MODAL SUPERLATIVES: A COMPOSITIONAL ANALYSIS

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ABSTRACT. Superlative adjectives accompanied by certain modal adjectives like *possible* (e.g. *John bought the largest possible present*) are ambiguous between a reading where *possible* is a regular noun modifier and a reading paraphrasable as 'as Adj as possible', called 'modal superlative reading'. Three interesting restrictions have been observed in the literature. First, *possible* and some other adjectives ending in *-able*, but not *potential* and *probable*, support the latter reading. Second, when the modal adjective appears postnominally, only the modal superlative reading is available. Third, prenominal *possible* needs to be in a local configuration to *-est* in order for the modal superlative reading to arise. Using LF structures independently motivated for degree constructions, the present paper develops a compositional semantic analysis of the modal superlative reading, makes correct new predictions concerning this reading, and – by reconciling previous, opposed syntactic analyses – allows us to derive the three empirical restrictions above. The key innovations are: (i) the previously proposed constituent [*possible* ▲ellipsis] is interpreted as an amount relative clause, and (ii) this constituent is treated as overtly expressing the comparison class argument of *-est*.

KEY WORDS: superlative; modal superlative; modal adjective; degree construction; comparatives; amount reading; locality; Antecendent-Contained Deletion

1. Introduction

Gradable adjectives are often assumed to denote relations between individuals and degrees (Seuren 1973, Cresswell 1976, von Stechow 1984, Heim 1999, among many others). For example, the adjective *tall* expects a degree argument (a degree point, of type d) and an individual argument (type e), as defined in the lexical entry (1b). Sentence (1), with the syntactic structure in (1a), is assigned the truth conditions in (1c). [1,2]

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[1] For a treatment of gradable adjectives as relations between individuals and degree intervals (instead of degree points), see Kennedy (2001) and Schwarzschild and Wilkinson (2002), among others. See Landman (2010) for an analysis combining insights from both approaches.

(1)   John is 172 centimeters tall.

      a. LF: [$_{IP}$ John is [$_{AdjP}$ [$_{DegP}$ 172 centimeters] tall]]

      b. $[\![tall]\!]$ = $\lambda d_d.\lambda x_e.tall(x,d)$ (i.e., $\lambda d_d.\lambda x_e.$ Height(x)$\geq$d)

      c. $[\![John\ is\ 172\ centimeters\ tall]\!]$ = 1   iff   tall(j,172cm)

(Positive) gradable adjectives are treated as downward monotonic (Heim 2000), as defined in (2). This means that, if John's exact height is 172cm, John also qualifies as 171cm tall, 170cm tall, 169cm tall, etc. Correspondingly, the formula *tall(x,d)* is to be read as 'x is tall at least to degree d', or, equivalently, as 'x's exact height is equal or greater than d'.

(2)   A predicate $R_{<d,<e,t>>}$ is downward monotonic with respect to its degree argument iff,

      for any x_e and d_d: if R(d)(x)=1   then R(d')(x)=1 for all d'<d.

The comparative morpheme *-er* and the superlative morpheme *-est* operate on this degree argument. Intuitively, the comparative sentence in (3) is true iff John is tall to a degree to which Bill is not (Seuren 1973, among many others). That is, (3) is true if and only if, among the degrees that $[\![tall]\!]$ assigns to John (172cm, 171cm, 170cm, 169cm, etc.), there is at least one degree that $[\![tall]\!]$ does not assign to Bill. In a parallel fashion, the superlative sentence in (4) is true iff John is tall to a degree to which nobody else in the comparison class C is tall (Heim 1999).

(3)   John is tall**er** than Bill $\Leftrightarrow$ $\exists$d [tall(j,d) $\wedge\neg$tall(b,d)]   (Seuren 1973)

(4)   John is the tall**est** (in the comparison class C)   (Heim 1999)

                  $\Leftrightarrow$ $\exists$d [tall(j,d) & $\forall$z$\in$C [z$\neq$j $\rightarrow$ $\neg$tall(z,d)]]

    This paper is concerned with a special reading arising when superlative predicates are accompanied by certain modal adjectives like *possible*. Consider, on the one hand, the simple superlative example (5) and, on the other, the simple example (6) with *possible*. In (6),

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possible modifies a head noun N, where *[possible N]* denotes the set of individuals that are N in some possible world (but not necessarily in the actual one). When we combine the two ingredients in (7), we have a reading that results from the combination of the simple readings above. This is the regular modifier reading in (7a). But, interestingly, a new reading arises not detected in the simple sentences: the so-called *'modal superlative reading'* in (7b) (Corver 1997, Larson 2000, Schwarz 2005). To see one truth-conditional difference between the two, note that the new reading (7b) entails that John met an actual spy, whereas (7a) does not.

(5)   John met the smart<u>est</u> spy.
        'John met the spy that is smarter than any other (relevant) spy.'

(6)   John met a **possible** spy.
        'John met somebody that is possibly a spy.'

(7)   John met the smart<u>est</u> **possible** spy.
        a. Regular modifier reading: 'John met the individual x such that: x is possibly a spy and x is smarter than any other (relevant) individual that is possibly a spy.'
        b. Modal superlative reading: 'John met as smart a spy as possible for him / one to meet.'

The phenomenon is further illustrated in (8)-(10). The simple superlative sentence (8) has the reading paraphrased below it, and similarly for the simple modal sentence (9). When we mix the two ingredients in (10), the new sentence has a reading resulting from the combination of those in the simple sentences, paraphrased in (10a). Additionally, a new reading arises not detected in the simple sentences: the modal superlative reading (10b).[3]

(8)   John talked to the few<u>est</u> guests.
        'John talked to fewer guests that anybody else (relevant) did.'

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[3] The attentive reader may have noticed that the paraphrases of the simple superlative examples are not parallel. Indeed, the paraphrase of (5) corresponds to the so-called 'absolute superlative reading' and that of (8) to the so-called 'comparative superlative reading' (see Sect. 3.1 later). The point here is that, whatever reading(s) the simple sentences may have, the insertion of *possible* generates, besides the corresponding reading(s) enriched with the contribution of *possible*, an additional modal superlative reading.

(9)　　John talked to some possible guests.

　　　　a. 'John talked to some individuals x that possibly were guests.'

(10)　　John talked to the few*est* **possible** guests.

　　　　a. Regular modifier reading: 'John talked to fewer individuals that possibly were
　　　　　guests than anybody else (relevant) did.'

　　　　b. Modal superlative reading: 'John talked to as few guests as it was possible for
　　　　　him/one to talk to.'

The new, modal superlative reading is the main concern of the present paper. This reading is not only interesting because *-est* and *possible* compose differently in the simple and the complex sentences, but also because this reading has three peculiar empirical restrictions. As we will see in more detail in Sect. 2, not all modal adjectives allow for this reading (lexical restriction), the linear position of the modal adjective with respect to the head noun matters (postnominal restriction), and, when the modal adjective precedes the noun, the reading requires adjacency between the superlative predicate and the modal adjective (locality restriction). Building on previous approaches to modal superlatives by Larson (2000) and Schwarz (2005), the goal of the present paper is to provide a compositional semantic analysis of sentences like (7) and (10) that derives the correct truth conditions for the modal superlative reading and that accounts for these three empirical restrictions.

　　　The rest of the paper is organized as follows. Section 2 introduces the three restrictions on the modal superlative reading and briefly presents the previous (partial) analyses of the data. Section 3 provides some background on LF analyses of degree constructions, focusing on ingredients of the semantic composition of superlatives (Sect. 3.1) and comparatives (Sect. 3.2) that will later be used in the proposed analysis. Section 4 develops the proposal, applies it to relevant examples, and evaluates further predictions made by it. Section 5 shows how the proposed analysis combines insights from previous syntactic approaches to capture the three empirical restrictions. Section 6 concludes.

2. Restrictions on the modal superlative reading

Three interesting restrictions have been observed concerning the modal superlative reading. First, this reading is lexically restricted. While *possible* and certain adjectives ending in *-able* (e.g. *imaginable*, *conceivable*)–among other modal predicates[4]–allow for this reading, other semantically similar adjectives do not, like *potential* and *probable* (Larson 2000). Sentence (11) has a modal superlative reading, but sentence (12) does not. We note that the same restriction applies in German (*möglich* 'possible' vs. *potenziell* 'potential', *wahrscheinlich* 'probable'), Spanish (*posible* 'possible', *imaginable* 'imaginable', *concebible* 'conceivable' vs. *potencial* 'potential', *probable* 'probable'), and Hebrew (*efshar* 'possible' vs. *potenciali* 'potencial', *savir* 'probable').[5]

(11)   John bought the lar<u>gest</u> **possible** / **imaginable** / **conceivable** present.

        a. Regular modifier reading: "John bought the object x such that: x is a possible / imaginable / conceivable present and x is larger than any other (relevant) object that is a possible / imaginable / conceivable present."

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[4] Some participles like *allowed* and *permitted* give rise to the modal superlative reading, albeit only when placed in postnominal position, as shown in (i)-(ii). Larson's (2000) diagnosis of the lexical restriction will correctly predict that the modal superlative reading arises in (i), but it will leave unexplained why the reading disappears in (ii). We leave this issue for future research.

(i)   John talked to the fewest guests **allowed**.

        ✓ Modal superlative reading: 'John talked to as few guests as it was allowed for him / one to talk to.'

(ii)   John talked to the fewest **allowed** guests.

        * Modal superlative reading

[5] Larson (2000) notes a second lexical restriction: the reading at issue arises with the superlative and with universal determiners like *every* and *all*, but not with other determiners, witness (i)-(ii). Note that Larson tests the reading using the paraphrases (ib)/(iib), but the same holds of the paraphrase template 'as X as possible' in (ia)/(iia) which I use in this paper. I will concentrate on generating this reading with *-est*, leaving an extension to *every* and *all* for future research.

(i)   Mary interviewed every (/ all) possible player(s).

        a. 'Mary interviewed as many players as it was possible for her to interview.'

        b. 'Mary interviewed every (/ all) player(s) that it was possible for her to interview.'

(ii)   Mary interviewed a / no / three possible players.

        a. *'Mary interviewed as many as players as it was possible for her to interview.'

        b. *'Mary interviewed a / no / many players that it was possible to interview.'

b. Modal superlative reading: 'John bought as large a present as it was possible /

imaginable / conceivable for him/one to buy.'

(12)   John bought the larg<u>est</u> **potential** / **probable** present.

✓REGULAR MODIFIER   *MODAL SUPERLATIVE

Second, when *possible* is placed postnominally in English, only the modal superlative reading arises. The regular modifier reading is lost (Larson 2000, Schwarz 2005):

(13)   John met the smart<u>est</u> spy **possible**.   ✓REGULAR MODIFIER   *MODAL SUPERLATIVE

(14)   John bought the larg<u>est</u> present **possible**.

✓REGULAR MODIFIER   *MODAL SUPERLATIVE

(15)   John talked to the few<u>est</u> guests **possible**.

✓REGULAR MODIFIER   *MODAL SUPERLATIVE

Third, for the modal superlative reading to arise when the modal adjective is prenominal, the modal adjective has to be in a special local configuration with the superlative morpheme -*est* (Schwarz 2005). In German, each prenominal adjective must carry its own agreement inflection, with this exception: superlative adjectives followed by modal adjectives like *möglich* ('possible') can optionally carry this inflection, as in (16), but do do not need to, as in (17). This choice correlates with semantic interpretation. Example (16) with inflection in each adjective only has the regular modifier reading, whereas example (17) with one final inflection suffix only has the modal superlative reading. A similar pattern has been described for Dutch (Corver 1997: (57), fn. 34). That is, for the modal superlative reading to arise, the superlative adjective and *möglich* ('possible') need to "share" the inflection suffix, as if the string was parsed as one complex modifier *[Adj+st möglich]+Infl* rather than as two independent adjectives *[Adj+st+Infl] [möglich+Infl]*.

