* DPs

We conclude from these facts that the correlation stated in the DMG is not merely due to the availability of weak vs. strong readings of weak determiners, but points to some ambiguity inherent in weak determiners under the weak reading. An explanation for the ambiguity of FIRs and for the DMG will have to find the property that makes quantificational determiners compatible only with *should*-readings while non-quantificational indefinites are compatible with both *could-* and *should*-readings.

What makes the DMG unexpected and interesting is the fact that the dependency between determiner strength and quantificational force of the modal only shows up in infinitival clauses. Even though finite relatives with overt modals have readings that seem to be exact paraphrases of *for*-infinitival relatives, they do not display any such dependency. In particular, strong determiners are perfectly fine with an existential modal inside a finite relative clause:

(11) Every/most/several of the topics that you could write about are on page four

In other words, there is nothing inherent to determiner strength or to modal force that should result in a dependency such as the DMG. Apparently, some property due to the infinitival nature of FIRs plays the crucial role.

1.3 Another correlation: obligatory reconstruction under the *could* reading

We will conclude this section by illustrating another fact that will have to inform the account of the DMG: a FIR under the *could*-reading yields 'obligatory reconstruction' effects. In environments where reconstruction would violate a grammatical constraint like Condition C of the binding theory, *could*-readings of FIRs disappear. Thus, when an r-expression in the 'head NP' is understood as 'co-referential' with a pronominal subject of the relative, only the *should*-reading survives (12a). When the pronoun and r-expression are reversed (12b), the *could*-reading reappears — a classic Condition C effect. The pattern is illustrated more dramatically in (13), where the forced *should*-reading in (13a) is pragmatically odd.

(12) a. there are many books about John for him to read   *SHOULD-READING ONLY*

b. there are many books about him for John to read   *could-reading is available*

(13) a. #Mrs. Birnbaum saw many women at Norman's$_i$ birthday party for him$_i$ to marry

b. Mrs. Birnbaum saw many women at his$_i$ birthday party for Norman$_i$ to marry

This pattern is surprising in light of the well-known fact that reconstruction is in general *optional* and not obligatory in relative clauses, as is seen in (14).

(14) a. the book about John that he should/could read   *no condition C effect*

   b. the book about his mother that every boy should/could read   *variable can be bound*

Should-readings of FIRs behave like other relative clauses with respect to reconstruction possibilities; no Condition C effect is created in (15a), yet variable binding is possible (15b):

(15) a. the book about John for him to read   *no condition C effect*

   b. the book about his mother for every boy to read   *variable can be bound*

1.3.1 Reconstruction and internally- vs. externally-headed relatives

We follow a long tradition of work on relative clauses in taking reconstruction effects to indicate the availability of an internally headed structure[4] (Carlson 1977, Sauerland 1998; cf. also Kayne 1995, Vergnaud 1975). On the other hand, we assume (with Carlson) that *an alternative structure* is also available, in which the relative modifies an external NP. It is the availability of this alternative structure — in which there is no raising of the NP[5] — that accounts for the non-obligatoriness that in general characterizes reconstruction in relative clauses.

We are then led to the conclusion that FIRs under the *could*-interpretation have *only* the head-internal structure available. The obligatory reconstruction effects seen above follow from the unavailability of the alternative structure. From this perspective, the puzzle to be explained is why FIRs under the *could*-reading have only the internally headed structure.

The assumption that *could*-readings require the relative clause to be internally headed allows an additional test for the claim made in section 1.2.1 that weak interpretations of weak determiner are compatible with the *should*-reading. Although the examples in (8) and (9) show quite clearly that a *should*-reading is available for FIRs that modify a weakly quantified DP, the data do not provide conclusive evidence that the *should*-reading is due to a structural property of the relative clause rather than due to a form of pragmatic strengthening. However, given the fact that FIRs employing anti-reconstruction environments preclude a *could*-reading, they can be used to show that the *should*-reading of FIRs modifying weakly quantified DPs is not just due to pragmatic strengthening. A particularly striking illustration can be given with FIRs in which the *should*-reading is structurally determined through an anti-reconstruction environment while at the same time pragmatically awkward. The contrast in (16)a,b is an examples of this sort.[6]

(16)   SPEAKER A: It is very difficult for a potential bride to gain the approval of Norman's mother. In fact, she probably thinks there aren't any women good enough for him.

SPEAKER B: That's not what she thinks…

a.   …There are several friends of his DOCTOR for Norman to marry (in her opinion).

b.   # …There are several friends of Norman's DOCTOR for him to marry (in her opinion).

c.   *cf.* There are (still) several friends of Norman's DOCTOR for him to consider (in her opinion).

Since Norman cannot marry more than one friend of his sister, the *should*-reading is pragmatically disfavored in (16)a,b and only the *could*-reading is coherent. The *could*-reading is however precluded in (16)b because the internally headed structure required to generate a *could*-

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reading would yield a condition C violation. (16)b therefore produces the same awkwardness that we have observed in sentences like (4)b. (16)c on the other hand shows that there is nothing inherently wrong with a *should*-reading (according to which Norman would be expected to consider more than one potential bride) of a FIR that modifies a DP in the coda position of the existential there construction.

1.4 Summary

We have seen that *for*-infinitival relatives are ambiguous between two readings, and that this ambiguity correlates systematically with different structural environments as well as different internal structures for the relative clause. Specifically the following two asymmetries have to be explained: First, a FIR modifies an NP complement of a quantificational determiner, the *should*-reading is forced, while non-quantificational DPs allow both *should*- and *could*-readings. Second, if the relative clause has an externally headed structure (as is forced in anti-reconstruction environments), the *should*-reading is again forced. Internally headed relatives allow both *should*- and *could*-readings.

2. The Proposal

To account for the DMG we have to make explicit assumptions about the encoding of "determiner strength" (assumption A), as well as the semantic properties of FIRs (assumption B). For expository reasons, we will state these assumptions in terms of the semantic types of determiners and of FIRs. In the next three subsections we state each of these assumptions in turn
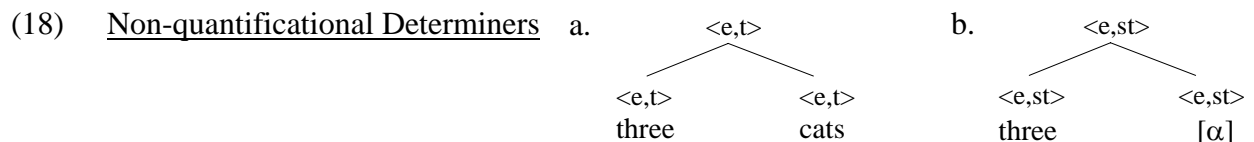
and then show how the DMG follows. In section 2.4 we provide evidence that the assumptions

are warranted independently of the DMG.

