MULTI-HEADED COMPARATIVES AND *TOUGH* MOVEMENT

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In comparatives, a *gradable property* is silenced by *Comparative Deletion* or *Comparative Subdeletion* (Chomsky 1965; Selkirk 1970; Bresnan 1973; Kennedy 1999; Lechner 2004; i.a.):

(1) ***Comparative Deletion***
- a. This book is longer than that book is.
- b. Syntax: This book is longer than [OP_1 that book is d_1-<**long>**]
- c. Interpretation: {d|that book is d-long} ⊂ {d|this book is d-long}

(2) ***Some types of comparatives***
- a. This book is **longer**$_{AP}$ than that book is. *predicative comparative*
- b. Mary read **longer books**$_{NP}$ than Bill read. *attributive comparative*
- c. Mary read **more books**$_{NP}$ than Bill read. *amount comparative*

(2)
- a. This book is longer$_{AP}$ than that book is d_1-<**long>**
- b. Mary read longer books$_{NP}$ than Bill read d_1-<**long books>**
- c. Mary read more books$_{NP}$ than Bill read d_1-<**many books>**

(3) ***Comparative Subdeletion*** (Chomsky 1965; Bresnan 1973; Kennedy & Merchant 2000; i.a.)
- a. The table is **longer** than the door is d_1**-wide.** *predicative subcomparative*
- ☞ b. Mary read **longer books**$_{NP}$ than Bill did d_1-<**many>** papers. *attributive subcomparative*
- c. Mary read **more books**$_{NP}$ than d_1-<**many>** papers. *multi-headed/*
- d. John drank **more milk**$_{NP}$ than d_1-<**much>** water. *amount subcomparative*
- ☞ e. **More men**$_{NP}$ than d_1-<**many>** women smoke.

The main focus of this talk is on attributive comparatives and multi-headed subcomparative.

The *comparative relation* is introduced by an abstract ***degree head***. Morphological exponents of this head are *more*, *-er*, *less*, *as*, etc. Degree heads project *degree phrases* (***DegP***):

(4)
- a. This book is longer/more interesting than that book is.
- b. This book is **[**$_{DegP}$ long/interesting **MORE** [than that book is d_1-<long/interesting>]]

Decomposition: the degree argument is ***compositionally*** introduced by an abstract version of *much* (Bresnan 1973; Wellwood 2012, 2014, et seq.; Solt 2009, 2015; cf. little v):

(5)
- a. The table is long.
- b. The table is <**MUCH**> long. (Bresnan 1973)
- c. Interpretation: ∃d.the table is **d**-much long.

In nominal contexts, MUCH shows up overtly (Bresnan 1973):

(6)
- a. so **much** water so **many** books
- b. as **much** water as **many** books
- c. too **much** water too **many** books

☞ *An underexplored issue:* How is the degree argument introduced in ***nominal*** comparatives?

Roadmap

§2. Comparatives
- Lexical theories of gradable adjectives
- Three options for the syntactic structure of degree phrases
- A decompositional analysis (following Wellwood 2014; Solt 2015)

➜ ***New evidence for decomposition***

§3. The proper treatment of attributive comparatives

➜ ***Prenominal APs are not adjoined to NP***

§4. (Attempt at) a new analysis for multi-headed subcomparatives.

§5. ***A new generalization*** about multi-headed subcomparatives

§6. Possible venues towards an analysis of the generalization

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2. COMPARATIVES

2.1. ORTHODOXY

Measure functions (type <e,d>) are functions that map individuals to the maximal degree on the scale the function is defined for:

(7) a. LENGTH = λx_e.x's length *Type <d,e>*
'for each x: the maximal degree to which x is long'

b. AGE = λx_e.x's age
'for each x: the maximal degree to which x is old'

The ***lexical entry*** of gradable adjectives includes measure functions. Gradable adjectives denotes a relation between individuals and sets of degrees on a scale (<d,<e,t>> or <e,<d,t>>; Seuren 1973; Hellan 1981; von Stechow 1984; Bierwisch 1989, i.a.).

(8) a. ⟦**tall**⟧ = $\lambda d_d.\lambda x_e$.HEIGHT(x) ≥ d *Type <d,<e,t>>*
('the degrees to which x is at most tall')

b. ⟦**old**⟧ = $\lambda d_d.\lambda x_e$.AGE(x) ≥ d
'the degrees to which x is at most old'

➜ The degree argument is part of the *lexical specification* of gradable predicates

Degree phrases: There are ***three*** main views of how adjectives combine with DegPs syntactically. Different choices about the syntax potentially require different meaning rules for MORE.

Option A (Chomsky 1965; Selkirk 1970; Bresnan 1973; Carlson 1977; Heim 2000; Bhatt & Pancheva 2004; Wellwood 2015; i.a.)

- ♦ AP includes DegP
- ♦ *than*-XP is complement of MORE ➜ *in-situ* or QR

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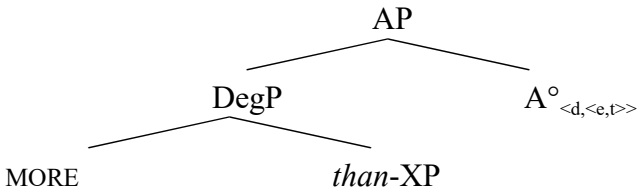
(9)



Lexical entry for MORE that fits the phrase structure (9) *without* scoping (von Stechow 1984, i.a.):

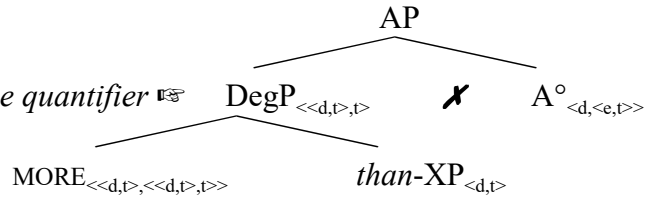
(10) $[\![\textbf{MORE}]\!] = \lambda d_d.\lambda AP_{<d,<e,t>>}.\lambda x_e.\exists d'[AP(d')(x) \wedge d < d']$ *Type <d,<d,et,<et>>>*

Alternative lexical entry as *generalized degree quantifier* that requires QR of *than*-XP (Heim 2000; Hackl 2000; Meier 2000, i.a.):

(11) a. $[\![\textbf{MORE}_{\textbf{GQ}}]\!] = \lambda D_{dt}.\lambda D'_{dt}.D' \subset D$ *Type <<d,t>,<<d,t>,t>>*
b. $[\![\textbf{MORE}_{\textbf{GQ}}]\!] = \lambda D_{dt}.\lambda D'_{dt}.\iota d[D'(d) < \iota d[D(d)]$

