Superlatives, NPIs and *Most*

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The felicitous appearance of negative polarity items (NPIs) in the restrictor of the English determiner *most*, like *any* in (1), has been used as an argument against the influential hypothesis that NPIs must appear in downward entailing (DE) environments (Fauconnier 1975, Ladusaw 1979) and as motivation for alternative accounts of various distances from DE-ness (cf. Heim 1984, Linebarger 1987, Ludlow 1995 and many others).

(1) Most people with **any** brains have already left town.

In this squib, I will argue that despite appearances NPIs in the restriction of *most* are licensed by being in the scope of a DE operator. In doing so, I will draw upon results from von Fintel (1999), Heim (1999) and especially Hackl (2009). Hackl argues that *most* should be analyzed as a superlative, using Heim's analysis of superlatives. I'll show that Heim's analysis of superlatives needs to be revised slightly to reconcile Hackl's account with the NPI licensing facts. Once Heim's semantics is suitably revised (for independent reasons), we will see that the superlative morpheme is Strawson downward entailing in the sense of von Fintel. Finally, I will explain in detail why *most* does not <u>appear</u> to be DE or even Strawson DE. The solution lies in the covert structure of *most* and the properties of presupposition projection.

To reiterate, my ultimate goal is to defuse what is often perceived as a potent argument against downward entailingness as the licensing condition for negative polarity items. We begin in Section 1 by examining in detail the presuppositions that are associated with superlatives. We lay out the evidence that supports the presupposition proposed by Heim (1999) and suggest that a slightly weaker presupposition fits better with the data. In Section 2, we turn to existing accounts of NPI-licensing in the scope of superlatives. Von Fintel's (1999) account is given special attention and amended to accommodate our discussion of the presuppositions of the superlative from Section 1. Section 3 introduces Hackl's (2009) analysis of *most* as a superlative form of *many*. Our discussion of presuppositions in section 1 necessitates some changes in Hackl's approach. Once those changes are made, it is demonstrated how a superlative analysis of *most* predicts the licensing of NPIs in *most*'s restrictor. Finally, we explain why it seems so counterintuitive to consider *most* downward entailing. Section 4 concludes.

1. The presuppositions of superlatives

Consider the following statement.

(2) Fred is the oldest linguist in this department.

In addition to its truth-conditional claim, this sentence has been claimed to carry several presuppositions. Perhaps the most obvious presupposition is that Fred is, in fact a linguist in this department (cf. von Fintel 1999, a.o.). The status of this as a presupposition can be seen in its survival under negation. (3) still implies that Fred is a linguist in this department.

(3) Fred is not the oldest linguist in this department.

Let's start to construct a lexical entry for –*est* that incorporates the necessary presupposition. I assume the constituency for superlatives proposed in Heim (1999):

(4) [-est 1[[$t_{1,d}$ old] linguist]]
a. ⟦**old** ⟧ = $\lambda d.\lambda x.height(x) \geq d$
b. ⟦**linguist**⟧ = $\lambda z.$ z is a student

(5) For all D of type <d,<e,t>> and x of type e,
⟦–**est**⟧(D)(x) = 1 is defined only if $\exists d[D(d)(x)=1]$

In the case of (2), this presupposition tells us that Fred is a linguist in this department and has some age. The latter presupposition means only that Fred registers on the relevant scale for **old** (the age scale), not that Fred is old – in the sense of the positive form of the adjective.

In (2) the NP *linguist in this department* most likely provides a complete description of the class of individuals to whom the speaker would like to compare Fred in age. This need not always be the case. The NP may offer an incomplete description of the class, in which case it is reasonable to infer that there is an implicit contextual restriction that specifies the relevant class, cf. von Fintel (1994). Let's refer to this implicit contextual restriction as C.

For example, the speaker of (6) most likely does not intend to say that Mary is the brightest student in the whole world, but probably only within some particular group of students she has in mind.

(6) Mary is the brightest student.
"Mary is the brightest individual among the students in C"

As observed in Heim (1999) the value of C can be fixed be a previous utterance.

(7) All the students in my LING 101 class are acceptable.
But Mary is the brightest student.

The sentence we have provided as context here both fixes the group of students to which we wish to compare Mary and provides us with additional information about Mary. As Heim points out, in such contexts we spontaneously infer that Mary is a student in my LING 101 class.

(8) All the students in my LING 101 class are acceptable.

$\Downarrow$ C:= the students in my LING 101 class
Mary is the brightest student
$\Downarrow$ Presupposes: Mary $\in$ C
Inference: Mary is a student in my LING 101 class

Let's adjust the lexical entry of –*est* to include this additional presupposition.

(9) For all D of type <d,<e,t>> and x of type e,
⟦-**est**⟧$\underline{(C)}$(D)(x) is defined only if $\underline{x \in C}$ & $\exists$d[D(d)(x)=1]

In addition to these presuppositions, superlatives also carry presuppositions about the size of the classes to which their subjects are being compared.[1] It is odd or ironic to say (10), given that we take it for granted that no one can have more than one (biological) mother.

