

RESEARCH

Universal quantification as degree modification in Arabic

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This paper demonstrates similarities between the universal quantifier *kull* ‘every/all’ and superlatives of quality and quantity in Standard Arabic. These similarities point to an analysis of *kull* as a kind of superlative. An analysis is developed that characterizes the meaning of *kull* as a minor variation on the meaning of the superlative morpheme that occurs in quality and quantity superlatives. The difference between *kull*’s strongly distributive meaning analogous to *every* and its weakly distributive meaning analogous to *all* is argued to be the result of a type-shifting mechanism. This analysis teases apart the syntactic and semantic components of the three construction types examined here and identifies the uniformity that runs through them.

Keywords: superlative; quantification; Arabic; degree; plurals

1 Introduction

In this paper, I develop an analysis of the meaning of the Arabic universal quantifier *kull* ‘every/all’ as a superlative term. This analysis extends treatments of the English proportional quantifier *most* (*ʔakθar* in Arabic) along the same lines (e.g. Gawron 1995; Hackl 2009; Teodorescu 2009). These treatments claim that *most students* describes a plurality of students more numerous than any other plurality of students. I claim that in Arabic, *kull* ‘every/all’ and *ʔakθar* ‘most’ differ in whether the pluralities they compare in cardinality are allowed to overlap or not. The possibility of overlap in the comparison of cardinality gives *kull* its universal character.

The idea sketched above emerges from an investigation of the semantic composition of the examples in (1)–(6) below, some of which are discussed by Elghamry (2004). The examples in (1)–(3) show the possibility of juxtaposing a superlative adjective (1), *ʔakθar* ‘most’ (2), or *kull* ‘every/all’ (3) with a definite nominal in Arabic. Example (1) shows a superlative adjective *ʔaʕlā* ‘highest’ with a definite dependent nominal, in what I will call a ‘quality superlative’ construction, after Gawron (1995) (the quality in question is ‘height’ in this case). The examples say that (the famous medieval explorer) Ibn Khaldun explored part of the denotation of the dependent nominal that is higher than any other part, whether this part is a plurality of mountains, as in (1a), or a particular mountain as in (1b).

- (1) Quality superlative + definite
- a. *ibn xaldūn istakšaf-a ʔaʕlā l-ʕibāl-i.*
ibn khaldun explored-3MS highest.ACC the-mountains-GEN
‘Ibn Khaldun explored the highest of the mountains.’
- b. *ibn xaldūn istakšaf-a ʔaʕlā l-ʕabal-i.*
ibn khaldun explored-3MS highest.ACC the-mountain-GEN
‘Ibn Khaldun explored the highest part of the mountain, i.e. the summit.’

The examples in (2) show the term *ʔakθar* ‘most’ with a definite dependent nominal. These examples say that Ibn Khaldun explored a part of the dependent nominal denotation (a plurality in (2a) and singularity in (2b) that is greater in size than any other non-overlapping parts, in what I will call the ‘quantity superlative’, also after Gawron (1995).

- (2) Quantity superlative + definite
- a. *ibn xaldūn istakšaf-a ʔakθar-a l-ʔibāl-i.*
 ibn khaldun explored-3MS ʔmost-ACC the-mountains-GEN
 ‘Ibn Khaldun explored most of the mountains.’
- b. *ibn xaldūn istakšaf-a ʔakθar-a l-ʔabal-i.*
 ibn khaldun explored-3MS most-ACC the-mountain-GEN
 ‘Ibn Khaldun explored most of the mountain.’

The examples in (3) show that the apparent universal quantifier *kull* with a definite dependent nominal has a meaning intuitively analogous to English *all*. I will claim the meaning of the examples in (3) are a variation on the meaning of those in (2). Specifically, these examples assert that Ibn Khaldun explored a part of the dependent nominal denotation that is greater in size than any other possibly overlapping part. The only such part is the totality. Anticipating this analysis, I call this construction the ‘universal superlative’ in contrast to the ‘quantity superlative’ in (2). Ultimately, then, I claim that superlative adjectives, *ʔakθar* and *kull* all have a superlative interpretation.

- (3) Universal superlative + definite
- a. *ibn xaldūn istakšaf-a kull-a l-ʔibāl-i.*
 ibn khaldun explored-3MS kull-ACC the-mountains-GEN
 ‘Ibn Khaldun explored all of the mountains.’
- b. *ibn xaldūn istakšaf-a kull-a l-ʔabal-i.*
 ibn khaldun explored-3MS kull-ACC the-mountain-GEN
 ‘Ibn Khaldun explored all of the mountain.’

When the dependent nominal is indefinite, the partitivity in the examples above disappears, and the result is sometimes grammatical and sometimes not. The examples in (4) show the superlative adjective *ʔaʔlā* ‘high’ with a plural (4a) and singular (4b) indefinite dependent nominal. This use corresponds to the garden variety quality superlative construction that lacks overt reference to a comparison class (of mountains under consideration, in this case), as opposed to the examples in (2), where the definite dependent overtly serves this purpose.

- (4) Quality superlative + indefinite
- a. *ibn xaldūn istakšaf-a ʔaʔlā ʔibāl-in.*
 ibn khaldun explored-3MS highest.ACC mountains-GEN
 ‘Ibn Khaldun explored the highest mountains.’
- b. *ibn xaldūn istakšaf-a ʔaʔlā ʔabal-in.*
 ibn khaldun explored-3MS highest.ACC mountain-GEN
 ‘Ibn Khaldun explored the highest mountain.’

Unlike English, the result of combining the quantity superlative term *ʔakθar* ‘most’ with an indefinite noun is ungrammatical, whether the noun is plural or singular (5).

(5) Quantity superlative + indefinite (ungrammatical in Arabic)

- a. *ibn xaldūn istakšaf-a **ʔakθar-a žibāl-in.**
 ibn khaldun explored-3MS most-ACC mountains-GEN
 ('Ibn Khaldun explored most mountains.')
- b. ibn xaldūn istakšaf-a **ʔakθar-a žabal-in.**
 ibn khaldun explored-3MS most-ACC mountain-GEN
 (*'Ibn Khaldun explored most mountain.')

And in combination with an indefinite dependent, the universal term *kull* falls into a usage similar to English *every*. It is incompatible with a plural indefinite dependent nominal (6a), but compatible with the singular (6b), and is strongly distributive in this case, as I show in section 3.3.

(6) Universal superlative + indefinite

- a. *ibn xaldūn istakšaf-a **kull-a žibāl-in.**
 ibn khaldun explored-3MS kull-ACC mountains-GEN
 ('Ibn Khaldun explored mountains.')
- b. ibn xaldūn istakšaf-a **kull-a žabal-in.**
 ibn khaldun explored-3MS kull-ACC mountain-GEN
 'Ibn Khaldun explored every mountain.'

Thus, changing the definiteness of the dependent nominal affects the meaning of the constructions above, but not in an obviously systematic way. I endeavour to show, however, that an analysis of the three terms at issue here as superlatives makes sense of this pattern, and clarifies the role that definiteness plays in the composition of these constructions.

The examples above display the syntactic format of the 'construct state', a compound-like dependency that is common in the Semitic languages. In the construct state, the first term bears the morphological case determined by its syntactic context and the second, immediately following 'dependent' term, bears genitive case. The first term never bears the definite article nor the indefinite *-n* declension,¹ but, as the examples above show, the second term may vary in definiteness freely. The examples above show this construction in syntactic object position but there are no construction-specific restrictions on its distribution; it has the same distribution as other nominal expressions. For syntactic analyses of the construct state see Ritter (1988), Fassi Fehri (1993; 1999), Mohammad (1999) and Shlonsky (2004). I restrict myself here to the issue of the semantic composition of these expressions.

I proceed in section 2 by investigating the 'definite' pattern in (1)–(3), beginning with the contrast between the superlative adjectives and *ʔakθar* and then extending the analysis developed there to *kull* in (3), where it corresponds intuitively to English *all*. In section 3 I extend this analysis to the 'indefinite' pattern in (4)–(6) with particular attention to the use of *kull* in (6), where it corresponds intuitively to English *every*.

¹ The case markers *-u* (nominative), *-a* (accusative) and *-i* (genitive) are expanded to *-un*, *-an* and *-in* respectively in indefinite contexts, though even there the *-n* is occasionally deleted by regular morphosyntactic processes.

2 The definite pattern

This section proposes a uniform semantic composition for the examples in (1)–(3), which identifies the semantic ingredients that will be put to use in analyzing the indefinite pattern in (4)–(6) in section 3.

2.1 Quality superlative + definite dependent

Adjectives typically follow the noun they modify in Arabic, and agree in definiteness, number, gender and case with the modified noun, as illustrated in (7) and (8).²

- (7) a. *žabal-un* *ʕāl-in*
 mountain-NOM high-NOM
 ‘a high mountain’
- b. *žibāl-un* *ʕāliy-at-un*
 mountains-NOM high-PL-NOM
 ‘high mountains’
- (8) a. *l-žabal-u* *l-ʕāl-i*
 the-mountain-NOM the-high-NOM
 ‘the high mountain’
- b. *l-žibāl-u* *l-ʕāliy-at-u*
 the-mountains-NOM the-high-PL-NOM
 ‘the high mountains’

I follow Link (1983), Lønning (1987) and others in taking plural nouns to denote predicates of algebraic sums of individuals—‘plural’ individuals or ‘pluralities’.³ For a predicate of atomic individuals P , its plural $*P$ denotes the closure of P under sum formation. If P includes elements a and b , then $*P$ includes their sum, written $a \oplus b$. The bare noun *žabal* ‘mountain’ has the denotation in (9a) and its plural *žibāl* the denotation in (9b). Drawing on the general equivalence between functions and the sets they are characteristic functions of, I abbreviate the denotation of the singular as \mathbf{M} and the plural as $*\mathbf{M}$.

- (9) a. $\llbracket \text{žabal ‘mountain’} \rrbracket = \lambda x_e [\text{mountain}(x)] = \mathbf{M}$
 b. $\llbracket \text{žibāl ‘mountains’} \rrbracket = \lambda x_e [* \text{mountain}(x)] = *\mathbf{M}$

Following Link and many others, I define the definite article as a ‘maximizing’ iota operator, as in (10), where P is a one-place (singular or plural) predicate and ‘ Π ’ is the ‘part of’ relation.

$$(10) \quad \llbracket \text{‘the’} \rrbracket = \lambda P_{\langle e,t \rangle} \iota x_e [P(x) \ \& \ \forall y [P(y) \rightarrow y \Pi x]] = \iota \mathbf{P}$$

² The indefinite nominative singular form of phonemic /ʕa:liy-un/ ‘high-NOM’, seen in (7a), is affected by phonological adjustments that delete the glide, resolve the resulting [iu] hiatus by overwriting with long [i:], and repairing the resulting superheavy syllable by shortening the long vowel, deriving *ʕāl-in*. In the definite counterpart in (8a) the long vowel is retained, since the $-n$ declension is not present there and consequently no superheavy syllable arises.

³ In analyzing plurals as predicates of sums, I depart from another line that takes plurals to denote predicates of sets of individuals (Bartsch 1973; Bennett 1974; Scha 1981; Gillon 1987; Landman 1989; Lasnik 1990; Does 1993; Schwarzschild 1996; Winter 2001). I will capitalize on the difference between sums and sets in section 3.3, where it will turn out that *kull* ‘every/all’ can be lifted to a predicate of sets, which derives the difference between a use of *kull* parallel to strongly distributive *every* and a use parallel to weakly distributive *all*. I therefore think we can make good use of both sums and sets in a theory of plurality and quantification. But the crucial ingredient for the analysis developed here is a difference in degree order between *all* and *every*, which can probably be formulated in a purely set-theoretic approach, though I do not attempt this here.

The expression ιxPx refers to the unique individual that meets the description P . It is undefined if there is no such individual. In practice we understand P to be restricted to some set of entities relevant to the context of utterance, on which see Cooper (1996), von Stechow (1994), Stanley & Szabó (2000), and Stanley (2002), among others. Link's definition in (10) adds the condition that x is the maximal element of P . If P is a predicate of atoms (the denotation of a singular noun), then (10) requires that every P element be identical to x , which is a subcase of being part of x . As a result, *l-žabal* 'the mountain' refers to the unique mountain in the utterance context. If P is a predicate of sums, on the other hand, ιxPx refers to that sum in P that every other sum in P is a part of. As a result, *l-žibāl* 'the mountains' refers to a sum that all mountains in the utterance context are part of. In treating plurality, I depart from Link here only in that plural noun phrases include atomic individuals in their denotation, following Krifka (1989), Schwarzschild (1996), Sauerland (2003), Spector (2007), Zweig (2008; 2009), and others, while Link excludes them. The importance of including atoms is discussed below (see particularly footnote 7). Drawing on the abbreviations in (9), I abbreviate the denotation of *l-žabal* 'the mountain' as $\iota\mathbf{M}$ and the denotation of *l-žibāl* 'the mountains' as $\iota^*\mathbf{M}$.