(12) $[\![\textbf{every}]\!] = \lambda P_{et}.\lambda Q_{et}.P \subseteq Q$ *Type <<e,t>,<<e,t>,t>>*

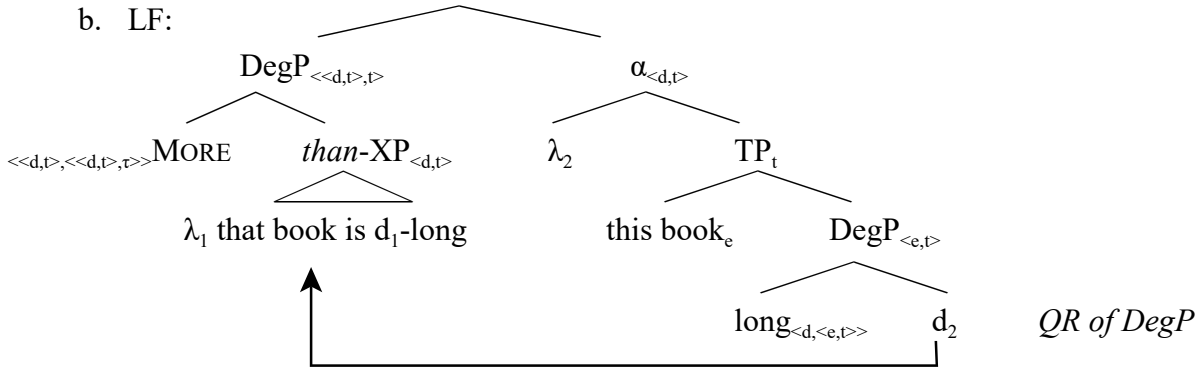
(13)



Generalized degree quantifier ☞ ✗ *Type mismatch*

DegP QRs to resolve type mismatch (Heim 2000; for early precedent see Dresher 1977: 375ff):

(14) a. This book is longer than that book is.
b. LF:



(15) a. LF: [MORE than λ_1 book is d_1-long] λ_2 this book is d_2-long
b. $[\![$[MORE than λ_1 that book is d_1-long] λ_2 this book is d_2-long$]\!]$
c. {d|that book is d-long} ⊂ {d|this book is d-long}
d. ≈ ιd[that book is d-long] < ιd[this book is d-long]

Evidence for QR: Interaction of (i) non-monotone differentials and (ii) *less*-comparatives with modals (Heim 2000; Stateva 1999; Rullmann 1995; Gawron 1995; i.a.):

(16) [*Context*: the draft is 10 pages]. The paper is required to be **exactly 5 pages longer** than that.
a. $\lambda w.\forall w' \in Acc_{Deon}(w)(w')$: ιd[the paper is d-long in w'] = 15 pages
'The paper must be no longer than 15 pages.' (*require* ≻ MORE, *maximum*)
b. $\lambda w.\iota d[\forall w' \in Acc_{Deon}(w)(w')$: the paper is d-long in w'] = 15 pages
'The paper must be at least 15 pages long.' (MORE ≻ *require*, *minimum*)

(17) $Acc_{Deon}(w)$: set of deontic alternatives accessible from w.

(18) a. Low DegP: [required [[exactly 5 pages MORE than 10 pages] [the paper be d-long]]]
☞ b. High DegP: [**[exactly 5 pages MORE than 10 pages]** [required [the paper be d-long]]]

(19) [*Context*: the draft is 10 pages]. The paper is required to be **less long** than that.

a. $\lambda w.\forall w' \in Acc_{Deon}(w)(w')$: ιd[the paper is d-long in w'] < 10 pages (*require* ≻ *less*)
'The paper must be less long than 10 pages.'

b. $\lambda w.\iota d[\forall w' \in Acc_{Deon}(w)(w')$: the paper is d-long in w'] < 10 (*less* ≻ *require*)
'The paper does not have to be 10 pages long.'

Option B (von Stechow 1984; Abney 1987; Larson 1988; Corver 1990, 1997; Rullmann 1995; s.a. Kennedy 1999):

- DegP includes AP.
- *than*-XP is an adjunct to DegP.
- *than*-XP and MORE do not form a constituent ➜ ✗QR

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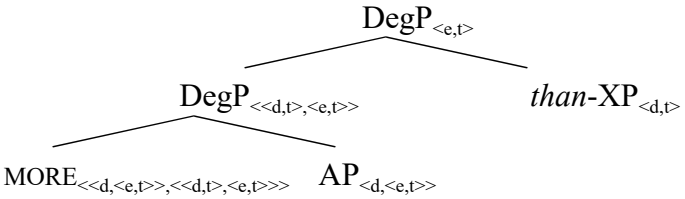
(20)



(21) $[\![\textbf{MORE}]\!] = \lambda AP_{<d,<e,t>>}.\lambda D_{<d,t>}.\lambda x_e.D \subset \lambda d.AP(d)(x)$ (von Stechow 1984)

Option C (Izvorski 1995; Lechner 1999, 2004):

- DegP includes AP.
- *than*-XP is the complement of MORE (selection)
- AP surfaces in SpecDegP.
- Comparative morphology reflects an Agree relation (specifier-head agreement) between the head of AP and MORE.
- *than*-XP and MORE form a unit ➜ ✓QR

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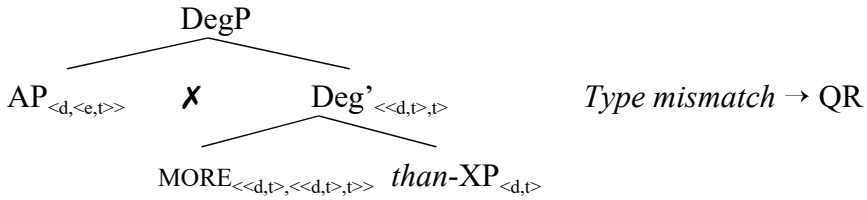
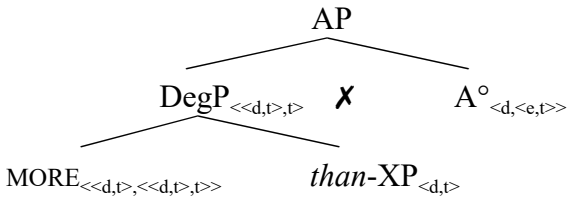
(22)



Type mismatch → QR

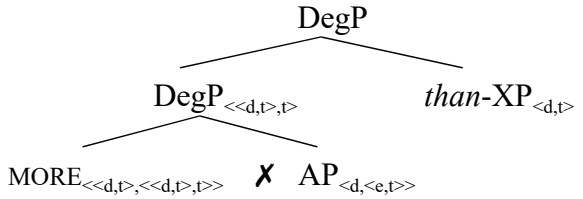
Constituency, scope and $MORE_{GQ}$: The Generalized Quantifier analysis of MORE requires scoping, which in turn imposes restrictions on the syntax of DegP. Only parses A and C are compatible with $MORE_{GQ}$:

(23) ✓*Option A*



Type mismatch → QR

(24) ✗*Option B*



Type mismatch - but QR is impossible!