2.1 Assumption A: The difference between weak and strong determiners

The specific assumption that we adopt is that quantificational determiners (i.e. strong

determiners and strong interpretations of weak determiners) compose with their restrictor, the

NP, to yield a generalized quantifier of type <et,t>. We also assume, following e.g. Chierchia

(1995) that the NP is a one-place (extensional) predicate of type <e,t> at least at the point at

which it composes with a determiner.[7] Hence the semantic type of strong determiner will be

<et,<et,t>>, and the structure of a quantificational DP is as indicated in (17).[8]

(17)   Quantificational Determiners   <et,t>

                              ┌────────────┴────────────┐
                      <et,<et,t>>   <e,t>
                         every   cat
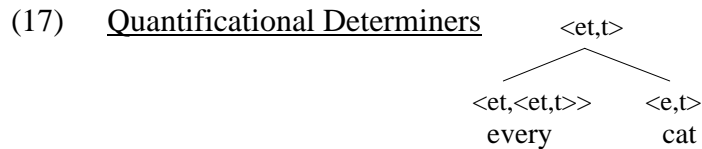
For non-quantificational (weak interpretations of weak) determiners we assume, on the other

hand, that they are cardinality predicates (cf. Milsark 1974, 1977). Further, we will argue that

they can come either in an extensional or in an intensional version. Specifically, they can be

optionally of type <e,t> or <e,st>. Given that they are modifiers, rather than quantifiers that

compose with their NP arguments via functional application, weak determiners compose via

predicate modification with their sister node (18). Consequently, for a non-quantificational

determiner to be interpretable, its sister node has to be of the same type as the determiner.

(18)   Non-quantificational Determiners   a.   <e,t>   b.   <e,st>

                                          ┌──────┴──────┐   ┌──────┴──────┐
                                       <e,t>   <e,t>   <e,st>   <e,st>
                                       three   cats   three   [α]

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Note that in the case of a weak determiner denoting an extensional cardinality predicate, its sister could be an NP (type <e,t>). For the intensional version, however, an extensional NP sister node would not be interpretable. The question that immediately arises is: what could [α] in the right-hand version of (18) possibly be. We address this question below.

These Predicate Modification structures leave free variables. With Diesing (1990) and Kratzer (1995) (following the proposal in Heim 1982), we assume that these variables in general get bound by an existential closure operation at the level of VP. This entails that non-quantificational determiners and — given the Determiner Modal Generalization, *could*-interpretations — are possible only if the DP is inside the VP.[9]

2.2 Assumption B: semantic types of *should*- and *could*-infinitival relatives

We assume that modals are quantifiers that operate over possible worlds. Hence we are led to attribute the difference between the *should*- and the *could*-interpretations of FIRs to a difference in quantificational force of two distinct covert modal operators:[10]

(19) a. topics [for us 𝕊ℍ𝕆𝕌𝕃𝔻 to work on _]

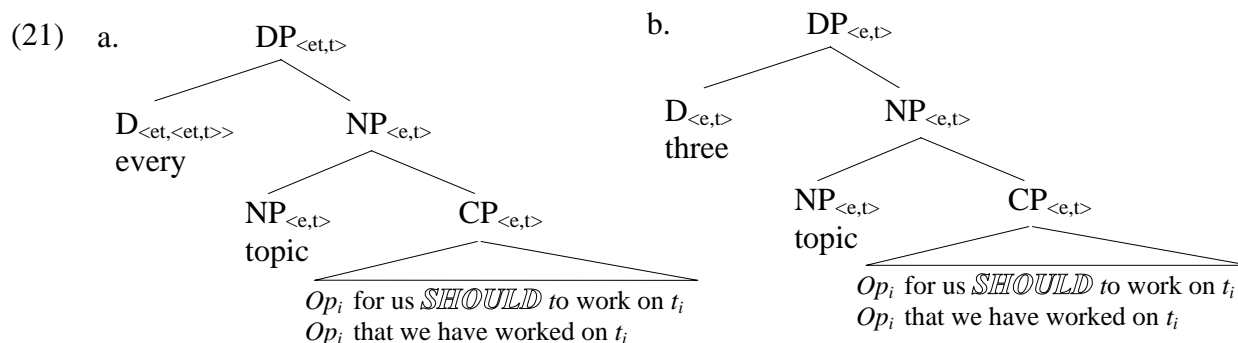   b. topics [for us ℂ𝕆𝕌𝕃𝔻 to work on _]

Furthermore, we will argue below that there is a difference in semantic type between the two types of infinitival relatives. Specifically, a *for*-infinitival that gives rise to the *should*-interpretation is always of type <e,t> while a for-infinitival that gives rise to the *could*-interpretation is always of type <e,st>:

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(20)   a. $\langle e,t\rangle$

for us *SHOULD* to work on

b. $\langle e,st\rangle$

for us *COULD* to work on
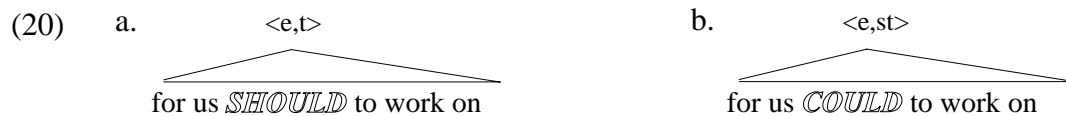
At this point in the discussion, for expository purposes, we simply stipulate this difference between the two types of FIRs. In section 3 we will show how it can be derived from claims about their internal structure. In addition, we provide evidence below that our assumptions (both about the semantic types of FIRs under the two readings and about the distinctions between determiner types) are warranted. But first we will demonstrate that the assumptions are sufficient to derive the DMG.
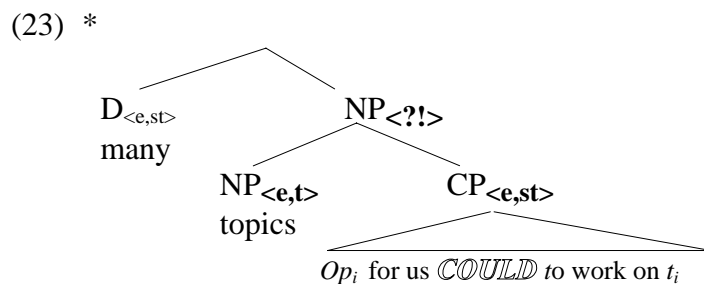
2.3 Deriving the DMG

Finite relatives and *should*-relatives: The syntax of DPs with *should*-FIRs is exactly the same as for DPs with ordinary finite relative clauses: the NP and its relative clause sister are both of type $\langle e,t\rangle$ and compose by predicate modification. The resulting node composes with the determiner, either as its complement (by functional application, in the case of quantificational determiners (21a)) or by predicate modification (with non-quantificational determiners of the extensional variety (21b)).