Cresswell (1976) claims that gradable adjectives denote relations between an individual and a degree to which the individual exemplifies some property. The lexical entry of an adjective like *ʕālī* 'high' looks like (11a), which holds of an individual x and a degree d when x is high to degree d . Degree scales on this view are downward monotonic, so that if a mountain is high to a degree d , it is also high to every degree below d on the height scale. Consequently, a plural adjective like $^*\text{ʕālī}(d)$ holds of sums whose individual parts are at least d high (11b). As such, the * -operator applies only to the individual-argument, not the degree argument, though see Fitzgibbons, Sharvit & Gajewski (2009) for an alternative that pluralizes the degree argument as well.

- (11) a. $\llbracket \text{ʕālī} \rrbracket = \lambda d_d \lambda x_e [\text{high}(x, d)]$
 b. $\llbracket \text{ʕālī}_{pl} \rrbracket = \lambda d_d \lambda x_e [^*\text{high}(x, d)]$

Superlative adjectives are formed in Arabic by placing the root consonants of the adjective—which are usually three in number—into the prosodic template $?aC_1C_2aC_3$. On this pattern, *?ažmal* 'most beautiful' is derived from *žamīl* 'beautiful', *?aṣʕab* 'most difficult' from *ṣaʕb* 'difficult', *?arxaṣ* 'cheapest' from *raxiṣ* 'cheap', etc.⁴ Therefore, just as an English term like *highest* consists of the adjective *high* and the superlative morpheme *est*, the Arabic counterpart *?aʕlā* consists of the adjective *ʕālī* and the templatic superlative morpheme *?aCCaC*.

Szabolcsi (1986), Heim (1985, 1999, 2001) and others claim that the superlative operator *est* denotes a relation between a degree relation R and an individual x , and is evaluated with respect to a contrast set C containing the alternatives we compare x to with respect to R . It asserts that x bears R to a greater degree than any alternative does. The definition in (12b) for the Arabic superlative morpheme is modified slightly from Heim (2001) along lines proposed by Hackl (2009) to accommodate the discussion of plural superlatives to come.⁵ It is preconditioned on the presupposition made explicit in (12a) that x is included

⁴ Regular phonological processes sometimes produce superficial deviations from this pattern, like glide deletion and hiatus resolution in *?aʕlā* 'highest', phonemically $/ʔaʕlay-u/$ 'highest-NOM', from the root $?-l-y$ pertaining to height, and metathesis in *?aḥarr-u* 'hottest-NOM', phonemically $/ʔaḥrar-u/$, from the root $ḥ-r-r$ pertaining to heat.

⁵ For any expression D denoting a set of degrees, the expression $\max(D)$ ("the maximum element in D ") denotes the highest degree in D . For all individuals x and y , $x \circ y$ ("x overlaps with y") is true if and only if there is a non-empty z such that $z \sqsubseteq x$ & $z \sqsubseteq y$.

in the contrast set C , and that every member of C bears the R relation to some degree (Heim 1999).

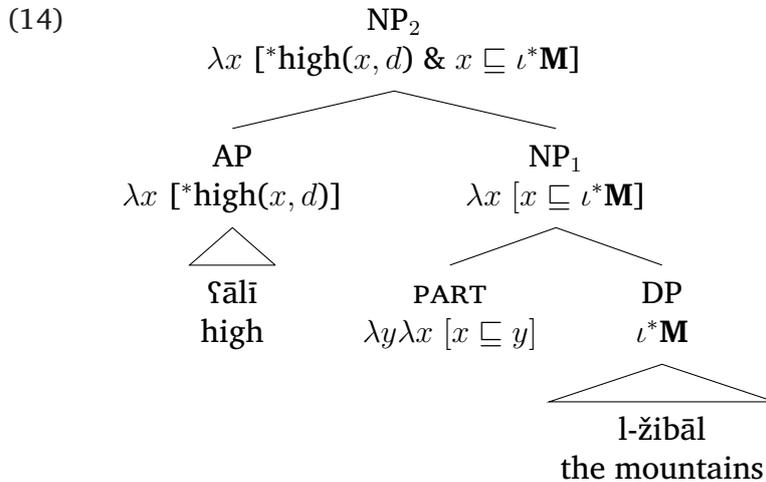
- (12) a. $\llbracket ?aCCaC(x, R) \rrbracket^c$ is defined iff $x \in C \ \& \ \forall x' [x' \in C \rightarrow \exists d R(x', d)]$
 b. When defined, $\llbracket ?aCCaC \rrbracket^c = \lambda R_{\langle d, \langle e, t \rangle \rangle} \lambda x_e \max(\lambda d R(x, d)) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ x' \in C \ \& \ R(x', d')])$

The background assumptions about plurality, degree constructions and the superlative articulated above are not fully innocent. I believe they are sufficient for the purposes they will be put to here, but might yet warrant improvement. See in particular Stateva (2005) and Fitzgibbons, Sharvit & Gajewski (2009) on difficulties for the analysis of distributivity of plural subjects over superlative predicates, and the literature cited in footnote 6 on difficulties faced by movement-type analysis of the kind I will adopt below. I do not incorporate more analytical innovations here than necessary for my limited purposes, but some innovations may be necessary to extend this analysis beyond these confines.

In example (1a), we compare a subpart of the denotation of the definite description *l-żibāl* ‘the mountains’ with other subparts of that plurality in terms of height. The definite plural DP itself denotes a particular plurality (10). In the morphosyntactic composition of (1a) there is no obvious overt reflex of the ‘part of’ relation that appears to play a role in its interpretation. I conclude that a covert partitive operator is hidden in (1a) which derives a predicate that holds of parts of the denotation of the definite noun phrase, defined in (13) after Link (1983), Krifka (1989, 1998) and others.

- (13) $\llbracket \text{PART} \rrbracket = \lambda y \lambda x [x \sqsubseteq y]$

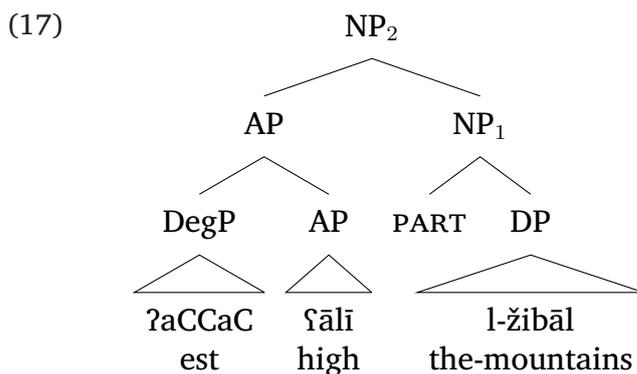
In (1a), *l-żibāl* ‘the mountains’ refers to a plurality of mountains, which, as mentioned above, I notate ι^*M . The underlying adjective *ṣālī* attributes degrees of height to subparts of this plurality. The attribution of height to subparts of ι^*M is an entailment of the structure in (14), where the adjective modifies the derivative of PART. The denotation of NP_2 is derived by ‘predicate modification’, a special combinatorial rule that unifies the arguments of two one-place predicates (Heim & Kratzer 1998). Pre-nominal adjectives do not agree morphologically with the noun they occur in construct with, unlike post-nominal adjectives as illustrated in (7) and (8). The adjective *ṣālī* ‘high’ is nonetheless semantically plural in (14), where it applies to the pluralities that NP_1 describes. The degree argument of *ṣālī* ‘high’ in (14) is the denotation of the trace of a moved degree operator, as I describe in more detail below. The denotation of this structure holds of an individual if it is both part of ι^*M and all its parts are high to degree d .



Two observations support the structure in (14) as the base for the superlative expression in (1a). First, the structure in (14) is attested on its own and displays a property supporting the constituency seen in (14). Fassi Fehri (1999: 115) mentions the examples in (15), cited here with his translations. The property these constructions have that supports the constituency in (14) is that the nominal dependent may be pronominalized stranding the adjective (16), indicating that the adjective originates in a position external to the definite dependent, as diagrammed in (14).

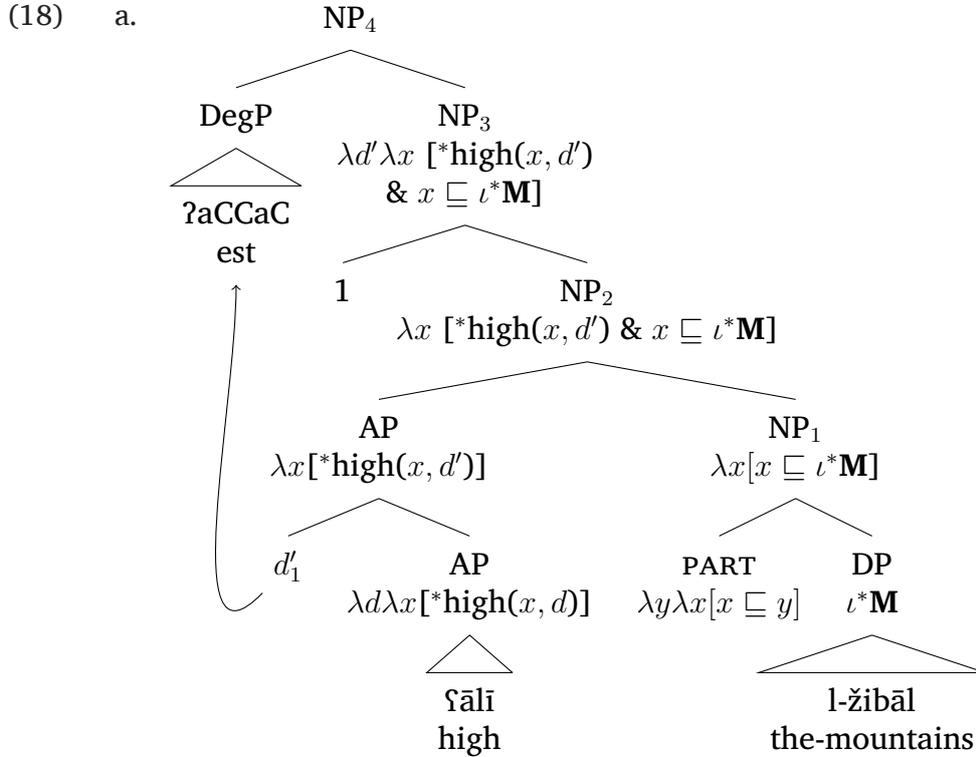
- (15) a. $\text{ʔakal-tu laḏīḏ-a t-ṭaḑām-i}$
ate-1S delicious-ACC the-food-GEN
'I ate the delicious (of the) food.'
- b. $\text{ʔa-qraʔ-u ḑadīd-a l-kutub-i}$
1S-read-IND new-ACC the-books-GEN
'I read the new (of the) books.'
- (16) a. $\text{ʔakal-tu laḏīḏ-a-hu}$
ate-1S delicious-ACC-it
'I ate the delicious (portion) of it.'
- b. $\text{ʔa-qraʔ-u ḑadīd-a-hā}$
1S-read-IND new-ACC-them
'I read the new (ones) of them.'

Second, the superlative morpheme in (1a) compares pluralities in terms of how high a part of ι^*M they are, that is, in terms of the meaning of (14) construed as a relation between entities (parts of ι^*M) and degrees (heights). The structure in (14) represents a proper argument for the superlative morpheme insofar as it can be construed as a relation between entities and values of the degree argument of ṣāli 'high'. Szabolcsi (1986) and Heim (1985; 1999; 2001) claim that such a degree relation is derived as part of a process of displacement of the superlative morpheme from a position adjacent to the associated scalar term—AP in (14)—to a position external to the root NP in (14). The base structure for an analysis along these lines looks like (17).



