What is wrong with doubles?

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Plot line

- Under safe semantic assumptions, sentences with multiple adjectival operators are predicted to have trivial truth-conditions.
- We explore three natural reactions to the puzzle and why they are insufficient:
  - Playing with the content of the ellipsis site
  - Allowing for quantification over pairs, triplets, etc. (hereafter *polyadic quantification*)
  - Delaying evaluation of the operators through postsuppositions
- Although all analyses are in trouble, I argue that the first one stands the best chance.

1 Some problematic sentences

(1) **Operators with complements**

a. Amelia carried a bigg**er** elephant over a long**er** distance than Josh.

b. She carried an elephant heavy **enough** over a distance long **enough** that she will be given a medal.

c. She read a **different** book on a **different** train than him.

d. She read the **same** book on the **same** train as him.

(2) **Operators without complements**[1]

a. She carried the bigg**est** elephant over the long**est** distance.

b. The suspects (all) read the **same** book on the **same** train.

c. Every cook here is preparing a **different** dish for a **different** occasion.

The intuitive truth-conditions of these sentences can be expressed through paraphrase that are both *conjunctive* and *existential*.

Procedure for paraphrasing doubles

1. Replace one of the operators by an existential.
2. Compute truth-conditions.
3. Do the same for the other operator.
4. Conjoin the truth-conditions obtained.

(3) Paraphrase of (1a)

a. The elephant that Amelia carried over *some* distance was bigger than the elephant that Josh carried over *some* distance and . . .

b. the distance over which Amelia carried *some* elephant was bigger than the distance over which Josh carried *some* elephant.

[1] Later, we'll evoke the possibility that these operators do have syntactic complements, of clausal size!

Importantly, where we may expect scope interactions, we find none ; either the operators are so luckily defined that they commute, or their scope is not independent of one another.

1.1 3-place *-er* and -est

What do standard assumptions deliver? Depends on the standard assumptions. Let us start with one line of approach that does not rely on covert syntactic material. We'll call this a *purely semantic approach*.

(4) Heim's three place -er

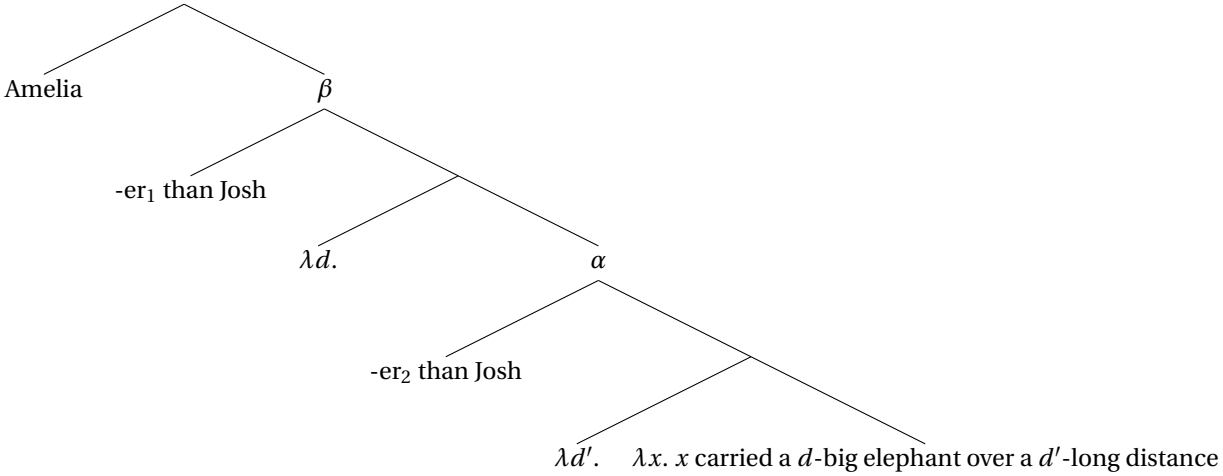
a. Amelia carried a bigger elephant than Josh
LF: Amelia [-er than Josh] $\lambda d.\ \lambda x.\ x$ carried a d-big elephant.

b. $[\![\text{-er}]\!] = \lambda x.\lambda p_{det}.\lambda y.\mathbf{max}(\lambda d.p(d)(y)) > \mathbf{max}(\lambda d.p(d)(x))$

c. **TC: max**(λd. Amelia carried a d-big elephant) >**max**(λd. Josh carried a d-big elephant)

This semantics is both adequate and quite robust, but it yields contradiction/infelicity in the case of doubles.