(21)   a. $DP_{\langle et,t\rangle}$

$D_{\langle et,\langle et,t\rangle\rangle}$
every

$NP_{\langle e,t\rangle}$

$NP_{\langle e,t\rangle}$
topic

$CP_{\langle e,t\rangle}$

Op$_i$ for us *SHOULD* *t*o work on *t$_i$*
Op$_i$ that we have worked on *t$_i$*

b. $DP_{\langle e,t\rangle}$

$D_{\langle e,t\rangle}$
three

$NP_{\langle e,t\rangle}$

$NP_{\langle e,t\rangle}$
topic

$CP_{\langle e,t\rangle}$

Op$_i$ for us *SHOULD* *t*o work on *t$_i$*
Op$_i$ that we have worked on *t$_i$*

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***Could*-relatives — a compositional problem:** Given the above assumptions, it is predicted that

<u>only</u> those FIRs that are of type <e,t> can modify a head NP in this way. A FIR that would yield

a *could*-interpretation is according to our assumptions of type <e,st> and can therefore not

combine with the head NP. The structure is uninterpretable (22).

(22)   *   NP$_{<?!>}$

     NP$_{<e,t>}$ CP$_{<e,st>}$
     topic

         Op$_i$ for us $\mathbb{COULD}$ *t*o work on *t$_i$*
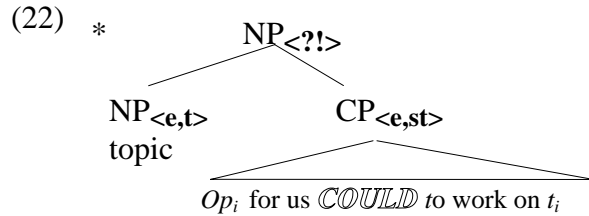
This reasoning, of course, immediately raises the question how a noun phrase could ever be

modified by a *could*-relative (which is by assumption B necessarily of type <e,st>) and, for that

matter, how a weak determiner of type <e,st> could ever compose with an NP. That is, even if

the intensional version of a weak determiner (type <e,st>) is chosen, the NP cannot compose

with a *for*-infinitival relative clause. This would be true even if the relative clause were of the

right type (<e,st>) because the head NP that is sandwiched in between the two nodes has a

different type, rendering the whole structure uninterpretable:

(23)   *

    D$_{<e,st>}$ NP$_{<?!>}$
    many

       NP$_{<e,t>}$ CP$_{<e,st>}$
       topics

        Op$_i$ for us $\mathbb{COULD}$ *t*o work on *t$_i$*

A solution: The compositional problem would be resolved if the head NP of the *could*-relative

were not sandwiched between the determiner and the relative (for the purpose of semantic

composition) but were instead interpreted *internal* to the relative clause. The modalized weak determiner instead composes directly with the *could*-relative as in (24). As a result, the set of assumptions made above predict that a *could*-interpretation of a FIR is possible only if the head NP is interpreted inside the relative, i.e. only if the head NP is reconstructed.[11]

(24)

$$\text{DP}_{<e,st>}$$

$\text{D}_{<e,st>}$ $\textbf{CP}_{\textbf{<e,st>}}$

many

[Op_i ~~topics~~] for us $\mathbb{COULD}$ to work on [t_i topics]

If the extensional version of a weak determiner is chosen, it can of course compose only with a node of the same type, e.g. a *for*-infinitival relative of type <e,t> (which may be head-external or head-internal[12]). By assumption B, such a relative necessarily gives rise to the *should*-interpretation. In other words, the proposal entails that weak determiners are "genuinely" ambiguous with respect to the interpretations they permit for FIRs. Even weak interpretations of weak determiners are compatible with a *should*-relative.

(25) a.

$$\text{DP}_{<e,t>}$$

$\text{D}_{<e,t>}$ $\text{NP}_{<e,t>}$

many

$\text{NP}_{<e,t>}$ $\text{CP}_{<e,t>}$

topics

Op_i for us $\mathbb{SHOULD}$ *t*o work on t_i

b.

$$\text{DP}_{<e,t>}$$

$\text{D}_{<e,t>}$ $\text{CP}_{<e,t>}$

many

[Op_i ~~topics~~] for us $\mathbb{SHOULD}$ to work on [t_i topics]

It is clear that the DMG follows from these assumptions. The *could*-reading of a FIR is possible only if the FIR is sister to an (intensional) weak determiner, while the *should*-reading is allowed both with quantificational determiners and with (extensional) weak determiners. The next subsection provides independent support for each of the assumptions.

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2.4 Further consequences

Taken together, the last two observations — the uninterpretability of the head NP in its surface position under the *could*-reading (a consequence of assumption A), and the type ambiguity of non-quantificational determiners (assumption B) — yield a fairly intricate range of predictions. First, they predict the asymmetric reconstruction pattern shown in section 1.3. If, for some reason, reconstruction of the head NP is impossible, only the *should*-interpretation will be detectable with weak determiners. Anti-reconstruction environments (like 12a, 13a) require an externally-headed structure for the relative, hence the relative has to be of type <e,t> and only a *should*-FIR will be possible.

Second, the claim that *could*-relatives cannot compose with external NPs predicts an otherwise completely unexpected pattern of Condition A reconstruction effects. Given that the head NP of a *could*-FIR cannot be interpreted in its surface position, the strict locality requirement on reflexive binding (Condition A) should be disrupted if the antecedent for a reflexive pronoun is external to a *could*-relative. (26) shows that, as predicted, an external antecedent disambiguates a FIR to the *should*-reading — it lacks the meaning that is paraphraseable as (27). The *could*-reading reappears if the reflexive is changed to a normal pronoun (28).

(26)   There seem to Clinton to be many stories about himself for you to write up,

       #…if you feel the need to write an article   *could-reading*

       …if you're interested in keeping your job   *should-reading*

(27)   There seem to Clinton to be many stories about himself that you could write up.

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(28)   There seem to Clinton to be many stories about him for you to write up,

        …if you feel the need to write an article   *could-reading*

        …if you're interested in keeping your job   *should-reading*

A third prediction is that the free variable provided by non-quantificational DPs has to be bound externally; if the external syntax does not provide a suitable binder, the DP has to be quantificational. We have already seen evidence for this in section 1.2. Indefinite subjects of individual-level predicates, positive-polarity *some* and subjects of small-clause complements of *seem* all escape existential closure, hence must be quantificational, which in turn forces FIRs modifying them to be of the *should*-variety.

The flip side of this coin consists of contexts in which a ban on vacuous quantification imposes a non-quantificational reading on an indefinite (e.g. when-conditionals). The familiar contrast in (29) shows that if the only candidate for providing a variable is an indefinite subject (e.g. of an individual-level predicate), then a non-quantificational reading is forced.