(16)   Ich habe das grö<u>ßt</u>.**e**   <u>möglich</u>.**e**   Geschenk gekauft.   (Schwarz 2005)

I   have the largest.**Infl** possible.**Infl** present   bought

'Out of the possible presents, I bought the largest one.'   REGULAR MODIFIER

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(17) Ich habe das größt   möglich.**e**   Geschenk gekauft.   (Schwarz 2005)

I   have the largest   possible.**Infl** present   bought

'I bought as large a present as it was possible for me to buy.'   MODAL SUPERLATIVE

Schwarz (2005) further notes that locality between -*est* and prenominal *possible* is required in English too. In (18), the adjective *affordable* intervenes between -*est* and *possible,* and as a consequence the modal superlative reading is not available. Compare this with the postnominal version in (19), which has the modal superlative reading (and only that reading).

(18) I bought the larg<u>est</u> **affordable** <u>possible</u> present.   (Schwarz 2005)

✓REGULAR MODIFIER   *MODAL SUPERLATIVE

(19) I bought the larg<u>est</u> **affordable** present <u>possible</u>.   (Schwarz 2005)

*REGULAR MODIFIER   ✓MODAL SUPERLATIVE

We note that locality is necessary for the modal superlative reading in Spanish and Hebrew too. Consider first the sentences in (20) and (21) without the adjectives *barato* and *zol* 'cheap'. They are grammatical, and they unambiguously express the modal superlative reading.[6] Then, if we insert an additional adjective between the superlative predicate and the modal adjective, the modal superlative reading disappears and, as a result, the sentences become deviant.

(20) Juan ha comprado el regalo <u>más</u> grande (***barato**) <u>posible</u>.   Spanish

Juan has bought the present most big   (***cheap**) possible

'Juan bought the biggest cheap present possible.'

(21) Kaniti   et   ha-matana hagdola   <u>be-yoter</u> (??**ha-zola**)   <u>ha-efsharit</u>

bought-1st-sg Acc the-gift   the-big-f-sg in-more (??**the-cheap**) the-possible-f-sg

'I bought the biggest cheap gift possible.'   Hebrew

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[6] In Spanish and Hebrew the regular modifier reading is expressed using the word order [N *possible* Adj+*est*] and the modal superlative reading using the word order [N Adj+*est possible*].

Hence, stated more generally, for the modal superlative reading to arise when the superlative predicate and the modal adjective are on the same side of the noun phrase (i.e., both prenominally or both postnominally), the modal adjective must be local to *-est* and no additional adjective is allowed to intervene.

There are two main approaches to the modal superlative reading in the literature. The first one, due to Larson (2000), sets out to explain the first and second restrictions above. It proposes that the source of the modal superlative reading is a postnominal reduced relative clause (RC) with a nonfinite complement, as in (22a). The nonfinite clause can be optionally elided, leaving an Antecedent-Contained Deletion (ACD) gap (Sag 1976), as in (22b). Finally, the adjective can be "promoted" to prenominal position, yielding (22c).[7] This derivation explains the lexical restriction: *possible*, but not *potential* and *probable*, gives rise to a modal superlative reading because the former but not the latter allows for a nonfinite complement, witness the contrast in (23). And it also explains the postnominal restriction: the only source of the modal superlative reading is the postnominal structure, with optional promotion of the modal adjective.

(22)   a. John bought the largest present [$_{\text{Reduced RC}}$ possible for him to buy]
        b. John bought the largest present [possible ▲]   (= string in (14))
        c. John bought the largest possible present [t ▲]   (= string in (11))

(23)   a. It is possible / conceivable / imaginable [for John to interview that candidate].
        b. * It is potential / probable [for John to interview that candidate].

The second analysis is due to Schwarz (2005). He contends that, under Larson's analysis, it is difficult to explain why the promoted *possible* should land in a position local to the superlative morpheme, as the locality restriction showed. Leaving the other restrictions aside, Schwarz concentrates on the locality restriction and treats *-est possible* as a syntactic unit, proposing the parse in (24). He then defines *-est possible* as a non-decomposible degree operator, given in (25). For instance, (25) produces the truth conditions (26b) for example (26a), where *R* is the accessibility relation introduced by *possible*:

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[7] Larson (2000) explicitly applies this analysis only to *every / all* with modal adjectives (see our footnote 5). But the idea is that it should also cover *-est* with modal adjectives.

(24)   [$_{AP}$ [$_{DegP}$ -est possible] [$_{A'}$ large]]

(25)   [[-*est possible*]]^w = $\lambda P_{<s,dt>}$. $\forall d$ [$\exists w'[wRw'$ & $P(w')(d)=1]$ → $P(w)(d)=1$]

(26)   a. John bought the largest possible present.

       b. $\forall d$ [$\exists w'[wRw'$ & John bought a d-large present in w'] →

            John bought a d-large present in w]

Schwarz argues that a decomposition of -*est possible* into two lexical entries -*est* and *possible* is unlikely to succeed, for two reasons. First, -*est* and -*est possible* compare different types of objects: -*est* compares a degree property with other degree properties, as in (27) below, whereas -*est possible* compares the actual world with other possible worlds, as in (25). Second, even if this difference could be derived compositionally, -*est* and -*est possible* would still have a different 'force': "*est ϕ* states that the degree property denoted by *ϕ* ranks higher than any of its alternatives. (...) in contrast, *[est possible ϕ]* states that the actual world ranks at least as high as any of its alternatives" (Schwarz 2005:197).

(27)   [[-*est*]] = $\lambda \mathbf{Q}_{<dt,t>}.\lambda P_{<d,t>}$. $\exists d$ [$P(d)$ & $\forall Q \in \mathbf{Q}$ [$Q \neq P$ → ¬$(Q(d))$]]   (Heim 1999)

Hence, Larson's approach derives the lexical and postnominal restrictions but not the locality restriction, and Schwarz's derives the locality restriction but not the lexical and postnominal restrictions. In the analysis to be proposed in the present paper, the string *[-est possible]* (together with some covert material) will be treated as a syntactic constituent (with Schwarz 2005, contra Larson 2000). This will derive the locality restriction. The modal superlative reading will be analysed as involving an LF structure with an elided nonfinite clause (with Larson 2000, contra Schwarz 2005). This will address the lexical and postnominal restrictions. Finally, the analysis will decompose *[-est possible]* into the standard lexical entries for -*est* and *possible* (contra Schwarz 2005) and will derive truth conditions equivalent to '(at least) as X as possible' (as in Schwarz 2005).

Before we can spell out the proposal, the next section reviews certain ingredients in the analyses of degree constructions in the literature that will be later used in our approach.

3. Background: LF analysis of degree constructions

3.1. Superlatives and the absolute / relative ambiguity

A well-known ambiguity is found in superlative sentences with a covert comparison class argument *C* like (28) (Szabolcsi 1986, Heim 1999). Under the so-called *absolute* reading, sentence (28) can be paraphrased as in (28a). The intuition is that we compare mountains in terms of their height, pick the highest one (Mount Everest, if the relevant comparison class is the set of mountains in the world), and assert that John climbed that mountain. Under the so-called *comparative* reading, (28) is paraphrasable as in (28b). Now we compare John to other mountain-climbers in terms of their climbing achievements. Heim's example (29) displays the same ambiguity, with each of the answers in (29a,b) corresponding to one of the readings:

(28)   John climbed the highest mountain.

    a. *Absolute reading:* 'John climbed a mountain higher than any other (relevant) mountain.'

    b. *Comparative reading:* 'John climbed a higher mountain than anybody else (relevant) climbed.'

(29)   Who wrote the largest prime number on the blackboard?

    a. Nobody, of course! There is no largest prime number!   *Absolute reading*

    b. John did. He was the only one above 100.   *Comparative reading*

Heim (1999) develops a scopal account of this ambiguity using the lexical entry *-est* in (27), repeated below as (30). The Degree Phrase (DegP) *[-est C]* can undergo LF movement within its host NP, as in (31a), or out of its host NP, as in (32a), leaving behind a trace of type d. The host NP, though headed with *the*, can be interpreted as definite or indefinite. Crucially, the LF position of *[-est C]* determines the range of possible choices for the comparison class $[\![C]\!]$, in that the members of $[\![C]\!]$ must have the same "shape" as the denotation of *[-est C]*'s LF sister. The rough idea is the following. In (31), since the LF sister of *[-est C]* denotes the set of degrees that (the mountain) g(2) is high to (see (31b)), the members of $[\![C]\!]$ will be sets of degrees that g(2) and other relevant mountains are high to, as illustrated in (31c). This corresponds to the absolute reading. In (32), since the LF sister of *[-est C]* denotes the set of

degrees d' such that John climbed a d'-high mountain (see (32b)), the members of $[\![C]\!]$ will be sets of degrees d' such that John and other mountain-climbers climbed a d'-high mountain, as illustrated in (32c). This gives us the relative reading.

(30) $[\![\text{-}est]\!] = \lambda Q_{<dt,t>}.\lambda P_{<d,t>}. \exists d [P(d) \& \forall Q \in \mathbf{Q} [Q \neq P \rightarrow \neg (Q(d))]]$ (Heim 1999)

(31)   Absolute reading:

      a. LF: John climbed the 2 [**[-est C]** 1[t_2 t_1-high mountain]]

      b. $[\![1[t_2\ t_1\text{-high mountain}]]\!]$ = $\lambda d'$. g(2) is a d'-high mountain

      c. $[\![C]\!]$ $\subseteq$ { $\lambda d'$. Everest is a d'-high mountain, $\lambda d'$. Kilimanjaro is a d'-high mountain, $\lambda d'$. Aneto is a d'-high mountain, ... }

(32)   Comparative reading:

      a. LF: [**[-est C]**   1[John climbed A t_1-high mountain]]

      b. $[\![1[\text{John climbed A } t_1\text{-high mountain}]]\!]$ = $\lambda d'$. John climbed a d'-high mountain

      c. $[\![C]\!]$ $\subseteq$ { $\lambda d'$. John climbed a d'-high mountain, $\lambda d'$. Bill climbed a d'-high mountain, $\lambda d'$. Chris climbed a d'-high mountain, ... }

More specifically, Heim (1999) derives the restrictions on $[\![C]\!]$'s shape illustrated in (31c)/(32c) from the focus structure of the LF sister of *-est*. That focus plays a role in shaping the readings can be seen in (33), where two comparative readings arise depending on focus (with focus marked in capitals): (33a) compares *recipients* of John's letters in terms of letter lengths, whereas (33b) compares *senders* of letters to Mary in terms of letter lengths (Szabolcsi 1986, Heim 1999). Leaving compositional details aside, the effect of focus is modeled in Heim (1999) using F(ocus)-marking (β_F) and Rooth's (1992a) squiggle (~) operator defined in (34). This gives us the enriched LFs in (35)-(36) for sentence (28). The felicity condition in (34) ensures that, in each case, $[\![C]\!]$ will be a subset of the set of alternatives that we obtain by replacing the meaning of the focused element in the LF sister of *-est* with some other meaning of the same type. [8]

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[8] *-Est, too,* and *always* behave as if their focus "associate" could be a phonologically null category, such as *PRO* or a trace (Szabolsci 1986, Krifka 1998, Beaver and Clark 2003). This is illustrated in (i)-(iii), where the intended "associates" appear underlined. One can formalize the relation between *-est* and its intuitive empty associate by making *-est* associate with focus and allowing F-marking on phonologically null elements, such as

(33)   a. John wrote the longest letter to MARY.

b. JOHN wrote the longest letter to Mary.