(5) a. **LF:**



b. $[\![\alpha]\!] = \lambda x.\ \mathbf{max}(\lambda d'.\ x$ carried a d-big elephant over $d') > \mathbf{max}(\lambda d'.$ Josh carried a d-big elephant over $d')$
$\approx$ *the set of people that carried a bigger elephant than Josh over* d. $\not\ni$ Josh

c. $[\![\beta]\!] = \lambda x.\ \mathbf{max}(\lambda d.\ [\![\alpha]\!](\text{x})) > \mathbf{max}(\underbrace{\lambda d.\ [\![\alpha]\!](\text{Josh})}_{=\emptyset!!!})$

One *-er* is in the scope of the other ; by composition rules, this means that Josh will eventually end up being compared to himself. One cannot best oneself, resulting in triviality.

Bones to pick on.

- The sentence has, on the surface, only one *than*-clause. $\rightsquigarrow$ *polyadic quantification*
- Are those comparatives really phrasal? $\rightsquigarrow$ von Stechow (1984)

1.2 Other "*purely semantic*" approaches

3-place denotations. One can similarly devise 3-place meanings for operators like *-est*, relative *same* and *different*. Not all such denotations have an antecedent in the literature. At any rate, they give rise to similar problems[2].

[2] In the case of relational *same*, the composition runs smoothly. To give the reason in the informal terms already used above, one cannot best oneself, but one can certainly be the same as oneself. However, there are reasons to think that the presuppositions obtained are too weak.

What about internal *same*? The analysis are controversial ;

- Beck (2000) Treats as reciprocal in some ways. The reciprocals stack, yielding problematic reading (along the lines discussed in Dotlačil (2012))
- Barker (2007) *same* builds in distributivity. Distributivity will not stack.
- Brasoveanu (2011); Dotlačil (2010). No problem! However, this relies on the fact that *same* and *different* are symmetric. Therefore, the logic of the solution cannot be imported to comparatives, superlatives, etc.

1.3 Goals

Recap.

- A large class of successful analysis of the operators face undue problems with doubles.
- Although it is conceivable that different operators call for different solutions, this would make the generalization about truth-conditions coincidental.
- Let's explore three approaches that have a chance at generalizing.

2 Fancy clausal ellipsis: reconstruction of von Stechow (1984)

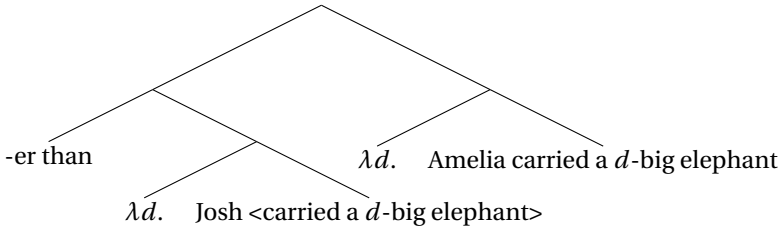
How much mileage can be gotten out of the fact that comparatives are clausal?

Standard assumptions

- *-er* scopes.
- Movement yields structure on which ellipisis can be resolved.

(6) a. Amelia carried a bigger elephant than Josh.

b.