(10) #You are the best mother I have. (Hackl 2009)

We can account for the oddity of (10) if we add a presupposition that the subject cannot be the only relevant individual that satisfies the descriptive content of the NP.[2]

(11) For all C of type <e,t>, D of type <d,<e,t>> and x of type e,
⟦-**est**⟧(C)(D)(x) is defined only if x$\in$C & $\exists$d[D(d)(x)=1] & $\underline{\exists y[\ y \neq x \ \&\ y \in C}$
$\underline{\&\ \exists d[D(d)(y)=1]\ ]}$

Our presupposition is growing a little long now, and indeed at this point some have attempted to simplify the presupposition a bit (Heim 1999, fn. 8; Hackl 2009). We are saying that the subject and another individual are in C and that both satisfy the degree predicate to some degree. We could accomplish this with a slightly shorter, though stronger statement. In particular we could say that the subject and another individual are in C and that <u>all</u> members of C satisfy the degree predicate to some degree:

(12) For all C of type <e,t>, D of type <d,<e,t>> and x of type e,
⟦-**est**⟧(C)(D)(x) is defined only if x$\in$C & $\exists$y[y$\neq$x & y$\in$C] & $\forall$z$\in$C[D(d)(z)=1]]

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[1] Herdan and Sharvit (2006) discuss the monotonicity of the superlative morpheme in detail but do not discuss or account for data such as (10).
[2] In fact, it seems that superlatives require that there be at least three individuals in the comparison class (including the subject).
(i) #Of these two people, Bill is the tallest.
(ii) Of these two people, Bill is the taller.
This may be an effect of competition with the comparative, cf. (ii). Even if we must add this explicitly to the presupposition, it will not affect anything we have to say here.

I think the leap to this stronger presupposition about C is unwarranted. First consider the content of this stronger presupposition. It says that all members of C must satisfy the degree predicate to some extent. Assuming that the contexts below set C to the set of Canadian professionals I know, this presupposition is too strong.

(13) a. Of all the Canadian professionals I know, Bill is the best doctor.
b. The Canadian professionals I know are very successful. For example, the best doctor was just named editor of the *CMAJ*.

These sentences do not suggest that all the Canadian professionals I know are doctors. Rather these contexts just winnow the doctors I'm comparing Bill to down to the Canadian ones. This suggests that the weaker presupposition in (11) is preferable.

Alternatively, it is conceivable that the set C is spontaneously restricted to the set of Canadian doctors once doctors are mentioned. In the next section, we turn to the effect of presuppositions on the NPI-licensing properties of superlatives. This will give another reason for preferring the weaker presupposition in (11).

2. Superlatives and NPI licensing

An important clue about the semantics of superlatives comes from the fact that they license negative polarity items (NPIs) like *any* and *ever*:

(14) a. Erin is the quickest volleyball player I have **ever** met.
b. Art is the tallest biologist who has **any** publications in *Crustacea*.

Ladusaw (1979) has influentially proposed that these NPIs are licensed in environments that are downward entailing (DE), i.e., that license inferences from sets to subsets. For example, *no* licenses NPIs in its scope; *every* does not, cf. (15). This mirrors the fact that the downward inference from publications to publications in *Crustacea* is valid in (16)a, but not in (16)b.

(15) a. No linguist has any publications in *Crustacea*.
b. *Every linguist has any publications in *Crustacea*.

(16) a. No linguist has publications.
$\vDash$ No linguist has publications in *Crustacea*.
b. Every linguist has publications.
$\nvDash$ Every linguist has publications in *Crustacea*.

Though superlatives license *any* and *ever* in their NPs as shown in (14), they do not license inferences from sets to subsets:

(17) a. Erin is the quickest volleyball player in Michigan.

b. $\not\models$ Erin is the quickest volleyball player in Lansing.

The truth of the premise here does not guarantee the truth of the conclusion. Erin might indeed be the quickest volleyball player in Michigan, but if she lives in Saginaw she cannot be the quickest volleyball player in Lansing.

Von Fintel (1999) proposes a solution to this problem. He suggests that when we assess entailment we must take for granted the presuppositions of the conclusion. He calls this special kind of entailment 'Strawson entailment.' As we have observed above, a superlative presupposes that its subject meets the descriptive content of its NP. So, the conclusion of the inference in (17) presupposes that Erin is a volleyball player in Lansing. So, to assess whether Strawson entailment obtains, we see if the inference in (18) is valid.

(18) Erin is the quickest volleyball player in Michigan.
Erin is a volleyball player in Lansing.
$\therefore$ Erin is the quickest volleyball player in Lansing.

This inference is valid. This means that (17)a Strawson entails (17)b, and thus that –*est* is Strawson DE. Von Fintel argues that being Strawson DE is a necessary condition for being a licenser of NPIs like *any* and *ever*.