(29) a.   When a farmer is tall, he plays basketball.   *IL-predicate, weak Det.*

     b.   #When most farmers are tall, (…they play basketball)   *IL-predicate, strong Det.*

     c.   When most farmers put on their shoes, (…they play basketball)   *SL-predicate*

This observation leads to a further prediction given our claim that non-quantificational DPs can be either of type <e,st> or type <e,t>, together with Kratzer's (1995) treatment of individual-level-predicates. Kratzer argued that IL-predicates are extensional (type <e,t>), lacking a

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"Davidsonian" variable. It follows that even in environments like *when*-conditionals — where a non-quantificational reading is forced on an indefinite subject— a FIR modifying the subject will allow only the *should*-reading. In this environment the extensional version of the weak determiner is the only available option — presumably it composes with its IL-predicate sister via predicate modification and therefore has to be also of type <e,t>:

(30) a. When a book for us to read is long…   *IL-predicate: should only*

    b. When a book for us to read is on the table…   *SL-predicate: could, should*

(31) a. #When a woman for Norman to marry lives in his home town, he usually likes her.   *IL*

      *cf. When a woman **that Norman can marry** lives in his home town, he usually likes her.*

    b. When a woman for Norman to marry shows up in his home town, he usually likes her. *SL*

2.5 Summary

We have shown in this section that the DMG follows from our assumptions about the compositional properties of quantificational (strong) and non-quantificational (weak) determiners on the one hand and the two kinds of FIRs on the other. These assumptions also explained the observed reconstruction asymmetry in FIRs. Furthermore, we argued that an intricate set of otherwise unexpected BT(A) reconstruction facts as well as variable binding effects with FIRs in when-clauses followed.

3. The Meaning of *For*-infinitival Relative Clauses

So far we have limited our description of the modality in FIRs to using the informal labels *should* and *could*, implying that the main difference lies in the quantificational force of a covert modal operator. Our account of the DMG relies on the assumption that there is a one-to-one correspondence between the semantic type of the FIR and its interpretation. Specifically, we assumed that FIRs that give rise to the *should*-reading are always of type <e,t> while those that give rise to the *could*-reading are always of type <e,st>. The purpose of this section will be to justify that claim.

We follow a longstanding tradition in philosophy and linguistics that analyzes modality in terms of restricted quantification over possible worlds. Given this perspective, *could*-FIRs can be taken to employ an existential modal operator, and *should*-FIRs, a universal operator. What they have in common (distinguishing them from other modals) is that the restrictor is *bouletic:* the worlds that are quantified over are characterized by salient desires, goals, etc. rather than what is known or what is physically possible/necessary. An important fact about desires/goals — as observed e.g. by Portner (1997) — is that they are inherently 'future-oriented.' The intuition to capture then is that a modal restrictor that is based on desires/goals contains only 'future possibilities' or 'possible developments' of the world of evaluation.[13]

In the first sub-section we will make an explicit proposal that spells out what it means for a modal operator to quantify over possible developments of the world of evaluation. We will then show how these properties — needed independently to capture the truth conditions of bouletic

statements — can be used to derive the correlation between the modal force of FIRs and their semantic type. Our specific proposal will be that all FIRs are inherently existential, and that the *should* meaning results from an additional (universal) operator that is 'stacked' above the existential; the truth conditions will be shown to follow from this derived structure together with the properties of the bouletic modal restrictor. We conclude the section with two independent arguments that support the 'modal stacking' hypothesis.

3.1 Bouletic modality: quantification over a world's 'possible developments'

In general, the restrictor of a modal operator (the *modal base*) is given by an accessibility relation R that maps the world of evaluation to a set of accessible worlds. For instance, in a sentence like *Hydrangeas can grow here* (Kratzer 1991) the modal quantifies over a set of worlds all of which have in common that the relevant facts about *here* (soil quality, climate, etc.) hold in them as well. In other words, the set of accessible worlds given by the modal restrictor is an equivalence class defined over these facts. To a first approximation, the sentence claims that there is at least one of these circumstantially equivalent worlds in which hydrangeas do indeed grow here (or the counterpart of here in that world). This is a rather weak claim as its truth doesn't depend on whether hydrangeas grow in the world of evaluation, or whether they ever did or ever will grow *here.*

A bouletic statement like *You could plant hydrangeas here (if you want to have a pretty garden)* crucially differs in that for it to be true it has to be a future possibility that you actually do grow hydrangeas and end up with a pretty garden.[14] This requirement imposed by the bouletic modal base is what makes bouletic modality more narrowly restricted than bare circumstantial modality

(the case illustrated in Kratzer's example above). Specifically, the modal quantifies not over

worlds that are just circumstantially equivalent, but rather those that share relevant features with

the evaluation world *at the time of evaluation* — and in which a contextually salient goal is

achieved *at some time in the future*.[15]

Building time into bouletic modality: branching timelines and world-time pairs

The claim about a bouletic base is that it contains worlds that are indistinguishable from the

world of evaluation up to the time of evaluation and differ only wrt. the future. To make things

more easily accessible, we think there is some justification for abstracting away from time in the

description of the meaning given by bouletic modality. Hence, we will use only properties of the

accessibility relation to yield the effects of quantification over world-time pairs. Even though this

is a simplification, we believe that it is a reasonable move for present purposes.[16] An

accessibility relation that ensures this will be anti-symmetric and transitive. The partially ordered

set of worlds given by such a relation can be depicted as a branching tree structure representing a

time line that branches into the future. In other words, the worlds that a bouletic modal quantifies

over is the set of all possible developments of the world of evaluation which is then further

narrowed down by intersecting it with the set of worlds that satisfy the salient goal/desire.[17]

Given these assumptions, we are equipped to give a (semi-explicit) description of the LFs that

we want to assign to bouletic modal sentences as in (32), which are the finite counterparts of our

could- and *should*-relatives. In the examples below, we use the notation R_b to indicate the

bouletic accessibility relation.[18]

(32) a.   There are many topics that you could write about (if you're still looking for one)

For many x: x is a topic & [∃w' [wR$_b$w'][you write about x in w']]

"There are many x s.t. x is a topic and there is at least one world w', a possible development of w that is consistent with some goal held in w, and you write about x in w'"

b.   There are many topics that you have to write about (so you'd better get started soon)

For many x: x is a topic & [∀w' [wR$_b$w'][you write about x in w']]

"There are many x s.t. x is a topic and all worlds w' that are possible developments of w consistent with some goal held in w, are s.t. you write about x in w' "

We think that, in order to give an accurate description of the truth conditions of bouletic sentences such as in (32a,b) something like our LFs is necessary. Whether our particular formulation, specifically the notion "possible development of a world," is indeed correct cannot be determined without independent considerations. In fact, once we complete our account of the Determiner-Modal Generalization we think that we will have provided independent support for that notion since something like it is a crucial component of our story.[19]