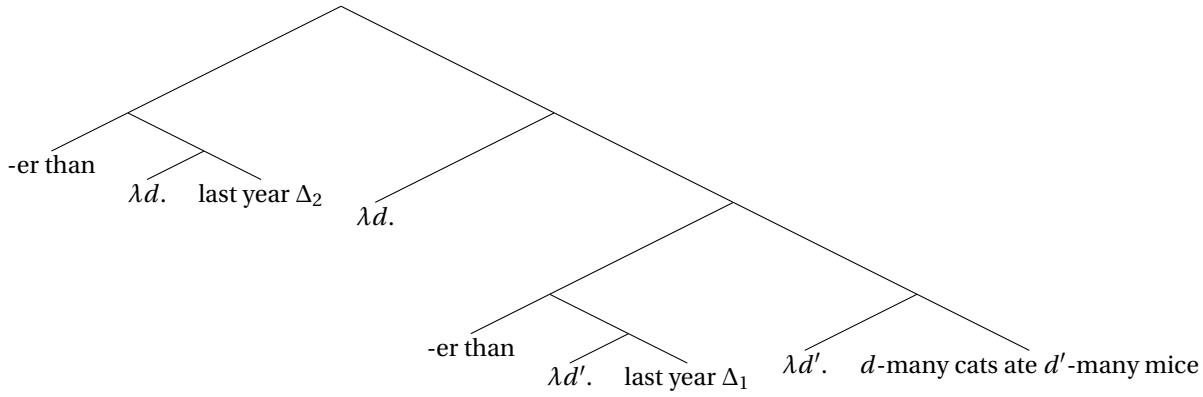


With an articulate structure required for doubles, the number of possible parses grows.

(7) a. This year, more cats ate more mice than last year[3].

[3] If you're wondering why I changed the original example, well spotted! It turns out that our original sentence has a parse that yield the right reading without requiring von Stechow (1984)'s existential closure ; this is because one of the comparative of our original sentence is in an adjunct that can be deleted under ellipsis. However, as the sentence I'm using will show, this parse doesn't generalize.

b.



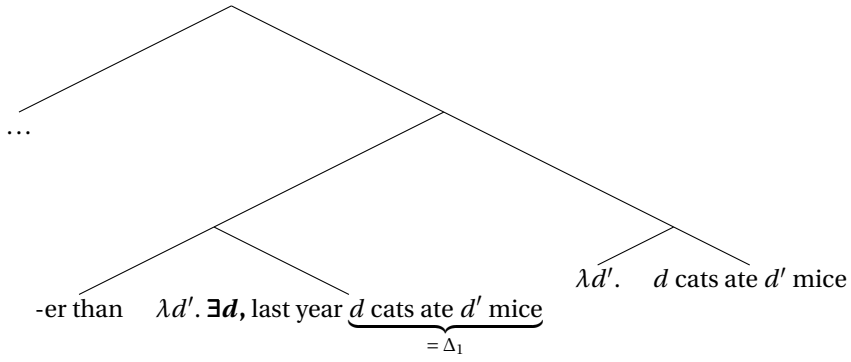
(8) **Resolution I of ellipsis**
$\Delta_1 = \lambda d'$. d-many cats ate d'-many mice
Δ_2 = [-er than $\lambda d'$. last year Δ_1] $\lambda d'$. d-many cats ate d'-many mice
$\rightsquigarrow$ *this compares last year to last year*

We are not out of the bind yet! But there is one other parse at least…

(9) **Resolution II of ellipsis**
Δ_1 = Josh carried a d-big elephant over a d'-long distance
Δ_2 = Josh carried a d-big elephant over a d'-long distance
$\rightsquigarrow$ *d' is unbound!*

Existential closure. We can salvage resolution II if we assume a freely available existential closure operator.

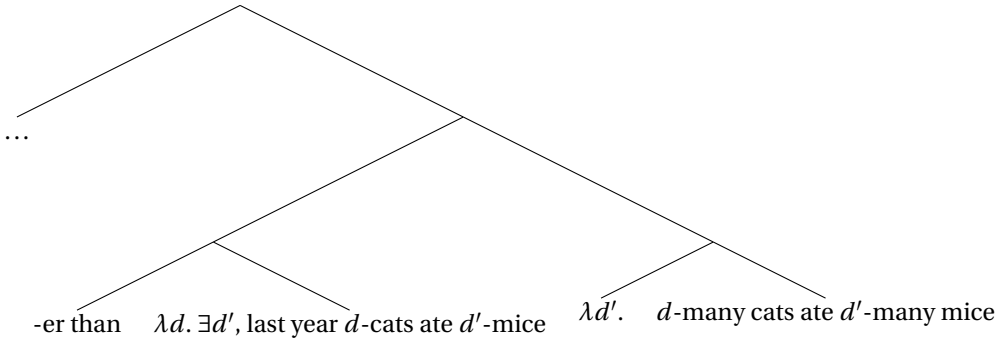
(10)



2.1 Problems

Non-parallel construals. When the two degree predicates are commensurate, there is no constraint that prevents existential closure from applying in the same way in both clauses.