Now, let's see if von Fintel's account holds up in light of all the presuppositions for superlatives we discussed above. For the sake of discussion I reproduce von Fintel's complete lexical entry for –*est*:

(19) For any P of type <e,<d,t>>, Q of type <e,t> and a of type e:
[the ... -est] (P) (Q) (a) is defined only if Q (a) = True
If defined, [the ... -est] (P) (Q) (a) = True iff
$\forall x \neq a$: (Q(x) = True -> ιd(P (x) (d)) < ιd(P (a) (d)))

Two issues are raised by von Fintel's treatment of superlatives. First, (19) includes no mention of a contextual restriction C. That is easy to rectify, but as we shall see what presupposition we choose for C has important consequences for NPI licensing. The second issue raised by (19) is the fact that this lexical entry is incompatible with a movement account of superlatives. The argument of type <e,t> in (19) is not a contextual restriction but the denotation of the NP itself (without the degree predicate denoted by the adjoined AP). This will become relevant below when we turn to Hackl's theory about the meaning of *most*.

2.1 A Universal Presupposition for C

Let's return to the issue of how presuppositions about C affect an account of NPI licensing in superlatives. First, let's look at the lexical entry that includes a universal presupposition as proposed in Heim (1999), Hackl (2009), a.o.

(20) For all D of type <d,<e,t>> and x of type e,

$[\![\textbf{-est}]\!](C)(D)(x)$ is defined only if $x \in C$ & $\exists y[\, y \neq x$ & $y \in C]$ & $\forall z \in C[D(d)(z)=1]\,]$
When defined,
$[\![\textbf{-est}]\!](C)(D)(x)=1$ iff $\exists d[D(d)(x)=1$ & $\forall y[y \neq x$ & $y \in C \rightarrow D(d)(y)=0]$

Let's assess the Strawson DE-ness of superlatives with this presupposition, informally. For example, does being the tallest student Strawson entail being the tallest semantics student? (22) shows that it does.

(21) a. tallest student
b. tallest semantics student

(22) <u>*-est* is Strawson DE</u>
Proof1: Suppose $[\![$**–est tall student**$]\!]$(**a**)=1, then **a** and another individual are in C, C is a subset of the students and **a** is taller than all other members of C. Now we assume the conclusion is defined; so C is a subset of the semantics students. If **a** is taller than all members of C, then **a** is taller than all semantics students in C.

This is a positive result, but there is a problem. The addition of the presupposition about C means that *–est* is also Strawson <u>up</u>ward entailing (UE):

(23) <u>*-est* is Strawson UE</u>
Proof1: Suppose $[\![$**–est tall semantics student**$]\!]$(**a**)=1then **a** and another individual are in C, C is a subset of the semantics students and **a** is taller than all other members of C. Now we assume the conclusion is defined; so C is a subset of the students. If **a** is taller than all members of C, then **a** is taller than all students in C.

This conclusion holds because the presupposition of the premise guarantees that the members of the contextual restriction are all semantics students. Thus, being taller than all semantics students in C means being taller than all students in C – since C contains only semantics students. Hence, *-est* is both Strawson downward and Strawson upward entailing.

Guerzoni and Sharvit (2007) and Cable (2002) argue that expressions that are both Strawson DE and Strawson UE cannot license NPIs. The example to which they point as support for this conclusion is the case of singular definites. Singular definites are both Strawson DE and Strawson UE – as (24) and (25) show, respectively – but do not license NPIs (26).

(24) the_{sg} is Strawson DE
The student is tall. (which implies there is exactly one student)
There is exactly one semantics student.
$\therefore$ The semantics student is tall.

(25) the_{sg} is Strawson UE
The semantics student is tall.
There is exactly one student.
∴ The student is tall.

(26) *The student I have **ever** seen is tall.

So, the boxed presupposition in (20) leads to the disqualification of –*est* as an NPI licenser. Let's turn now to our alternative proposal for the presupposition of superlatives, (11).

2.2 An Existential Presupposition for C

On the basis of (13) above, we argued for a weaker presupposition than the standard universal presupposition in (20). A further benefit in the shift in presupposition is the effect that this has on our predictions about the NPI licensing capabilities of superlatives. Let's repeat this new presupposition below with a set of standard truth conditions:

(27) For all C of type <e,t>, D of type <d,<e,t>> and x of type e,
$[\![\textbf{-est}]\!](C)(D)(x)$ is defined only if $x \in C$ & $\exists d[D(d)(x)=1]$ & $\boxed{\exists y[\, y \neq x \text{ \& } y \in C \text{ \& } \exists d[D(d)(y)=1]}\,]$
When defined,
$[\![\textbf{-est}]\!](C)(D)(x)=1$ iff $\exists d[D(d)(x)=1$ & $\forall y[y \neq x$ & $y \in C \rightarrow D(d)(y)=0]$

This lexical entry makes –*est* Strawson DE.

(28) <u>*-est* is Strawson DE</u>
Proof1: Suppose $[\![\textbf{–est tall student}]\!](\mathbf{a})=1$, then **a** is a student, there is another student in C, and **a** is taller than all other students in C. Now we assume the conclusion is defined; **a** is a semantics student. If **a** is taller than all students in C, then **a** is taller than all semantics students in C.