3.2. The Central Idea: *Could*-meanings are basic

The central insight of our proposal is that the *should*-interpretation can be derived from the structure that gives rise to the *could*-interpretation by means that are needed independently. As for the *could*-interpretation, we assume that it is basic, due to the very fact that the relatives in question are *for-to*-infinitivals. In other words, we claim that the *could* interpretation is intrinsic

to FIRs — however, detectable only if there is no motivation to produce a derived structure that yields the *should*-interpretation.
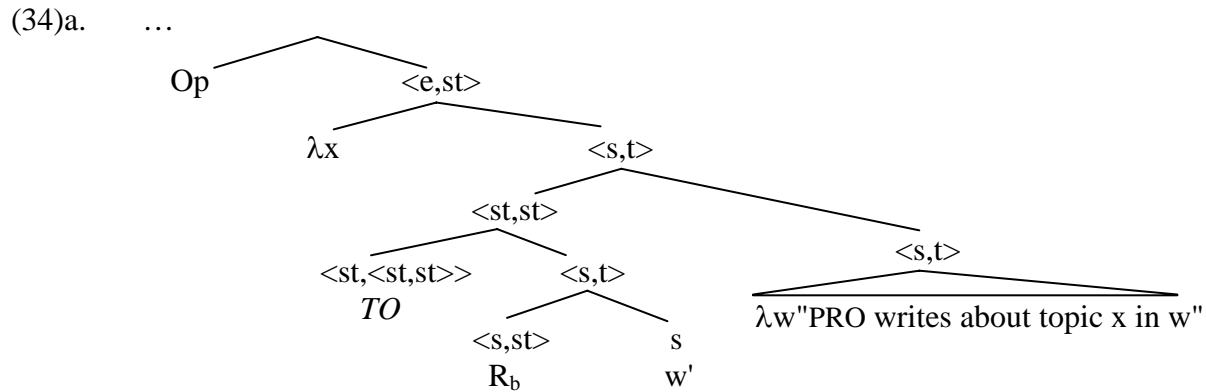
A natural hypothesis about the source of the existential meaning intrinsic to FIRs is that it comes from the infinitival marker *TO*. Infinitival *TO* is syntactically in the right position to compose with a sentential node (the VP). We propose the lexical entry in (33), according to which *TO* denotes a modal operator that has existential force and that takes a bouletic modal base as restrictor, i.e. a set of possible developments of *w,* ordered with respect to some desire held in the world of evaluation. Furthermore, we assume that existential *TO* applied to its complement yields a set of possible worlds — it results in a constituent of type <s,t>, with an open world position that must be bound from above.[20]

(33)   For any $p \in D_{<s,t>}$ & $p \subseteq R_b$, $q \in D_{<s,t>}$, $w \in D_s$

$[\![TO]\!](p)(q)(w) = 1$ iff among the worlds accessible from w there is at least one w' s.t. $p(w') = q(w') = 1$.

Our assumption that the existential modal (whether or not it is *TO*) has an extra world argument position in its lexical entry is crucial. A consequence is that after the relative clause operator[21] moves — which has the semantic effect of producing a derived predicate (expressed in terms of lambda abstraction over individuals) — we end up with a structure that has the semantic type <e,st>. This is, of course, exactly what we needed according to our type assignment for *could*-infinitivals. (34a) shows in detail the resulting structure for a *could*-infinitival relative clause given what we have said so far.[22]
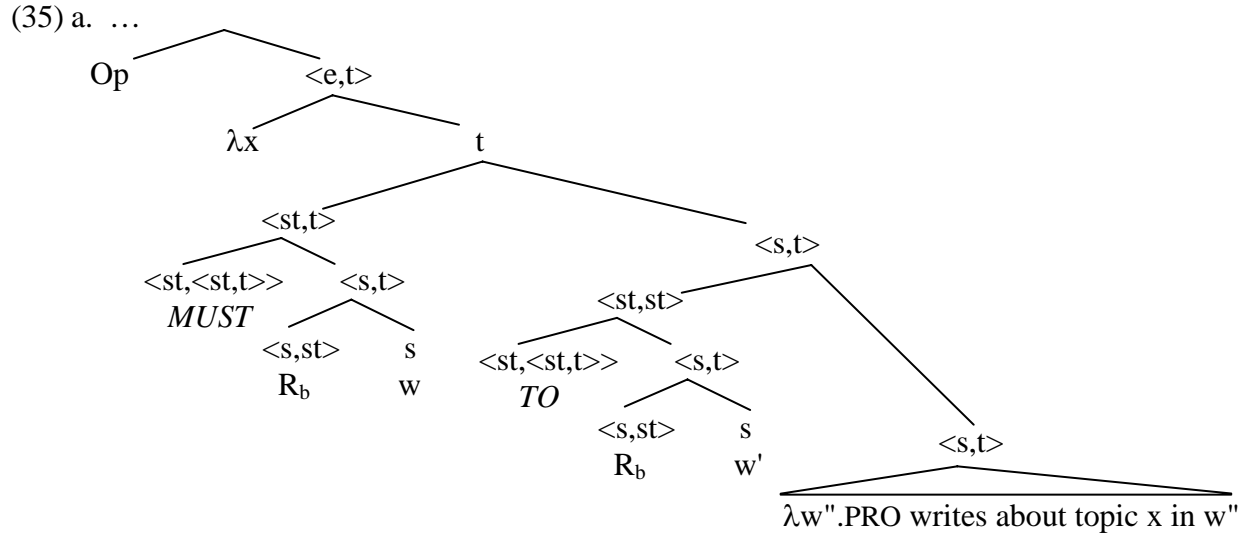
(34) a.   …

```
        Op          <e,st>
               λx              <s,t>
                        <st,st>              <s,t>
                   <st,<st,st>>    <s,t>
                        TO                        λw"PRO writes about topic x in w"
                              <s,st>    s
                                Rb      w'
```

b.   ... λx. λw' [∃w"[(w'Rw")]][PRO writes about topic x in w"]]

   (the set of individuals x s.t. there is at least one world w" that is a possible development

   of w' that is consistent with some goal held in w', and in which PRO writes about topic

   x)

We do not have independent evidence for the crucial assumption that *TO* passes up an open

world position. However there is a clear intuition behind that assumption. Infinitival clauses are

dependent: typically they cannot stand just by themselves and yield a grammatical output. One

natural way to encode this requirement of an embedding matrix is to assume that a variable —

the world or situation pronouns by which the tense, mode or mood of a clause is encoded[23] —

has to be bound or quantified over and the binder/quantifier has to be introduced by the higher

structure that embeds the infinitival. Presumably, it is a property of the INFL node of infinitival

clauses to introduce the lambda abstraction over worlds, which is exactly what our assumption

stipulates, since the abstraction is built into the lexical entry for the infinitival marker.[24]

The next question to ask is how we get a *should*-reading given that all *for*-infinitivals are inherently *could*-infinitivals. Following our type assignment, the infinitival has to be of type <e,t> to yield a *should*-interpretation. Therefore we need to find a way to turn an <e,st> infinitival relative into one that is of type <e,t>. Building on the assumptions made for *could*-infinitivals, we can achieve this goal by means of "binding off" (i.e. quantifying over) the open world variable that was introduced by the existential *TO* operator — before raising of the relative operator. What we need is a modal operator that takes the infinitival as its nuclear scope. The result of applying this modal operator to the infinitival clause is a node of type t, which is then turned into a derived (extensional) predicate after the relative operator moves, as in (35).