On the model of Szabolcsi and Heim's movement analysis of the interpretation of superlatives, the superlative morpheme in (17) moves to adjoin to the root NP. Movement of the superlative morpheme leaves a degree-denoting trace in its base position, which in turn functions as argument of the degree relation denoted by the AP. Movement of the superlative morpheme goes hand in hand with insertion of an abstraction operator ('1' in (18a)) over the degree variable in its base position, which derives a degree relation at the level of the superlative morpheme's derived position (see Heim & Kratzer 1998 on the relation

between movement and predicate abstraction). The denotation of NP₄, shown in (18b), results from the application of the superlative morpheme *ʔaCCaC* (as defined in (12b)) to the degree predicate abstracted over NP₂.⁶



b. $\llbracket \text{NP}_4 \rrbracket^c = \lambda x \max(\lambda d \llbracket *high(x, d) \& x \subseteq \iota^*M \rrbracket) > \max(\lambda d' \exists x' [\neg x \circ x' \& x' \in C \& *high(x', d') \& x' \subseteq \iota^*M])$

The denotation in (18b) holds of a plural individual x if all the atoms in x are at least d high, x is a part of the plurality ι^*M , and there is no non-overlapping plurality x' whose atoms are also at least d high and which is also a part of ι^*M . Suppose \mathbf{m}_1 , \mathbf{m}_2 and \mathbf{m}_3 are the three highest mountains in the denotation of *l-ʔibāl*, in that order. If we were to use this expression to describe $\mathbf{m}_2 \oplus \mathbf{m}_3$, then there would be a value for x' in (18b), namely \mathbf{m}_1 , that does not overlap with $\mathbf{m}_2 \oplus \mathbf{m}_3$ but which has a higher maximal height than $\mathbf{m}_2 \oplus \mathbf{m}_3$. This correctly predicts that the expression in (1a) cannot describe $\mathbf{m}_2 \oplus \mathbf{m}_3$ in this situation. Note in this connection that it is critical that the domain of the plural adjective **high* contains singularities as well as sums. Otherwise the singularity \mathbf{m}_1 would not count as a possible alternative to the sum $\mathbf{m}_2 \oplus \mathbf{m}_3$.⁷

⁶ If the superlative morpheme were interpreted in situ in (17), then the denotation of the tree would hold of an entity that is both the highest thing in the universe and a part of the mountain plurality ι^*M , which is not a correct characterization of the meaning of examples like those in (1). However, the literature on the superlative includes analyses that postulate additional semantic structure or pragmatic principles that seek to derive the meaning of superlative constructions with little or no movement of the superlative morpheme itself (Gawron 1995; Farkas & Kiss 2000; Sharvit & Stateva 2002; Gutiérrez-Rexach 2006; Teodorescu 2009; Krasikova 2012; Coppock & Beaver 2014). I trust that if these analyses are correct, they will carry over to the data described here, but continue for perspicuity's sake to draw on the relatively transparent structural approach developed by Szabolcsi and Heim.

⁷ Other evidence favors the conclusion that plural individuals include atoms, contra Link (1983). As Krifka (1989), Schwarzschild (1996), Sauerland (2003), Spector (2007), Zweig (2008; 2009) and others point out,

Note that the possibility of pronominalizing the dependent DP persists in the superlative derivative of examples like (15), shown in (19), indicating that a structure like (14) is contained in the superlative construction in (1a) (Elghamry 2004). Both the superlative morpheme and the adjectival base are external to the dependent DP in the superlative structure in (1a), just as the structure in (18a) characterizes it.

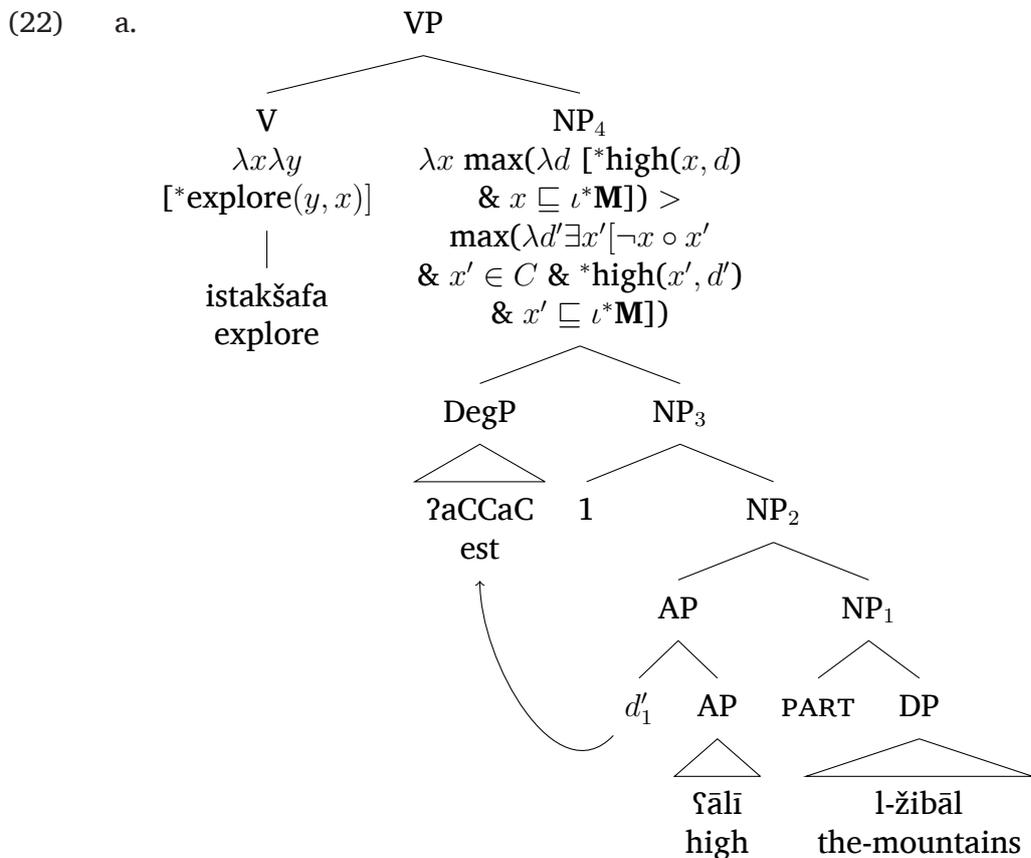
- (19) ʔaʕlā-hā
 highest.NOM-them
 ‘the highest of them’

Regarding the integration of the constituent in (18a) into a sentence such as (1a), evidence suggests that the superlative object there is semantically indefinite, just as it is morphologically indefinite. Though it is clear it contains a definite DP *l-żibāl* ‘the mountains’, the superlative derivative *ʔaʕlā l-żibāl* ‘highest of the mountains’ does not itself display the definite article (there is no indefinite article in Arabic) and fails to display the uniqueness presupposition characteristic of definiteness. Specifically, the sentence in (20b) is felicitous as a continuation of the negative superlative statement in (20a). It is somewhat awkward since it forces a reading of the negative statement in (20a) where it does not deny that Ibn Khaldun climbed some high mountains (which is what is likely to be ‘at issue’ here), but rather it denies that there were any other mountains that were just as high. Aside from being somewhat off topic, the statement in (20b) makes sense as a continuation of the negative superlative statement in (20a). This suggests that whatever uniqueness is part of the meaning of the superlative falls under the scope of negation here, and therefore is not a presupposition. The pair in (21) presents another, perhaps somewhat more plausible example of the pattern in (20). Note that the same argument can be applied to the English translations to (20) and (21), which actually *do* contain a definite article. The interpretational similarity to Arabic, where no article occurs, suggests that the definite article that appears in English in such contexts is semantically not contentful.

- (20) a. *ibn xaldūn lam ya-stakšif ʔaʕlā l-żibāl-i.*
 ibn khaldun not 3MS-explore highest.ACC the-mountains-GEN
 ‘Ibn Khaldun didn’t explore the highest of the mountains.’
- b. *baqiyyat-u l-żibāl-i ta-stawī-hā ʕuluww-an.*
 rest-NOM the-mountains-GEN 3PL-equal-them height-ACC
 ‘The rest of the mountains are just as high.’
- (21) a. *lam yu-sažžin-ū ʔašžaʕ-a š-šabāb-i.*
 not 3M-imprison-PL most.courageous-ACC the-youth-GEN
 ‘They didn’t imprison the most courageous of the youth.’
- b. *baqiyyat-u šabāb-i kān-ū bi-nafs-i š-šažāʕat-i.*
 rest-NOM youth-GEN was-3MPL in-same-GEN the-courage-GEN
 ‘The rest of the youth were just as courageous.’

if a sentence like *Jack saw horses* entailed that Jack saw two or more horses, then its negation *Jack didn’t see horses* would be true if he saw exactly one horse, since then he did not see two or more. The fact that it isn’t true means that single horses fall under the denotation of the plural *horses*. The literature cited above claims that the plurality entailment of plurals in postive contexts is a pragmatic implicature.

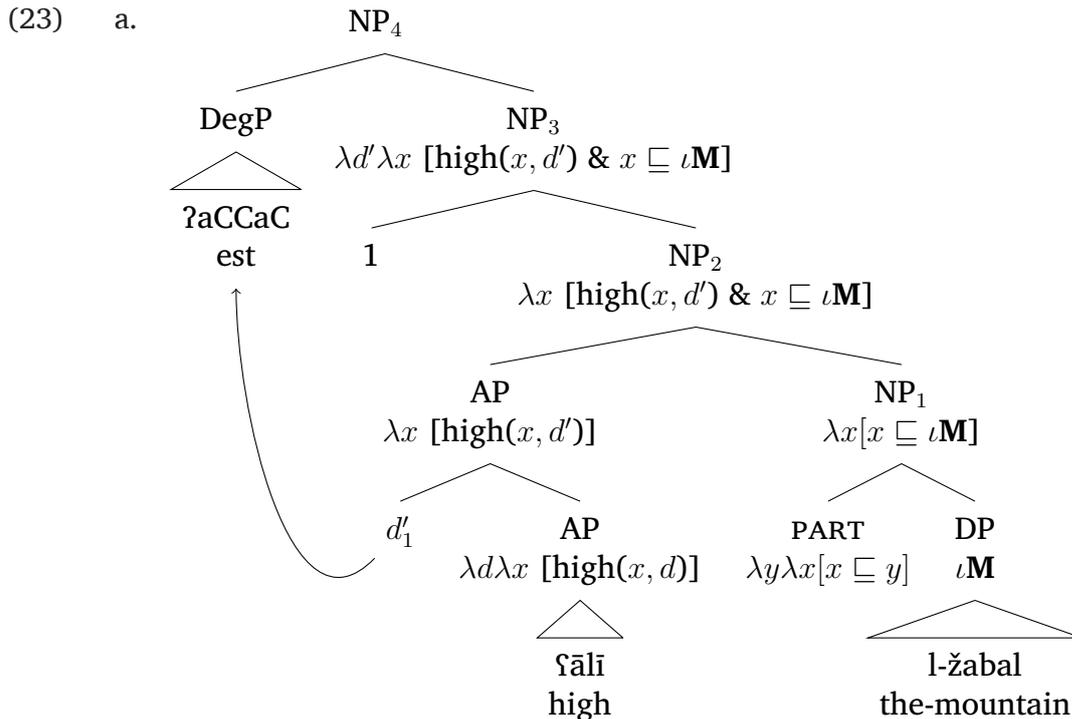
I take these observations to mean that the expression in (18a) is existentially quantified in the sentence in (1a). This proposal is compatible with various implementations. I assume for concreteness that the predicate in (18a) restricts the internal argument variable of the transitive verb by the RESTRICT operation described by Chung & Ladusaw (2004), which combines a monadic and a diadic predicate by unifying the argument of the monadic predicate with the internal argument of the diadic predicate and ‘passing up’ the other.⁸ The internal argument of this predicate is then saturated by existential closure, i.e., insertion of a covert existential quantifier over the verb phrase (Heim 1983; Diesing 1992). This way of composing V and NP₄ below derives the verb phrase denotation in (22b). It holds of an individual y (who is Ibn Khaldun in (1a)) if there is a (plural) individual x that y explores, which is part of the mountain plurality ι*M, and which has a greater height than any non-overlapping part of ι*M. The *-operator for explore pluralizes only the internal argument position in this case, on which see Link (1991).



b. $[[VP]]^c = \lambda y \exists x [\text{explore}(y, x) \ \& \ \max(\lambda d [\text{*high}(x, d) \ \& \ x \sqsubseteq \iota^*M]) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ x' \in C \ \& \ \text{*high}(x', d') \ \& \ x' \sqsubseteq \iota^*M])]$

This same derivation generates the counterpart in (1b) with a singular dependent DP, illustrated in (23a) with the denotation in (23b). The denotation in (23b) holds of an individual x if the maximal degree to which x is both high and part of the single mountain ιM is greater than the maximal degree to which any non-overlapping alternative is high and part of ιM. I assume (23a) composes with the main verb in the same manner as its plural counterpart in (22a).

⁸ More precisely: $\text{RESTRICT}(\lambda y \lambda x [R(x, y)], \lambda y [P(y)]) = \lambda y \lambda x [R(x, y) \ \& \ P(y)]$



- b. $[[NP_4]^C = \lambda x \max(\lambda d [\text{high}(x, d) \ \& \ x \subseteq \iota\mathbf{M}]) > \max(\lambda d' \exists x' [-x \circ x' \ \& \ x' \in C \ \& \ \text{high}(x', d') \ \& \ x' \subseteq \iota\mathbf{M}])$

Before turning to quantity superlatives, it is worth pointing out that examples of quality superlatives with a singular definite dependent nominal like (1b) are a great deal less productive than their plural counterparts of the kind in (1a). Specifically, the choice of DP is more limited in the singular than in the plural. Example (24a) refers predictably to a plurality of schools that are better than all the schools not included in this plurality, while the singular counterpart in (24b) is infelicitous (Elghamry 2004).