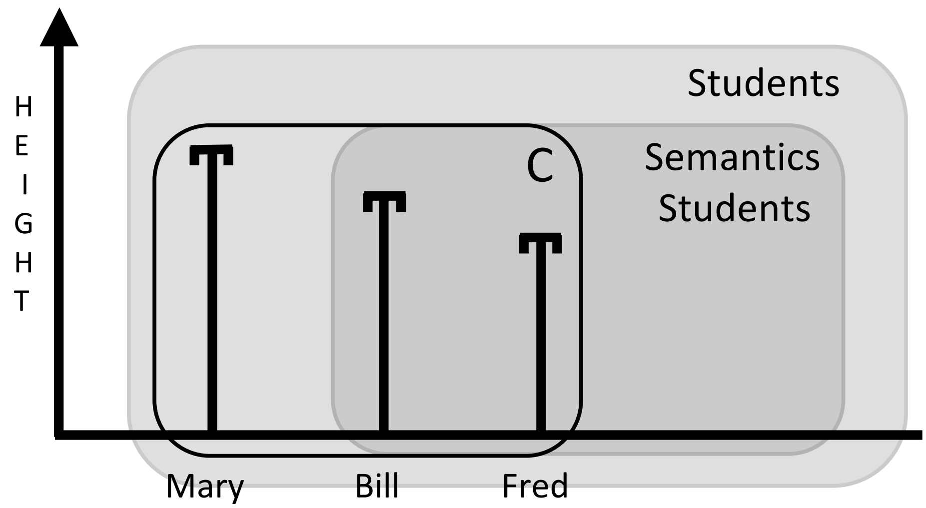
Unlike the lexical entry in (20) , the lexical entry in (27) does not make –*est* Strawson upward entailing. Let's show this by constructing a counterexample to the claim that –*est* is Strawson upward entailing. We will show that (29)a does not Strawson entail (29)b

(29) a. Bill is the tallest_C semantics student.
b. Bill is the tallest_C student.

Suppose that C contains three individuals: Bill, Fred and Mary. Bill and Fred are both semantics students and Mary is a phonology student. Bill is 6' tall, Fred is 5'9" tall and Mary is 6'2" tall. The presuppositions of –*est* are met with respect to C in both (29)a and (29)b. However, (29)a is defined and true in this scenario; while

(29)b is defined and false: Bill is a student in C, there is another student in C, but Bill is not taller than all other students in C. See Figure 1 below for an illustration.

Figure 1



Summary

Our main contribution to this point has been to clarify the lexical entry of the superlative morpheme and its monotonicity. I conclude from Sections 1 and 2 that the presupposition in (27) is the correct one for superlatives and that the superlative morpheme is a Strawson DE function (as von Fintel 1999 suggested). In the next section, I will turn to an application of this revised semantics to a special case, that of *most*. In addition to the revised semantics, we will make crucial use of Hackl's account of the meaning of *most*.

3. *Most* as a superlative

The English word *most* derives historically from the superlative form of *many*.[3] In many languages[4], the superlative form of MANY shares with English *most* the proportional ('more than half') meaning illustrated below in a Generalized Quantifier-type lexical entry.

(30) $[\![\textbf{most}]\!](A)(B) = 1$ iff $|A \cap B| > .5|A|$

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[3] Or rather the superlative form of *mere* an obsolete form meaning roughly 'many' *Oxford English Dictionary*.
[4] Though not in all languages. See Bošković (2008), Živanovič (2008), and Bošković and Gajewski (2009) for discussion of differences in the readings of *most* cross-linguistically.

Notice that this lexical entry predicts that *most* is neither upward nor downward entailing with respect to its first argument, its restrictor. This accords with intuitions about inferences.

(31) a. Most students are diligent.
$\not\models$ Most semantics students are diligent.
b. Most semantics students are diligent.
$\not\models$ Most students are diligent.

The apparent non-monotonicity of *most* in its first argument poses a significant puzzle. NPIs such as *any* and *ever* show up felicitously in the restrictor of *most*, in conflict with our judgments about monotonicity.

(32) a. Most students who have **ever** been to Paris remember it fondly.
b. Most students who have **any** knowledge of French visit Paris.

Fortunately there is reason to believe the lexical entry in (30) is incorrect. That lexical entry ignores the structural complexity implied by the superlative form of *most*. See Hackl (2009) for additional arguments for treating *most* as a superlative. Though *most*'s superlative heritage is transparent, it has long been a puzzle how the proportional reading could be derived from a standard meaning for the superlative morpheme combined with *many*.

3.1 Hackl's (2009) Superlative Analysis of *most*

Hackl (2009) provides a compelling solution to this puzzle. His important insight has to do with how we apply the semantics of superlatives to gradable predicates that apply to pluralities, like *many*. Here is Hackl's lexical entry for *many*:

(33) For all d of type d, A of type <e,t> and x of type e,
$[\![\textbf{many}]\!](d)(A)(x) = 1$ iff $A(x) = 1$ and $|x| \geq d$

Hackl adopts an approach to superlatives reminiscent of Heim (1999).