➜ Option B is incompatible with MORE_{GQ} (Late Merge of *than*-XP; Bhatt & Pancheva 2004)

2.2. DECOMPOSITIONAL THEORIES

In the lexical account, degrees are part of the denotation of gradable predicates. Alternatively, it has been suggested to separate the degree argument from the adjective denotation:

(25) a. Gradable adjectives denote ***properties of states*** (type <v,t>; Fults 2006; Wellwood 2012, 2014, 2019, and references therein)

b. Degree arguments are ***compositionally introduced*** by functional heads (Bresnan 1973; Fults 2006; Wellwood 2012, 2014; Solt 2015)

(26) $[\![\textbf{long}]\!]$ = $\lambda s_v.\text{long}(s)$
'states of being long'

Proposal: An object language head μ° introduces the degree and the individual argument.

(27) $[\![\boldsymbol{\mu}]\!]$ = $\lambda P_{vt}.\lambda d.\lambda x.\exists s.P(s) \wedge \text{Holder}(s)(x) \wedge \mu_S(s) \geq d$ *Type <<v,t>,<d,et>>*
(μ_S: meta language measure function relative to a scale S)

(28) $[\![\boldsymbol{\mu}\ \textbf{long}]\!]$ = $\lambda P_{vt}.\lambda d.\lambda x.\exists s.P(s) \wedge \text{Holder}(s)(x) \wedge \mu_S(s) \geq d\ (\lambda s_v.\text{long}(s))$
= $\lambda d.\lambda x.\exists s.\text{long}(s) \wedge \text{Holder}(s)(x) \wedge \mu_S(s) \geq d$

Previous proposals:

(29) $[\![\textbf{Meas}]\!]$ = $\lambda x.\lambda d.\mu_S(x) \geq d$ (Solt 2015: 35)

(30) $[\![\textbf{much}]\!]$ = $\lambda d.\lambda \alpha.\mu(\alpha) = d$ (Wellwood 2012: 11)
(where α is a type of an ordered domain)

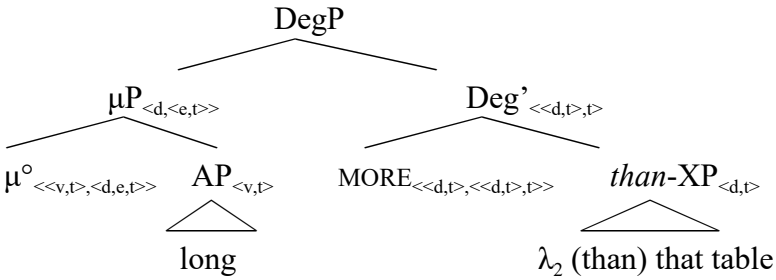
Some differences between the present proposal and Wellwood (2012, 2014, 2019)

- μ° introduces **both** the degree argument and the individual argument (the holder of the state).
- Denotation of μ° existentially closes off states.
- μP denotations remain of standard type <d,<e,t>>.

➜ There is no need for new composition rules or additional lexical entries for MORE.

Details: Assembling the DegP (Option C)

(31) (This table is) longer than that table is long



Type mismatch → QR

(32) a. This table is longer than that book is.

b. LF: [[(than) that table is λ_2 is [μ° long]-d_2] MORE_{GQ}] λ_1 [this table is [$_{\mu P}$ μ° long] t_1]

c. $[\![[_{\mu P}\ \boldsymbol{\mu^\circ}\ \textbf{long}]\ \mathbf{t_1}]\!]$ = $\lambda x.\exists s.\text{long}(s) \wedge \text{Holder}(s)(x) \wedge \mu_S(s) \succeq t_1$

d. $[\![\textbf{this table is } [_{\mu P}\ \boldsymbol{\mu^\circ}\ \textbf{long}]\ \mathbf{t_1}]\!]$ = $\exists s.\text{long}(s) \wedge \text{Holder}(s)(\text{this table}) \wedge \mu_S(s) \succeq t_1$

e. $[\![\boldsymbol{\lambda_1}\ \textbf{this table is } [_{\mu P}\ \boldsymbol{\mu^\circ}\ \textbf{long}]\ \mathbf{t_1}]\!]$ = $\lambda d.\exists s.\text{long}(s) \wedge \text{Holder}(s)(\text{this table}) \wedge \mu_S(s) \succeq d$

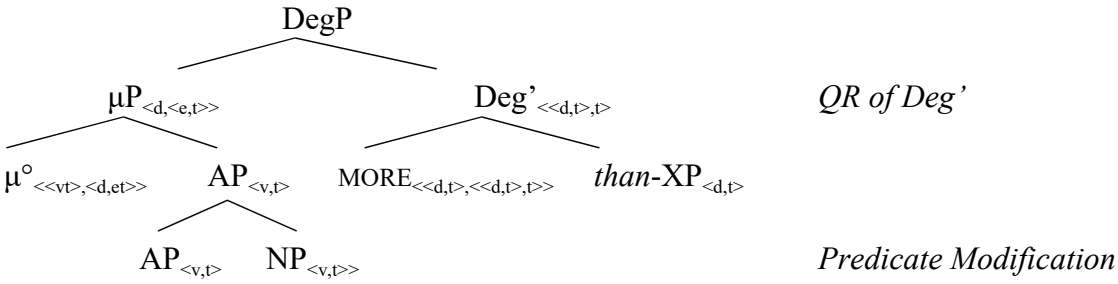
f. $[\![[[(\textbf{than})\ \textbf{that table is}\ \boldsymbol{\lambda_2}\ \textbf{is}\ [\boldsymbol{\mu^\circ}\ \textbf{long}]\text{-}\mathbf{d_2}]\ \mathbf{MORE_{GQ}}]\ \boldsymbol{\lambda_1}\ [\textbf{this table is}\ [_{\mu P}\ \boldsymbol{\mu^\circ}\ \textbf{long}]\ \mathbf{t_1}]]\!]$

= $\iota d[\exists s.\text{long}(s) \wedge \text{Holder}(s)(\text{that table}) \wedge \mu_S(s) \succeq d] <$
$\iota d[\exists s.\text{long}(s) \wedge \text{Holder}(s)(\text{this table}) \wedge \mu_S(s) \succeq d]$

Attributive comparatives: the μ-theory, combined with Option C, affords a simpler and empirically better analysis of attributive comparatives than Wellwood (2015: 82; 2019).