- (24) a. *ʔaḥsan-u l-madāris-i*
best-NOM the-schools-GEN
'the best of the schools'
- b. *#ʔaḥsan-u l-madrasat-i*
best-NOM the-school-GEN
'(the best part of the school)'

This contrast falls out from the presupposition of the superlative stated in (12a). The superlative is only defined if everything we contrast the subject denotation with also bears the degree relation to some degree. But we cannot predicate 'good' of schools and parts of schools in the same sense. What makes schools good (having demanding curricula, motivated faculty, modern facilities etc.) is not measured in the same dimension as what makes parts of schools good (whatever that might be). The expression in (24b) is therefore a presupposition failure. The phrase *ʔaḥlā l-žabal* 'highest (of the) mountain', on the other hand, is felicitous precisely because we can naturally attribute height to both mountains and parts of mountains. Consequently, the singular construction exemplified by (1b) and (24b) is grammatical only to the extent that the adjective property can be said to hold of all parts of the dependent DP.

In summary, the construction under inspection here has a structure in which a superlative operator combines with a constituent formed by the combination of an adjective with a partitive definite DP. The following section turns to the examples in (2) and claims that they are essentially the same as those in (1), but contain a degree predicate abstracted over a measure of quantity.

2.2 Quantity superlative + definite dependent

The quantity superlative illustrated in (2) contains the term *ʔakθar*, corresponding to English *most*. The term *ʔakθar* consists morphologically of the superlative template *ʔaCCaC* discussed in the previous section and the base adjective *kaθīr* ‘much/many’. As such, it displays the same morphological composition that Bresnan (1973) and Hackl (2009) attribute to English *most*, which they analyse as *many/much* + *est*. Hackl (2009) presents an analysis that derives the meaning of *most* from these component parts. He claims that the meaning of *most* as a proportional quantifier is derivable from its function as a superlative of *many*. Cresti (1995) and Hackl (2009) analyse *many/much* as a relation between an individual and a degree that measures out the cardinality of the individual. However, Wellwood, Hacquard & Pancheva (2012), Solt (2015) and Wellwood (2015) point out that *much* measures out more than just cardinality. Arabic *kaθīr* is like *much* in this respect. It not only may describe extent in quantity as a modifier of either count (25a) or mass (25b) nouns, but also extent in degree (25c) or temporal duration (25d) as a verb phrase modifier. Accusative case on *kaθīr* is in agreement with the object head noun in (25a)–(25b) but marks adverbhood in (25c)–(25d).

- (25)
- a. *xālid qaraʔ-a kutub-an kaθīr-at-an.*
khalid read-3MS books-ACC much-PL-ACC
‘Khalid read many books.’
 - b. *xālid šarib-a māʔ-an kaθīr-an.*
khalid drank-3MS water-ACC much-ACC
‘Khalid drank a lot of water.’
 - c. *xālid istaḥaqq-a l-žāʔizat-a kaθīr-an.*
khalid deserved-3MS the-prize-ACC much-ACC
‘Khalid deserved the prize a lot.’
 - d. *xālid ṣallā kaθīr-an.*
khalid prayed much-ACC
‘Khalid prayed a lot.’

For this reason, the literature cited above attributes a more general meaning to *much*, one that generalizes away from cardinality as such and relates an individual (or event) to a degree on a scale that is contextually determined, where English *many* simply specifies the subcase of cardinality. Solt (2015) departs from Wellwood, Hacquard & Pancheva (2012) and Wellwood (2015) in attributing this more general meaning not to *much* directly, but to a covert operator she terms MEAS. Data like the examples in (25) indicate that the analysis of *kaθīr* constructions as involving an underspecified degree relation is appropriate for Arabic as well, and I follow Solt in attributing the meaning in question to covert MEAS. The rationale for dissociating the underspecified degree relation from *much/kaθīr* is that *much/kaθīr* occurs in some contexts where some other term contributes a degree relation, and at the same time it fails to occur in some contexts where no other (overt) degree relation-contributing term is found. An example of the

first case is the occurrence of *much* underlying *most* in expressions like *the most intelligent student*, where *intelligent* already introduces a degree relation that *est* can apply to. Corver (1997) argues that *much* is vacuous in such cases. I claim in section 2.3 that the Arabic *kull* constructions in (3) represent an example of the second case. An expression like *kull l-żibāl* ‘all the mountains’ contains a degree relation that attributes a degree of quantity to parts of the plurality that *l-żibāl* ‘the mountains’ denotes, but yet *kaθīr* does not occur in *kull* constructions.⁹

Solt attributes the meaning in (26a) to MEAS and the meaning in (26b) to *much/many*, which I extend to *kaθīr*. MEAS applies to an individual and a degree *d* and says that the individual’s measure on the contextually specified scale *S* is greater than *d*. The expression μ_s functions like a pronoun that ranges over measure functions, with referential index *S* specified by the context of evaluation (via an assignment function in Solt 2015). In connection with a value for *S*, like ‘height’ or ‘cardinality’, μ_s denotes a measure function along that dimension.¹⁰ The term *kaθīr* applies to a degree and a degree relation and ‘feeds’ the degree to the degree relation. As such, it is essentially vacuous. Following Corver, I assume it is inserted by default when the ‘real’ degree predicate is not a suitable morphological host for the superlative morpheme, for example when it is not overt, as in the case of MEAS.¹¹

- (26) a. $\llbracket \text{MEAS} \rrbracket^s = \lambda x_e \lambda d_d [\mu_s(x) \geq d]$
 b. For any type τ , $\llbracket \text{ka}\theta\text{ir} \rrbracket = \lambda d_d \lambda I_{\langle d, \tau \rangle} [I(d)]$

In the tree in (27a) for (2a), MEAS functions as a covert adjectival modifier of the partitive noun phrase, like the adjective *řālī* in (18a) for (1a). The term *kaθīr* is morphologically like other adjectives, being based on the adjectival template *CaCiC* (compare *marīđ* ‘sick’, *lađīđ* ‘delicious’, *raxīř* ‘inexpensive’, *řamīl* ‘beautiful’, etc., etc.). Here, though, it occurs as an adjunct of the AP headed by MEAS, and semantically composes with it by function application, reflecting its use as a pleonastic host for the superlative morpheme that in turn adjoins to it. I assign it the category ‘ \mathcal{AP} ’ to reflect its second order semantics and distinguish it from the ‘real’ adjective MEAS. All of the complex nodes in this tree compose by function application except for NP_2 , which is built by predicate modification, and NP_3 , which is built by predicate abstraction.¹² The usual displacement of the superlative morpheme *řaCCaC* leaves a trace behind that saturates the degree argument of *kaθīr*. The

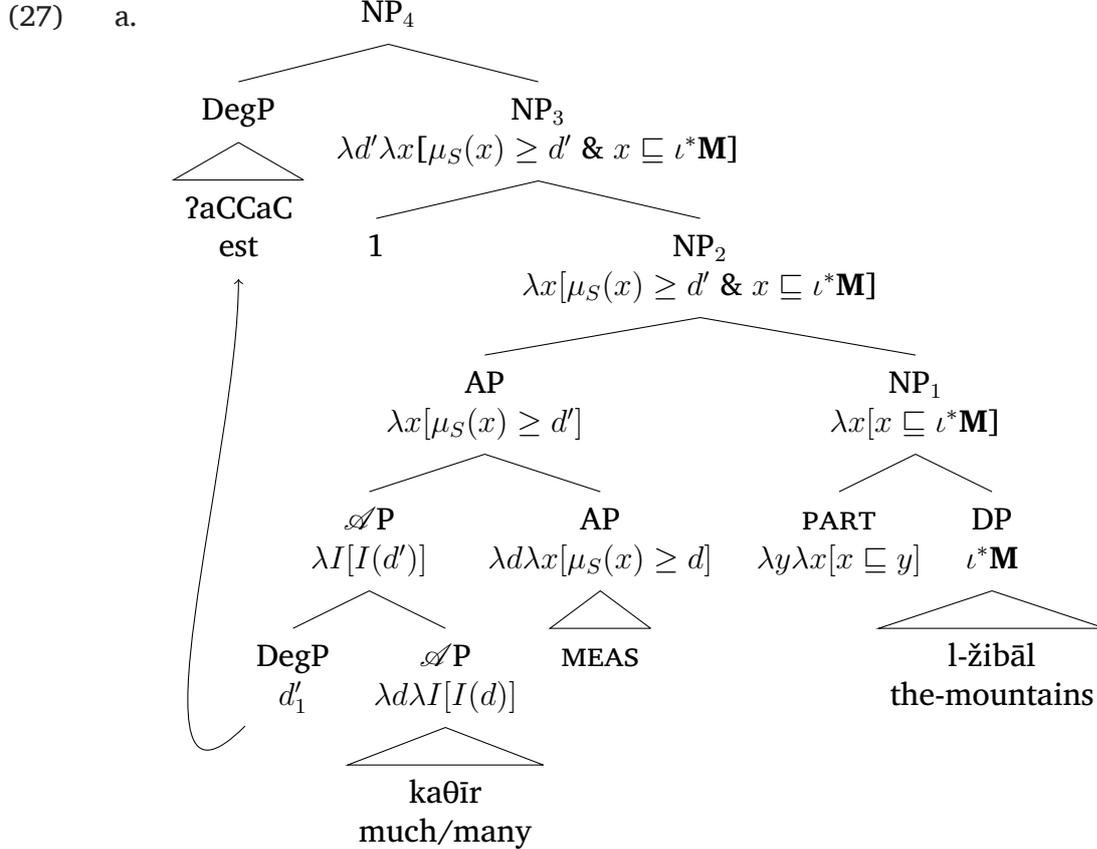
⁹ Wellwood (2015) discusses Corver’s (1997) observations in detail and claims that in fact, *much* always contributes the degree relation in degree constructions; gradable adjectives are not degree relations themselves but rather describe states that may manifest themselves to a degree specified by *much*. This makes *most intelligent* the base case. *Much* goes unpronounced in expressions like *the smartest student*, which she decomposes as *the est much smart student*. At this level of structure, *much* is deleted by virtue of directly preceding an adjective, following Bresnan (1973). Insofar as the cases in which *kaθīr* unexpectedly fails to materialize can all be analysed as involving surface deletion of *kaθīr*, the claims made here can be reformulated along the lines developed in Wellwood (2015).

¹⁰ See Wellwood (2014: 78–79) for a discussion of formal options for relating the measure function to its discourse context. Note, too, that the choice of dimension *S* is restricted by a generalization identified by Schwarzschild (2006). Schwarzschild points out that what he calls Q-adjectives, including *much/many*, may only make reference to scales that are monotonic on the part-whole relation in the modified nominal. Hence, *much water* cannot describe how hot the water in question is, because it is not the case that subparts of the quantity of water in question are correspondingly less hot than the totality.

¹¹ Solt characterizes *I* as a degree predicate of type $\langle d, t \rangle$, which suffices for her purposes. The flexible type attributed to *I* in (26b) is necessary for compatibility with the superlative, a construction she does not discuss.

¹² This composition represents another small departure from Solt, who treats the phrase headed by *much/many* in English as a QP, following Bresnan (1973), Schwarzschild (2006) and others, and applies MEAS directly to the NP using a special combinatorial rule (237). None of the Arabic facts motivate a departure from standard combinatorial procedures, though I believe they are also compatible with Solt’s approach.