(11)



⇝ *the number of mice this year is compared to the number of cats last year.*

One may hope to prevent that parse with the following loosely stated constraint:

Constraint. Variables in ellipsis and variables in antecedent must be bound from parallel positions positions

(12) Harry told Hermione that the announcement made him fear for her[4].

a. And then, Ron_1 told Draco_2 that it didn't <make him_1 fear for him_2>.

b. *And then, Ron_1 told Draco_2 that it didn't <make him_2 fear for him_1>.

But the condition will not be satisfied by von Stechow (1984)'s original analysis!

(13) $\lambda d. \ldots \lambda d'.\ d$-many cats ate d'-many mice

a. **Higher *than*:** $\lambda d.\ \exists d',\ d$-many cats ate d'-many mice

b. **Lower *than*:** $*\lambda d'.\ \exists d,\ d$-many cats ate d'-many mice

Other operators. Extending the analysis to the other operators commits to a clausal ellipsis of each case where the issue of double arises. 3 cases are problematic:

(14) a. **Internal readings of *same* and *different*:**
Every boy will carry the same elephant over the same distance.

b. **Result clauses:**
Amelia carried an elephant heavy enough over a distance long enough that she will be given a medal.

c. **Relative superlatives:**
Amelia carried the biggest elephant over the longest distance.

On paper, these analyses don't seem impossible:

(15) **Sketch of a clausal ellipsis**

a. Every boy read the same book as ~~each other read the P-book~~

b. Enough people came that ~~if d-many people came~~, the show can go on for a week.

c. Amelia read the longest book ~~than all the others read a d-long book~~

But they are tricky because partial ellipsis does not seem to be an option.

[4] Simpler examples of similar shapes are discussed in the literature (Fox, 1999).

(16) a. The two boys read the same book as yesterday. (*as each other yesterday)

b. # Enough rabbits were caught that if chickens, we could have eaten for a month.

c. # Amelia read the longest book than yesterday.

However, precedents have been set in the literature for structures of that sort.

- **Internal readings of *same* and *different*:** Charnavel (2015)
- **Result clauses:** Meier (2001)
- **Relative superlatives:** Howard (2014)

3 Polyadic quantification

Although the *conjunctive existential* paraphrase of the introduction seems adequate, a pair quantificational paraphrase is also appropriate.

(17) a. Amelia carried the biggest elephant over the longest distance

b. for all $x \neq$ Amelia,
the (d, d') such that Amelia carried a d-big elephant over a d'-long distance
is (component-wise) greater than
the (d, d') such that x carried a d-big elephant over a d'-long distance

A tentative argument for pair quantification. Under the standard movement single-degree analysis, (18) requires a violation of the Coordinate Structure Constraint (compare with (18b))...

(18) a. We are enjoying a richer and fuller life than our ancestors.[5] (adapted from COCA)

b. We are enjoying a richer and full life than our ancestors.

c. [-er than our ancestors] λd. [-er than our ancestors] $\lambda d'$. we are enjoying a d-rich and d'-full life than our ancestors.

...unless the movement is ATB! But if that is so, we are committed to a single *than*-clause. This in turn has repercussions downstream for what kind of variable *-er* quantifies over.

(19) [-er than our ancestors] λX. we are enjoying a X-rich and X-full life.

(20) seems sensible. If it is, then we are committed to pair quantification and more generally to polyadic quantification.

(20) [-er than our ancestors] $\lambda(d, d')$. we are enjoying a d-rich and d'-full life.

[5] Although I have not confirmed with speakers of Native English, it feels to me that one could convey this meaning equally well with *...a richer and **a** fuller life ...*. How the two indefinites come to pick out one and the same referent in that version of the sentence is an interesting side puzzle.

Accounting for doubles with polyadic quantification. There are choice points in how the entry for *-er* should generalize ; similar choice points exist for the other operators. Here, the following is appropriate:

(21) a. **Monadic *-er*:** $\lambda q_{dt}.\lambda p_{dt}.\max_d\ p(d) > \max_d\ q(d)$