We assume that the quantificational force of this covert modal operator is universal, and that inserting it is a freely available option. Various researchers have concluded on the basis of converging lines of evidence that there is such a silent universal modal operator: probably the best known and most widely accepted example is Kratzer's account of conditional *if*-clauses as restricting a silent universal modal. Except for the fact that it is silent, it behaves exactly like any other modal operator. In particular, its modal base is determined by the conversational background via anaphor resolution.[25] The result for our cases is that it has the same modal base as the existential modal *TO*. Taking these observations together, we end up with structures like (35) for *should*-infinitivals. We propose that (35) is the actual representation of FIRs that gives rise to the *should*-reading.

(35) a. …

$$\begin{array}{l}
\text{Op} \quad \langle e,t\rangle \\
\qquad \lambda x \qquad t \\
\qquad\qquad \langle st,t\rangle \qquad\qquad\qquad \langle s,t\rangle \\
\qquad \langle st,\langle st,t\rangle\rangle \quad \langle s,t\rangle \qquad\qquad \langle st,st\rangle \\
\qquad\qquad MUST \\
\qquad\qquad\qquad \langle s,st\rangle \quad s \qquad \langle st,\langle st,t\rangle\rangle \quad \langle s,t\rangle \\
\qquad\qquad\qquad R_b \qquad w \qquad\qquad TO \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \langle s,st\rangle \quad s \qquad \langle s,t\rangle \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad R_b \qquad w' \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \lambda w''.\text{PRO writes about topic x in } w''
\end{array}$$

b.   ...$\lambda x.\ [\forall w'\ [wR_b w']\ [\exists w''[w'R_b w''][\text{PRO writes about topic x in } w'']]]$

   (the set of individuals x s.t. for every w' that is a possible development of w consistent with the salient goal held in w, there is at least one w", a possible development of w' that is consistent with the salient goal held in w' and in which PRO writes about topic x)

In other words, we claim that *should*-infinitivals are more complicated than the label or the paraphrase would suggest. They actually contain two modal operators, an existential which comes directly from the infinitive (specifically from *TO),* and on top of that a universal modal that effectively inherits the modal base from *TO*. Since we assume that the modal restrictor is bouletic for both modal operators (both being anaphoric on the context), this stacking of the modals predicts, as we argue below, the right truth conditions for *should*-FIRs.[26]

To see that this is the case it is helpful to work with the branching tree structure representation of the worlds that are quantified over in bouletic statements. A simple universal modal with a bouletic restrictor will yield a sentence that is true iff every world that branches off from the

world of evaluation and is consistent with the salient goal also verifies the nuclear scope (e.g.

PRO writes about topic x). If the nuclear scope of the universal is an existential modal statement

that is *also* bouletic and whose evaluation world is bound by the universal, then an additional

layer of branching worlds is introduced. That means that the whole sentence will be true iff for

every world that branches off from the evaluation world (and is consistent with the salient goal

— a 'p-world' for short), there is at least one further world branching off from it in which the

nuclear scope of the embedded existential is true (a 'q-world').

(36)
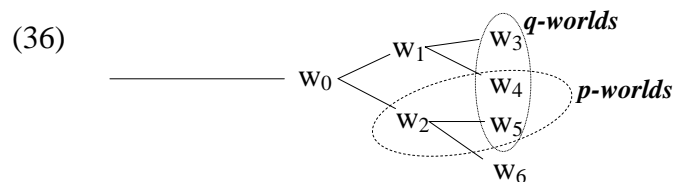
Notice that the truth conditions predicted by a statement with stacked modal operators are

weaker than those predicted if a universal operator alone is used. In particular, the situation

depicted in (36) contains a world (w_2) that is a p-world and not a q-world. The existence of such

a world immediately falsifies a simple universal statement; however the stacked structure would

come out to be true — because w_2 gives off a branch that is both a p- *and* a q-world.

On the other hand, the truth conditions predicted by stacking are crucially stronger than those

that would result from a simple existential operator. To see this, consider (37). The situation

depicted there also contains a world (w_6) that is a p-world without being a q-world, but (unlike

w_2 in (36)) does *not* itself branch into a p- and q-world. This is sufficient to falsify our stacking

structure. However, a simple existential statement would clearly come out true, because there *are*

worlds that are both p- and q-worlds (namely w_4 and w_5).

(37)
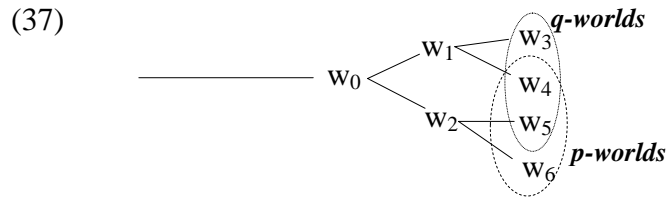
Thus far, we have shown that modal stacking as proposed above (universal over existential), together with the specific properties of the bouletic base, yields a statement that is neither universal nor existential. We think that one can make sense of this peculiar result by a consideration of the notion 'being consistent with a goal,' which comes with the bouletic base. It seems that a world can be 'consistent with' a goal held in the evaluation world even if the goal is not yet achieved — as long as there is some future world branching from it in which the goal *is* satisfied. Notice that this 'postponement' of goal-satisfaction is allowed only with the multiple layers of branching given by stacked modals. What is enforced by such a statement — and what crucially makes it stronger than an existential statement — is that a world in a given layer of branching may be a p-world without necessarily being a q-world, but only if it leads to a world that is a p- *and* q-world. What the *should*-reading says, then, is that every world that is consistent with the goals held in the evaluation world is *either* a q-world *or* a non-q-world that is *on a path* leading to at least one world that is both a p- and q-world.[27,28]

3.3 A further argument for modal stacking: Negation and existential *TO*

Inserting the universal modal to "bind off" the free variable is a freely available strategy; i.e. the modal operator is never selected but can always be chosen. The principles of semantic composition will filter out under which conditions inserting that modal will yield an interpretable

structure. As we have shown, these two structures and the underlying derivations that give rise to them allows for a principled explanation for the DMG.[29] If it can be shown that *TO* denotes an existential modal operator, then we will have independent evidence for the existence of stacked operators under the *should*-reading. Since *TO* is present in all FIRs, something else has to be responsible for the universal force in *should*-FIRs. We give an argument here that this is indeed the case.