(33) Mary read a longer book than Bill.

(34)



Analysis

- The DegP is structured as in ***Option C*** (gradable property in SpecDegP).
- AP and NP form a unit to the exclusion of MORE (Lechner 1999, 2004).
- ***Nouns*** are analyzed as ***predicates of states*** (Schwarzschild 2021).
- AP and NP combine by Predicate Modification.
- μP denotations remain of standard type <d,<e,t>>.

➜ There is no need for new composition rules or new lexical entries for MORE.

Observation: In lexical theories, AP and NP cannot combine by standardly sanctioned rules. One could of course devise one, but the decompositional analysis offers a more parsimonious account.

(35) a. $[\![\textbf{long}]\!]$ = $\lambda d.\lambda x.\text{long}(d)(x)$
b. $[\![\textbf{book}]\!]$ = $\lambda x.\text{book}(d)(x)$
c. $[\![\textbf{long}]\!] \not\circ [\![\textbf{book}]\!]$

➜ *Evidence for a decompositional analysis of gradable adjectives*

Observation: Under Option A, AP embeds the whole DegP. Hence, AP cannot combine with NP to the exclusion of MORE. As a result, AP needs to adjoin to NP.

Prediction: ***Option A:*** Prenominal attributive modifiers ***behave like adjuncts***.

☞ ***Option C:*** Prenominal AP and NP (can) ***form a unit*** excluding MORE

In the next section, it will be seen that attributive comparatives are compatible with Option C only.

3. THE STRUCTURE OF ATTRIBUTIVE COMPARATIVES

1. CED Islands. The *than*-XP embeds an empty operator movement chain:

(36) than OP λ_1 Bill is d_1-tall

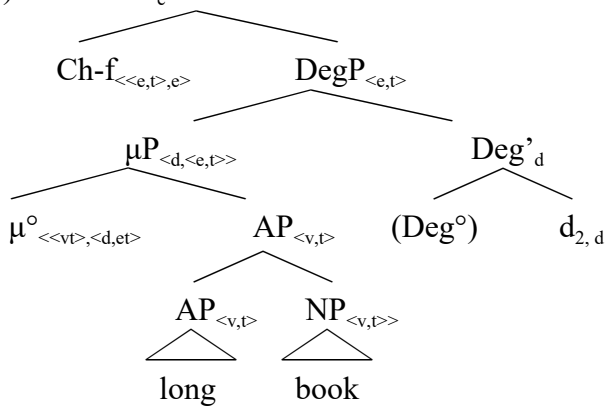
The AP-adjunction analysis entails that OP-movement crosses an adjunct island (Left Branch Condition; Heim 1985; Moltmann 1992, i.a.):

(37) Mary read a longer book than Bill did.

(38) *AP is adjoined to NP*
[than OP λ_1 Bill read a [$_{NP}$ [$_{DegP}$ ☛ d_1-long] [$_{NP}$ book]] ✗*Left Branch Condition*

Island violations are avoided under Option C, because degree abstraction binds a variable that is the complement of (a semantically empty) Deg°:

(39) a. Mary read a longer book than Bill.
b. λ_2 (than) Bill read α_e



(Ch-f: choice function)

✓*Left Branch Condition*

➜ Evidence in support of Option C and against adjunction analysis

2. Word order. The *than*-XP cannot precede AP:

(40) a. *She read **than Sally** older books
b. *She read more **than Sally** interesting books

This is unexpected under Option A and for decompositional analyses (Wellwood 2015, 2019):

(41) Option A: [$_{NP}$ [$_{AP}$ [$_{DegP}$ MORE *than*-XP] A°] NP]

(42) a. *She read **than Sally** older books
b. *She read more **than Sally** interesting books

Possible reply (Wellwood 2015, i.a.): the *than*-XP undergoes obligatory extraposition

3. Extraposition. This can't be correct. While *than*-phrases can extrapose ((43)a), prenominal APs are known to block extraposition of other constituents ((43)b and (44); Lechner 2004). Again, this comes as a surprise for Option A.

(43) a. Mary met [an [older t] man] yesterday [**than Sally met**]. (ex. from Alrenga et al. 2012)
b. *Mary met [an [angry t] man] yesterday [**at Sally].**

(44) *eine [$_{NP}$ [$_{NP}$ [$_{AP/DegP}$ stolze t_1] [$_{NP}$ Frau]] [auf ihren Hund]$_1$]
a proud woman of her dog

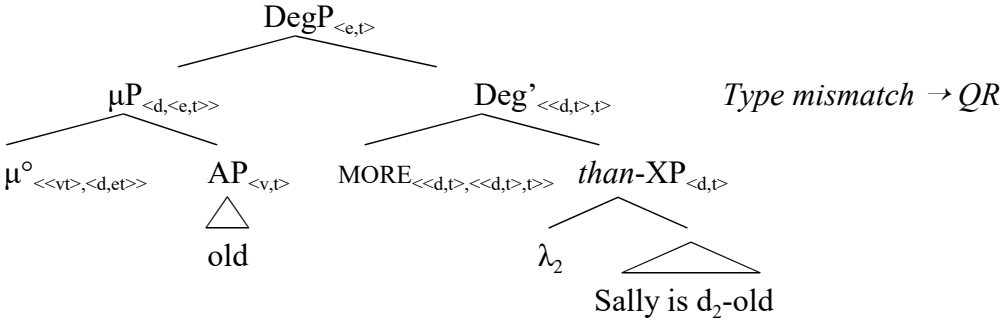
➜ Evidence for Option C and against adjunction

4. The ellipsis-attachment generalization. Certain attributive comparatives have a small clause/small ellipsis reading:

(45) Mary met a man older than Sally.

a. *Possible:* Mary met a man who was/is older than Sally **is d-<old>**
b. *Impossible:* Mary met a man who was/is older than Sally **<met a d-old man>**

(46) *Postnominal attributive comparatives*



(47) LF: [MORE λ_2 than Sally d_2-old] [λ_1 Mary met a [[$_{NP}$ men]$_{<e,t>}$ [$_{DegP}$ **d-old**]$_{<e,t>}$]]

Observation: The size of ellipsis co-varies with word-order (Bresnan 1973; Gawron 1995: 343).

(48) *Postnominal modifiers → small ellipsis (**AP** only)*

a. Mary met a **man older** than Sally.
   ↛ Sally is a man
b. Mary met a man [$_{DegP}$ [**older**] than Sally <old>].

