Q-adjectives, Type Shifting and Cross-Linguistic Variation

Stephanie Solt
Zentrum für Allgemeine Sprachwissenschaft, Berlin
3 March 2015
solt@zas.gwz-berlin.de

1. Q-adjectives

The challenge of Q-adjectives: Cross-categorical usage

1a. Many/few students attended the lecture.       Quantificational
b. John’s friends are many/few.                  Predicative
c. The many/few students who attended enjoyed the lecture. Attributive
d. Many fewer than 100 students attended the lecture. Differential
e. Fred is much taller than Barney               Adj. Differential

(1a): Quantifiers?
(1b-c): Cardinality predicates?
(1d-e): Not cardinality predicates

The analysis of Solt (2009, 2014): Q-adjectives across all of their uses denote gradable predicates of scalar intervals / gradable quantifiers over degrees:

2a. [[many]] = λdI_{dp}\{I(d) \land \mu_{d}(x) = d \land attended(x)\}

2b. [[few]] = λdI_{dp}\{I(d) \land \mu_{d}(x) = d \land attended(x)\}

The positive form derives from composition with null POS. Preliminarily:

3a. [[POS many]] = λdI_{dp}\{I(d_{dp}) \land \mu_{d}(x) = d \land attended(x)\}

3b. [[POS few]] = λdI_{dp}\{I(d_{dp}) \land \mu_{d}(x) = d \land attended(x)\}

NB: We probably need different standards for many and few; see below

Additional components of the analysis:

• Introduction of degrees via phonologically null syntactic head Meas:

(4) [[Meas]] = λdI_{dp}\{I(d_{dp}) \land \mu_{d}(x) = d \land attended(x)\}

• Composition via intersective modification / Restrict (Chung & Ladusaw 2003)

• Quantificational force via Existential Closure

Compositional implementation:

5a. SS: [[Meas t1 Meas students]] attended the lecture
   b. LF: [[POS many] [[Meas t1 Meas students]] attended the lecture]

6a. [[t1 Meas students attended]] =
   = λd∃x[students(x) \land \mu_{d}(x) = d \land attended(x)]

6b. [[POS-many] [[Meas t1 Meas students attended]] ] =
   = ∃x[students(x) \land \mu_{d}(x) = d_{std} \land attended(x)]

6c. [[POS-few] [[Meas t1 Meas students attended]] ] =
   = ¬∃x[students(x) \land \mu_{d}(x) = d_{std} \land attended(x)]

Advantages:

• Correct semantics for quantificational few without ‘van Benthem’s problem’

7    few > ∃

• Extends to non-quantificational uses

• Much support and more

8a. John is diligent; in fact, he is too much so
    b. Smarter / more [much + -er] intelligent

2. Cardinal numerals and type shifting

Parallels between few, many and cardinal numerals:

9a. Few students presented at the workshop
   b. Many students presented at the workshop
   c. Three students presented at the workshop

10. There are few/many/three/*every/*most students on the program

11. The few/many/three students who presented (cf. *the every/most students)

Kennedy (to appear): de-Fregean semantics for number:

12. [[three]] = λI_{dp}\{d: I(d) \leq 3\} \land attended(x)

13. Three students attended the lecture
   max\{d: ∃x[students(x) \land \mu_{d}(x) = d \land attended(x)]\} = 3

   • Upper bounded reading

This work was in part funded by the Deutsche Forschungsgemeinschaft under grant SO1157/1-1.
Type shift via BE operator (Partee 1987):

(14) \( \text{BE} = \lambda d. \exists x. (\exists y. y = x) \)

- Collects all elements of all singleton sets that satisfy predicate into set

(15) \( \text{BE(three)} = \lambda d.d = 3 \quad <d,> \)

Lower type interpretation of cardinal responsible for ‘at least’ readings. On one option:

(16) Three students attended the lecture

a. \([[[	ext{three students}]]] = [[[\text{Meas students}]]] \)
   \(= (\lambda d.d = 3)(\lambda d.\exists x.\text{students}(x) \land \mu(x) = d) \)
   \(= \lambda d.\exists x.\text{students}(x) \land \mu(x) = d \land d = 3 \quad \text{via Restrict} \)

b. \(\exists d.\exists d[\text{students}(x) \land \mu(x) = d \land d = 3 \land \text{attended(x)}] \)
   \(= \exists x.\text{students}(x) \land \mu(x) = 3 \land \text{attended(x)} \)

3. Do Q-adjectives undergo type-shifting?

Application of BE to Q-adjectives (after composition with POS):

(17) a. \( \text{BE(POS many)} = \lambda d. d \geq d_{\text{mnl}} \quad <d,> \)

b. \( \text{BE(POS few)} = \lambda d. d < d_{\text{mnl}} \)

Quantificational Use

What we derive in parallel to (16):

(18) Many students attended the lecture

\( \exists d.\exists d[[\text{students}(x) \land \mu(x) = d \land d \geq d_{\text{mnl}} \land \text{attended(x)}]] \)

- Equivalent to (6b)

(19) Few students attended the lecture

\( \exists d.\exists d[[\text{students}(x) \land \mu(x) = d \land d < d_{\text{mnl}} \land \text{attended(x)}]] \)

- This is a lower-bounded reading; it does not rule out the possibility that there is some group of cardinality \(\geq d_{\text{mnl}}\) who attended.