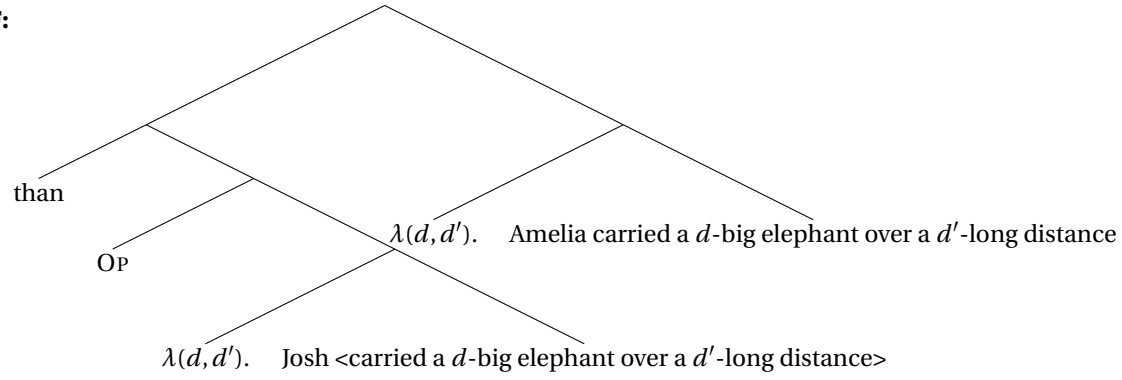
b. **Dyadic *-er*:** $\lambda q_{d^2t}.\lambda p_{d^2t}.\max_{(d,d')}\ p(d,d') > \max_{(d,d')}\ q(d,d')$ with:

- $(d_1,d_1') > (d_2,d_2')$ iff $d_1 > d_2$ and $d_1' > d_2'$
- $\max_x\ p(x) = \iota x : \forall y, p(y) \rightarrow y < x$

c. ...

(22) a. Amelia carried a bigger elephant over a longer distance than Josh.

b. **LF:**



Unclear how such an LF is obtained. Here is a suggestion:

- *than* is base-generated.
- The relation between *than* and *-er* is one of agreement (multiple agree possible)
- Same goes for Op

3.1 Problems

Polyadic quantification can treat limited cases where quantifications contributed by the two operators can be "*unified*". There are at least two cases where that doesn't seem to be possible.

Multiple complements. Two *than*-clauses may be expressed.

(23) a. I gave more books than Aviva to more people than Peter

b. So many lectures that we had no time to attend them all were given by such boring professors that we didn't want to attend them all. (Meier, 2001)

c. I gave a different speech than Sue in a different room than Peter.

Accounting for the sentences in (23) within the polyadic approach is impossible. Note however the interesting restrictions and possibilities for multiple complement sentences.

(24) a. ?I gave the same lecture as Roger on the same day as Danny.

b. I hit the car harder than Bill with a bigger hammer than Sue[6].
Well, of course, Bill used his bare hands so the comparison is not fair[7].

[6] I am indebted to Christopher for remarking this.

[7] This possibility is straightforward in von Stechow (1984), confirming my intuition that this account is on the right track.

Different operators. Sentences with doubles can be constructed where the two operators are different. They are equally hard to account for by the "*purely semantic*" approach we discussed.

(25) a. I gave a different speech than Sue to more people than her (…so our situations are not at all comparable.)

b. Amelia carried a bigger elephant than Josh over a distance long enough that she should be given the gold medal.

4 Postsuppositions

The non-scopal behaviour of double sentences is reminiscent of cumulative readings of modified numerals.

(26) Exactly 10 ghostwriters wrote exactly 15 autobiographies last month.

Brasoveanu (2013)'s claim. No ordering of the quantifiers at play can explain the cumulative reading of (26)[8].

Standard accounts always generate at least the LF (everything in this section is written in patasemantics, more details are offered in the appendix)

(27) $m = 15$ [$\max_m$ [$n = 10$ [$\max_n$ [n ghostwriters wrote m autobiographies]]]

Brasoveanu (2013) proposes to "*delay*" the assertion about the numerals after maximality operators have applied.

(28) $\underbrace{m = 15}_{\textit{post-sup.}}$ [$\max_m$ [$\underbrace{n = 10}_{\textit{post-sup.}}$ [$\max_n$ [n ghostwriters wrote m autobiographies]]]
$\Leftrightarrow$

The adaptation of Brasoveanu (2013) in a nutshell. If comparatives are phrasal (as in "*purely semantic*" approaches), then the computation involves two steps:

a forming the standard (or complement, whatever the case may be)

b performing the comparison

(29) Amelia [-er than Josh] λd. carried a d-big elephant

a. **standard:** λd. Josh carried a d-big elephant

b. **comparison:** $\max(\lambda d$. Amelia carried a d-big elephant$) > \max(\lambda d$. Josh carried a d-big elephant$)$

The idea is to delay the evaluation of b. This way, when two operators are in the sentence, neither of their standards will contain a comparison. This avoids the problem faced by the "*purely semantic*" approaches.