(49) *Prenominal modifiers → large ellipsis (**AP + NP**)*

a. #Mary met an **older man** than Sally.
   ⇒ Sally is a man
b. #Mary met an [$_{DegP}$ [**older man**] than Sally <old man>].
c. *Relevant reading:* Mary met a man who was/is an older man than Sally is.
d. *Irrelevant reading:* Mary met a man who was/is older than the man Sally met.

(50) *Ellipsis Attachment generalization (following Bresnan 1973)*
The size of the ellipsis is the sister node of Deg' (μP)
(follows from the assumption that μP is the result of movement; Lechner 1999, 2004)

(50) poses a challenge problem for ***adjunction analyses*** of prenominal modifiers. By contrast, (50) is a direct consequence of ***Option C*** and the ***[AP NP]*** parse.

➜ Evidence for Option C
➜ Evidence for the assumption that AP NP forms a unit to the exclusion of MORE.

5. Intersective-subsective generalization. Prenominal APs are ambiguous between an 'intersective' and a subsective construal, while postnominal adjectives admit intersective readings only (Siegel 1976).

(51) an **older** friend than Peter
  a. a friend who is more advanced in years (*intersective*)
  b. a better, more long standing friend (*subsective*)

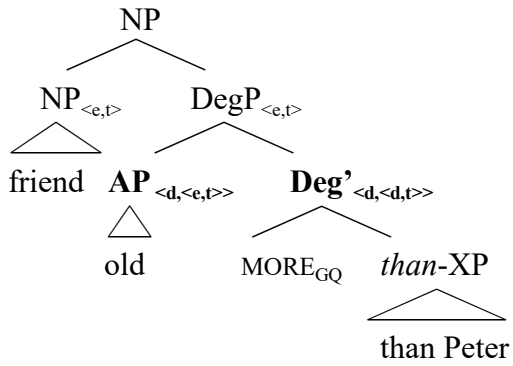
(52) a friend **older** than Peter
  a. a friend who is more advanced in years (*intersective*)
  b. *a better, more long standing friend (*subsective*)

Analysis:

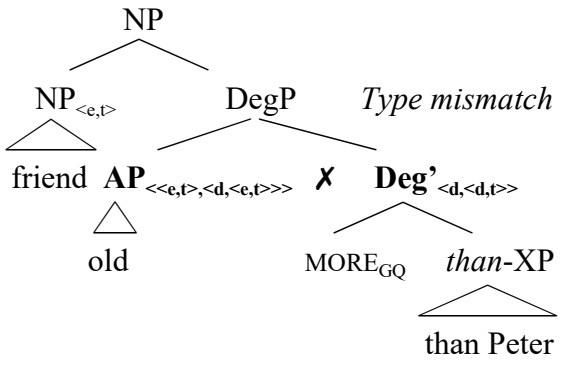
- Postnominal modifiers are (unlike prenominal one) adjuncts to NP.
- Subsective readings require higher, subsective type for A-denotation (<<e,t>,<d,<e,t>>>)

NB: For ease of exposition, I revert from now on to a treatment of nouns as predicates of individuals.

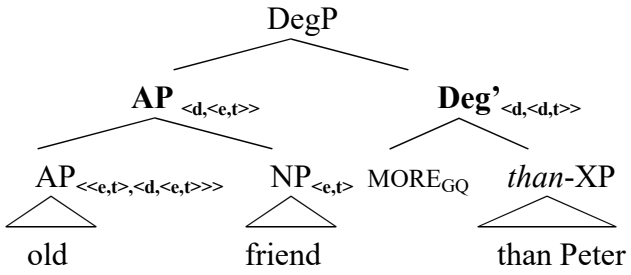
(53)a friend older than Peter (intersective)



(53)b a friend older than Peter (subsective)



(51) an older friend than Peter (subsective/intersective)



Type mismatch → QR

Conclusion
- DegP embeds AP, not vice versa.
- AP NP form a unit
- against adjunction analysis of nominal modifiers

➜ ***Phrase Structure of DegP follows Option C***

Questions: Both post- and the prenominal comparatives implicate QR. Why does QR not determine the size of ellipsis? (Reply: CD is movement; Lechner 2004). Does QR feed additional scope options?

4. MULTI-HEADED SUBCOMPARATIVES

(54) *Multi-headed subcomparatives*
a. **More men than women$_{\textbf{SUB}}$** smoke.
b. The project generated **more problems than solutions$_{\textbf{DO}}$.**

Grant (2013) defines a triadic meaning rule for MORE (see also Hackl 2001: 102, i.a.):

(55) $[\![\textbf{MORE}_{\textbf{GRANT}}]\!] = \lambda P_{et}.\lambda Q_{et}.\lambda R_{et}.|P(x) \wedge R(x)| < |Q(x) \wedge R(x)|$ (Grant 2013: p. 187)

Subjects can be interpreted *in-situ.*

(56) a. More men than women smoke.
b. LF: [men [MORE (than) women]] smoke.
c. $[\![\textbf{MORE}_{\textbf{GRANT}}]\!]([\![\textbf{women}]\!])([\![\textbf{men}]\!])([\![\textbf{smoke}]\!])$
d. $|\text{women}(x) \wedge \text{smoke}(x)| < |\text{men}(x) \wedge \text{smoke}(x)|$

Objects need to QR:

(57) a. The company fired more men than women.
b. LF: **[men [MORE (than) women]]** λ_1 [the company fired t_1]
c. $[\![\textbf{MORE}_{\textbf{GRANT}}]\!]([\![\textbf{women}]\!])([\![\textbf{men}]\!])([\![\boldsymbol{\lambda_1}\textbf{ the company fired }\boldsymbol{t_1}]\!])$
d. $|\text{women}(x) \wedge \text{the company fired}(x)| < |\text{men}(x) \wedge \text{the company fired}(x)|$