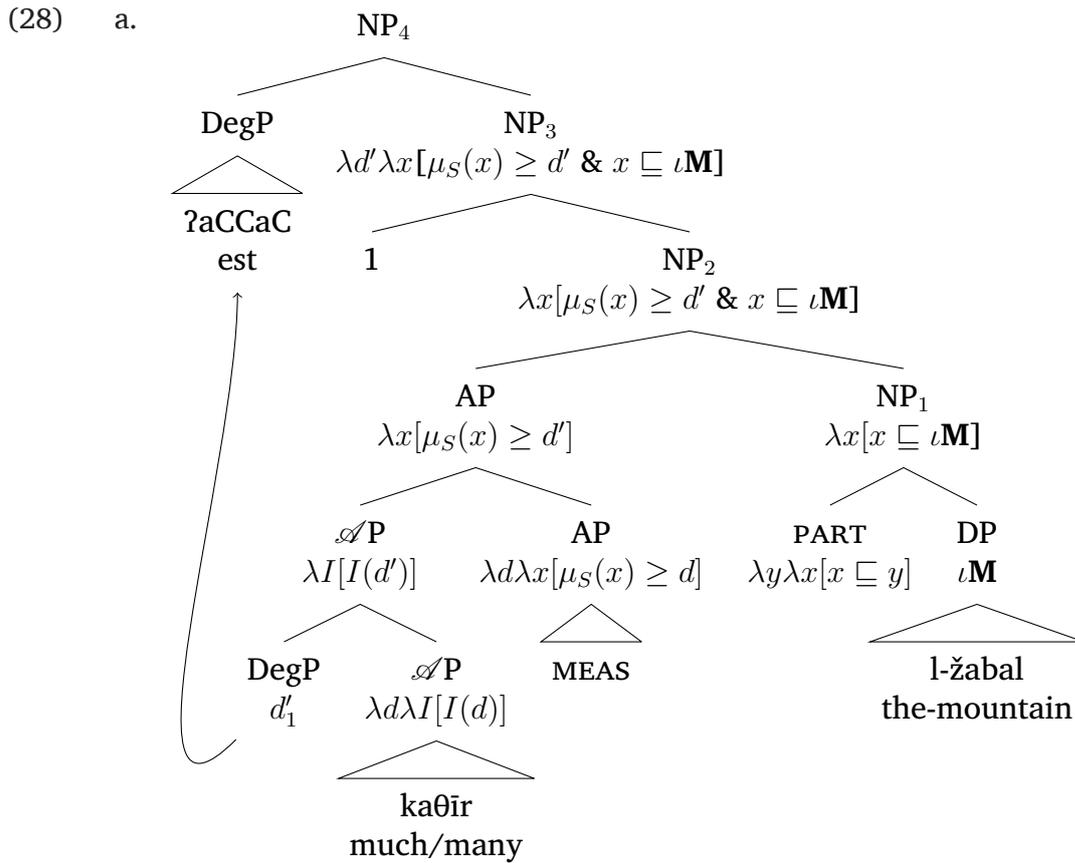
result of applying *kaθīr* to MEAS serves to identify the degree argument of MEAS with the trace of the moved degree operator. Predicate abstraction over that degree argument derives NP₃, which presents the superlative morpheme with an argument of the appropriate type. The tree in (27a) represents the structure of the object NP in (2a). Its denotation is specified in (27b).



b. $\llbracket \text{NP}_4 \rrbracket^{C,S} = \lambda x \max(\lambda d[\mu_S(x) \geq d \ \& \ x \subseteq \iota^*M]) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ x' \in C \ \& \ \mu_S(x') \geq d' \ \& \ x' \subseteq \iota^*M])$

The tree in (27a) denotes a predicate that holds of an individual *x* (in this case a plurality of mountains) if *x* is part of the plurality ι^*M and *x* has a greater degree on the dimension *S* than any non-overlapping alternative part of ι^*M . Because of the monotonicity restriction that μ is subject to (see footnote 10), the only dimension that comes into question in this case is quantity/cardinality.

As Hackl (2009) points out in relation to similar examples in English, if *x* were less than half of ι^*M , then the other, larger, half would represent an alternative to *x* with a greater cardinality, falsifying the superlative claim. This means that for the denotation in (27b) to hold of an individual, that individual must comprise more than half of the plurality ι^*M . For this reason, *ʔakθar l-żibāl* ‘most of the mountains’ holds of a plurality of mountains that comprises more than half of the plurality that *l-żibāl* refers to. This is the desired result. The same ingredients derive the interpretation of the singular counterpart in (2b), diagrammed in (28a), whose denotation is similar to (27b) except that we are dealing with parts of a single mountain ιM rather than a plurality.



- b. $\llbracket \text{NP}_4 \rrbracket^{CS} = \lambda x \max(\lambda d [\mu_S(x) \geq d \ \& \ x \sqsubseteq \iota \mathbf{M}]) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ \mu_S(x') \geq d' \ \& \ x' \in C \ \& \ x' \sqsubseteq \iota \mathbf{M}])$

The similarity in form and interpretation between the quantity superlative described above and the quality superlative described in section 2.1 is reinforced by the observation that here, too, the dependent DP may be pronominalized (29), as in the superlative construction in (19). This means that both the superlative morpheme and its base *kaθīr* are external to the dependent DP in (2), as in the quality superlative construction in (1).

- (29) a. ?akθar-u-hu
 most-NOM-it
 ‘most of it’
- b. ?akθar-u-hā
 most-NOM-them
 ‘most of them’

Thus, the semantic composition of *est* with *much/many* that Bresnan (1973), Hackl (2009) and others attribute to *most* extends to Arabic in a way that captures the similarity in format and interpretation between the quality superlative construction in (1) and the quantity superlative in (2). The following section addresses the issue of how *kull* ‘every/all’ fits into this picture.

2.3 Universal superlative + definite dependent

The superlative term *ʔakθar* ‘most’ in (2) can be replaced by *kull* ‘every/all’, as illustrated in (3), without disturbing the syntactic and semantic composition of those examples. The syntactic structure appears to be the same, as evidenced by the possibility of pronominalizing the dependent (30), as in the quantity superlative in (29) (Elghamry 2004). As there, this indicates that *kull* is structurally external to that DP.

- (30) a. *kull-u-hu*
all-NOM-it
‘all of it’
- b. *kull-u-hā*
all-NOM-them
‘all of them’

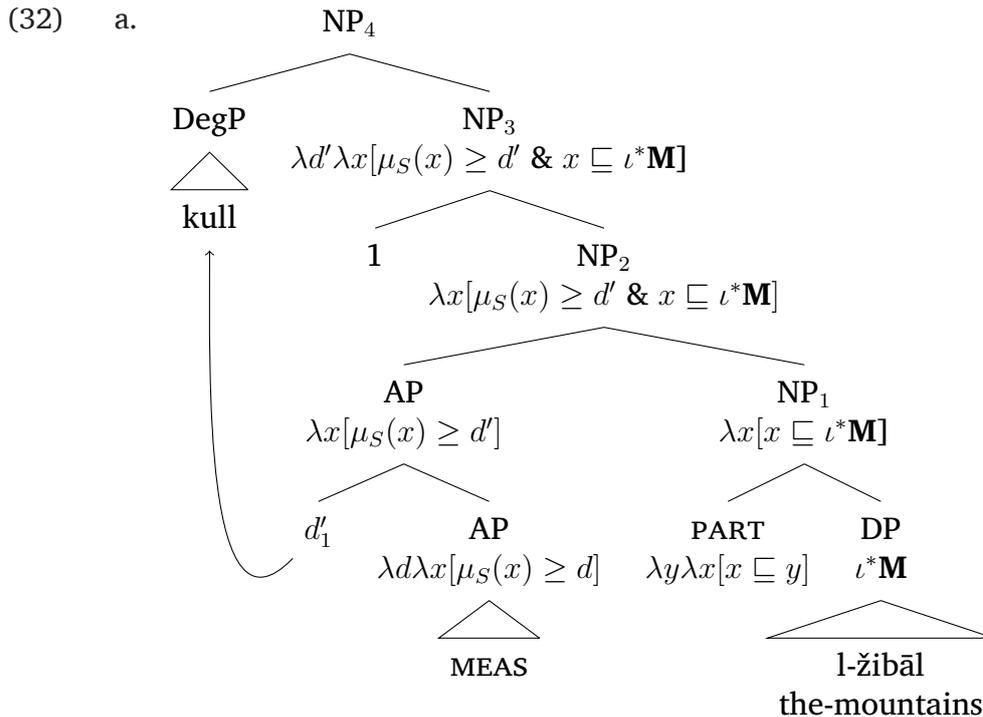
Semantically, too, the examples in (3) are similar to the quantity superlative examples in (2). The sentences in (2) and (3) differ intuitively only in the proportion of mountains they say that Ibn Khaldun explored. *ʔakθar* specifies the proportion ‘more than half’ (indirectly, as Hackl (2009) shows, by virtue of the meaning of the superlative morpheme), while *kull* specifies the proportion ‘all’. These similarities raise the question of whether an analysis of *kull* is conceivable that characterizes its meaning as a variation on the meaning of *ʔakθar*, such that the proportion it specifies is different but everything else about its meaning and distribution is the same.

I explore here the possibility that *kull* means the same as the superlative morpheme *ʔaCCaC/est* except that it compares *possibly overlapping* members of the contrast set. Recall that the definition of the superlative in (12b), repeated below in (31a), compares an individual x with values of x' that do not overlap with x , encoded in the condition $\neg x \circ x'$. The definition in (31b) for *kull* is just that in (31a) for *ʔaCCaC/est* except that the overlap symbol ‘ \circ ’ is replaced with the equivalence symbol ‘ $=$ ’, so that the non-overlap condition on the alternatives to x is replaced by a non-identity condition. On this interpretation, *kull* asserts of a (possibly plural) individual x that x bears the degree relation in question to a greater degree than any alternative not identical to x , including alternatives that overlap with x . I propose that the possibility of overlap between x and its alternatives distinguishes the meaning of degree modifier *kull* from the meaning of *ʔaCCaC*. They are otherwise identical.

- (31) a. $\llbracket ʔaCCaC \rrbracket^C = \lambda R_{\langle d, \langle e, t \rangle \rangle} \lambda x_e \max(\lambda d R(x, d)) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ x' \in C \ \& \ R(x', d')])$
- b. $\llbracket kull \rrbracket^C = \lambda R_{\langle d, \langle e, t \rangle \rangle} \lambda x_e \max(\lambda d R(x, d)) > \max(\lambda d' \exists x' [\neg x = x' \ \& \ x' \in C \ \& \ R(x', d')])$

Since *kull* is a quantity superlative on this view, then like *ʔakθar* it must occur together with an operator that derives a degree relation from the partitive DP, which is the role that MEAS plays in the interpretation of *ʔakθar*. Unlike *ʔakθar*, however, *kull* does not occur with the base adjective *kaθir*. The base adjective *kaθir* in *ʔakθar* was analysed in

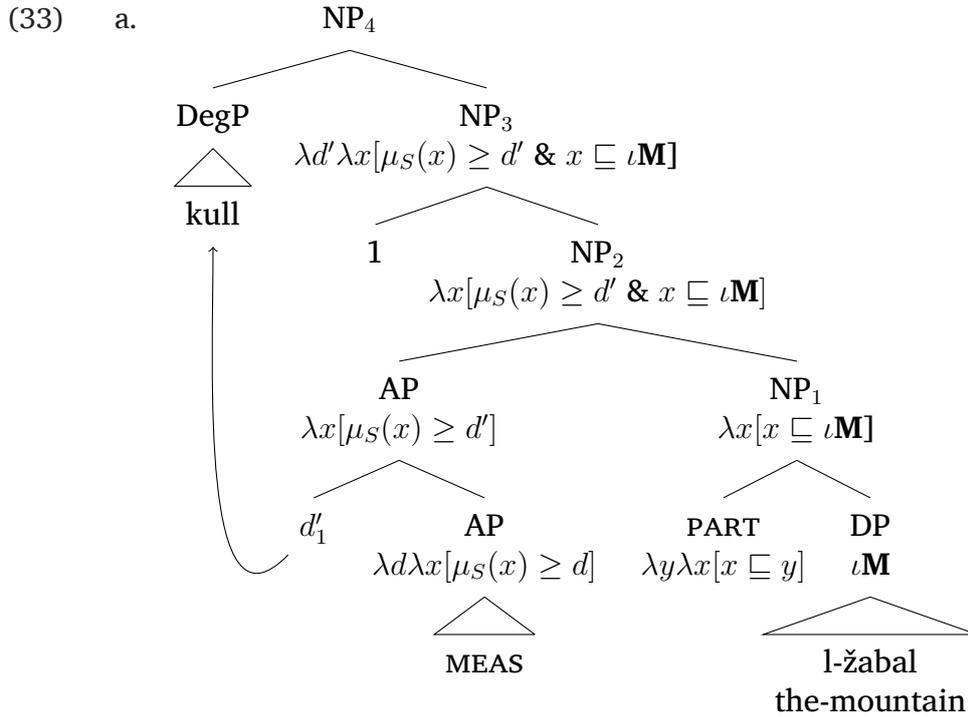
section 2.2, following Solt (2015), as an essentially vacuous host for the phonologically defective superlative morpheme. Since *kull* is a prosodic word in its own right, the appearance of *kaθīr* in *kull*-constructions is unnecessary, nor does its absence interrupt the semantic composition, as the tree in (32a) for the object expression *kull l-žibāl* ‘all the mountains’ in (3a) shows. Because *kull* does not need to associate with an adjective for morphological reasons, it can apply directly to the degree relation MEAS. The rest of the structure is analogous to the structure of quantity superlatives discussed in section 2.2, which in turn is analogous to the structure of quality superlatives shown in section 2.1.