(30) Amelia [-er$_2$ than Josh] λd. [-er$_1$ than Josh] $\lambda d'$. carried a d-big elephant over a d'-long distance.

a. **standard of *-er*$_1$:** λd. Josh carried a d-big elephant over a $\exists$-long distance

b. **comparison of *-er*$_1$ delayed**

c. **standard of *-er*$_2$:** λd. Josh carried a $\exists$-big elephant over a d'-long distance

d. **comparison of *-er*$_2$ delayed**

e. **comparisons of *-er*$_1$ and *-er*$_2$ performed**

A functioning set-up that does that is given in the appendix.

[8] Under decompositional analysis of numerals *à la* Hackl (2000), the correct reading can be generated but the pseudo-cumulative reading of (27) can as well.

A even higher-level recap. The adaptation comes at a cost not required by the account of cumulative readings.

Assumptions

- The operators at play are always phrasal.
- Abstraction over degrees must be "*dynamic*". In other words, the trace is interpreted as an existential and a predicate is formed through *existential disclosure*
  $\rightsquigarrow$ *a binder may not be separated from its bindee by externally static operators, such as negation, universal quantification, etc.*
- Assertive (i.e. non-postsuppositional content) must be accessible to semantic operators.

4.1 Problems

Missed interactions. The operators are postsuppositional and will therefore interact with other postsuppositional material, in particular modified numerals.

(31) a. This year, more cats ate exactly five mice than last year

b. **Predicted TCs:**
the number of mice that were eaten by cats this year is 5
and the number of cats that ate mice this year is greater than the number of cats that ate mice last year.

In other words, any number of mice can be eaten[9].

Intervention. The reliance of "*dynamic binding*" underpredicts standard cases that the literature has been interested in, because the relevant operator is externally static.

(32) Amelia wants to carry a bigger elephant than Josh.

5 Avenues

None of the analyses above have proven successful but I see more hope with von Stechow (1984)

The inevitability of clausal ellipsis. Since some of the operators at play are unambiguously clausal, we owe an account of what is in the ellipsis site *anyway*... Thus, all of the analysis above must incorporate von Stechow (1984) in some way.

(33) Amelia carried a heavier elephant than Sue yesterday over a longer distance than Bill this morning.

For reasons already explored, neither complement can contain a comparative operator. Thus, our licensing conditions of ellipsis must be sufficiently loose that they tolerate removal of an operator.

5.1 Some speculations about the challenges raised by von Stechow (1984)

5.1.1 Existential closure

My reconstruction of von Stechow (1984) used covert degree closures. The freedom afforded by free existential closure lead to overgeneration. Let me suggest another way of getting that existential in the LF, by exploiting parallel to other types of ellipsis

[9] There does not seem to be a cumulative reading of that sentence interestingly ; this is not predicted by a standard account.

Similarities with sluices. It is thought that there must parallelism between the sluice and the previous clause (here, I follow the recent Kotek and Barros (2019)).

(34) a. He read some poems but I don't remember which ones λ_i <he read t_i>.

b. $\bigcup [\![\text{he read some poems}]\!]^f = \bigcup [\![\text{which poems he read}]\!]^f$

What then licenses the following sluice:

(35) He read a lot of poems yesterday but I don't really know which ones λ_i <he read t_i>.

Maybe a "*super QR*"?

(36) a lot of poems λ_i he read t_i yesterday but I don't really know which ones <λ_i he read t_i>.