(34) $[\![\alpha \sim C]\!]$ is felicitous only if C is a subset of the focus semantic value of α, $[\![\alpha]\!]^f$.

(Rooth 1992a)

(35)   Absolute LF with F-marking and $\sim$:

LF: John climbed the 2 [**[-est C]** [1[$t_{2,F}$ t_1-high mountain]] $\sim$ **C**]

(36)   Comparative LF with F-marking and $\sim$:

LF: [**[-est C]** [1[JOHN$_F$ climbed A t_1-high mountain]] $\sim$ **C**]

Heim's (1999) lexical entry for *-est* and the ability of DegP to take scope inside and outside the host NP will be ingredients in our proposal.

3.2. Comparatives: the *than*-complement and type conversion

The superlative morpheme *-est* and the comparative morpheme *-er* have been syntactically analysed in a parallel way. Similar to *-est*, *-er* combines with the *than*-clause or -phrase to form a DegP. This DegP can undergo LF movement to gain sentential scope, leaving behind a trace of type d (von Stechow 1984, Rullmann 1995, Heim 2000, among many others). The meaning of the two morphemes is parallel as well, the only difference being hat *-er* involves a single comparison, as we saw in (3), and *-est* involves a multiple comparison, as seen in (4). Hence, whereas *-est* in (37) compares the set of degrees $P_{<d,t>}$ originating from the matrix clause with all the sets of degrees in the comparison class $Q_{<dt,t>}$, the comparative morpheme -

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$t_{2,F}$ in (35), or by making *-est* associate with a contextually salient set of situations (or relevant objects) instead, as Beaver and Clark (2003) explicitly argue for *always*. The choice between the two treatments of focus sensitivity will not affect the argument in the present paper.

(i)   a. I met the person that John wrote the longest letter to <u>t</u>.   (cf. (33))

b. I met the person that <u>t</u> wrote the longest letter to Mary.

(i)   It would be strange [<u>PRO</u> to be invited too].   (Heim 1999)

(iii)   Kim's is the tank I said I always stock <u>t</u> with clownfish.   (Beaver and Clark 2003)

er in (38) compares the matrix set of degrees $P_{<d,t>}$ with a single set of degrees $Q_{<d,t>}$ obtained from the *than*-constituent. This is illustrated in example (39).

(37) $[\![-est]\!]$ = $\lambda Q_{<dt,t>}.\lambda P_{<d,t>}. \exists d\ [\ P(d)\ \&\ \forall Q \in \mathbf{Q}\ [Q \neq P \rightarrow \neg(Q(d))]\ ]$ (Heim 1999)

(38) $[\![-er]\!]$ = $\lambda Q_{<d,t>}.\lambda P_{<d,t>}. \exists d\ [P(d)\ \&\ \neg(Q(d))]$[9]   (Heim 2006)

(39)   John is taller than Mary is.
   a. LF: $[_{DegP}$ -er [(than) 1 Mary is $<t_1$-tall$>$]] [2 John is t_2-tall]
   b. $[\![2\ John\ is\ t_2\text{-}tall]\!]$ = $\lambda d'.\ tall(j,d')$
   c. $[\![1\ Mary\ is\ t_1\text{-}tall]\!]$ = $\lambda d'.\ tall(m,d')$
   d. $[\![[\text{-}er\ [(than)\ 1\ Mary\ is\ <t_1\text{-}tall>]\ ]\ [\ 2\ John\ is\ t_2\text{-}tall\ ]]\!] = 1$ iff
        $\exists d\ [tall(j,d)\ \&\ \neg tall(m,d)]$

In (39), *than* is treated as semantically vacuous and the entire *than*-constituent is of type $<d,t>$, as seen in (39c). But this is not always the case. In (40), *than* takes as complement the NP *the world record*, which is of type d and, thus, refers to a particular degree point.[10] If we treat *than* as semantically vacuous, we have a type mismatch: *-er* expects a set of degrees $D_{<d,t>}$ from the *than*-phrase, but the complement of *than* provides a single degree d_d.

(40)   Al jumped higher than the world record.

The same point has been made for other languages. As argued in Pancheva (2006), in Polish *niz-* and *jak* 'wh-' comparatives and in Russian *cem* 'wh-' comparatives, the clause following

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[9] Heim's actual formulation of the lexical entry for *-er* is a follows (Heim 2006:(25)):

(i) $[\![-er]\!]$ = $\lambda P_{<d,t>}.\lambda Q_{<d,t>}.\ P \subset Q$

[10] Schwarzschild (2005) argues that the degree argument of gradable adjectives can be bound by degree operators like *too* or modified by measure phrases of type $<d,t>$ like *two meters*, but it cannot be saturated by an expression of type d like *John's height*. This is illustrated in (i). The NP *the world record* behaves like *John's height*, witness (ii). Hence, according to Schwarzschild's test, *the world record* is of type d.

(i)   a. Al jumped too high.
        b. Al jumped two meters high.
        c. * Al jumped John's height high.

(ii)   * Al jumped the world record high.

"than" is a free relative that is interpreted as a definite description referring to a degree: the maximal (or maximally informative) degree for which the predication holds (type d). This is illustrated in (41) for Russian. Further evidence for definiteness comes from languages like Spanish, where the definite article appears overtly, as in (42):

(41)   Anna vyše Ø [$_{FreeRC}$ cem   Ivan].   Russian
       Anna taller Ø [$_{FreeRC}$ wh-INSTR Ivan]
       'Anna is taller than Ivan.'

(42)   Juan es más alto **de** [$_{FreeRC}$ **lo**   que   lo es María].   Spanish
       John is more tall   **of** [$_{FreeRC}$ **the** that$_{REL-PRON}$ it is Mary]
       'John is taller than Mary is.'

Hence, sometimes the complement of "than" is of type d. This gives a type mismatch with *-er* in (38), which expects a $\langle d,t\rangle$-argument. To save the mismatch, operators turning a degree into a set of degrees have been defined in the literature (e.g. Hackl 2000, Pancheva 2006). Here we will use the shifter defined in (43): it takes a degree d and yields the set of degrees smaller or equal to d. The use of this shifter is illustrated in (44): [11]

(43)   SHIFT$_{d\rightarrow\langle d,t\rangle}$ = $\lambda d''.\lambda d'.\ d'\leq d''$

(44)   Al jumped higher than the world record.
       a. LF: [$_{DegP}$ -er [the world record]] [2 Al jumped t$_2$-high]
       b. ⟦*2 Al jumped t$_2$-high*⟧   = $\lambda d'.$ jump-high(a,d')
       c. ⟦*(than) the world record*⟧ =$_{e.g.}$ 2,5m

---

[11] SHIFT$_{d\rightarrow\langle d,t\rangle}$ can be seen as Hackl's (2000:50) BE shifter over degrees, given in (i), adapted to the semantics of comparatives assumed in the present paper. Hackl's lexical entry for *–er*, given in (ii), compares the maxima of two degree sets, so that it suffices that the output of the shifting operation be singleton containing solely the original degree. Our entry for *-er* in (38) compares two full sets and, thus, we need the entire upper-bound set. As for Pancheva (2006), who assumes an interval-based semantics for degrees, a degree interval is shifted into a set of degree intervals in examples like (41).

(i)   BE $_{\langle d,\langle d,t\rangle\rangle}$ = $\lambda d''.\lambda d'.\ d'=d''$ (Hackl 2000)

(ii)   ⟦*-er*⟧   = $\lambda D_{\langle d,t\rangle}.\lambda D'_{\langle d,t\rangle}.$ max(D) > max(D')   (Hackl 2000)

d. SHIFT$^\downarrow_{d\to<d,t>}$ ($[\![$*the world record*$]\!]$) = $\lambda d'.\ d'\leq 2,5m$

e. $[\![[\![$*-er (than) the world record*$]\!]\ [\ 2\ Al\ jumped\ t_2$-*high*$]]\!] = 1$ iff

  $\exists d\ [\ \text{jump-high}(a,d)\ \&\ \neg(d\leq 2,5m)\ ]$

There are, no doubt, other ways to make the expectations of *-er* and the variability between d-type and <d,t>-type 'than'-phrases match. Regardless of what route one takes, the point is that a type mismatch exists in some comparatives sentences. As we will see, a parallel mismatch is found with modal superlatives as well. For concreteness, I will assume the shifter in (43) for comparatives and define a parallel function for superlatives, anticipated in (45). (But see the Appendix for another potential avenue to circumvent the mismatch in modal superlatives, sketched in Howard (2011).)

(45)   SHIFT$^\downarrow_{<d,t>\to<dt,t>}$ = $\lambda D_{<d,t>}.\lambda D'_{<d,t>}.\ \exists d'\ [D(d')\ \&\ D'=\lambda d''.d''\leq d']$

4. Proposal: Decomposing the modal superlative reading

4.1. Key ingredients

With this background on degree constructions, let us now go back to the modal superlative reading. We want to derive appropriate truth conditions for examples like (46):

(46)   a. John climbed the <u>highest possible</u> mountain.

  b. John climbed the <u>most possible</u> mountains.

  c. John climbed the <u>fewest possible</u> mountains.

The aim is to derive this reading while separating the contribution of the superlative morpheme *-est* from that of the modal adjective. I will use Heim's (1999) lexical entry for *-est*, repeated in (47) below.[12] For *possible*, I will use the run-of-the-mill semantic rule in (48),

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[12] Heim (1999) provides a 3-place variant of *-est* as well, defined in (i). See Romero (2011) for arguments against using 3-place *-est* to derive the modal superlative reading.

(i) $[\![$*-est*$_{3\text{-place}}]\!] = \lambda Y_{<e,t>}.\lambda P_{<d,et>}.\lambda x_e.\ \exists d\ [\ P(d)(x)\ \&\ \forall y\in Y[y\neq x\to\neg(P(d)(y))]\ ]$

abbreviated as $\Diamond\phi$ in the computations below (where ϕ is the formula corresponding to the IP complement of *possible*).