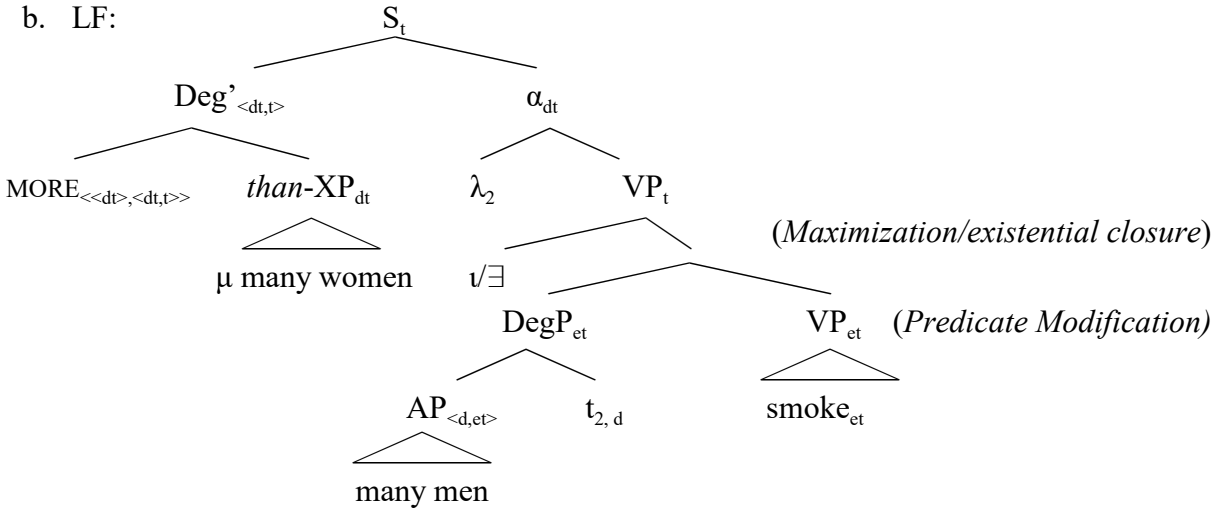
Generalized Quantifier analysis, 1st try: Suppose that multi-headed subcomparatives use the standard generalized quantifier degree head, i.e. $[\![\textbf{more}_{\textbf{MH}}]\!] = [\![\textbf{more}_{\textbf{GQ}}]\!]$,

(11) $[\![\textbf{MORE}_{\textbf{GQ}}]\!] = \lambda D_{<d,t>}.\lambda D'_{<d,t>}.D \subset D'$

Just like in attributive constructions, μ is introducing the degree. Alternatively, *many* can be seen as the morphological exponent of μ.

(58) a. [μ [many men]] (cf. [μ [long book]])
b. [μ men] $\rightarrow_{\text{lexical insertion}}$ *many men*

(59) a. More men than women smoke.
b. LF:



(60) a. $[\![\textbf{MORE}_{\textbf{GQ}}]\!]([\![\textbf{λd.than d-many women}]\!])([\![\textbf{λd.d-many men smoke}]\!])$ =
b. = ιdιx[d-many women(x)] < ιdιx[d-many men(x) ∧ smoke(x)]

Formal link problem: The reading is too weak, (60)b is verified if male smokers are outnumbered by women in genral, instead of women who smoke. (Possible way out: *than*-XP is elliptical.)

(61) *Intended reading*: ιdιx[d-many women(x) ∧ **smoke(x)**] < ιdιx[d-many men(x) ∧ smoke(x)]

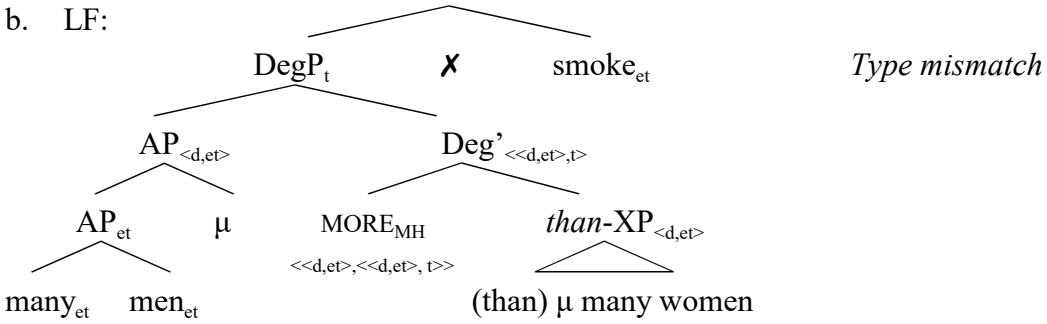
Generalized Quantifier analysis, 2nd try: Suppose that MORE is a dyadic GQ of (orthodox) gradable adjective denotation, instead of degree predicates. This requires a more complex syntax. Maybe this additional step helps in solving the problem of the formal link?

☞ (62) $[\![\textbf{MORE}_{\textbf{MH}}]\!]$ = $\lambda P_{<d,et>}.\lambda Q_{<d,et>}.\iota d\iota x[P(d)(x)] < \iota d\, \iota x[Q(d)(x)]$ <d,**e** t,<<d,**e** t>,t>>

(11) $[\![\textbf{MORE}_{\textbf{GQ}}]\!]$ = $\lambda D_{<d,t>}.\lambda D'_{<d,t>}.D \subset D'$ <d t, <d t, t>>

(63) a. More men than women smoke.

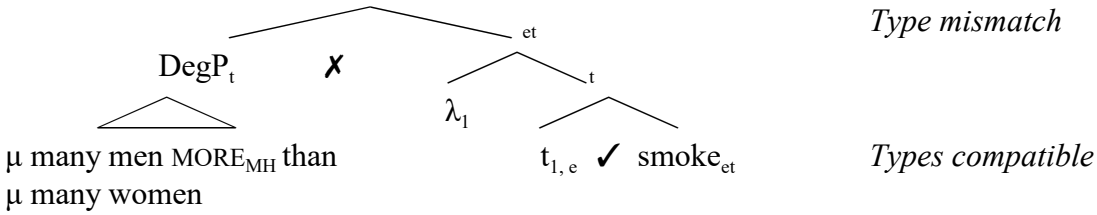
b. LF:



➜ The *whole* subject needs to QR!

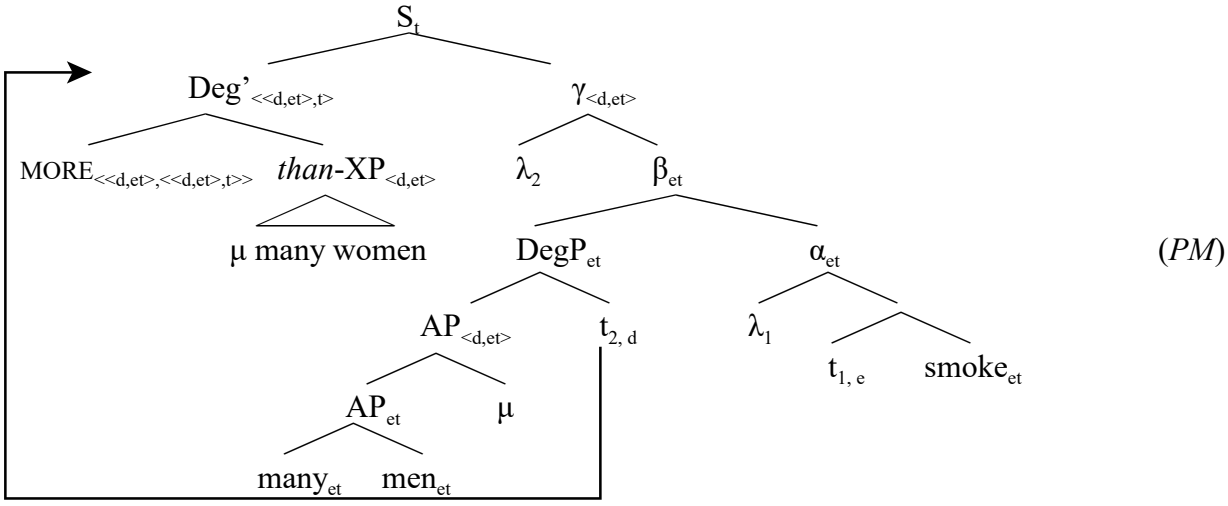
Step 1: QR of DegP ([more men than women])