(34) For all C of type <e,t>, D of type <d,<e,t>> and x of type e,
a. $[\![\textbf{-est}]\!](C)(D)(x) = 1$ iff $\forall y \in C[y \neq x \rightarrow \max\{d{:}D(d)(x)=1\} > \max\{d{:}D(d)(y)=1\}]$
b. $[\![\textbf{-est}]\!](C)(D)(x)$ is defined only if $x \in C$ & $\exists y\ [y \neq x\ \&\ y \in C]$

As in Heim's approach, the type of –*est* means that it will have to undergo short QR in order to be interpreted. Hence, the LF structure of *most students* is as in (36).[5]

(35) MOST = MANY + EST

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[5] Hackl (2009) also explores the consequences of long QR for –*est*. The issue is irrelevant for our purposes.

(36) [-est 1[[$t_{1,d}$ many] students]]

Hackl derives the proportional reading of *most* from the superlative of *many* by clarifying how we interpret the clause ‘y≠x’ in the lexical entry in (34) when x and y range over pluralities. Hackl suggests that we interpret this clause as saying that x and y do not overlap, i.e., they share no atomic parts. With this, understanding ⟦-**est** ⟧ maps the denotation of its sister in (36) onto a predicate that is true of a plural individual x just in case every plurality in C that shares no atomic parts with x has fewer atomic parts than x. On the assumption that every relevant atomic student belongs to some plurality in C and that C is closed under plurality formation, this means that denotation of (36) is true just of those pluralities that are made up of more than half of the students.

Let me explain in a bit more detail. Suppose the subject x is composed of more than half the students. Then the largest plurality that can be formed of students that does not overlap x will have to contain less than half the students. So, the predicate is true of x. Suppose the subject x is composed of less than half or exactly half the students, then it is possible to form a plurality of students that is not lesser than x in cardinality, namely the plurality made up of the rest of the students. As you can see it is necessary that C be closed under plurality formation, or else we could not be assured that this falsifying plurality would be in C when x is composed of less than half the students.

To give us a meaning for *most students* that is equivalent to the GQ entry in (30), Hackl proposes that the predicate denoted by (36) is closed by a covert existential quantifier:

(37) a. [∃ [-est 1[[$t_{1,d}$ many] students]]]
b. ⟦∃ ⟧ = $\lambda P_{<e,t>}.\lambda Q_{<e,t>}$.there is an $x \in D_e$ s.t. P(x)=1 and Q(x)=1
(cp. Partee 1987)

Hence, *most students* VP is true if and only if there is a plural individual composed of more than half the students that also satisfies the predicate denoted by VP.

3.2 Amending the Closure Conditions on C

Hackl (2009) imposes the crucial closure conditions on C mentioned above by stating that when –*est* undergoes short QR, C is set equal to the extension of the plural NP, *students* in (37).

(38) Hackl’s proposal: C = ⟦***student**⟧

As stated, this suggestion leaves no room for contextual restriction to a salient subset of the students. This is undesirable. Furthermore, we know from our arguments in Sections 1 and 2 that this requirement cannot be imposed as a lexical presupposition of the superlative. In those sections, we argued that the superlative could not carry a presupposition that C is a subset of the denotation of the NP, e.g., C $\subseteq$ [[**student**]]. Therefore, it cannot carry a presupposition that C is the denotation of the NP.

I would like to suggest the following approach to guaranteeing that C contains all relevant members of the denotation of NP and the pluralities formed from them. First, I think that it is reasonable to make the following statement about contextual restrictions.

(39) If an atomic individual x is relevant to a quantifier Q_C, then
$\exists z[\, x \leq z$ and $z \in C]$

This assures that every relevant student will get into C either as an atom or as part of a relevant plurality. Now, I propose that closure under plurality formation over these atomic individuals follows from the following principle:

(40) <u>Transparency of pluralities to relevance</u> (axiom)
If x and y are relevant, then $x \sqcup y$ is relevant.
If x is relevant, the for all z s.t. $z \leq x$, z is relevant.

This guarantees that contextual restrictions are closed upward and downward with respect to plurality formation. Note that this principle does not extend to groups (for groups vs. pluralities see Landman 1989).

Let's return to Hackl's lexical entry, which I repeat below.

(34) a. [[-**est**]](C)(D)(x) = 1 iff $\forall y \in C[y \neq x \rightarrow \max\{d{:}D(d)(x)=1\} > \max\{d{:}D(d)(y)=1\}]$
b. [[-**est**]](C)(D)(x) is defined only if $x \in C$ & $\exists y\, [y \neq x$ & $y \in C]$

Though Hackl gives only the presuppositions in (34)b, he seems to assume an additional presupposition. His way of stating the truth conditions assumes that there is a maximum amount of D-ness specified for every individual in C.[6] Furthermore, Hackl suggests that the presuppositions of the superlative guarantee that (10), repeated below, is a presupposition failure.

(10) #You are the best mother I have.

As they are stated, his presuppositions do not guarantee this. They require that C have two members, but no further conditions are imposed on the members of C – the second member of C could be my father. A presupposition that every member of C has some degree of D-ness would make (10) a presupposition failure.