(47) $[\![-est]\!] = \lambda \mathbf{Q}_{<dt,t>}.\lambda P_{<d,t>}. \exists d [P(d) \& \forall Q \in \mathbf{Q} [Q \neq P \rightarrow \neg Q(d)]]$ (Heim 1999)

(48) $[\![possible\ IP]\!]^w = 1$ iff $\exists w' \in Acc_w: [\![IP]\!]^{w'} = 1$

The first ingredient of our proposal is an elaboration on Larson's (2000) analysis of *[1 possible ▲ACD]*, which took it to be a reduced relative clause but did not spell out its semantics. I propose to treat this constituent semantically as an amount relative clause (Carlson 1977, Heim 1987, Grosu and Landman 1998), that is, as a relative clause ranging over degrees. In other words, we take Larson's idea that *possible* heads a reduced relative containing an ACD gap and add the innovation that the trace and the corresponding λ-abstractor range over degrees rather than over individuals. To see the idea applied to an example, *[1 possible ▲ACD]* is an amount or degree relative clause (cf. (49a)) expressed as a reduced relative ((49b)) with antecedent-contained IP deletion ((49c)) – in all of which t_1 is, crucially, the degree argument of *high*.[13]

(49)   a. [RC (that)1 it was possible for him/one to climb a t_1-high mountain]

    b. [ReducedRC 1 possible for him/one to climb a t_1-high mountain]

    c. [ReducedRC 1 possible ▲ACD]

The second ingredient concerns the relation between this (reduced) amount relative and -*est*. In comparative constructions, the comparison term – the complement of -*er* – can be introduced by an overt *than*-phrase/clause, as in (3) and (39)-(42), or by a covert indexical variable *C*, as in (50). In the latter case, the value of *C* is resolved contextually. Similarly, in superlative constructions, the comparison class – the complement of -*est* – can be expressed

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[13] The idea to have an amount relative clause interpretation is hinted at, but not pursued, in Schwarz (2005). He notes that the relative clause in (i) does not range over individuals but over degrees. He adds: " I speculate that postnominal *possible* is always interpreted as being part of a reduced degree relative. (…) Future work will have to show whether this speculation can be extended into a concrete analysis" (Schwarz 2005:§5.4). The proposal in the present paper can be taken as just the kind of concrete analysis that would develop Schwarz's idea.

(i)   I talked to the fewest guests possible.

overtly, e.g. with the PPs *among the candidates* and *of all my friends* in (51) (Heim 1985), or be introduced by a covert indexical *C*, as we saw in (28). The second key ingredient of the proposal is that modal superlative readings arise from the former possibility, with *[1 possible ▲$_{ACD}$]* overtly expressing the comparison class argument of -*est*, as in (52):[14]

(50)　　John is taller.

(51)　　a. John is the tallest among the candidates.
　　　　b. Of all my friends, he sang the loudest.　　　　　　　　　　　(Heim 1985:19)

(52)　　[$_{DegP}$ -est [1 possible ▲$_{ACD}$]]

　　　In the next subsections, Sects. 4.2 and 4.3, we will apply these ideas to the examples in (46). Section 4.4 will present and evaluate further predictions of the proposed analysis.

4.2. Applying the proposed analysis to examples

Sentence (53) in its modal superlative reading has the LF below. The DegP consists of -*est* plus its comparison class complement, the reduced *[1 possible ▲]*. DegP moves out of the host NP to gain sentential scope, as in the comparative superlative LF in (32). Finally, the ACD gap is resolved, feeding the structure in (54) to semantic interpretation.[15,16]

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[14] Independently of Romero (2010) (a predecessor of the present paper), Howard (2011) develops a similar idea to account for negative polarity items (NPIs) in sentences like (i) (with -*est* scoping outside its host NP). He proposes that the relative clause *[(that) anyone in the class ever read]* functions as the complement of –*est*, which is a Strawson-downward entailing context and thus licences NPIs. See the Appendix at the end of the present paper for an interesting extension of aspects of Howard's analysis to modal superlatives.

(i)　　　　John read the most books [(that) anyone in the class ever read].

[15] For the cases examined in this paper, we will assume that ellipsis is resolved by finding an antecedent constituent in the discourse that is identical to the elided constituent up to different indices (e.g., t_1 vs. t_2 in (54)), up to different shapes of coindexed NPs (e.g., vehicle change between *John* and *him* in (54)) (Fiengo and May 1994), and up to mismatch of other morphosyntactic features (e.g., finite vs. nonfinite structure in (54)). The latter type of permitted mismatch is illustrated with Larson's example below (Larson 2000:(20)).

(i)　　　　Can Gwen lift 1000 lbs?　　　　　　　　　　　　　　　　(Larson 2000)
　　　　　　Yes, but it isn't easy <**for Gwen to lift 100 lbs**>.

(53)   John climbed the highest possible mountain.
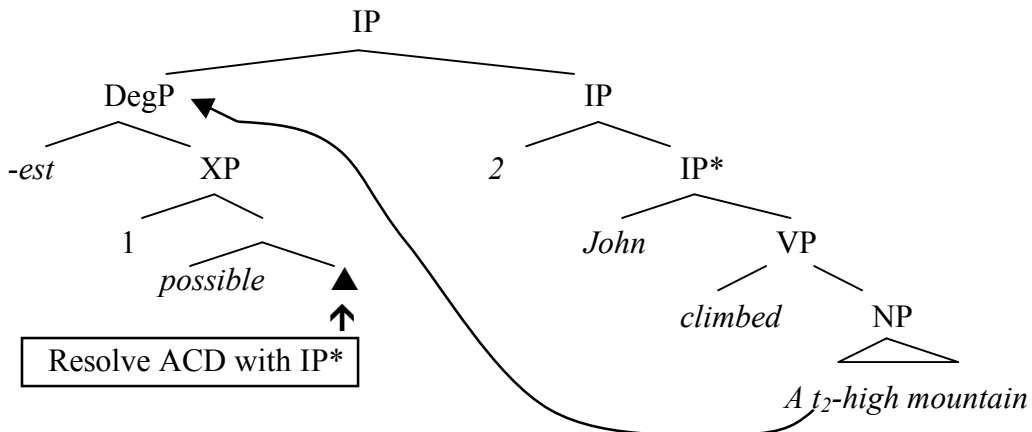
(54)   [-est [1 possible <for John(/him) to climb A t_1-high mountain>]] [2 John climbed A t_2-high mountain]

Parallel to the shifter SHIFT$^{\downarrow}_{d\rightarrow<d,t>}$ (cf. (43)) adjusting the type of the *than*-complement in comparatives, we need a shifter for superlatives turning the compositionally derived $<d,t>$-interpretation of *[1 possible <...>]* into a comparison class of type $<<d,t>,t>$, so that it can properly combine with –*est*. The new shifter, called SHIFT$^{\downarrow}_{<d,t>\rightarrow<dt,t>}$ and anticipated in (45), is spelled out below in (55). Note that it does the same job as its comparative partner (43),

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[16] In VP-ellipsis cases like (i), the ellipsis site in the second clause can be resolved to the "containing", local VP, as in (ia), or to an external, non-local antececent VP, as in (ib). For modal superlatives, only the ACD-based local resolution is available: the ellipsis site in the second clause of (ii) can be resolved as in (iia) but not as in (iib). This restriction is also found in comparative deletion, as shown in (iii) (Kennedy 1999:140ff). We thank an anonymous reviewer for pointing out the asymmetry between (i) and (iii) and raising the question about (ii). We leave the reason for this asymmetry open for future research. (But see Kennedy 1999 for an account of (iii).)

(i)   Marcus read every book I bought, and I read every book Charles did ▲.   (Kennedy 1999)

     a. ... and I read every book Charles did **<read t>**.

     b. ... and I read every book Charles did **<bought t>**.

(ii)   John bought the longest desk possible ▲, and Charles bought the widest desk possible ▲.

     John bought the longest desk 1 possible <for him to buy a t_1-long desk>...

     a. ... and Charles bought the widest desk 2 possible **<for him to buy a t_2-wide desk>**.

     b. * ... and Charles bought the widest desk 2 possible **<for him to buy a t_2-long desk>**.

(iii)   The table is wider than the rug is ▲, but this rug is longer than the desk is ▲.   (Kennedy 1999)

     The table is wider than 1 the rug is <t_1-wide>, ...

     a. ... but this rug is longer than 2 the desk is **<t_2-long>**.

     b. * ... but this rug is longer than 2 the desk is **<t_2-wide>**.

except that the comparative version turned the single degree compositionally obtained from the *than*-phrase into its corresponding upper-bound set, whereas the superlative version, involving multiple comparison, turns the *set* of degrees compositionally obtained from *[1 possible <...>]* into the corresponding *set* of upper-bound degree sets.

(55) $\text{SHIFT}^\downarrow_{<d,t> \to <dt,t>} = \lambda D_{<d,t>}.\lambda D'_{<d,t>}. \exists d' [D(d') \& D'=\lambda d''.d'' \le d']$

The semantic computation is spelled out in (56). To see more intuitively how the computation proceeds, consider a scenario where John is allowed to climb mountains that are 3000m high or less, but no higher than that. The set (56d) of allowed degrees compositionally obtained from *[1 possible <...>]* will be {1m, 2m, … 1000m, …, 2000m, … 3000m}. This set is then shifted into the set of corresponding degree sets {$\lambda d''.d'' \le 1m$, $\lambda d''.d'' \le 2m$, ..., $\lambda d''.d'' \le 1000m$, ..., $\lambda d''.d'' \le 2000m$, ..., $\lambda d''.d'' \le 3000m$}. The latter set is the comparison class (56e) on which the meaning of *–est* will operate. Now consider the degree set corresponding to the maximal mountain-height that John climbed in the actual world. This is John's actual degree set in (56a). The sentence then asserts that John's actual degree set contains a degree point that no other set in the comparison class contains. Hence, John climbed as high a mountain as possible/allowed (and perhaps higher).[17]

(56)   a. ⟦*2 John climbed A t₂-high mountain*⟧ =

$\lambda d. \exists x [\text{mount}(x) \& \text{climb}(j,x) \& \text{high}(x,d)]$

b. ⟦*<for John to climb A t₁-high mountain>*⟧ =1 iff

$\exists x [\text{mount}(x) \& \text{climb}(j,x) \& \text{high}(x,g(1))]$

c. ⟦*possible <for John to climb A t₁-high mountain>*⟧ =1 iff

$\Diamond \exists x [\text{mount}(x) \& \text{climb}(j,x) \& \text{high}(x,g(1))]$

d. ⟦*1 possible <for John to climb A t₁-high mountain>*⟧ =

$\lambda d. \Diamond \exists x [\text{mount}(x) \& \text{climb}(j,x) \& \text{high}(x,d)]$

e. $\text{SHIFT}^\downarrow_{<d,t> \to <dt,t>}$ (⟦*1 possible <for John to climb A t₁-high mountain>*⟧) =

$\lambda D'_{<d,t>}. \exists d' [\Diamond \exists x[\text{mount}(x) \& \text{climb}(j,x) \& \text{high}(x,d')] \& D'=\lambda d''.d'' \le d']$

f. ⟦(54)⟧ = 1   iff

---

[17] The truth conditions in (56f) correspond to the reading 'at least as as X as possible', matching the final truth conditions generated in Schwarz (2005). For discussion on whether the desired truth conditions correspond to the paraphrase 'at least as X as possible' or to 'exactly as X as possible', see Sect. 6 in the present paper.

$$\exists d\ [\ \exists x[\text{mount}(x)\ \&\ \text{climb}(j,x)\ \&\ \text{high}(x,d)]\ \&$$

$$\forall D'\ [\ (\exists d'\ [\Diamond\exists x[\text{mount}(x)\ \&\ \text{climb}(j,x)\ \&\ \text{high}(x,d')]\ \&\ D'=\lambda d''.d''\leq d']$$

$$\&\ D'\neq\lambda d.\exists x[\text{mount}(x)\ \&\ \text{climb}(j,x)\ \&\ \text{high}(x,d)])\ \rightarrow\ \neg D'(d)]\ ]$$

We turn now to the example (46b) with *most possible*, repeated as (57). *Most* is treated as consisting of *many* + *-est* underlyingly (Hackl 2009), where *many* is a parametrized determiner (Hackl 2000)—that is, a determiner with an extra degree argument—as defined in (58):

(57)   John climbed the most possible mountains.   (=(46b))

        Modal superlative reading: 'John climbed as many mountains as possible.'