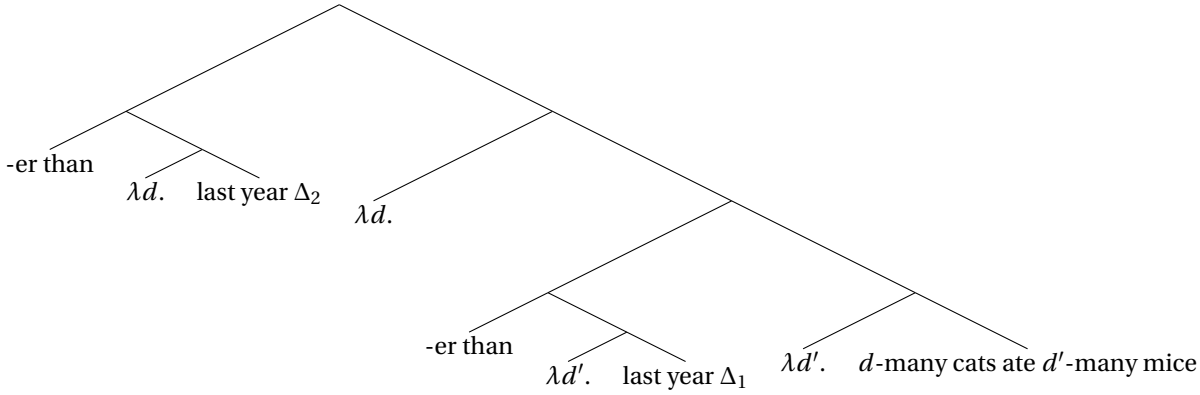
Arguments in Kotek & Barros against this easy solution is based on Scope Economy, but they may be weak. If not, then it seems that a quantificational antecedent is considered equal enough to an existential in ellipsis.

Tantalizing possibility. For the purpose of ellipsis, *sometimes*[10],

$$\text{Op } \lambda a. \ldots a \approx \exists\, \lambda a. \ldots a$$

Back to comparatives. The tantalizing possibility above paves the way to another resolution of ellipsis.

(37)



(38) **Resolution III of ellipsis**

$\Delta_1 = \lambda d'.\ d$-many cats ate d'-many mice

$\Delta_2 = [\sout{\text{-er than } \lambda d'.\ \text{last year } \Delta_1}]\ \lambda d'.\ d$-many cats ate d'-many mice

$\rightsquigarrow \exists$

In this account, there would be no freely available degree closure (i.e. Resolution II from section 2 is not available). This allows us to escape the non-parallel construals discussed in section 2.1.

5.1.2 Relating clausal ellipsis to other operators

There are connections between focus semantics and ellipsis licensing conditions. Whatever in the focus semantics licenses the mismatch between antecedent and ellipsis may license similar mismatches for focus-sensitive operators.This could be used to adress the lack of generalizability to operators that did not *transparently* take a complement. In particular, we may be able to extend von Stechow (1984) to operators without complement which are focus-sensitive (i.e. *-est*).

Some other operators are still mysterious because they seem to involve neither ellipsis nor focus-sensitivity: internal *same* and *different* and result clauses.

[10] It is obvious that this must be constrained to avoid massive overgeneration. I'm still trying to figure out how. In any case, if we accept Kotek and Barros (2019)'s argument, then this must be true at least sometimes.

6 Conclusion

Recap

- Sentences with two adjectival operators involve difficulties that cannot be solved by "*purely semantic*" means
- We formalized three natural reactions to the puzzle
  - Playing with the content of ellipsis von Stechow (1984)
  - Allowing for polyadic quantification
  - Delaying evaluation of the operators using postsuppositions
- All approaches are unsuccessful but I showed the challenges raised to von Stechow (1984) are in fact problems to everyone.

Appendix: postsuppositional framework

6.1 Setting up postsuppositions

(39) Exactly three boys read exactly five books

Two-tiered meaning: normal update content and postsuppositions. Formally, a pair of a meaning (i.e. an update) and a test. Visually, formulas that have no assertive content and only postsuppositional content will be represented as this: $\underline{|\boldsymbol{x}| = \mathbf{3} \wedge |\boldsymbol{y}| = \mathbf{5}}$

(40) a. $\sigma x\left(\mathtt{boy}'(x) \wedge \sigma y\left(\mathtt{book}'(y) \wedge \mathtt{read}'(x)(y)\right)\right) \wedge \underline{|\boldsymbol{x}| = \mathbf{3} \wedge |\boldsymbol{y}| = \mathbf{5}}$

b. **Operator accessing assertive content of a formula:**
$Assert(\phi) = \sigma x\left(\mathtt{boy}'(x) \wedge \sigma y\left(\mathtt{book}'(y) \wedge \mathtt{read}'(x)(y)\right)\right)$

c. **Operator accessing postsuppositional content of a formula:**
$Post(\phi) = |x| = 3 \wedge |y| = 5$

d. $\lightning \phi := Assert(\phi) \wedge Post(\phi)$ (discharge operator)

Postsuppositions must be discharged at CP (why?).