b. $[[\text{NP4}]^{C,S}] = \lambda x \max(\lambda d [\mu_S(x) > d \ \& \ x \sqsubseteq \iota^* \mathbf{M}]) > \max(\lambda d' \exists x' [\neg x = x' \ \& \ x' \in C \ \& \ \mu_S(x') > d' \ \& \ x' \sqsubseteq \iota^* \mathbf{M}])$

The denotation in (32b) of the tree in (32a) asserts of an individual x that x is part of the mountain plurality $\iota^* \mathbf{M}$ and that the extent of x on the scale S , in this case cardinality, is greater than any non-identical but possibly overlapping part of $\iota^* \mathbf{M}$. Supposing there are ten mountains in total, this description does not hold of a subpart including only nine of the mountains, since then there is a distinct (though overlapping) subpart including all ten of the mountains that has a greater cardinality than the subpart containing only nine. Only the maximal subpart including all ten mountains meets the description in (32b), where the subparts whose cardinality is compared may overlap. The singular case in (3b) has a similar composition and denotation, spelled out in (33a) and (33b). Once again, no proper subpart of the mountain in question meets the description in (33b), since the

maximal subpart is larger than all proper subparts. Only a subpart comprised of all of the mountain meets the condition in (33b).



b. $[[NP_4]]^{c,s} = \lambda x \max(\lambda d[\mu_S(x) \geq d \ \& \ x \subseteq \iota M]) \geq \max(\lambda d' \exists x' [\neg x = x' \ \& \ x' \in C \ \& \ \mu_S(x') > d' \ \& \ x' \subseteq \iota M])$

The remarks above spell out an analysis for *kull* that correctly predicts its resemblance to a universal quantifier but which, as a minor variation on the meaning of the superlative *ʔaCCaC*, predicts that *kull* and *ʔakθar* differ only the proportion they specify and are otherwise similar in meaning and distribution. A substantial challenge to this view of the meaning of *kull* is the fact that *kull* may also combine with a singular count NP to denote an expression analogous in meaning to English *every NP*. This raises the question of whether the meaning attributed to *kull* above extends to its use as a quantifier analogous to *every*. I claim that in fact it does, in connection with the possibility of lifting the meaning of *kull* to a predicate of sets rather than individuals, a step that in turn explains its strong distributivity in that usage. I describe this analysis of *kull* in section 3.3 below, in the context of a general discussion of what I called the ‘indefinite’ pattern for quality and quantity superlatives and *kull* illustrated in (4)–(6).

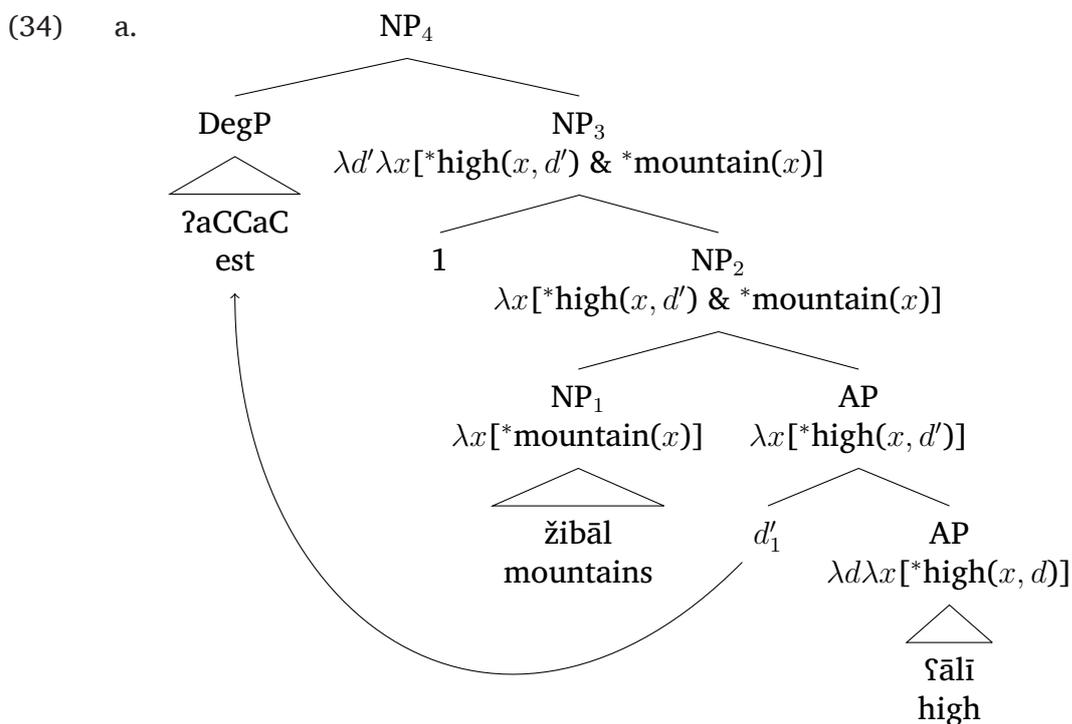
3 The indefinite pattern

What remains now to be investigated is whether there is any relation between the analysis constructed above for the case of the definite dependent in (1)–(3) and the case of the indefinite dependent illustrated in (4)–(6). Again, of particular interest is whether the analysis of *kull* described above for cases where it intuitively corresponds to English *all* carries over to the cases where it intuitively corresponds to English *every*. I begin with the observation that the indefinite dependent does not have a clitic counterpart. The examples in (19), (29) and (30) of a superlative term (including *kull*) in construct with a clitic pronoun have only the interpretation available to them according to which the clitic corresponds to a definite DP.

3.1 Quality superlative + indefinite dependent

Morphosyntactically, the indefinite pattern differs from the definite pattern in that the dependent nominal is not marked with the definite article *l-*. The quality superlative examples in (4) correspond in meaning and use to garden variety superlative noun phrases like *the highest mountain(s)* in English, but the definite article seen in English does not make an appearance in Arabic, neither on the dependent nominal nor anywhere else in the structure. Nor, as mentioned above, can the indefinite dependent nominal be cliticized to the superlative adjective.

As in section 2, I follow Szabolcsi (1986), Heim (1985, 1999, 2001) and others in maintaining that the superlative morpheme originates adjoined to its scalar associate, and moves to the edge of the constituent that functions as the degree relation argument of the superlative, leaving a degree-denoting trace in its base position. In the quality superlative cases in (4), the scalar associate of the superlative is an adjective that modifies the indefinite dependent nominal. In Arabic, the superlative adjective occurs pre-nominally (4), while the canonical position of the positive counterpart is post-nominal (7). This fact lends some credence to the movement account, though in Arabic apparently movement of the superlative from the post-nominal position of its adjectival associate to its pre-nominal surface position pied pipes the adjective. I assume this pied piping is limited to the surface structure and the adjective is interpreted *in situ*, so that the LF derived by movement of the superlative in an example like (4a) looks like (34a). The partitive operator PART does not appear here, since the adjectival host of the superlative finds a predicative modifyee in the indefinite dependent nominal itself, nor does the MEAS modifier appear, since the adjective *ṣālī* ‘high’ provides the scale.



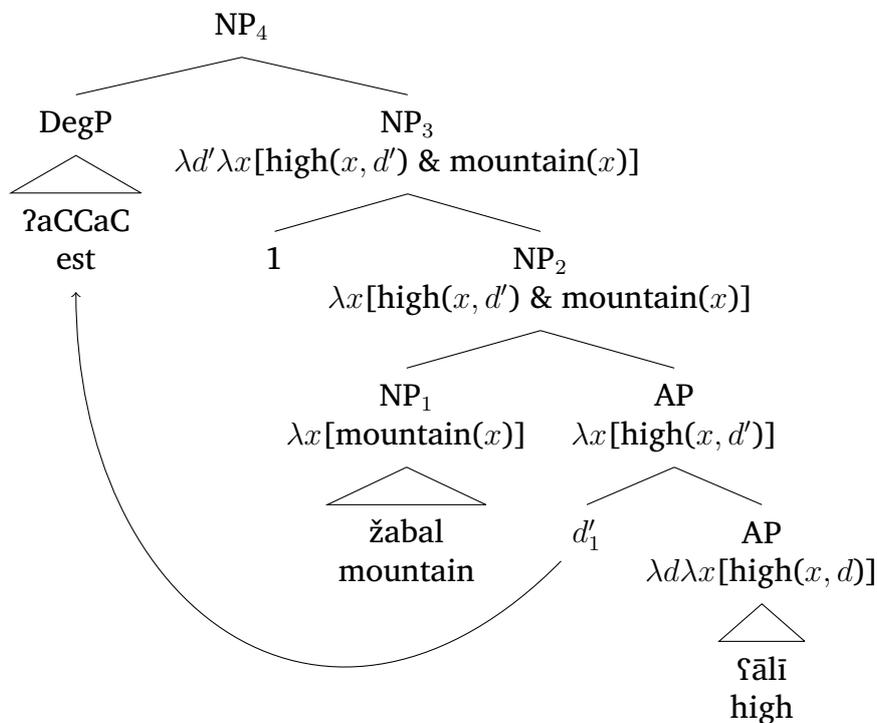
- b. $\llbracket \text{NP}_4 \rrbracket^c = \lambda x \max(\lambda d [\text{*high}(x, d) \ \& \ \text{*mountain}(x)]) > \max(\lambda d' \exists x' [\neg x \circ x' \ \& \ x' \in C \ \& \ \text{*high}(x', d') \ \& \ \text{*mountain}(x')])$

The structure in (34a) holds of any entity that is a plurality of mountains whose height is greater than any non-overlapping plurality of mountains (34b). Since, as discussed in section 2.1, a sum of mountains is *d*-high when all its parts are *d*-high, the maximal degree

of height of a sum of mountains is the height of the shortest mountain in the sum. In any context containing a number of mountains, there are potentially many sums of mountains that satisfy the description in (34b). A sum containing the three highest mountains satisfies it, but so does a sum containing the four highest, the five highest, etc. Consequently, there is no unique individual satisfying the description in (34b) to the exclusion of all others. In light of this, the indefiniteness of expressions like that in (4a) is expected; nothing could meet the uniqueness presupposition typically contributed by the definite article. I conclude that these expressions are semantically indefinite, like the corresponding examples with a definite dependent discussed in section 2.1, once again in spite of the morphological definiteness of the corresponding English translations. The similarity between Arabic English in the interpretation of superlatives suggests that the morphological definiteness in the English construction makes no semantic contribution.

The singular example in (4b) has the same structure as the plural counterpart but without pluralization of the noun and adjective. The tree below for (4b) has the denotation in (35b), which describes an entity as being a higher mountain than any other mountain in the contrast set. This description is also morphologically indefinite, though by virtue of its meaning it can only hold of one thing.

(35) a.

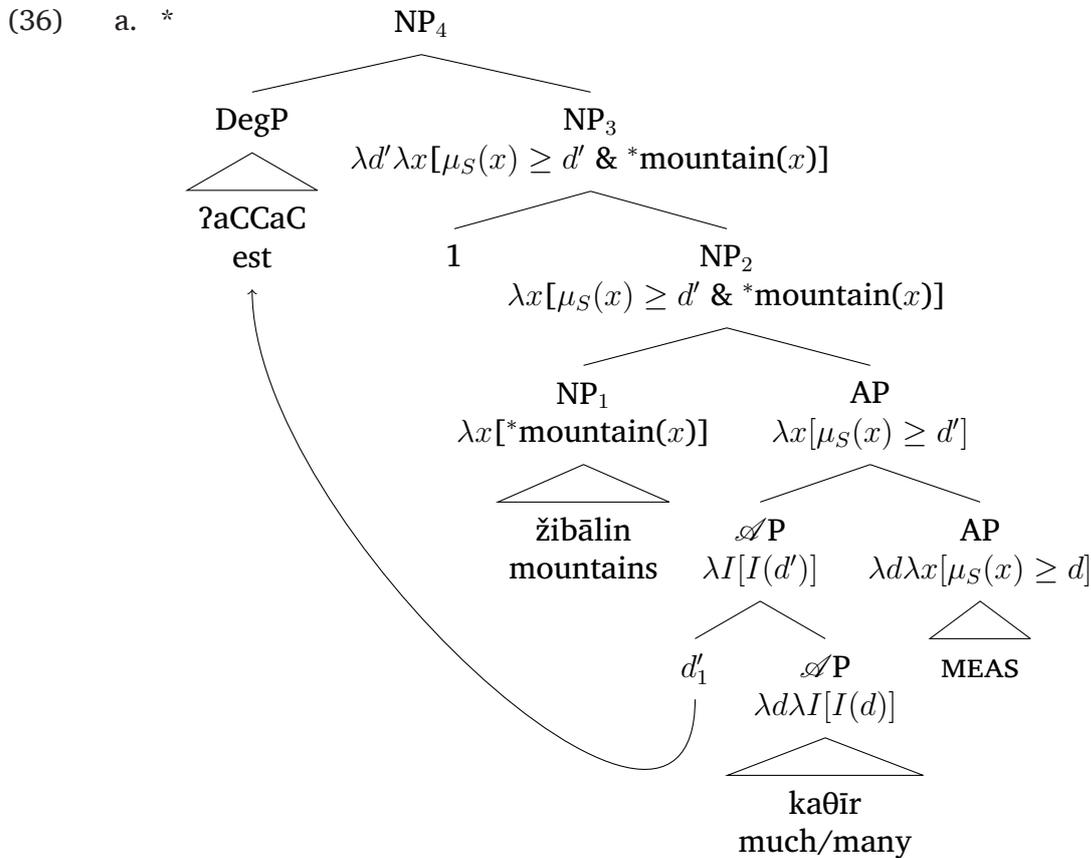


b. $[[NP_4]]^c = \lambda x \max(\lambda d [\text{high}(x, d) \ \& \ \text{mountain}(x)]) > \max(\lambda d' \exists x' [-x \circ x' \ \& \ x' \in C \ \& \ \text{high}(x', d') \ \& \ \text{mountain}(x')])$