(58) $[\![many]\!]\ =\ \lambda d_d.\ \lambda P_{<e,t>}.\lambda Q_{<e,t>}.\ \exists x\ [\ |x|\geq d\ \&\ P(x)=1\ \&\ Q(x)=1]$ [18]

This allows us to analyse sentence (57) with *most* in the same way as we analysed sentence (53) with *highest*. DegP moves out of the host NP to the top of the clause and ACD is resolved, as shown in the tree in (59). The resulting LF is (60):

(59)   John climbed the most possible mountains.
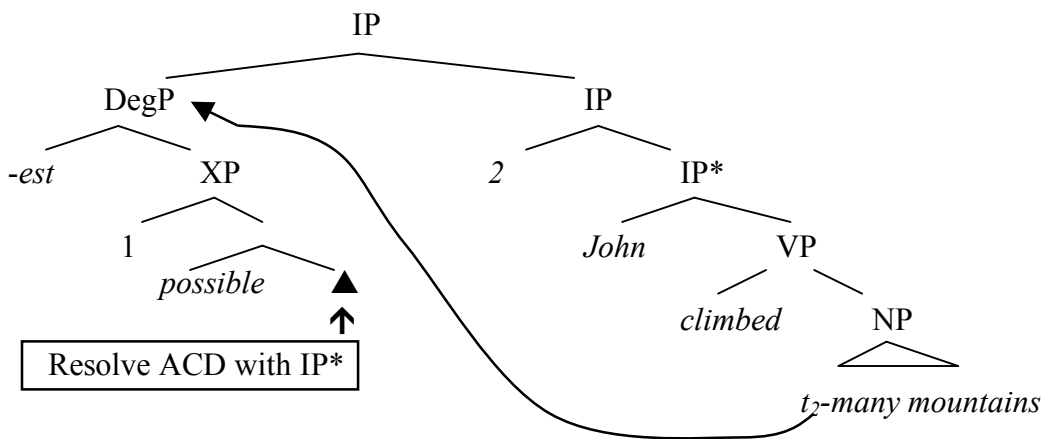
(60)   [-est [1 possible <for John/(him) to climb t_1-many mountains>]] [2 John climbed t_2-

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[18] Hackl's (2000) lexical entry for *many* is actually (i), with the equal sign '=' rather than '≥'. We use '≥' to make *many* and adjectives like *high* more transparently parallel. The choice between the two does not affect the arguments in the present paper.

(i) $[\![many]\!]\ =\ \lambda d_d.\ \lambda P_{<e,t>}.\lambda Q_{<e,t>}.\ \exists x\ [\ |x|=d\ \&\ P(x)=1\ \&\ Q(x)=1]$ (Hackl 2000:83)

many mountains]

The abridged semantic derivation is in (61). Consider a scenario where John is allowed to climb 10 mountains and no more than that. Then (61b) will be the set $\{..., 7, 8, 9, 10\}$, which after type-shifting results in the comparison class set $\{..., \lambda d''.d''\leq 7, \lambda d''.d''\leq 8, \lambda d''.d''\leq 9, \lambda d''.d''\leq 10\}$. The sentence then asserts that the set of mountain-amounts (61a) that John actually climbed contains a degree that no other allowed set in the comparison class contains. Hence, John climbed as many mountains as he was allowed to (and perhaps more).

(61)   a. $[\![2 \ John \ climbed \ t_2\text{-}many \ mountains]\!] = \lambda d. \exists x \ [*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d]$

   b. $[\![1 \ possible \ <John \ climbed \ t_1\text{-}many \ mountains>]\!]$

   $= \lambda d. \Diamond \exists x[*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d]$

   c. $\text{SHIFT}^{\downarrow}_{<d,t>\rightarrow<dt,t>}([\![1 \ possible \ <for \ John \ to \ climb \ t_1\text{-}many \ mountains>]\!]) =$

   $\lambda D'_{<d,t>}. \ \exists d' \ [\ \Diamond \exists x[*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d'] \ \& \ D'=\lambda d''.d''\leq d' \ ]$

   d. $[\![(60)]\!] = 1$ iff

   $\exists d \ [\ \exists x \ [*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d] \ \&$

   $\forall D' \ [\ (\exists d' \ [\Diamond \exists x[*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d'] \ \& \ D'=\lambda d''.d''\leq d'] \ \&$

   $D' \neq \lambda d. \exists x[*mount(x) \ \& \ climb(j,x) \ \& \ |x|\geq d]) \ \rightarrow \neg D'(d) \ ] \ ]$

4.3. Modal superlative *fewest possible*

For readers interested in antonyms, it may be worth checking how the proposed analysis works for examples like (46c), repeated below as (62). In the same way that *most* is decomposed into *many + est*, *fewest* is decomposed into *few + -est* (Hackl 2009), where *few* is the antonym of *many*. We assume the treatment of polar opposites sketched in Heim (2006: Sect. 7), according to which a negative antonym amounts to the corresponding positive antonym with negation semantically built in, as exemplified in (63).[19] Correspondingly, *few* is defined in (64) as the negated version of *many* in (58).

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[19] See Büring (2007) and Heim (2008) on the (un)movability of this negation. See Kennedy (2001) for a different treatment of antonymy.

(62)   John climbed the fewest possible mountains.

         Modal superlative reading: 'John climbed as few mountains as possible.'

(63)   a. $[\![tall]\!]$ = $\lambda d_d.\lambda x_e.$ tall(x,d)   (i.e., $\lambda d_d.\lambda x_e.$ Height(x)$\geq$d)

         b. $[\![short]\!]$ = $\lambda d_d.\lambda x_e. \neg$ tall(x,d)   (i.e., $\lambda d_d.\lambda x_e.$ Height(x)$<$d)

(64) $[\![few]\!]$ = $\lambda d_d. \lambda P_{<e,t>}.\lambda Q_{<e,t>}. \neg \exists x [|x| \geq d$ & P(x)=1 & Q(x)=1]

The LF syntactic structure of the sentence is parallel to that of the previous example, now with *few* instead of *many*:

(65)   [-est [1 possible <for John(/him) to climb t_1-few mountains>]] [2 John climbed t_2-few mountains]

The semantic derivation of the sentence with *fewest* differs from that with *most* in one respect. In example (59) with *most*, the relevant gradable property was *downward* monotonic: if John climbed a total of 10 mountains, the actual set of climbed mountain amounts was the upper-bound set $\lambda d''.d''\leq10$. This set was then compared with upper-bound sets in the comparison class resulting from the shifter SHIFT$^\downarrow$: {..., $\lambda d''.d''\leq7$, $\lambda d''.d''\leq8$, $\lambda d''.d''\leq9$, $\lambda d''.d''\leq10$}. Now consider example (62) with *fewest*. The relevant gradable property is *upward* monotonic: assuming again that John climbed a total of 10 mountains, the actual set of *un*climbed mountain-amounts is the lower-bound set $\lambda d''.d''>10$. We thus have to compare this set with other lower-bound sets in the comparison class. This means that, instead of the shifter SHIFT$^\downarrow$ in (55), we need a shifter SHIFT$^\uparrow$ turning degree points into the corresponding lower-bound degree sets. This shifter is defined in (66).[20]

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[20] Note that a parallel shifter is needed for the comparative examples with negative adjectives in (i)-(iii) as well. The *than*-complement here denotes a single degree. (In (ii)-(iii), this is the most informative degree of which the degree property expressed by the relative clause holds; cf. Beck and Rullmann 1996.) As the reader can verify for herself, for the correct truth conditions to obtain, we need the shifter in (iv).

(i)   Context: Cell phone companies compete every year to produce the thinnest cell phone in the world. The new XSP phone is thinner than last year's world record.

(ii)   Anna niže $\varnothing$ [FreeRC čem   Ivan].   Russian

         Anna shorter $\varnothing$ [FreeRC wh-INSTR Ivan]

         'Anna is shorter han Ivan.'

(66) $\text{SHIFT}^{\dagger}_{<d,t> \to <dt,t>} = \lambda D_{<d,t>}.\lambda D'_{<d,t>}. \exists d' [D(d') \& D'=\lambda d''.d''\geq d']$

The main steps of semantic derivation are given in (67). Consider a scenario where John climbed exactly five mountains and where he is required to climb a minimum of five mountains. The set of degrees denoted by the matrix clause in (67a) – the set of degrees d such that John failed to climbed d-many mountains – is the lower-bound set {6, 7, 8, 9, ...}, that is, $\lambda d''.d''\geq 6$. The set of degrees that he is allowed to not climb is {6, 7, 8, 9, ...}. Shifting this latter set with $\text{SHIFT}^{\dagger}$ in (66) gives us the comparison class {$\lambda d''.d''\geq 6$, $\lambda d''.d''\geq 7$, $\lambda d''.d''\geq 8$, $\lambda d''.d''\geq 9$, ...} in (67c), that is, the set of corresponding lower-bound sets. The sentence asserts that John's actual set of unclimbed mountain-amounts contains a degree that no other allowed set of unclimbed mountain-amounts in the comparison class contains. Hence, the total amount of mountains that John climbed is as low as permitted (and perhaps lower).

(67)   a. ⟦*2 John climbed t₂-few mountains*⟧ =

   $\lambda d.\neg\exists x[*mount(x) \& climb(j,x) \& |x|\geq d]$

   b. ⟦*1 possible <John climbed t₁-few mountains>*⟧ =

   $\lambda d.\Diamond\neg\exists x[*mount(x) \& climb(j,x) \& |x|\geq d]$

   c. $\text{SHIFT}^{\dagger}_{<d,t> \to <dt,t>}$ (⟦*1 possible < for John to climb t₁-few mountains]>*⟧) =

   $\lambda D'_{<d,t>}. \exists d' [\Diamond\neg\exists x[*mount(x) \& climb(j,x) \& |x|\geq d'] \& D'=\lambda d''.d''\geq d']$

   d. ⟦(65)⟧ = 1   iff

   $\exists d [\neg\exists x [*mount(x) \& climb(j,x) \& |x|\geq d] \&$

   $\forall D' [(\exists d'[\Diamond\neg\exists x[*mount(x) \& climb(j,x) \& |x|\geq d'] \& D'=\lambda d''.d''\geq d']$

   $\& D' \neq \lambda d.\neg\exists x[*mount(x) \& climb(j,x) \& |x|\geq d]) \to \neg D'(d)]]$

In sum, we have seen how the proposed analysis of modal superlatives derives the same truth conditions '(at least) as X as possible' as predicted by Schwarz (2005), both for positive and for negative polar opposites, and that it does so while separating the contributions of -*est* and *possible* and assigning them standard denotations.

(iii)   María es más baja **de** [FreeRC **lo** que   lo es Juan].   Spanish

   Mary is more short **of** [FreeRC **the** thatREL-PRON it is John]

(iv) $\text{SHIFT}^{\dagger}_{d \to <d,t>} = \lambda d''.\lambda d'. d'\geq d''$

4.4. Further predictions of the proposed analysis

In this section we will examine three further predictions made by the proposed analysis.

The first prediction concerns *among*- and *of*-phrases, which have been argued to overtly specify the comparison class argument of *-est*, as we saw in (51). According to the proposed analysis, the phrase *[1 possible ▲]* serves precisely this function in the modal superlative reading. Hence, we predict *among/of*-phrases to be incompatible with the modal superlative reading. This prediction is borne out: if *among/of the students* in (68) is understood as setting up the comparison class (i.e., we are comparing students in terms of their present-buying achievements), *possible* has to be understood as a regular modifier of *present.*[21]

(68)   Among / Of the students, John bought the largest possible present.