- It doesn’t seem that (18) has this reading.
  o But maybe there is a phantom reading per Marty et al. (2014)? Hard to tell (though testable)

Attributive Use

A type-lowered interpretation would allow Q-adjective to be interpreted within DP on attributive use

(20) The few students

a. \([[[\text{BE(POS few)} \text{ Meas students}]]] = ( [[\text{BE(POS few)} ]] ) ( [[\text{Meas students}]] ) \)
   \(= (\lambda d.d < d_{\text{mnl}})(\lambda d.\exists x.\text{students}(x) \land \mu(x) = d) \)
   \(= \lambda d.\exists x.\text{students}(x) \land \mu(x) = d \land d < d_{\text{mnl}} \)
   \(\rightarrow \lambda x.\exists d.\exists d[\text{students}(x) \land \mu(x) = d \land d < d_{\text{mnl}}] \)

b. \([[[\text{BE(POS few)} \text{ Meas students}]]] = \nu x.\exists d.\exists d[\text{students}(x) \land \mu(x) = d \land d < d_{\text{mnl}}] \)

\(\text{where } \nu = \max(P) \text{ iff } \max(P) \text{ exists}; \text{ otherwise undefined} \)

- the few students is the maximum plurality of students if their number is few; otherwise undefined

However, evidence of clausal structure…

(21) a. ?the few students

b. the few students who attended

(22) a. The fortunately few families who were displaced by the flood

b. The frankly few really good computer games released this year

c. The undoubtedly many business travelers who need wireless

… and NPI licensing suggests Q-adjective has scope over remainder of NP

(23) a. Few people who ever visited made donations.

b. Few people who visited ever made donations.

c. The few people who ever visited made donations.

d. *The few people who visited ever made donations.

Analysis in Solt (2014): covert there relatives; few as degree quantifier, as in quantificational use

- No evidence for type \(<d,>\) interpretation here.

Collective and cumulative readings

Marty et al. (2014): Collective readings of doubly bounded numerical noun phrases show evidence of reading based on Existential Closure
(24) Between 40 and 60 soldiers surrounded the castle
   • Not falsified by a second group of soldiers

Extended to many / few:

(25) a. Many soldiers surrounded the castle  Collective?
    b. Few soldiers surrounded the castle  --

Krifka (1999): cumulative readings involve existential quantification over pluralities

(26) Three boys ate seven apples
    ∃x[three-boys(x) ∧ ∃y[apples(y) ∧ ate(x,y)]]
    • 3 boys & 7 apples total

(27) … and the other three boys ate four apples
    • Supports existential semantics

Extended to many / few:

(28) a. Few boys ate seven apples  ✓Distrib ×Cum
    b. Many boys ate seven apples  ✓Distrib ×?Cum

(29) a. Five guests drank 10 bottles of wine  ✓Distrib ✓Cum
    b. Few guests drank 10 bottles of wine  ✓Distrib ✓Cum
    c. Many guests drank (only) 10 bottles of wine  ✓Distrib ✓?Cum

(30) a. Three of our employees do 90% of all the work  ✓Distrib ✓Cum
    b. Few of our employees do 90% of all the work  ✓Distrib ✓Cum
    c. Many of our employees do only 10% of all the work  ✓Distrib ✓?Cum

(31) a. Ten women gave birth to twelve babies  ✓Distrib ✓Cum
    b. Ten women gave birth to few babies  ✓Distrib ✓?Cum
    c. Ten women gave birth to many babies  ✓Distrib ✓?Cum

(32) a. Three potatoes are (is?) enough to make a soup  ✓Distrib ✓Cum
    b. Few potatoes are (is?) enough to make a soup  ✓Distrib ✓Cum
    c. Many potatoes are (is?) enough to make a soup  ✓Distrib ✓?Cum
    d. Many potatoes are (is?) excessive for a small soup  ✓Distrib ✓?Cum
    • If cumulative readings based on type-lowered interpretation for quantity word, this
      is apparently not available to few and (?) many

Some possibly related facts:
- Specific indefinite readings:

(33) a. If three relatives of mine die, I’ll inherit a million dollars  (Reinhardt ’97)
    ✓ There are 3 specific relatives s.t. if they (all) die, I get rich
    b. If few relatives of mine die, I’ll inherit a million dollars
    ✗ There is a specific small group of relatives s.t. if they all die I get rich
    ✓ For me to get rich, my relatives need to stay alive
    c. If many relatives of mine die, I’ll inherit a million dollars
    ✗? There is a specific large group of relatives s.t. if they all die I get rich

- In-adverbials

(34) a. John wrote the paper in 3 days
    b. *John wrote the paper in few days
    c. *John wrote the paper in many days

An analysis of (34a) per Krifka (1989):