6.2 Abstraction in Dynamic Semantics

In DS, we can approach the problem of abstraction in one of two ways

(41) a. Standard way: Trace is a variable ; creates function mapping from value for variable to value of constituent.

b. Dynamic way: Trace is a referent introducer ; creates function by *existential disclosure*

Existential disclosure

$$\Lambda_x\left(\exists x, f(x)\right) = \lambda y.\left(\exists x, f(x)\right) \wedge y = x$$
$$= \lambda x.f(x)$$

Dynamic abstraction is what we need here because it will insert the existentials we need for the *conjunctive existential* paraphrase we're aiming for.

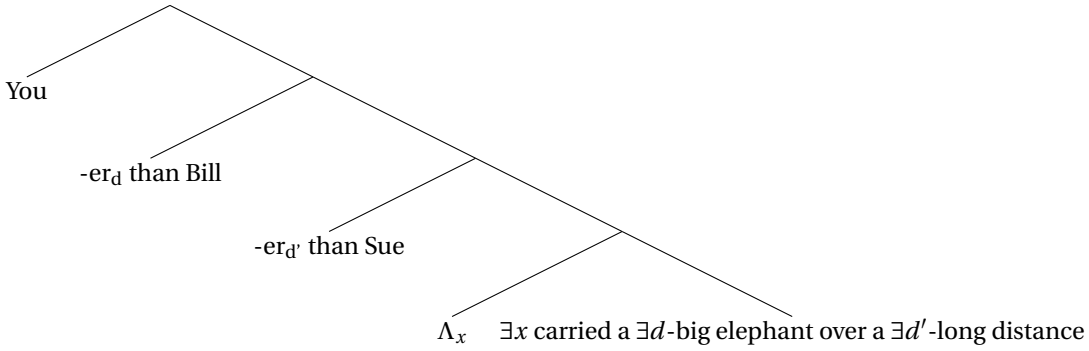
6.3 Postsuppositional more

We'll focus on a putative phrasal *more*.

(42) $[\![\text{-er than } \beta]\!] = \lambda p_{et}.\lambda x.\ p(x) \wedge \underline{\boldsymbol{d} > \boldsymbol{d}_{\boldsymbol{Assert(p([\![\beta]\!]))}}}$
where $d_F = \lambda g.F(g)(d')$, i.e. the value of d after performing the update of formula F on input g.[11]

(43) a. You carried a heavier elephant than Bill over a longer distance than Sue.

b. **LF:**



c. **Derivation:**

$$\left[\!\left[\textcircled{1}\right]\!\right] = \lambda x.\left(\exists d, \exists d', C(x)(d)(d')\right) \wedge \underline{\boldsymbol{d} > \boldsymbol{d}_{\exists \boldsymbol{d}, \exists \boldsymbol{d}', \boldsymbol{C}(\text{Sue})(\boldsymbol{d})(\boldsymbol{d}')}}$$

$$\left[\!\left[\textcircled{2}\right]\!\right] = \lambda x.\left(\exists d, \exists d', C(x)(d)(d')\right) \wedge \underline{\boldsymbol{d} > \boldsymbol{d}_{\exists \boldsymbol{d}, \exists \boldsymbol{d}', \boldsymbol{C}(\text{Sue})(\boldsymbol{d})(\boldsymbol{d}')}} \wedge \underline{\boldsymbol{d}' > \boldsymbol{d}'_{\exists \boldsymbol{d}, \exists \boldsymbol{d}', \boldsymbol{C}(\text{Bill})(\boldsymbol{d})(\boldsymbol{d}')}}$$

$$[\![(43b)]\!] = \left(\exists d', \exists d, C(\text{you})(d)(d')\right) \wedge \underline{\boldsymbol{d} > \boldsymbol{d}_{\exists \boldsymbol{d}, \exists \boldsymbol{d}', \boldsymbol{C}(\text{Sue})(\boldsymbol{d})(\boldsymbol{d}')}} \wedge \underline{\boldsymbol{d}' > \boldsymbol{d}'_{\exists \boldsymbol{d}, \exists \boldsymbol{d}', \boldsymbol{C}(\text{Bill})(\boldsymbol{d})(\boldsymbol{d}')}}$$

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