3.2 Quantity superlative + indefinite dependent

The examples in (5) are constructed on the model of the superlative with an indefinite dependent in (4). They consist of the superlative adjective *ʔakθar* and an indefinite noun in the genitive case. But unlike the analogous sentences in (4), they are ungrammatical. The ungrammaticality of the plural construction in (5a) is particularly surprising, since it corresponds morphologically to the grammatical English *most mountains*. Building on the

analysis of the quality superlative above, with MEAS in place of the adjective and with the pleonastic host *kaθīr* for the superlative, we arrive at (36a), with MEAS in post-nominal position like the adjective in (34a). This tree should have the denotation in (36b). Unlike in (34a), though, something blocks this structure.



b. $\llbracket [NP_4]^{C,S} \rrbracket = \lambda x \max(\lambda d [\mu_S(x) \geq d \ \& \ *mountain(x)]) > \max(\lambda d' \exists x' [-x \circ x' \ \& \ \mu_S(x') \geq d' \ \& \ x' \in C \ \& \ *mountain(x')])$

Nothing about the tree in (36a) or its denotation in (36b) is obviously deviant. The denotation in (36b) holds of an individual if it is a plurality of mountains with cardinality d and no non-overlapping plurality of mountains has cardinality higher than d . This should hold of any plurality that is more than half of all mountains, just like the meaning of the analogous English expression *most mountains*. Puzzlingly, this unavailable denotation is very similar to what goes on in the composition of the quantity superlative with a definite dependent *ʔakθar l-žibāl* ‘most of the mountains’ diagrammed in (27a). The difference is only that (27a) is based on a partitive derivative of a definite plural, while the ungrammatical (36a) is based on a bare plural. It would appear that the MEAS modifier that derives a degree relation for the superlative can apply to a partitive definite but not to a (type logically identical) bare plural. In fact, the tree in (36a) is the first tree we have considered where MEAS occurs without PART. I propose that this is what is wrong with (36a).

Specifically, I propose that MEAS is subject to a syntactic selectional restriction that requires it to modify an NP headed by PART (where PART in turn embeds a DP). As a result, PART may occur without MEAS, as it does in quality superlatives (see (18a) and

(23a)), but MEAS may not occur without PART, which is what excludes (36a).¹³ Note that simply applying the PART operator to NP₁ in the tree in (36a) will not help, since PART, as a relation between individuals, is type-incompatible with the predicative interpretation of NP₁.

The explanation for the ungrammaticality of (5a), then, is that MEAS obligatorily selects PART but PART is incompatible with the plural predicate that *žibāl* ‘mountains’ denotes. This explanation raises the question of why the English morpheme-for-morpheme counterpart *most mountains* is grammatical. Are English quantity superlatives fundamentally different in structure from their Arabic counterparts? A closer inspection reveals that English is not as different from Arabic as it seems at first glance. The expression *most* + bare plural is most natural in contexts that also license generic bare plurals (Cooper 1996; Matthewson 2001; Crnič 2010), such as object of a subject experiencer verb (37a) (Erteschik-Shir 1997; Hallman 2004) or subject of an individual level predicate (37b) (Milsark 1974; Carlson 1977a; Diesing 1992).

- (37) a. John admires most linguists.
b. Most linguists are friendly.

Following Carlson (1977a, b), Chierchia (1998) claims that bare plurals in English may in principle refer to either a ‘kind’, an individual concept with the type of an individual, or a predicate (a set or its characteristic function), and may freely shift between the two denotation types. Crucially, the kind-level reading of bare plurals is type-logically on par with the interpretation of definite nominals, which refer to individuals. Accordingly, Matthewson (2001) and Crnič (2010) analyse *most mountains* in English as involving a kind-level, individual-denoting interpretation of *mountains* that is type-logically on par with the denotation of *the mountains* in *most of the mountains*. Arabic has a morphosyntactic counterpart to *most of the mountains*, namely *ʔakθar l-žibāl*, shown in (2a). The fact that the morphosyntactic counterpart of *most mountains*, **ʔakθar žibāl*, is ungrammatical must mean that Arabic does not allow a kind-level reading for the bare plural *žibāl* ‘mountains’. This in turn predicts that bare plurals in Arabic cannot occur in generic contexts, with or without *ʔakθar*. As Fassi Fehri (2012) shows, this is correct. Like French, Italian and Spanish as described by Chierchia, Longobardi (1994) and others, Arabic generic plurals are obligatorily accompanied by the definite article. Compare Arabic (38) with English (37). Note that as a result, the Arabic expression *ʔakθar l-žibāl* discussed in section 2.2 is actually ambiguous between the meaning of individual-level *most of the mountains* and kind-level *most mountains*. The difference between the two English expressions arises because bare plurals have a kind-level reading in English that is missing in Arabic.

- (38) a. xālid ya-ħtarim-u l-luḡawiyy-ina / ʔakθar-a l-luḡawiyy-ina.
khalid 3M-respect-SG the-linguist-ACC.PL / most-ACC the-linguists-GEN.PL
(i) ‘Khalid respects linguists / most linguists.’
(ii) ‘Khalid respects the linguists / most of the linguists.’
b. l-luḡawiyy-ūna / ʔakθar-u l-luḡawiyy-ina laṭīf-ūna.
the-linguist-NOM.PL / most-NOM the-linguist-GEN.PL friendly-NOM.PL
(i) ‘Linguists / most linguists are friendly.’

¹³ This selectional restriction might be encoded by saying that PART projects the category ‘PartP’ and that MEAS occurs only in [spec,PartP]. I continue to call the derivative of PART an NP to emphasize the nominal character of the structure as a whole.

(ii) ‘The linguists / most of the linguists are friendly.’

I therefore maintain the conclusion above that *?akθar* may not combine with a bare predicate because of a type mismatch that arises between the bare predicate and PART, which is obligatory in the context of MEAS. The type mismatch does not arise in English because English bare plurals may have the type of entities. This proposal correctly blocks *?akθar* with a singular indefinite dependent nominal (5b) as much as with a plural (5a). The singular case becomes relevant again in the next section, though, which extends this treatment of *?akθar* to *kull*.

3.3 Universal superlative + indefinite dependent

In section 2, *?aCCaC* (in the form of *?akθar*) and *kull* compose with a definite dependent in the same manner, with the help of MEAS and PART. In the previous section, I concluded that *?akθar* fails to occur with an indefinite dependent because PART is type-incompatible with the predicate of individuals that the indefinite denotes. In light of this, we expect *kull* to be incompatible with an indefinite dependent for the same reason. The fact that *kull* is ungrammatical with a plural indefinite dependent is therefore unsurprising (6a), but its compatibility with a bare singular (6b) is puzzling.

In this section, I explore the consequences of lifting the semantic type of *kull* to accommodate a bare singular dependent nominal. I show that lifting *kull* in the manner proposed here not only accommodates a bare singular dependent, but also derives the fact that *kull* is strongly distributive in this case (a property shared by English *every*), while it is only weakly distributive in combination with a definite plural dependent (a property shared by English *all*). I discuss distributivity in section 3.4 below. Note that any way of accommodating the bare singular dependent must be prevented from accommodating the bare plural as well, which is ungrammatical with *kull* (6a). I address this contrast in section 3.5.

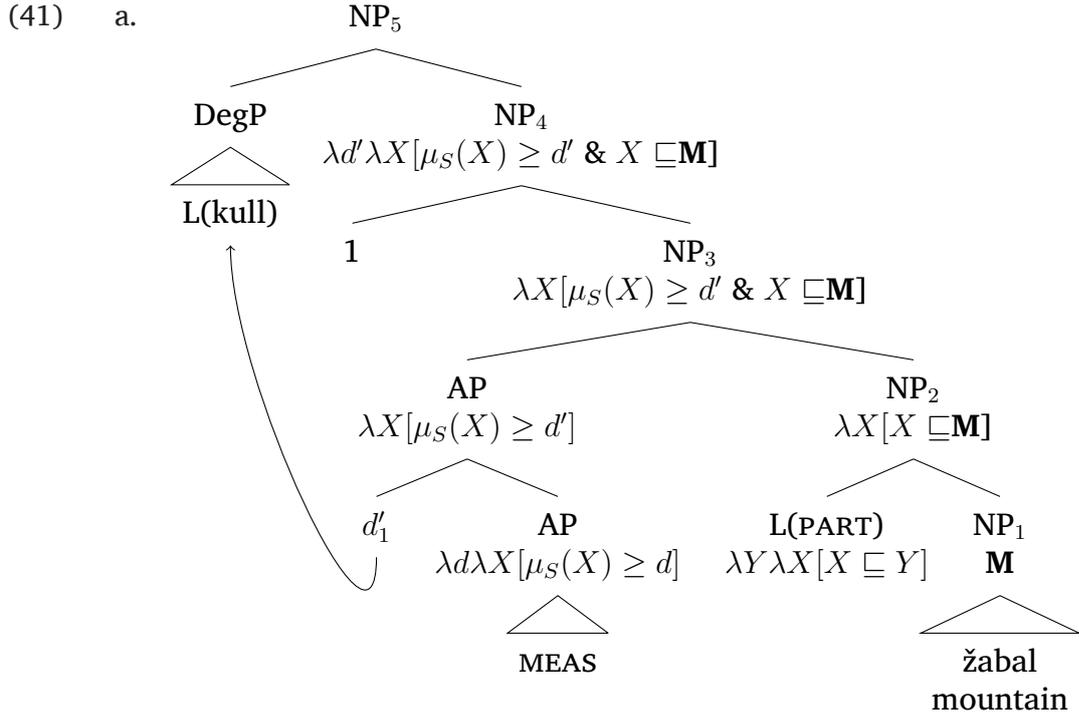
Observe first that if we lift the denotation of PART from a relation between individuals to a relation between sets, it becomes compatible with the meaning of the indefinite singular dependent noun, which denotes a set of entities. Such a lift is shown in (39). If we continue to construe the meaning of *žabal/mountain* as a set **M**, it represents a possible argument of L(PART). The capital letters *X*, *Y*, . . . represent second order (set denoting) variables.¹⁴

$$(39) \quad \llbracket \text{L(PART)} \rrbracket = \lambda Y_{\langle e,t \rangle} \lambda X_{\langle e,t \rangle} [X \sqsubseteq Y]$$

Lifting the meanings of MEAS and *kull* in a similar manner, as illustrated in (40a) and (40b), results in a viable composition for the expression *kull žabal* ‘every mountain’, shown in (41a), with the denotation in (41b). Fancy \mathcal{R} in (40b) represents a second order relation (with a first order, set denoting, argument).

$$(40) \quad \begin{array}{l} \text{a. } \llbracket \text{L(MEAS)} \rrbracket^s = \lambda d_d \lambda X_{\langle e,t \rangle} [\mu_s(X) \geq d] \\ \text{b. } \llbracket \text{L(kull)} \rrbracket^{\mathcal{R}} = \lambda \mathcal{R}_{\langle d, \langle \langle e,t \rangle, t \rangle \rangle} \lambda X_{\langle e,t \rangle} [\max(\lambda d \mathcal{R}(X, d)) > \max(\lambda d' \exists X' [-X = X' \ \& \\ X' \in \mathcal{E} \ \& \ \mathcal{R}(X', d')])] \end{array}$$

¹⁴ Informally, the lift function notated ‘L’ is one that combines with an *n*-ary predicate *P* and returns the counterpart *P'* that has, for each non-degree argument variable of *P* with some type τ , an argument variable of type τ , *t* in its place. I assume a ‘polymorphic’ interpretation of the part-of relation ‘ \sqsubseteq ’ that denotes, depending on the types of its arguments, either the subpart or the subset relation (or the implication relation; see Winter 2001: 23).



b. $\llbracket \text{NP}_5 \rrbracket^{\mathcal{S}} = \lambda X \max(\lambda d [\mu_S(X) \geq d \ \& \ X \subseteq \mathbf{M}]) > \max(\lambda d' X' [-X = X' \ \& \ \mu_S(X') \geq d' \ \& \ X' \in \mathcal{E} \ \& \ X' \subseteq \mathbf{M}])$

The denotation of the tree in (41a) is a description of a set. It holds of a set X (of mountains, in this case) if X has a greater cardinality than any non-identical set of mountains. The only set of mountains that has a greater cardinality than any non-identical set of mountains is the set containing every mountain. As a description of a set, the denotation in (41b) differs from the other superlative expressions described so far, which denote descriptions of (possibly plural) individuals. This raises the question of whether the higher type of the expression in (41a) is detectable in the way it interacts with its syntactic and/or semantic context. In fact, in connection with Szabolcsi’s (1997) and Beghelli and Stowell’s (1997) analyses of the source of what they call ‘strong distributivity’, the analysis in (41a) makes a prediction that is borne out, as described below.