The second prediction concerns comparative and superlative readings in modal superlative sentences. Recall from Sect. 3.1 that, in superlative sentences with a covert comparison class argument, DegP can take scope within its host NP, producing the absolute reading, or outside its host NP, yielding the comparative reading. Our analysis of modal superlatives predicts that, provided that the ellipsis site can be appropriately resolved, modal superlative sentences in principle give rise to two different readings as well. The two potential LFs and paraphrases are given in (69), where (a) is the modal superlative reading analyzed so far:[22]

(69)   John climbed the highest mountain possible.
   a. Modal superlative reading parallel to the *comparative* reading:
       LF: [[$_{DegP}$ -est 1 possible ▲] [2 John climbed A t_2-high mountain]]
       'John climbed as high a mountain as it was possible <u>for him/one to climb</u>.'
   b. Modal superlative reading parallel to the *absolute* reading:
       LF: John climbed the 3 [[$_{DegP}$ -est 1 possible ▲] 2 t_3 t_2-high mountain]
       'John climbed the mountain that is as high as it is possible <u>for it/a mountain to be</u>.'

The prediction is borne out. Intuitively, two readings can be distinguished in (70), indicated in the (a)- and (b)-paraphrases and primed by contexts (71) and (72) respectively. To make the difference between the two interpretations sharper, consider cases where one of the readings is available and the other one is deviant. In (73), the (a)-reading is possible but the (b)-reading is pragmatically odd. In (74) and (75), the (b)-reading is possible and the (a)-reading is unavailable—either ruled out by the grammar (assuming that DegP cannot move out of a Subject or Coordinate Structure Island) or pragmatically deviant.[23]

(70) Pina solved in five minutes the hardest problem possible.
    a. 'Pina solved in five minutes as hard a problem as it was possible for her / one to solve in five minutes.'
    b. 'Pina solved in five minutes the problem that is as hard as it is possible for a problem to be.'

(71) Pina knows how to organize the little time she has. She solved in five minutes the hardest problem possible, left the harder problems untouched, and then ran to catch the bus.

(72) Pina is a genius!!! She solved in (just) five minutes the hardest (math) problem possible.

(73) John talked to the fewest guests possible.
    a. 'John talked to as few guests as it was possible for him / one to talk to.'
    b. #'John talked to the guest sum x that is as small as it is possible for it / a guest sum to be.'

(74) The most beautiful poem possible is Neruda's *Canción Desesperada*.
    a. */# 'A poem that is as beautiful as it is possible for that beautiful a poem to equal Neruda's *CD* equals Neruda's *CD*.'
    b. 'The poem that is as beautiful as it is possible for it / a poem to be equals Neruda's *CD*.'

(75) *War and Peace* and the most boring novel possible are of equal length.

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[23] I thank Irene Heim (p.c.) for constructing example (75).

a. */# 'War and Peace and a novel that is as boring as it is possible for War and Peace and that boring a novel to be of equal length are of equal length.'

b. 'War and Peace and the novel that is as boring as it is possible for it / a novel to be are of equal length.'

The new, absolute modal superlative reading is derived in the proposed analysis as follows. DegP has scope within the host NP, as in (76). Allowing for the ellipsis site to be resolved to a proposition-denoting constituent like NP*, we obtain the LF (77). The main steps in the semantic derivation are spelled out in (78):[24]

(76)   John climbed the highest mountain possible.
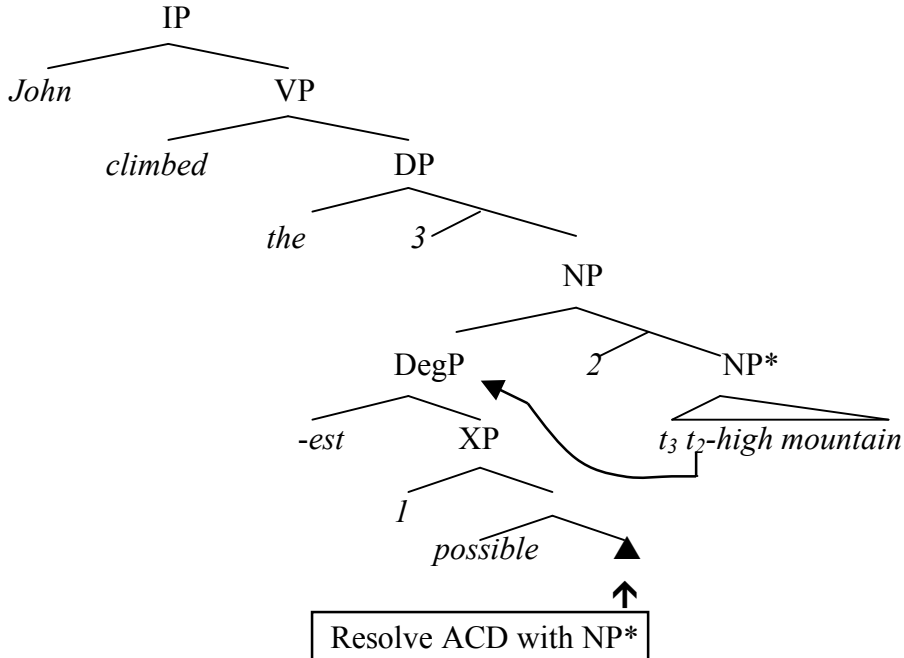
(77)   LF: John climbed the 3 [[-est 1 possible **<t_3 t_1-high mountain>**] 2 t_3 t_2-high mountain]

(78)   a. ⟦*2 t_3 t_2-high mountain*⟧ = $\lambda d'''.$ mount(g(3)) & high(g(3),d''')

d. ⟦*1 possible <t_3 t_1-high mountain>*⟧=1 iff $\lambda d.\Diamond[$mount(g(3)) & high(g(3),d)]

c. SHIFT$_{<d,t> \rightarrow <dt,t>}$ (⟦*1 possible <t_3 t_1-high mountain>*⟧) =

$\lambda D'_{<d,t>}. \exists d' [\Diamond[$mount(g(3)) & high(g(3),d')] & D'=$\lambda d''.d'' \leq d']$

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[24] On how the truth conditions in (78e) validate the paraphrase 'as high as it is possible for a mountain to be' / 'as high as it is possible for an object to be that high a mountain', see footnote 29. Alternatively, one could use generic *PRO$_{ARB}$* instead of t_3 in the ellipsis site.

d. $[\![\textit{[-est 1 possible} <t_3\ t_1\textit{-high mountain>]}\ t_3\ t_2\textit{-high mountain}]\!] = 1$ iff

$\exists d\ [\ mount(g(3))\ \&\ high(g(3),d)\ \&$

$\quad \forall D'_{<d,t>}\ [\ (\exists d'[\Diamond[mount(g(3))\ \&\ high(g(3),d')]\ \&\ D'=\lambda d''.d''{\leq}d']\ \&$

$\quad\quad D'{\neq}[\lambda d'''.mount(g(3))\ \&\ high(g(3),d''')]) \rightarrow \neg D'(d)\ ]\ ]$

e. $[\![(77)]\!]\ =1$ iff

John climbed the mountain x such that:

$\exists d\ [\ mount(x)\ \&\ high(x,d)\ \&$

$\quad \forall D'_{<d,t>}\ [\ (\exists d'[\Diamond[mount(x)\ \&\ high(x,d')]\ \&\ D'=\lambda d''.d''{\leq}d']\ \&$

$\quad\quad D'{\neq}[\lambda d'''.mount(x)\ \&\ high(x,d''')]) \rightarrow \neg D'(d)\ ]\ ]$

The third and final prediction relates to the following aspect of the elided proposition. As the attentive reader will have noticed, we have been using the double paraphrase 'as X as possible for him / one to' in (79), glossing over a potential distinction between having a co-indexed expression and having a *PRO_{ARB}* in the recovered ellipsis site, as sketched in (80). Does each paraphrase correspond to a different reading? Or is there only one genuine reading and the other paraphrase corresponds just to a sub-case of that reading? If the latter, what paraphrase corresponds to the genuine reading?

(79)   John climbed the highest possible mountain.

'He climbed as high a mountain as it was possible for him / one to climb.'

(80)   a. *[possible for John_i/him_i to buy]*   ⇨   'as X as possible for <u>him</u> to …'

b. *[possible for PRO_{ARB} to buy]*   ⇨   'as X as possible for <u>one</u> to …'

Our account predicts that option (80a) with coindexation corresponds to a genuine reading of the sentence. The ellipsis site of (79) is recovered as in (81), with the proper name *John* or – via vehicle change – with the co-indexed pronoun *him*. That this is a genuine reading of the sentence is shown in (82). Consider a scenario where the host of the party and the speaker have different minimal requirements as to how many guests they should talk to: let's say the host must talk to at least 20 guests and the speaker must talk to at least 5 guests. The sentence is judged true if the two characters fulfilled their respective duties to the minimum. That is, the sentence has a sloppy reading corresponding to the co-indexed pronoun paraphrase.[25,26]

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[25] I thank Barbara Partee (p.c.) for bringing the sloppy reading to my attention.

(81)   [-est [1 possible **\<for John$_i$(/him$_i$) to climb A t$_1$-high mountain>**]] [2 John$_i$ climbed A t$_2$-high mountain]

(82)   I talked to the fewest guests possible, and so did the host.
        ✓Sloppy reading: 'I talked to as few guests as it was possible for me to talk to, and the host also talked to as few guests as it was possible for the host to talk to.'

Whether our account also derives a separate reading for the generic paraphrase 'as X as it is possible for one to' in (80b) depends on one's assumptions about identity conditions in ellipsis. Does a proper name (e.g. *John*) count as identical to *PRO$_{ARB}$* in ellipsis? I will leave this question open for future research.[27] Nevertheless, let me point out that, in all the examples considered in this paper, the intuitive generic rendering of the modal superlative reading can be constructed as a sub-case of the truth conditions resulting from option (80a): whenever the modal base of the modal adjective treats the relevant set of individuals alike (e.g. the allowed limit is the same for all mountain climbers, the geophysical and technical conditions are the same for all mountain climbers, etc.), the sets of degrees in (83) and (84) are the same and, thus, both paraphrases are intuitively appropriate.[28,29]

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[26] For some reason, a strict reading of the pronoun is not possible, as shown by (i). This is reminiscent of the locality restrictions in comparative ellipsis and modal superlative constructions discussed in footnote 16. We leave this question for future research.

(i)   John talked to the fewest guests possible, and so did Bill.
         * Strict reading: 'John talked to as few guests as it was possible for John to talk to and Bill talked to as few guests as it was possible for John to talk to.'

[27] Instances of vehicle change between proper names and other empty categories—e.g. a trace—have been claimed to be permitted, as exemplified in (i). However, (i) can be analysed as having the LF in (ii), where the only difference between the antecedent and the elided VP is the index on the traces. Parallelism between the trace binders is then ensured by focusing *who* and applying Rooth's (1992b) Focus Condition. See also Larson (2000: Sect. 3.4) for some considerations against granting the generic paraphrase the status of genuine reading.