(35) a. e.writing(e) ∧ Ag(e)=John ∧ Pat(e)=paper ∧ ∃t[CONV(t) ∧ days(t)= 3
    ∧ τ(e) ⊆ τ]  ✓
    b. λe.max{d: writing(e) ∧ Ag(e)=John ∧ Pat(e)=paper ∧ ∃t[CONV(t) ∧ days(t)= d
    ∧ τ(e) ⊆ τ]} = 3  ✗

Interim conclusion: few does not have a type <d,t> interpretation. Less clear this is ruled
out for many

4. Are lower-type readings really absent?

Fewer than n patterns with cardinal numerals, not few:

(36) a. Fewer than 10 guests drank 10 bottles of wine  ✓Distrib ✓Cum
    b. Fewer than 5 of our employees do 90% of all the work  ✓Distrib ✓Cum
    c. Ten women gave birth to fewer than 8 babies  ✓Distrib ✓Cum

(37) Fewer than 10 potatoes are (is?) enough to make a soup  ✓Distrib ✓?Cum

(38) If fewer than five relatives of mine die, I’ll inherit a million dollars
    ✗? There is a specific group of relatives numbering <5 s.t.
    if they (all) die, I get rich

(39) John wrote the paper in fewer (less) than five days
(40) Fewer than 10 people ever drank 10 bottles of wine
   • NPI not licensed on cumulative interpretation

Similar (?) for more vs. many:
(41) a. More than 10 guests drank only 5 bottles of wine
    b. More than 10 of our employees do only 5% of all the work
    c. Ten women gave birth to more than 12 babies

Missing readings for few expressed by a few:
(42) a. A few guests drank 10 bottles of wine
    b. A few of our employees do 90% of all the work
    c. Ten women gave birth to a few babies

(43) A few potatoes are (is?) enough to make a soup
    • Suggests compositional relation between few and a few

(44) If a few relatives of mine die, I’ll inherit a million dollars
    • There are a few specific relatives s.t. if they (all) die, I get rich

(45) John wrote the paper in a few days.

Could the type-lowered interpretation for few be spelled out as a few?
(46) a. (Only) a very few students presented at the conference
    b. An incredibly few collectors have the good fortune to own one
    • Suggests compositional relation between few and a few

(47) A few students attended the lecture
    \[3x[x \land \mu_d(x) = \lambda d d < d_{\text{std}} \land \text{attended}(x)]\]
    • Problem: this is too weak (1 or 2 – or perhaps even 0 – would suffice). Maybe fixable?

Conclusion: Type lowered interpretations are available to at least some modified forms of Q-adjectives – and to a few.

5. A possible (technical) explanation for the difference?
   Three and fewer than n have degree quantifier interpretations to which BE can apply:
   (48) a. \([\text{three}] = \lambda I_{\text{std}} \cdot \max\{d: I(d)\} = 3\]
   b. \([\text{fewer than } n] = \lambda n I_{\text{std}} \cdot \max\{d: I(d)\} < n\]
       • Need to derive somehow from underlying semantics for few and -er
   c. \([\text{fewer than 10}] = \lambda I_{\text{std}} \cdot \max\{d: I(d)\} < 10\]

(49) \(BE(\text{fewer than 10}) = \lambda d, d < 10\)

Suppose POS defined as degree quantifier introducing ‘neutral range’ as standard (von Stechow 2009):
(50) \([\text{POS}] = \lambda I_{\text{std}} \cdot \forall d \in N_d [I(d)]\]

(51) \([\text{POS}] = \lambda I_{\text{std}} \cdot \forall d \in N_d [I(d)]\]

(2b) \([\text{few}] = \lambda d I_{\text{std}} \cdot \neg I(d)\]
    • POS cannot compose in situ with few; thus ‘bare’ few never has type to which BE applies
    • Judgments relating to many become crucial

Alternate possibility: blocking by a few?

6. Some possible cross-linguistic variation
   German wenig ‘few’ diverges in some ways from English few:
   (52) a. *Only few students came to the party.
       b. Only a few students came to the party.
       c. Nur wenige Studenten sind zur Party gekommen.

   (53) a. *John wrote the paper in few days.
       b. John wrote the paper in a few days.
       c. Hans hat das Paper in nur wenigen Tagen geschrieben.

   • German wenig can occur in some contexts where English requires a few
• So maybe *wenig* has the type <d,t> interpretation that seems to be missing for few?

(54) a. Weniger als 10 Gäste haben 10 Flaschen Wein getrunken ✓Distrib ✓Cum
b. Wenige Gäste haben 10 Flaschen Wein getrunken ✓Distrib ✗Cum

• Same contrast as in English…

7. Overall Conclusions

⇒ Q-adjectives have a quantificational type – gradable quantifiers over degrees.
⇒ Data suggest that in principle, they can shift to a lower type – though this appears to be limited to modified forms (for reasons that remain to be understood)
⇒ Supports alignment of Q-adjectives and cardinal numerals
⇒ Studying cross-linguistic variation will be helpful

References