(64)



Step 2: QR of Deg' ([more than women])

(65)



(*PM*)

(66) a. $[\![(65)]\!]$ = $\lambda P_{<d,et>}.\lambda Q_{<d,et>}.\iota d\iota x[P(d)(x)] < \iota d\iota x[Q(d)(x)]$ ($\lambda d.\lambda x.$d-many women(x)) ($\lambda d.\lambda x.$d-many men(x) $\wedge$ smoke(x))

b. = $\iota d\iota x$[d-many women(x)] < $\iota d\iota x$[d-many men(x) $\wedge$ smoke(x)]

Formal link problem: The problem persists. Suppose the problem can be fixed. Then there is still...

Problem 2: The generalized quantifier analysis overgenerates.

Observation: In subject position, $\text{MORE}_{\text{GRANT}}$ can be interpreted *in-situ*, while MORE_{MH} requires scoping.

Prediction:

MORE_{MH}: The comparative interacts with other operators.

$\text{MORE}_{\text{GRANT}}$: The comparative does *not* (have to) interact with other operators (modals).

(67) Fewer men than women must apply.

(68) $[\![\textbf{FEW}_{\textbf{MH}}]\!]$ = $\lambda P_{<d,et>}.\lambda Q_{<d,et>}.\iota d\iota x[Q(d)(x)] < \iota d\iota x[P(d)(x)]$

(69) a. *LF1*: *must* ≻ *few* ***must*** [**FEW than many** ♀ [many ♂ λ_1 t_1 apply]]

b. *LF2*: *few* ≻ *must*
[**FEW than many** ♀ [many ♂ λ_1 ***must*** t_1 apply]]

c. *LF3: Split scope*
[**FEW than many** ♀ λ_2 ***must*** [d_2-many ♂ λ_1 t_1 apply]]

(70) a. $\lambda w.\forall w' \in \text{Acc}_{\text{Deon}}(w)(w')$: $\iota d\iota x$[d-many men(x) apply in w'] < $\iota d\iota x$[d-many women(x) apply in w'] (*must* ≻ *few*)

b. $\lambda w.\iota d[\forall w' \in \text{Acc}_{\text{Deon}}(w)(w')$: ιx[d-many men(x) apply in w']] < $\iota d[\forall w' \in \text{Acc}_{\text{Deon}}(w)(w')$: ιx[d-many women(x) apply in w']] (*few* ≻ *must*)

c. $\lambda w.\iota d[\forall w' \in \text{Acc}_{\text{Deon}}(w)(w')$: ιx[d-many men(x) in $\boxed{w'}$ apply in w']] < $\iota d\iota x$[d-many women(x) in $\boxed{w}$ $\wedge$ $\forall w' \in \text{Acc}_{\text{Deon}}(w)(w')$: x apply in $\boxed{w'}$] (*split scope*)

≈ "The number of inidivuals who are men and apply in all deontic alternatives is smaller than the number of actual women who apply in all alternatives." (cf. Greer 2014?)

(71) *Context discriminating between (70)a and (70)b*

	|men who apply|	|women who apply|
w_1	2	3
w_2	10	5

- (67) is ***false*** in the narrow scope reading (70)a, because in w_2, more men than women apply
- (67) is ***true*** in wide scope reading (70)b, because the minimal number of men applying across worlds is 2, the minimal number of women applying across worlds is 3, and 2 < 3

Observation: (67) appears to lack the wide scope reading (70)b. The generalized quantifier version would have to explain why this interpretation is missing. (Similarly for split reading LF3.)

➜ Further support for the triadic version $\text{MORE}_{\text{GRANT}}$

Conclusion: A GQ-version of MORE_{MH} is unlikely to succeed. (This result might still be relevant, tough, as it potentially helps to cut down on the analytical options in section 6.)

5. A NEW OBSERVATION

Tough predicates occur in two frames (Lees 1960; Chomsky 1964, 1973; Postal 1971; Lasnik & Fiengo 1974; Rosenbaum 1967; Rezac 2006; Hicks 2009; Keine & Poole 2017; Gluckman 2021; Mortier 2022, i.a.):

(72) a. *Expletive Construction*
It is tough to please enemies.

b. *Tough construction*
Enemies$_1$ are tough to please **t_1.**

Observation: *Tough*-movement does not admit multi-headed comparatives in subject position of the *tough*-predicate.

(73) a. It is difficult to read **more books than articles**.
b. ***More books than articles** are difficult to read.
c. ***More books** are difficult to read **than articles.**

(74)c indicates that nothing is in principle wrong with the meaning.

(74) a. It is important to find **more solutions than problems.**
b. ***More solutions than problems** are important to find.
c. "The number of books which are difficult to read exceeds the number of articles which are difficult to read."

A note on judgements: '*' denotes contrastive judgements. Also, there is speaker variation. Partially, this might be due to the fact that some speakers re-interpret complex *tough*-predicates as predicates like *readable* (Rajesh Bhatt, pc).

The contrasts is more pronounced with non-standard variants of *tough* predicates (on the typology of *tough*-predicates see Gluckman 2018, 2021; i.a.):

(75) *Psych verbs*
a. It frightens/amuses/depresses me to talk about **war**.
b. **War** frightens/amuses/depresses me to talk about.
c. It frightens/amuses/depresses me to talk about **more problems than solutions.**
d. ***More problems than solutions** frighten/amuse/depress me to talk about.

(76) *Take-time construction*
a. It took me a while to grow **these plants**.
b. **These plants** took me a while to grow.
c. It took me a while to grow **more plants than weeds.**
d. ***More plants than weeds** took me a while to grow.

(77) *make-sense construction*
a. It makes sense to grow **these plants**.
b. **These plants** make sense to grow.
c. It makes sense to grow **more plants than weeds.**
d. ***More plants than weeds** make sense to grow.