(i)   John kissed Mary, but I wonder who Harry did ~~kiss t~~.
                          (Fiengo and May 1994:219, attributed to Wyngaerd-Zwart)

(ii)   LF: [Mary 1[John kissed t$_1$]] but [I wonder who$_F$ 2[Harry did \<kiss t$_2$>]]

[28] For simplicity, I treat generic *PRO$_{ARB}$* as a universal quantifier with wide scope over the modal; see (i) below and (84) in the text.

(i)   a. It is possible PRO$_{ARB}$ to go to Meersburg by boat.

(83) $[\![\textit{1 possible <for John to climb A } t_1\textit{-high mountain>}]\!] =$

$\qquad\qquad \lambda d. \diamond\exists x\, [\text{mount}(x)\ \&\ \text{climb}(j,x)\ \&\ \text{high}(x,d)]$

(84) $[\![\textit{1 possible <PRO}_{ARB}\textit{ to climb A } t_1\textit{-high mountain>}]\!] =$

$\qquad\qquad \lambda d. \forall y\diamond\exists x[\text{mount}(x)\ \&\ \text{climb}(y,x)\ \&\ \text{high}(x,d)]$

This concludes Sect. 4. To sum it up: A compositional analysis of the modal superlative reading has been proposed where the semantic contribution of *-est* is separated from that of *possible*. The central ideas behind the analysis are that the constituent *[1 possible ▲*$_{ACD}$*]* is interpreted as a reduced amount relative clause and that this constituent functions as the overt comparison class argument of *-est*. To derive the reading, we have used LF structures that are independently motivated for degree constructions, such as (i) movement of DegP outside its host NP, (ii) decomposition of *most* as *many+est* and *fewest* as *few+est*, and (iii) type adjustment of the complements of *–er* and *–est*, implemented here using shifters that turn (sets of) degree points into (sets of) degree sets. This analysis correctly derives the modal superlative reading for the examples in the literature and makes three further empirical predictions: (a) *among*/*of*-phrases expressing the comparison class are incompatible with the modal superlative reading; (b) two modal superlative readings can be distinguished, parallel to the absolute and comparative reading of other superlative sentences; and (c) the paraphrase 'as X as it is possible for him to' corresponds to a genuine reading of modal superlative sentences.

$\qquad$ b. $\forall y\diamond[y$ goes to Meersburg by boat$]$

[29] The same set equivalence holds for modal superlatives in the absolute reading. For (75) in the text, assuming that the same boredom limits apply to g(3) and to all other relevant objects (presumably, all other novels), the sets in (i) and (ii) are the same.

(i) $[\![\textit{1 possible <}t_3\textit{ }t_1\textit{-boring novel>}]\!]$ $\qquad$ = $\qquad$ $\lambda d.\diamond[\text{novel}(g(3))\ \&\ \text{boring}(g(3),d)]$

(ii) $[\![\textit{1 possible <PRO}_{ARB}\textit{ }t_1\textit{-boring novel>}]\!]$ $\qquad$ = $\qquad$ $\lambda d.\ \forall y\diamond[\text{novel}(y)\ \&\ \text{boring}(y,d)]$

5. Deriving the three empirical restrictions

Recall the three empirical restrictions observed for the modal superlative reading, summarized in (85).

(85)　a. *Lexical restriction*: Certain modal adjectives (e.g. *possible, imaginable, conceivable,* and their counterparts in other languages) allow for the modal superlative reading, whereas others (e.g. *potential, probable,* and their counterparts in other languages) do not.

　　b. *Postnominal restriction:* In English, when the modal adjective is placed postnominally, the modal superlative reading is available but the regular modifier reading is lost.

　　c. *Locality restriction:* When the superlative predicate and the modal adjective are located on the same side of the noun phrase (i.e., both prenominally or both postnominally), the modal adjective must be local to *-est* in order for the modal superlative reading to arise.

As we saw in Sect. 2, Larson (2000) derives the lexical and postnominal restrictions but is unaware of the locality restriction, whereas Schwarz's (2005) proposal concentrates on the locality restriction but does not tackle the others. In the analysis proposed in the present paper, Larson's (2000) diagnosis of the lexical restriction—namely, that the modal superlative reading requires *possible* with an (elided) nonfinite clause complement—and Schwarz's (2005) source of the locality restriction—namely, that *[-est possible]* forms a constituent—are reconciled by means of the two key ingredients of our proposal. The first key ingredient was to treat Larson's structure *[(1) possible* ▲nonfinite*]* not as an individual relative but as an amount relative, thus denoting a set of degrees. The second key ingredient was to treat *possible* not as part of the lexical entry *[-est possible]* but as a separate adjective heading the complement of *–est*, providing the degree comparison class for *-est*. These two steps produce the syntactic parse *[-est [1 possible* ▲nonfinite*]]*. By combining Larson's (2000) and Schwarz's (2005) structures into this new parse, the proposed account inherits the benefits of the two previous approaches and allows us to derive the three empirical restrictions observed. Let us see how.

First, consider the locality restriction seen in (18), repeated as (86). In the proposed analysis, the locality requirement follows from the fact that *[-est [1 possible ▲]]* is a syntactic unit, where *[1 possible ▲]* is the complement of the superlative morpheme *-est*. As long as it remains in base-generated position, *[1 possible ▲]* is the direct sister of the superlative morpheme, as in (87a) and (88a). Hence, no additional modifier <u>Adj</u> of the head noun can intervene between the superlative morpheme and its complement, as sketched in (87b)/(88b). This derives the English data in (86) as well as the Spanish and Hebrew data in (20)-(21). The proposed analysis also predicts that, if the additional noun modifier <u>Adj</u> does not intervene between the superlative adjective and the modal adjective, the resulting NP structure (87c)/(88c) would support the modal superlative reading. This prediction is borne out, witness (89)-(91).

(86)   I bought the larg<u>est</u> **affordable** <u>possible</u> present.   (Schwarz 2005)

✓Regular modifier   *Modal superlative

(87)   NP structure with prenominal restrictive adjectives: English
        a. [NP Det Adj + [DegP -est [1 possible ▲ACD]] N]
        b. * [NP Det Adj + [DegP -est <u>Adj</u> [1 possible ▲ACD]] N]
        c. [NP Det Adj + [DegP -est [1 possible ▲ACD]] <u>Adj</u> N]

(88)   NP structure with postnominal restrictive adjectives: Spanish, Hebrew
        a. [NP Det N Adj + [DegP -est [1 possible ▲ACD]]]
        b. * [NP Det N Adj + [DegP -est <u>Adj</u> [1 possible ▲ACD]]]
        c. [NP Det N <u>Adj</u> Adj + [DegP -est [1 possible ▲ACD]]]

(89)   I bought the larg<u>est</u> <u>possible</u> **inexpensive** present.

(90)   Juan ha comprado el   regalo **barato** <u>más</u> grande <u>posible</u>.   Spanish
        Juan has bought   the present **barato** most big   possible
        'Juan bought the biggest cheap present possible.'

(91)   Kaniti   et   ha-matana **ha-zola**   hagdola   <u>be-yoter</u> <u>ha-efsharit</u>
        bought-1st-sg acc the-gift   **the-cheap** the-big-f-sg in-more the-possible-f-sg'
        'I bought the biggest cheap gift possible.'   Hebrew

The proposed constituency structure accounts for the German data in (16)-(17) as well. The string *[-st 1 möglich ▲ACD]* '[-est 1 possible ▲ACD]' is the DegP of *gross* 'large'. Thus, under the modal superlative reading, the head noun has one complex modifier *gross*+DegP and not two independent modifiers *gross* 'large' and *möglich* 'possible'. Under the assumption that all and only noun modifiers agree with the head noun, the pattern is derived: the modal superlative reading requires a shared agreement suffix at the end of the single complex modifier *[gross+[st 1 möglich ▲ACD]]*, whereas the regular modifier reading requires agreement on each of the two noun modifiers. This is sketched in (92):

(92)   NP structure for German:
        a. Modal superlative reading: [NP Det [Adj [-est 1 possible ▲ACD]]-Infl   N]
        b. Regular modifier reading: [NP Det   Adj-Infl   possible-Infl   N]

Second, the proposed account derives the behavior of postnominal *possible* in English witnessed in (93). If *possible* is treated as a simple regular modifier with no elided IP, *possible* is "light" and thus is not allowed to postpose, as in (93). In contrast, if *possible* is understood as introducing a reduced relative clause with an elided IP, the constituent is "heavy" and it is allowed to postpose, as in (94). When this reduced relative clause ranges over degrees, as in structures (54), (60), and (65), the modal superlative reading obtains.[30] Hence, the postnominal restriction is derived: when the modal adjective is postposed, the modal superlative reading is available but the regular modifier reading disappears.[31]

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[30] See Guéron and May (1984) for other cases of extraposition of the complement of degree operators like *too* or *so*, illustrated in (i):

(i)   Too many books have been published recently [for me to be able to read them all].

[31] Note that a third logical possibility remains: one could in principle treat *possible* as a reduced relative clause with an elided IP ranging not over degrees but over individuals. In this case, (i) would have the reading in (ia) − where presents need to be allowed in a de re fashion—rather than the proper modal superlative reading in (ib) − where presents need not be allowed on a de re basis. (Note that Larson's (2000) paraphrase (ib) in our footnote 5 also conveys the degree/amount reading, that is, the modal superlative reading.)

(i)   I bought the largest present possible.
         a. Reading where the reduced relative ranges over individuals: 'I bought the largest one among the presents x such that it was possible for me to buy x.'

(93)   John bought the lar<u>gest</u> present **possible**.

<div align="right">*R<small>EGULAR</small> <small>MODIFIER</small>   ✓M<small>ODAL</small> S<small>UPERLATIVE</small></div>

(93)   a. [$_{NP}$ Det [Adj+est] [possible] N]

       b. [$_{NP}$ Det [Adj+est] t N]   [possible]

(94)   a. [$_{NP}$ Det Adj + [$_{DegP}$ -est [1 possible ▲$_{ACD}$]] N]

       b. [$_{NP}$ Det Adj + [$_{DegP}$ -est t] N]   [1 possible ▲$_{ACD}$]

Third and finally, the lexical restriction recalled in (95)-(96) is captured as in Larson (2000). The non-elliptical version of (97a) is (97b), with a full-fledged complement clause. Larson's diagnosis is that only modal adjectives that take a nonfinite complement allow for a modal superlative reading. Hence in English, *possible, imaginable,* and *conceivable*, but not *potential* and *probable*, support the modal superlative reading, because the former but not the latter can combine with a nonfinite complement. This is shown in (98), recalled from (23).

(95)   John bought the lar<u>gest</u> **possible** / **imaginable** / **conceivable** present.

<div align="right">✓ M<small>ODAL SUPERLATIVE</small></div>

(96)   John bought the lar<u>gest</u> **potential** / **probable** present.   * M<small>ODAL SUPERLATIVE</small>

(97)   a. John bought the largest present possible ▲.

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      b. Reading where the reduced relative ranges over degrees (= modal superlative reading): 'I bought a present large to a degree that is the greatest degree d such that it was possible for me to buy a d-large present.'

It is not clear to me whether (ia) is a possible reading of (i) (or of its prenominal counterpart). Note that, if that reading were available, one would expect for it to arise regardless of the superlative, that is, regardless of whether there is degree quantification or not. However, when we remove *-est*, it seems that reduced relative clauses ranging over individuals do not tolerate IP ellipsis: (iia,b) are acceptable, but ellipsis leads to unacceptability in (iic). See also Schwarz (2005: Sect. 5.4) for related speculations about postnominal *possible*.