3.3 A New Version of the Superlative Analysis of *most*

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[6] The usual definition for max carries the presupposition that its argument is not empty.

So, I suggest again that we adopt the lexical entry for the superlative suggested above in Section 2:

(41) For all D of type <d,<e,t>> and x of type e,
$[\![\textbf{-est}]\!](C)(D)(x)$ is defined only if $x \in C$ & $\exists d[D(d)(x)=1]$ & $\exists y[\, y \neq x$ & $y \in C$ & $\exists d[D(d)(y)=1]\,]$
When defined,
$[\![\textbf{-est}]\!](C)(D)(x)=1$ iff $\exists d[D(d)(x)=1$ & $\forall y[y \neq x$ & $y \in C \rightarrow D(d)(y)=0]$

When construed in Hackl's way, with $\neq$ read as non-overlap, this lexical entry is still Strawson DE, and still not Strawson UE. This accounts for the occurrence of NPIs in the restrictor of *most*; they are in the scope of a Strawson DE operator. [See Appendix 2 for semi-formal proof that the lexical entry in (41) together with the principles in (40) still in fact yield the 'more than half' meaning.]

The fact that the superlative morpheme is merely Strawson DE, and not DE (the proof in Appendix 1 depends crucially on Premise 3), also partially accounts for the fact that downward inferences do not appear valid in *most*'s restrictor. The presupposition of the superlative morpheme intereferes with our perception of the validity of the inference. In the next section we examine further reasons that *most* appears to be non-monotonic.

3.4 Why *most*'s Restrictor Appears to be Non-Monotonic

In addition to –*est* being merely Strawson DE, the monotonicity of the superlative component of *most* is furthermore masked by embedding. Recall that Hackl proposes that a covert existential quantifier closes off the meaning of the DP *most*. The presupposition of the superlative morpheme must be projected through this existential quantifier. Beaver (1994) proposes that following generalization about the projection of presuppositions from the restrictors of quantifiers [Beaver's proposal: Beaver 1994: Fact 11, p.25; for Heim's predictions see Beaver 1994: Fact 7, p. 19]:

(42) Fact F11 (Existential projection from quantified contexts) If ϕ presupposes ψ, then (for Q a quantifier and `true` any tautology):
a. $Q(x; \phi; \chi)$ presupposes $\texttt{some}(x; \texttt{true}; \psi)$
b. $Q(x; \chi; \phi)$ presupposes $\texttt{some}(x; \chi; \psi)$

In other words, if the restrictor of a quantifier carries a presupposition, the quantificational statement as a whole presupposes that some element in the domain satisfies that presupposition. This predicts that the presupposition of (43)a is (43)b, namely that C contains two non-overlapping elements that are made up entirely of students.

(43) a. Most_C students are diligent
b. $\exists x[\, x \in C$ & $\exists d[|x| \geq d]$ & x are students &

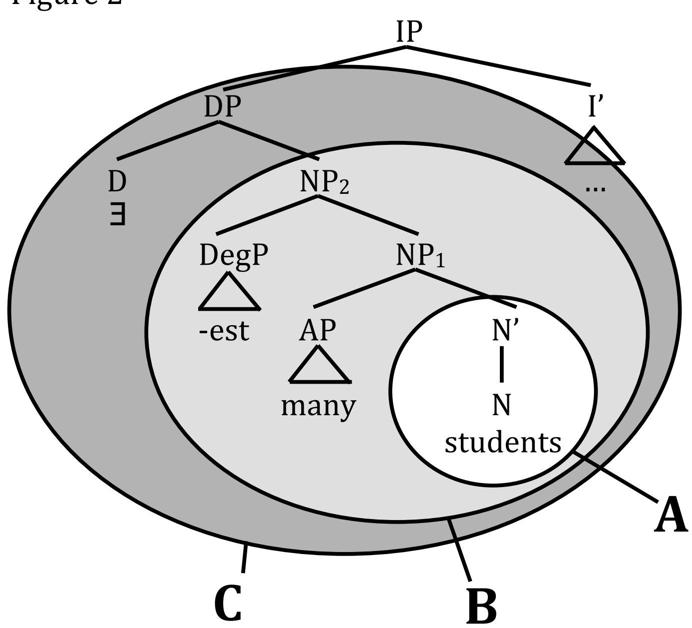
$\exists$y[y does not overlap x & y$\in$C & $\exists$d[|y|$\geq$d] & y are students]]

Notice that after projection downward inferences in the NP position are no longer Strawson valid. For example, (43)a does not Strawson entail (44). We cannot conclude from the assumptions (i) that C contains two non-overlapping pluralities of semantics students and (ii) that there is a plurality made up of more than half the students all of whom are diligent that there is a plurality made up of more than half the semantics students all of whom are diligent.

(44) Most semantics students are diligent.