The contrast can be replicated in other languages:

(78) *Greek tough-movement requires object clitic*
a. Ine diskolo na diavaso to arthro. [Greek]
is difficult C° read the paper
b. *To arthro ine diskolo na diavaso.
the paper is difficult C° I-read
c. To arthro ine diskolo na ***to*** diavaso.
the paper is difficult C° Cl I-read

(79) a. Ine diskola na diavaso **perissotera vivlia apo arthra.**
is difficult C° I-read more books than papers
b. ***Perissotera vivlia apo arthra** ine diskola na ta diavaso.
more books than papers are difficult C° CL read

(80) a. Es ist schwer, mehr Bücher als Artikel zu lesen. [German]
it is difficult more books than papers C° read
b. Einige Bücher sind schwer zu lesen.
some books are difficult to read
c. ***Mehr Bücher als Artikel** sind schwer zu lesen.
more books than papers are difficult C° CL read

Question: Is the contrast due to a more general prohibition on comparatives in *tough*-constructions?

Answer: No*, tough* constructions are compatible with both predicative and nominal comparatives:

(81) a. Books are **more difficult** to read than articles.
b. The first problem was **harder** to solve than the second one.

(82) a. weil **mehr Bücher** für Hans schwer zu lesen sind als für Maria
since more books for John difficult to read are than for Mary
b. since **More books** are difficult to read for John than for Mary. [ok?]

In fact, gradability is one of two defining properties of *tough*-predicates:

(83) *Two defining properties of tough-predicate (Gluckman 2021)*
a. Gradability
b. Judge dependence

(84) This book is more difficult for me_{judge} to read than that book

Question: Is the contrast due to the fact that indefinites do not make good *tough* subjects (Postal 1971)?

(85) a. It would be easy to kill **a man** with a gun like that. (Lasnik & Fiengo 1974: (52a))
b. It would be easy to kill **someone** with a gun like that.

(86) a. ***A man** would be easy to kill with a gun like that. (ibid, (52b))
b. ***Someone** would be easy to kill with a gun like that.

(87) a. It was a delight to talk to **someone** interesting. (Rose 2018)
b. ***Someone** interesting was a delight to talk to

Answer: No. First, some indefinites are fine and others can be rescued by subtrigging:

(88) Some girls will be easy for me to find (Postal 1974: 224)

(89) a. A number of people are easy to talk to.
b. A number of people are tall.

(90) *Subtrigging*
a. *Anyone fell.
b. Anyone who tried to jump fell.

(91) a. *A person/anyone was a delight to talk to. (Rose 2018)
b. A person/anyone from Rio de Janeiro was a delight to talk to.

Second, amount NPs headed by *many* are perfectly fine as *tough*-subjects:

(92) a. Many people are tall
b. Many people are easy to talk to

Conclusion: The phenomenon appears to be real.

(93) ***Generalization T***
Multi-headed subcomparatives cannot function as subjects of *tough*-constructions.

Additional observation 1: Multi-headed comparative are incompatible with differentials.

(94) a. *John read **five more** books than papers.
b. *John read **five** books **more** than papers.
c. Mary read **five** books **more** than John.

(95) a. *Hans las **fünf mehr** Bücher als Artikel. [German]
b. *Hans las **fünf** Bücher **mehr** als Artikel.
c. Hans las **fünf** Bücher **mehr** als Maria.

Additional observation 2: Correlative comparatives are possible with attributive comparatives, but not with subcomparatives:

(96) a. **Longer books** are usually **more difficult**.
b. ***More books** are usually **more difficult**.

(97) a. **Longer books** are **more difficult/harder** to read.
b. ***More books** are **more difficult/harder** to read.

6. POSSIBLE ANALYTICAL OPTIONS

***Road A*.** Multi-headed comparatives for some reason need to take narrow scope, but *tough*-subjects are known to resist scope reconstruction. (98)a lacks reading (98)b (Postal 1974; Fleisher 2013):

(98) a. Many articles are easy to read.
b. ↛ It is easy to read many articles.

Prediction: (99) should only allow narrow scope *de dicto* reading:

(99) More books than articles seem to have been published last year.

Road B. Conflict between entailments/presuppositions of comparative and *tough*. *Tough*-predicates preserve entailments to absolute/positive meaning also in their comparative form:

(100) a. The book is more **interesting** than the paper
b. ↛ The book is interesting

(101) a. The book is more **difficult** to read than the paper
b. ⇒ The book is difficult to read

Note that the entailment disappears in the expletive construction - which admits subcomparatives:

(102) a. It is more **difficult** to read the book than the paper
b. ↛ The book is difficult to read

(103) It is difficult to read **more books than articles**.

Road C. Formal and structural properties, properties of the derivation or type conflicts.

(104) *Possible venues for structural accounts*
a. Intervention effect triggered by judge (Hartmann 2011, Keine & Poole 2017, i.a.)
b. Interaction degree argument of *tough*-predicate with comparative
c. Structural conditions on comparative quantifiers (Takahashi 2006)
d. General cyclicity restrictions on logical forms (Lechner 2017)
e. Type mismatches

Road D. Predicate restrictions

(105) *Hypothesis 1*
a. Multi-headed comparatives are incompatible with individual level (IL) predicates
b. *tough*-predicates are IL

Problem: Multi-headed comparatives are fine with some IL predicates.

(106) *IL vs. SL*

a. There are some squares on this page.	(*on this page* is stage level; SL)
b. *There are some squares green.	(*green* is IL)
c. There are more squares than circles on this page.	SL
d. *There are more squares than circles green.	IL
e. (Generally) More men than women are **psychotic**.	IL

(107) *Hypothesis 2*
a. Multi-headed comparatives are incompatible with *judge-dependent* IL-predicates.
b. *tough*-predicates are IL and judge-dependent

Problem: Some judge-dependent IL predicates allow amount subcomparatives.

(108) a. *There are some cakes tasty. (*tasty* is IL)
b. More cakes than doughnuts were **tasty**.

(109) a. *There are some linguists interesting (*interesting* is IL)
b. This problem is interesting for/to Mary. (*interesting* is judge-dependent)
c. More problems than solutions were **interesting** to us.

Other factors to explore on road D: *so*-modification (Anderson & Morzycki 2015); event structure,...

Summary

- Attributive comparative can be ***decomposed*** (similar to predicative ones).
- The ***generalized quantifier version*** of MORE extends to attributive comparatives.
- The analysis requires a parse in which
  (i) [AP NP] form a unit and
  (ii) this unit occupies the sister node of MORE (***against NP-adjunction***)
- Multi-headed subcomparative are formed by standard *in-situ* variant of MORE. A generalized quantifier version of MORE is unlikely to succeed.

  ➜ What does the full taxonomy of the degree heads MORE look like?
- A ***new generalization*** about nominal subcomparatives

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