On the assumption that *TO* is an existential operator, we expect it to interact with scope bearing elements just like any other modal operator does. Specifically, for clausemate negation that takes scope over *to* (to express "not>could p"[30]) we expect that it will result in a structure equivalent in meaning to "should>not p", following simple predicate logic equivalences. That means that inserting a silent modal operator to bind off the free variable will not result in a detectable change in meaning even though the type changes from $\langle e, st \rangle$ to $\langle e, t \rangle$. This is so because stacking a universal on top of a "universal", i.e. a structure that is already equivalent in meaning to a universal, will not change the modal force. In other words, we predict that only a *should*-reading will be detectable in *for*-infinitivals with clausemate negation taking scope over *TO*. On the other hand, forcing negation to take scope under *TO*, we get *could>not p*. In this case, both *should-* and a *could-* interpretation are predicted to be available depending on whether the default universal is inserted or not. This is so because the basic reading is existential and stacking a universal modal on top of *TO* as proposed for the regular cases would also change the modal force to a universal in this case. In other words, assuming that *TO* is an existential modal operator together with the proposal for the derivation of the *should*-reading makes the surprising prediction that negation depending on its relative scope with respect to *TO* will disambiguate the

31

for-infinitival in one case but not in the other. This prediction is borne out as can be seen in the contrast in (38).[31]

(38) a. Mrs. Schaden came up with many problems for us not to work on   *not>could⇔should>not*

could>not

   b. Mrs. Schaden came up with many problems for us to [put aside] and [not worry about

   too much]   *should>not, could>not*

   c. Mrs. Schaden came up with every problem for us to put aside and not worry about too

   much   *should>not*

In (38a) where negation takes scope over *TO* only, one reading, the *should>not* reading, is detectable. In (38b) where we force negation to take scope under the infinitival using conjunction we get the familiar ambiguity, i.e. both the *could>not* and *should>not* reading is available. Finally, (38c) shows that the Determiner Modal Generalization still holds, i.e. a strong determiner like *every* still disambiguates in favor of the *should (not)* reading because it forces the infinitival to be of type <e,t> which means that the structure is interpretable only if the world variable is closed off by the default universal.[32,33]

This pattern of interaction between syntactic position of negation and interpretation of the FIR is unexpected unless two modal operators are present in *should-* readings, the existential being in the scope of the universal. In particular, it would be inadequate to assume that there is one modal operator that is strengthened in various contexts. Such a modal would be obviously inadequate if it were in any other position than the one *TO* occupies, since the different positions of negation

wouldn't have any effect. However, even if it were in the position of *TO,* or if it were *TO* itself

that in a chameleon like fashion would acquire universal or existential force depending on the

context, it would be left unexplained why the *not>should* (equivalently the *could>not*) reading is

impossible.

4. Summary

We have presented a set of new facts about the syntax and the semantics of for-infinitival relative

clauses which established a rather striking generalization: that FIRs can in principle have two

readings which are distinguished in their modal force (*could* vs. *should*), and that the modal

interpretation correlates with the strength of the determiner (the Determiner Modal

Generalization). We argue that the DMG follows from the compositional properties of the

players involved (i.e. strong and weak determiners, NPs and FIRs). Limiting ourselves to the

basic semantic composition rules (Functional Application and Predicate Modification) and fairly

well-motivated assumptions about the nature of quantificational and non-quantificational

determiners, we used the DMG to probe into the internal structure of these infinitival clauses.

Among the chief results of our investigation is that one of the readings (the *could*-interpretation)

is inherent to the infinitival — due to the fact that *TO* is an existential modal operator — while

the other reading (the *should*-interpretation) is derived. The explanation we gave for the DMG

also accounted for a surprising pattern of reconstruction effects, in particular, that in *could-*

infinitivals the head NP has to be interpreted internal to the relative clause, entailing a 'head

raising' derivation for these cases.

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Notes:

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[1] Very often, *should* carries a "deontic flavor", however it is not limited to this type of interpretation. The full range of meanings available to *should* is available as well to infinitival relatives. Their most important characteristic is that they can be paraphrased in terms of achieving a goal that is salient in the discourse, as in *If you want to have good coffee, you should try mine /here's a cup for you to try.* Here, the salient goal of "having good coffee" is supplied by the *if*-clause, and the *should* modal is understood, informally, as "the way to achieve that goal...." (The *could* modal on the other hand is understood more as "*one* way to achieve the goal....")

[2] We won't have anything profoundly new to say about "weak" and "strong" determiners, but will simply follow Milsark (1974, 1977) and much subsequent work in distinguishing between them — i.e. we use the familiar classification given by the "there-construction test" among others to categorize determiners. As is well-known this characterization of the notion "determiner strength" makes it necessary to distinguish between strong and weak interpretations of weak determiners.

[3] Rajesh Bhatt has pointed out to us a class of apparent counterexamples to the DMG. Thus the examples in (i) all have strong determiners, yet seem to have perfectly natural *could*-readings.

(i)   a.   Every pen to write with (is in the top desk drawer)

       b.   All the cash to buy books with (has been spent already)

       c.   Three of the charts to do your homework with (are in the back of the book)

       d.   Most guns to shoot quail with (have wooden handles)

A characteristic property of these examples seems to be that they are interpreted teleologically; that is, the head NPs are understood as in some sense "designed" for the purpose expressed by

the FIR. For a suggestion that this class of apparent exceptions has a principled explanation, see note 28.

[4] If the head NP raises to its surface position then reconstruction effects follow from the copy theory of movement.

[5] And hence no copy in the position of the gap (cf. previous footnote). See Sauerland 1998 for an alternative account that assumes the optionality does not lie in the availability of different structures.

[6] Capital letters indicate phonological prominence.

[7] Note that we do not exclude the possibility that there could be a world variable inside the NP which could then be available for binding from outside. What is crucial for our account is that at the level at which the NP composes with a strong determiner it is an extensional predicate.

[8] Assigning generalized quantifiers the type $\langle et,ett \rangle$ rather than $\langle s,\langle et,ett \rangle \rangle$ abstracts away from the situation/world dependency of the whole generalized quantifier.

[9] With the exception of one VP-external environment, to be discussed in section 2.4.

[10] Note that $SHOULD$ and $COULD$ are meant here to represent a covert modal structure, not necessarily the covert counterparts of the modals *could* and *should*. We do not yet make specific claims as to the details of the assumed covert structure. See section 3 for an elaboration of the structure *internal* to FIRs.

[11] We put aside the question of how the constituent *[t$_i$ topics]* gets interpreted. A few proposals have been made for interpreting operator-variable constructions with *in situ* restrictors (Cf. Rullman and Beck 1998, Sauerland 1998). For the purposes of discussion, we'll assume that *[t$_i$ topics]* is interpreted as "the x such that [[topics]](x)=1 & x=y," and the Operator is interpreted as

an abstract that binds *y*. This assumption is also made in Fox (forthcoming) and spelled out (for *which*-phrases) in Rullman and Beck (1998).

[12] We have already seen (section 1.3) that we cannot exclude a head internal structure for *should*-infinitivals.

[13] Many researchers have noticed that *for*-infinitivals have a future orientation (Bresnan 1972, Stowell 1982, Pesetsky 1992). Our claim is that this future-orientation is a property of bouletic modality in general; *for*-infinitivals have the range of meanings that they do because they are limited to bouletic modality.

[14] Bouletic statements seem to also have felicity conditions which include that *having a pretty garden* is in principle not impossible as well as that *growing hydrangeas* and *having a pretty garden* is not realized in the world of evaluation yet.