(ii)   a. I bought a present that it was possible for me to buy.

      b. I bought a present possible for me to buy.

      c. * I bought a present possible.

b. John bought the largest present possible for him to buy.[32]

(98)   a. It is possible / imaginable / conceivable [PRO / for John to interview that candidate].

b. * It is potential / probable [PRO / for John to interview that candidate].

The same correlation holds for German, Spanish, and Hebrew: modal adjectives that permit the reading at issue also take nonfinite complements, whereas modal adjectives that do not permit the reading do not combine with nonfinite clauses. This is shown in (99)-(101), all of which receive the same English translation (given below (101)):

(99)   German:
    a. Es ist möglich, [PRO den   Kandidaten zu befragen].
        it is possible PRO the-Acc candidate   to interview
    b. * Es ist potenziell / wahrscheinlich, [PRO den   Kandidaten zu befragen].
        it is potential   / probable   PRO the-Acc candidate   to interview

(100)   Spanish:
    a. Es posible / imaginable / concebible [PRO entrevistar   al   candidato].
        is possible / imaginable / conceivable PRO to-interview A-the candidate
    b. * Es potencial / probable [PRO entrevistar   al   candidato].
        is potential / probable PRO to-interview A-the candidate

(101)   Hebrew:
    a. Efshar/nitan le-raa'yen   et   ha-mua'mad
        possible   to-interview acc the-candidate
        'It is possible to interview the candidate.
    b. * Potenciali / Karov le-vaday le-raa'yen   et   ha-mua'mad
        potential   / near to certain   to-interview acc the-candidate

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[32] The LF of (97b) is provided in (i), where the surface gap in the relative clause is the underlying constituent *[A t-large present]*. I leave open whether this constituent results from ellipsis resolution or from a copy theory of traces (Chomsky 1995) where a single overt constituent may have two interpretable copies at LF.

(i)   [-est [1 possible for him to buy **A t_1-large present**>]] [2 John bought A t_2-large present]

'It is potential / probable to interview the candidate.'

Thus, Larson's idea to link licensing of the modal superlative reading to the ability to combine with a nonfinite clause finds crosslinguistic support.[33]

6. Conclusions

A compositional analysis of the modal superlative reading has been proposed with the following key ingredients. In comparative constructions, the comparison term – the complement of the superlative morpheme -*er* – can be expressed by an overt constituent, as in (102), or it can be recovered via a contextual variable *C*, as in (103). For superlative constructions, the latter possibility is illustrated by examples like (104b), both in its absolute reading and its relative reading. The first key ingredient is that the modal superlative reading instantiates the former possibility: the partially elided reduced relative clause *[1 possible ▲]* is the explicit complement of the superlative morpheme -*est*, as in (105).

(102)   a. [$_{DegP}$ -er [than Mary (is)]]

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[33] What is yet in want of explanation is why this link between allowing for the modal superlative reading and combining with a *nonfinite* complement should exist. Is it due to some syntactic property of nonfinite clauses, or does it arise from their semantics? Larson (2000: Sect. 2.0) briefly considers syntactic extraction out of the complement clause as the critical factor. But note that wh-extraction does not distinguish between the nonfinite clause in (ia) and the finite clause in (ib). In both of them, a wh-word ranging over degrees (with reconstruction of [a t-long story]) (Heycock 1995) is able to extract from the complement clause. Thus, it is unclear how extraction could produce the contrast in (ii). Interestingly, the finite vs. nonfinite shape of the complement has an impact on the meaning (namely, on the modal base) of the adjective. As Larson (2000: Sect. 3.3) himself notes, *possible* can in principle take a finite or a nonfinite complement, but the modal superlative reading is only compatible with the meaning conveyed by the latter, nonfinite option, exemplified in (iii). I leave this important issue for future investigation.

(i)   a. How long a story is it possible for John to come up with?

         b. How long a story is it probable that John will come up with?

(ii)   a. John invented the longest story possible for him to invent.

         b. * John invented the longest story probable that he would invent.

(iii)   John talked to the fewest guests possible.

         a.   'John talked to as few guests as it was possible for him to talk to.'

         b.   * 'John talked to as few guests as it is (/was) possible that he talked to.'

b. John is taller than Mary (is).

(103) a. [$_{DegP}$ -er C]

  b. John is taller.

(104) a. [$_{DegP}$ -est C]

  b. John climbed the highest mountain.

(105) a. [$_{DegP}$ -est [1 possible ▲]]

  b. John climbed the highest possible mountain.

The second key ingredient is the interpretation of the constituent *[1 possible ▲]* as an amount relative ranging over degrees. This way, Schwarz's (2005) degree operator *[-est possible]* could be decomposed into two separate units: Heim's (1999) -*est* operator and the run-of-the-mill adjective *possible* heading a reduced amount relative clause.

The proposed analysis meets the following two desiderata.

First, it provides a compositional analysis of the modal superlative reading, and it does so assuming a standard lexical entry for -*est* – (106a), parallel to –*er* in (106b) – and using LF structures independently motivated for degree constructions, namely: (i) movement of DegP outside its host NP (von Stechow 1984, Rullmann 1995, Heim 1999, 2000), (ii) decomposition of *most* into *many+est* and *fewest* into *few+est* (Hackl 2000, 2009), and (iii) conversion of (sets of) degree points into (sets of) degree sets (Hackl 2000, Pancheva 2006).

(106) a. $[\![$-*est*$]\!]$ = $\lambda Q_{<dt,t>}.\lambda P_{<d,t>}.$ ∃d [P(d) & ∀Q∈**Q** [Q≠P → ¬Q(d)]]   (Heim 1999)

  b. $[\![$-*er*$]\!]$ = $\lambda Q_{<d,t>}.\lambda P_{<d,t>}.$ ∃d [P(d) & ¬(Q(d))]   (Heim 2006)

This compositional analysis does not only derive the modal superlative reading for the examples in the literature, but it also makes three further predictions: (a) *among/of*-phrases expressing the comparison class are incompatible with the modal superlative reading; (b) there are absolute and comparative modal superlative readings; and (c) the paraphrase 'as X as it is possible for him to' corresponds to a genuine reading of modal superlative sentences. These predictions are borne out.

Second, the proposed analysis allows us to reconcile previous syntactic analyses in the literature and derive the three empirical restrictions observed: the lexical restriction, the postnominal restriction, and the locality restriction.

The lexical restriction is explained as in Larson (2000). It is assumed that the full-fledged counterpart of (107a) is (107b), where *possible* takes a nonfinite complement. Only adjectives like *possible* that take a nonfinite complement support the modal superlative reading; *potential* and *probable*, which do not combine with nonfinite clauses, do not permit this reading.

(107)   a. John bought the largest present possible ▲.
        b. John bought the largest present possible for him to buy.

The postnominal restriction is related to heaviness. In the regular modifier reading, we have a bare *possible*; thus, *possible* is "light" and cannot be postposed. In the modal superlative reading, we have a reduced relative clause with ellipsis: *[1 possible ▲ₐ𝒸𝒹]*. The reduced relative counts as "heavy" and can be postposed.

The locality restriction follows directly from one of the key ingredients of the present analysis: since *[1 possible ▲ₐ𝒸𝒹]* is the complement of *-est* in the modal superlative reading, no additional adjective can intervene between *-est* and *possible* when the modal adjective remains in base-generated position.

One interesting open issue remains, concerning the truth conditions that the proposed analysis generates for the modal superlative reading. Just as in Schwarz (2005), sentence (108) receives truth conditions paraphrasable as in (108a). Understanding *possible* deontically, this means that John may have climbed a mountain higher than the maximal height permitted. Is this the correct literal meaning of the sentence, or should we generate a stronger literal meaning along the lines of (108b)?

(108)   John climbed the highest possible mountain.
        a. 'John climbed <u>at least</u> as high a mountain as it was possible/allowed for him to climb.'
        b. 'John climbed as high a mountain as it was possible/allowed for him to climb <u>and no higher</u>.'

A similar question has been posed and answered for equative constructions of the form *as...as*, exemplified in (109). The standard answer for equative constructions is that the "at least" truth conditions correspond to literal meaning and that the "exactly" truth conditions arise via a conversational implicature (see e.g. Schwarzschild 2008:315ff). This analysis is supported by the fact that the latter piece of information is defeasible, as in (110a,b).

(109) John is as tall as Mary.

(110) a. (Of course) John is as tall as Mary. In fact, he is taller.
       b. (Of course) John is as short as Mary. In fact, he is shorter.

Admittedly, the "exactly" truth conditions of (108) do not feel the same way. When one tries to defeat the alleged conversational implicature, the discourse becomes deviant. To my ear, (111a) is marked and (111b) is very odd. However, let me note that the same deviance is felt if we express a similar content directly with the equative construction *as...as*. This is shown in (112).

(111) a. (Of course) John climbed the most mountains possible. #? In fact, he climbed more than the maximum allowed.
       b. (Of course) John climbed the fewest mountains possible. # In fact, he climbed less than the minimum allowed.

(112) a. (Of course) John climbed as many mountains as possible (/he was allowed to). #? In fact, he climbed more than the maximum allowed.
       b. (Of course) John climbed as few mountains as possible (/he was allowed to). # In fact, he climbed less than the minimum allowed.

Taken together, this suggests that the modal superlative reading should probably receive the weaker, "at least" truth conditions in (108a) as its literal meaning. The truth conditions in (108b) and the judgments in (111)-(112) may result from a conspiracy of factors that make certain conversational implicatures indefeasible (cf. Ippolito 2003, Magri 2009). We leave this issue open for future investigation.

Howard (2011) investigates NPIs in sentences like (113). To explain why NPIs are licensed here, he proposes that the underlined relative clause is not a modifier of the head noun, but rather the comparison class argument of -*est*, as in (113a). The NPIs *anyone* and *ever* are interpreted as giving rise to a set of Hamblin alternatives, as in (113b). The final truth conditions are those in (113c):

(113)   John read the most books <u>(that) anyone has ever read</u>.

  a. LF: [est [that anyone in the class has ever read]] l [John read t_1-many books]

  b. ⟦*that anyone has ever read*⟧ = {λd. x read d-many books at t: $x \in C_e$, $t \in C_i$}

  c. $\exists d$ [John read d-many books &

   $\forall D' \in$ {λd. x read d-many books at t: $x \in C_e$, $t \in C_i$}

   [$D' \neq$ [$\lambda d'$.John read d-many books] $\rightarrow \neg D'(d)$]]

Howard (2011) then takes the core analysis of modal superlatives in Romero (2010) and, instead of using SHIFT$^{\downarrow}_{<d,t> \rightarrow <dt,t>}$, he tentatively suggests to treat *possible* as playing an analogous role to *ever* or *anyone*. This produces (114):

(114)   John climbed the most possible mountains.

  a. LF: [est [2 possible <John climbed t_2-many mountains>]] 1 [John climbed t_1-many mountains]

  b. ⟦*2 possible <John climbed t_2-many mountains>*⟧^{w0} =

   {λd. John climbed d-many mountains in w': $w' \in Acc(w_0)$}

  c. $\exists d$ [John climbed d-many mountains in w_0 &

   $\forall D' \in$ {λd. x climbed d-many mountains in w': $w' \in Acc(w_0)$}

   [$D' \neq$ [λd.John climbed d-many mountains in w_0] $\rightarrow \neg D'(d)$]]

We leave open the question whether the appropriate comparison class of degree sets should be derived from *[1 possible ▲]* using the shifters (55) and (66) or using Howard's (2011) method.

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