In sum, embedding and presupposition projection make it so that the restrictor of *most* does not appear to be downward entailing. Figure 2 illustrates that idea that the position occupied by the nominal (A) is DE with respect to NP_2 (B, the minimal constituent containing the superlative morpheme, but is not DE with respect to the DP (C, or any larger containing constituent).

Figure 2



4. Conclusion

The NPI-licensing abilities of determiner *most* have long stood as a thorn in the side of theories that seek to explain the distribution of NPIs in terms of downward entailingness. In this squib, I have argued that the appearance of NPIs in the restrictor of *most* is compatible with such DE theories. The keys to my analysis have been (i) the fine tuning of the presuppositions of superlatives in a way that dovetails with von Fintel's Strawsonian version of the DE theory and (ii) the recognition of covert complexity in the structure of *most*, argued for by Hackl, and its effects on our judgments about monotonicity.

APPENDIX 1

Proof that *–est* is Strawson DE with the denotation in (27). We will show that (45)a Strawson entails (45)b when Ψ describes a subset of Φ.

(45) a. [-est$_C$ 1[[$t_{1,d}$ many] Φ]
b. [-est$_C$ 1[[$t_{1,d}$ many] Ψ]

(46) Prove that (45)a Strawson entails (45)b.
Premise 1: $\Psi \subseteq \Phi$.
Premise 2: (45)a is true of **a**. In this case, $\mathbf{a} \in C$ & $\exists d[|\mathbf{a}| \geq d$ & $\Phi(\mathbf{a})=1]$ & $\exists y[y \neq \mathbf{a}$ & $y \in C$ & $\exists d[|y| \geq d$ & $\Phi(y)=1]]$ and $\exists d[|\mathbf{a}| \geq d$ & $\Phi(\mathbf{a})=1$ & $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<d \vee \Phi(y)=0]]]$
Premise 3: (45)b is defined for **a**
$\exists d[|\mathbf{a}| \geq d$ & $\Psi(\mathbf{a})=1]$ & $\exists y[y \neq \mathbf{a}$ & $y \in C$ & $\exists d[|y| \geq d$ & $\Psi(y)=1]]$
Theorem 1: Premises 2 and 3 can be simplified to
Theorem 1a: $\mathbf{a} \in C$ & $\Psi(\mathbf{a})=1$
Theorem 1b: $\exists y[y \neq \mathbf{a}$ & $y \in C$ & $\exists d[|y| \geq d$ & $\Psi(y)=1]]$
Theorem 1c: $\exists d[|\mathbf{a}| \geq d$ & $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<d \vee \Phi(y)=0]]$
It is our goal to prove from this that (45)b is true of **a**, i.e., $\exists d[|\mathbf{a}| \geq d$ & $\Psi(\mathbf{a})=1$ & $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<d \vee \Psi(y)=0]]]$
Existential instantiation for Theorem 1c:
Theorem 2a: $|\mathbf{a}| \geq \mathbf{e}$
Theorem 2b: $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<\mathbf{e} \vee \Phi(y)=0]]$
Universal instantiation for Theorem 2b:
Theorem 3: $\mathbf{b} \neq \mathbf{a}$ & $\mathbf{b} \in C \rightarrow [|\mathbf{b}|<\mathbf{e} \vee \Phi(\mathbf{b})=0]$
Conditional Proof:
Conditional Premise: $\mathbf{b} \neq \mathbf{a}$ & $\mathbf{b} \in C$.
CP Theorem 1a. $|\mathbf{b}|<\mathbf{e} \vee \Phi(\mathbf{b})=0$ Modus Ponens
CP Theorem 1b: $|\mathbf{b}|<\mathbf{e} \vee \Psi(\mathbf{b})=0$ CPT1 and T1
[It follows from $\Phi(\mathbf{b})=0$ and the assumption $\Psi \subseteq \Phi$ that $\Psi(\mathbf{b})=0$]
Theorem 4: $\mathbf{b} \neq \mathbf{a}$ & $\mathbf{b} \in C \rightarrow [|\mathbf{b}|<\mathbf{e} \vee \Psi(\mathbf{b})=0]$.
Universal Generalization for Theorem 4
Theorem 5: $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<\mathbf{e} \vee \Psi(y)=0]]$
Conjunction Introduction Theorem 1a, 2b and 5:
Theorem 6: $|\mathbf{a}| \geq \mathbf{e}$ & $\Psi(\mathbf{a})=1$ & $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<\mathbf{e} \vee \Psi(y)=0]]$
Existential Generalization for Theorem 6:
Theorem 7: $\exists d[|\mathbf{a}| \geq d$ & $\Psi(\mathbf{a})=1$ & $\forall y[y \neq \mathbf{a}$ & $y \in C \rightarrow [|y|<d \vee \Psi(y)=0]]]$
QED

APPENDIX 2

Proof that Hackl's superlative analysis of *most*, as stated in (41), plus our relevance axioms (40) yields the "more than half" reading. We show this by applying the denotation of (47) to an arbitrary argument x.