[15] One of the most important insights of Kratzer's work on modality — which we assume in our exposition as the basic framework — is the recognition that the context determines the nature of the modality involved in an utterance. A formal way of encoding this dependency is to assume that the restrictor of a modal operator is ultimately determined by the context. This can be achieved by supposing that the set of accessible worlds given by a particular accessibility relation is intersected with whatever is salient in the discourse e.g. the desires held by the speaker.

[16] Cf. Landmann (1991) for a way of mapping branching timelines into a model where worlds are understood to encompass entire histories. In such a framework, the branching structures we use would be characterized by quantifican over worlds and times, or over world-time pairs. The *could*-reading, for instance, might be represented as $\exists w[wRw_0 \ \& \ \exists t[t \text{ follows } t_0 \ \& \ q(t)(w)]]$. (cf.

Thomason & Gupta 1982) Should it turn out that there is strong evidence to stick with that picture, our basic proposal would still remain intact.

[17] We are abstracting away from Krazer's *ordering source* which would impose a partial ordering over the modal base based on how close the worlds come to realize the desire.

[18] It should be clear from the above discussion that R_b is not a primitive notion of the theory, but merely a shorthand for a particular choice of accessibility relation together with a contextually supplied set of worlds (i.e. a salient "desire," "goal," etc.).

[19] Portner (1992, 1997) invokes a similar intuition using the metaphor of the reference situation s *growing into a* larger situation s' that is a p-situation, where the implicit assumption is that situations can grow only into the future.

[20] For concreteness, we encode the observation that FIRs tolerate only a specific kind of modal base in terms of a definedness condition ("$p \subseteq R_b$") on the first argument of *TO,* where R_b is assumed to stand for the modal base rather than the accessibility relation per se. Another possibility would be to say that it is the *FOR* complementizer that is the source of the bouletic modal base.

[21] Or the NP in the case of a head-raising structure.

[22] For explicitness, we represent the world variables syntactically as pronouns in the tree (34a). We have no particular stake in whether these pronouns are actually in LF representations. What is crucial is that such variables (e.g. the sister of R_b, w') are able to be bound by operators that are present in the syntax at whatever level of representation operator-variable relationships are interpreted.

[23] In a situation semantic rendition of the framework (cf. Berman 1987, Kratzer 1989, Heim 1990, Portner 1992) these phenomena can be submitted to essentially the same treatment.

[24] Cf. Portner (1992, 1997) for a different proposal for why infinitivals can't stand alone as an utterance.

[25] Cf. the discussion in section 3.1 on the context dependency of the modal base.

[26] This state of affairs is somewhat surprising given that stacking a universal on top of an existential operator generally results in weak truth conditions (i.e. existential force).

[27] It is clear that the way 'being consistent with a goal' is used here is weaker than what is typically assumed about how modal bases are constructed, namely that p has to hold in all the worlds of the modal base. It remains to be seen whether this weaker notion can be justified on independent grounds.

[28] Note also that the possibility of deriving these surprisingly strong truth conditions from a universal stacked over an existential modal operator relies on a crucial assumption: both operators must be restricted by a bouletic base (and more specifically, by the *same contextually salient goal or desire*). If one of the modal operators were restricted by a non-bouletic base, we would then expect to find weak truth conditions: the higher quantifier would no longer have an effect on the truth-conditions and we would be left with an existential statement. Such cases should yield apparent violations of the Determiner Modal Generalization, but would ideally be marked by some distinctive property suggesting a distinct modal restrictor. We believe that the "design" readings mentioned in note 3 constitute exactly this predicted class of apparent counterexamples:

(i)   Every pen to write with is in the top desk drawer.

Recall that those examples are characterized by a teleological interpretation. This interpretation seems to us to indicate a modal base akin to the one that characterizes 'ability' or 'dispositional' attributions (cf. Hackl 1998). A distinguishing property of these — unlike modals restricted by

the bouletic base — is that their truth is independent of whether the nuclear scope is (or was) ever realized (see the discussion of Kratzer's example in section 3.1).

To illustrate, the truth conditions for (i) say about every pen x (roughly) that x must be in the desk drawer as long as it has the following property: that all worlds equivalent to the evaluation world (with respect to the essential properties of x) have at least one possible development that is both consistent with the contextually salient goal and in which PRO writes with x. These truth conditions are as weak as those of the *could*-reading.

[29] On a side note, given the derivation for the *should-* reading — specifically the claim that inserting a default universal modal operator is freely available — we predict that stand-alone infinitives actually should be grammatical. Recall that we pinpointed the problem of infinitival clauses standing alone as well-formed utterances in terms of a variable that needed to be bound. Since the universal can do that in relative clauses without recourse to the matrix, it should be able to do that in general. In other words, we predict stand-alone infinitives to be fine (at least under certain pragmatically marked conditions) — and that they should have universal modal force. In fact cases like this are attested. Portner (1997:183) for instance gives the following cases:

(i)   a.   Oh, to someday meet her!

       b.   To have suffered so long and had it come in the end to this.

For (ia) it is clear that the modal force is universal as predicted. In (i.b) there doesn't appear to be any modal dimension to the interpretation of the infinitival. Obviously, the aspectual properties of the predicate are crucial. We leave the question how these non-modal readings can be derived consistently with our theory for future research.

[30] We use the notation *should>not* and *could>not* to make it obvious that we refer to readings with the indicated scope relations, i.e. wide scope of the modal which means in particular that *could>not* is equivalent to *don't have to* which is not (necessarily) true for "couldn't" for which at least the preferred reading is with negation taking scope over the modal.

[31] Negation that takes narrow scope with respect to *TO* seems to yield what is frequently called "(VP-) constituent negation" which is supposed to be different from sentential negation. But this won't affect the argument. Even if the narrow-scope negation is different, one still needs to explain the absence of one of the readings when sentential negation is used. On our account, it is straightforward why sentential negation lacks the *could>not* reading: negation takes scope over existential *TO*.

[32] There may be a pragmatic confound, namely that the *could>not* reading is possibly unavailable independently on the grounds that its truth is implied by *could* alone. To be certain that the result claimed in the text is a real one, we need to set up a context that makes a *should>not* interpretation infelicitous while favoring a *don't have to* (which is equivalent to *could>not*) reading. An infinitival that has negation taking scope over *to* should simply be odd under these circumstances, because the only reading that the structure supports is one that is equivalent to *should>not.* Narrow scope for negation, on the other hand, should be fine. This seems to be the case. Imagine for the following examples that Norman is stingy and want to go out with a woman whom he doesn't have to spend money on:

(i) a. There are quite a few women for Norman to [go out with] and [not spend money on].

could>not

   b. #There are quite a few women for Norman not to spend money on   *not>could⇔should>not*

cf. There are quite a few women that Norman could (possibly) not spend money on   *could>not*

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[33] I. Heim (pc.) points out that the argument relies on the assumption that the covert universal modal takes scope over negation. See von Fintel(1997) for a parallel assumption to account for excluded middle phenomena.