(47) $[\text{-est } 1[\ [\ t_{1,d} \text{ many }]\ \Phi\ ]\ ]$

Premises

$$\left.\begin{array}{l} \text{A. } x \in C \\ \text{B. } \exists d[d \leq |x|\ \&\ \Phi(x)=1] \\ \text{C. } \exists y[\ y \neq x\ \&\ y \in C\ \&\ \exists d[d \leq |y|\ \&\ \Phi(y)=1]\ ] \end{array}\right\} [\![\textbf{-est}]\!](C)(\lambda d.\lambda y.|y| \geq d\ \&\ \Phi(y)=1)(x) \text{ is defined}$$

$$\left.\text{D. } \exists d[d \leq |x|\ \&\ \Phi(x)=1\ \&\ \forall y[y \neq x\ \ \&\ y \in C \rightarrow d > |y| \vee \Phi(y)=0]]\right\} [\![\textbf{-est}]\!](C)(\lambda d.\lambda y.|y| \geq d\ \&\ \Phi(y)=1)(x)=1$$

$$\left.\begin{array}{l} \text{E. } \forall x,z[\ x \in C\ \&\ z \leq x \rightarrow z \in C\ ] \\ \text{F. } \forall x,y[\ x \in C\ \&\ y \in C \rightarrow x \sqcup y \in C\ ] \end{array}\right\} \text{Transparency of pluralities to relevance}$$

$$\left.\begin{array}{l} \text{G. } \forall x,z[\Phi(x)=1\ \&\ z \leq x \rightarrow \Phi(z)=1] \\ \text{H. } \forall x,y[\Phi(x)=1\ \&\ \Phi(y)=1 \rightarrow \Phi(x \sqcup y)=1\ ] \end{array}\right\} \text{Distributivity/cumulativity of } \Phi$$

Theorem 1

There are atomic individuals that are Φ to some degree in C that are not parts of x.

$\exists y[\ y \neq x\ \&\ y \in C\ \&\ \exists d[d \leq |y|\ \&\ \Phi(y)=1]\ ]$ (Premise C; '$\neq$' is non-overlap; Premise E)

Theorem 2

The sum of atomic individuals in C that are Φ and not part of x is itself in C.

$\sqcup\{z: AT(z)\ \&\ z \nleq x\ \&\ z \in C\ \&\ \exists d[d \leq |z|\ \&\ \Phi(z)=1]\} \in C$ (Premise F)

Definition 1

$\bar{x} := \sqcup\{z: AT(z)\ \&\ z \nleq x\ \&\ z \in C\ \&\ \exists d[d \leq |z|\ \&\ \Phi(z)=1]\}$

Theorem 3

Existential Instantiation of Premise D:

T3.1 $\mathbf{e} \leq |x|$

T3.2 $\Phi(x)=1$

T3.3 $\forall y[y \neq x\ \ \&\ y \in C \rightarrow \mathbf{e} > |y| \vee \Phi(y)=0]$

Theorem 4

Universal Instantiation of T3.3 w/ $\bar{x}$:

$[\ \bar{x} \neq x\ \&\ \bar{x} \in C\ \rightarrow \mathbf{e} > |\bar{x}|\ \&\ \Phi(\bar{x})=0]$

Theorem 5

Modus Ponens (T4, T2):

$\mathbf{e} > |\bar{x}| \vee \Phi(\bar{x})=0$

Theorem 6

Universal Instantiation of Premise H w/x and $\bar{x}$:

$\Phi(\bar{x})=1$

Theorem 7

Modus Tollendo Ponens (T5, T6)

$\mathbf{e}>|\bar{x}|$

Theorem 8

Conjunction Introduction & Existential Generalization (T3.1, T7)

$\exists d[d\leq|x|\ \&\ d>|\bar{x}|]$

Theorem 9

Transitivity of Ordering (T8)

$|x| > |\bar{x}|$

Theorem 10

Distributivity of Φ (Universal Instantiation of Premise G)

$\forall z[\Phi(x)=1\ \&\ z\leq x \rightarrow \Phi(z)=1]$ (Hence, $\forall z[z\leq x \rightarrow \Phi(z)=1]$)

Theorem 11

(Premise A, Premise B, Theorem 10)

$x = \sqcup\{z\text{: } AT(z)\ \&\ z\leq x\ \&\ z\in C\ \&\ \exists d[d\leq|z|\ \&\ \Phi(z)=1]\}$

$\{z\text{: } AT(z)\ \&\ z\leq x\ \} \subseteq \{z\text{: } AT(z)\ \&\ z\leq x\ \&\ z\in C\ \&\ \exists d[d\leq|z|\ \&\ \Phi(z)=1]\}$ (Prems E, G)

Theorem 12

x and $\bar{x}$ do not overlap. (See Definition 1)

Theorem 13

x and $\bar{x}$ partition the set $\{z\text{: } AT(z)\ \&\ z\in C\ \&\ \exists d[d\leq|z|\ \&\ \Phi(z)=1]\}$

It follows from T9 and T13 that $\boxed{|x| > .5|\{z\text{: } AT(z)\ \&\ z\in C\ \&\ \exists d[d\leq|z|\ \&\ \Phi(z)=1]\}|}$

QED

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