3.4 Strong and weak distributivity with kull

Beghelli & Stowell (1997) seek to explain the fact that the English term *every* differs from *all* and other determiners in licensing a bound, non-deictic reading of the term *different*. Both *(all) the boys* and *every boy* distribute over the predicate *read a book* in (42), but only in the latter case can *different* convey the assertion that each boy’s book is distinct (that they didn’t all read the same book).¹⁵ Beghelli and Stowell call the ability to license this use of *different* ‘strong distributivity’. *Every* is strongly distributive while *all* is weakly distributive.

- (42) a. (All) the boys read a (*different) book.
 b. Every boy read a (different) book.

Szabolcsi (1997) claims that both indefinite noun phrases and what she calls ‘essential quantifiers’ like English *every* introduce discourse referents in the sense of Discourse Representation Theory (Kamp & Reyle 1993). Discourse referents can be referred to by

¹⁵ The term *different* is grammatical in (42a) on a deictic reading, where it refers to a particular book **b** and says that all the boys read a book different from **b**.

referring expressions introduced later in the discourse, subject to configurational restrictions imposed by the structure of the discourse representations themselves. Szabolcsi claims the discourse referent introduced by an indefinite like *two boys* is a variable ranging over plural individuals whose atoms are the elements of some minimal witness set of the denotation of the indefinite. A minimal witness set for the term *two boys* is any set containing two boys and nothing else.¹⁶ The discourse referent that *two boys* establishes is a plural individual consisting of two boys.

According to Szabolcsi, essential quantifiers like *every boy* establish a set-denoting discourse referent. This discourse referent is a variable that ranges over witness sets of the quantifier (rather than over plural individuals whose atoms are drawn from a witness set of the quantifier). A universal quantifier has only one witness set, the set containing all the elements in its restriction, the set containing all boys in the case of *every boy*. Szabolcsi then claims that it is distributivity over members of a set that licenses the bound use of *different* that Beghelli and Stowell take to be diagnostic of strong distributivity. Both Szabolcsi and Beghelli and Stowell maintain that strong distributivity emerges from a distributive operator that resides in a syntactic head *Dist* (whose specifier houses the quantifier) distinct from the pluralizing **-operator*.

In Arabic, the use of *kull* with an indefinite singular dependent nominal licenses a non-deictic use of the term *muxtalif* ‘different’ (43a). *Kull* with a definite dependent noun does not (43b). In this respect, *kull* + indefinite singular patterns like English *every* and *kull* + definite plural patterns like English *all*.

- (43) a. kull-u walad-in qara?-a kitāb-an (muxtalif-an)
 kull-NOM boy-GEN read-3MS book-ACC (different-ACC)
 ‘Every boy read a (different) book.’
- b. kull-u l-?awlād-i qara?-ū kitāb-an (*muxtalif-an)
 kull-NOM the-boys-GEN read-3MP book-ACC (*different-ACC)
 ‘All the boys read a (*different) book.’

In light of Szabolcsi’s and Beghelli and Stowell’s analysis of the origin of strong distributivity, it is remarkable that the lift described above that results in a coherent interpretation for *kull* + indefinite singular derives a predicate of sets, while the analysis for *kull* + definite plural described in section 2.3 makes it a predicate of plural individuals. In concert with Szabolcsi’s analysis, this analysis predicts that *kull* + indefinite singular licenses strong distributivity, while *kull* + definite plural does not. In fact, the present analysis goes a step further than Szabolcsi’s and derives the source of the difference in what kind of discourse referent ‘essential’ (*every*) and non-essential (*two*, *all*) quantifiers introduce. In Szabolcsi’s analysis, it is stipulated that *every boy* introduces its witness set as a discourse referent, while other terms like *two boys* introduce a plural individual constructed from a minimal witness set of the quantifier. On the view of *kull* as a degree modifier like the superlative, the only way of composing *kull* with a singular noun is by lifting it, together with MEAS and PART, to a predicate of sets. Here, the discourse referent a term introduces simply has the type of a member of its extension—an individual for a predicate of individuals and a set for a predicate of sets.

I take the striking convergence of this analysis with that of Szabolcsi and Beghelli and Stowell to support the view articulated here of *kull* as a degree modifier. Although *every* and *all* are very similar in meaning and both have a universal flavor, the literature cited

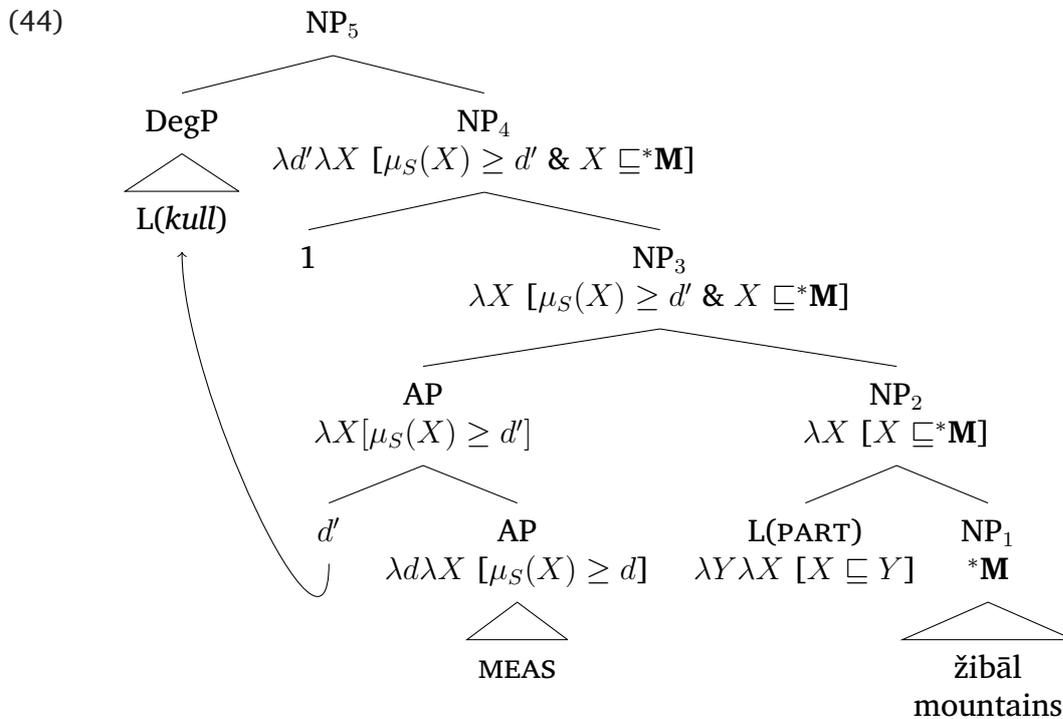
¹⁶ Barwise & Cooper (1981) define *witness set* in terms of the notion *live on set*, as follows.

- (i) a. A quantifier *Q* **lives on** a set *A* if for any set *X*: $X \in Q$ iff $(X \cap A) \in Q$.
 b. A **witness set** for a quantifier $D(A)$ living on *A* is any subset *w* of *A* such that $w \in D(A)$.

in this paper consistently remarks that *every* is more robustly distributive than *all*. The fact that these are lexicalized the same in Arabic supports some version of an analysis that makes them fundamentally synonymous. The analysis presented here is such an analysis. It is tempting to draw the conclusion at this point that English *every* and *all* are lexicalizations of the lifted and unlifted counterparts respectively of the superlative operator with a non-identity condition (rather than a non-overlap condition of the ‘true’ superlative). As described above, this analysis predicts the strong distributivity of *every*. How far such an analysis of English can be pursued is an issue I must leave for another occasion. I conclude below with a discussion of a final similarity between Arabic and English.

3.5 On the ungrammaticality of **kull žibāl* as **every mountains*

If lifting *kull*, MEAS and PART to predicates of sets allows us to compose *kull žabal* ‘every mountain’, it is puzzling why the same procedure does not allow us to compose *kull* with a bare plural noun, as in **kull žibāl* in (6a). The fact that the corresponding expression **every mountains* is also ungrammatical in English suggests that the ungrammaticality of **kull žibāl* is not a superficial fact about Arabic. Changing the singular noun in (41a) to a plural yields the tree in (44) for the ungrammatical expression **kull žibāl*.



Although this tree is type-logically just as coherent as its singular counterpart in (41a), I suggest that it is semantically incoherent in another respect. Evaluating the denotation of NP₃ and higher nodes requires us to count the elements that comprise the set *X* to see if that quantity is greater than *d'*. The elements in this set are plural individuals, since *X* is asserted to be a subset of **M*, itself a set of plural individuals. There are reasons to believe that natural languages cannot count plural individuals. First, we cannot refer to two groups of mountains as *two mountains*, even though *mountains* holds of sums of mountains. The numeral *two* can only count the atoms in such a sum. Further, Link’s (1983) theory of plurality adopted here sets up the expectation that we cannot count plural individuals. His theory is designed to capture similarities in the meaning and distribution of plurals and mass terms, among others the fact, for example, that neither can be pluralized

(plurals cannot be doubly pluralized). On this view, counting plural individuals makes no more sense than counting the parts of a body of water. In the case of plural individuals, it is not strictly speaking impossible to count the possible sub-groupings of its atoms, but again, natural language does not seem to avail itself of this possibility. Landman (1989: 566–7) points out that if three children mess up the living room, and we ask how many entities were involved, ‘three’ is a possible answer, as is ‘one’ if we think of the children as acting as a group, but we cannot answer ‘seven’ under any circumstances. Seven is the number of elements in the join semilattice generated by three atoms—which models the denotation of *the three children* on Link’s view, adopted here. The term *children* does not make these sub-groupings available for counting. In light of these remarks, though (44) is type-logically well formed, it asks the truth-evaluation process to do something it apparently cannot do—count the pluralities in *X*. I submit that this is the reason for the unacceptability of *kull* + indefinite plural (6a), even when we adjust the types of the other elements in its syntactic context to accommodate set-denoting *žibāl* ‘mountains’. The fact that bare plurals do not have a kind-level denotation in Arabic rules out an interpretation of **kull žibāl* along the lines of *most mountains*.

If this analysis extends to English, the same reasoning explains the ungrammaticality of **every mountains*. The grammaticality of *all mountains*, on the other hand, has the same source as the grammaticality of *most mountains* as described in section 3.2. The fact that a kind-level denotation is available to *mountains* in English allows it to combine with unlifted *all* (which counts its atoms), but only with a generic interpretation.

4 Conclusion

This paper has demonstrated similarities between superlatives of quality, superlatives of quantity, and *kull* ‘every/all’ in Arabic and fleshed out the semantic underpinnings of these similarities. The analysis traces the similarities to the fact that all three are superlatives. Quality and quantity superlatives both contain the superlative morpheme *?aCCaC*, while *kull* denotes a variation on the meaning of *?aCCaC* that gives it its universal force. Like *?aCCaC*, *kull* occurs with a definite dependent nominal in combination with a partitive operator PART and degree-relation deriving MEAS. Since PART is incompatible with a predicate-denoting bare indefinite, *?aCCaC* cannot combine with an indefinite dependent nominal. *Kull*, however, may be lifted to a predicate of sets, which, in combination with lifted derivatives of MEAS and PART, may occur with a bare singular dependent nominal. Lifting turns *kull* + indefinite singular into a predicate of sets, the semantic type that Szabolcsi (1997) links to strong distributivity. This explains why *kull* + indefinite singular is strongly distributive, while yet *kull* + definite plural fails to license strong distributivity. The context is not compatible with lifting in the latter case. These facts lend credence to the proposal that what appears to be a universal quantifier is actually a superlative term. The parallels between *?akθar* and *most* on one hand and those between lifted and unlifted *kull* and *every* and *all* respectively suggest that the analysis of *kull* as a superlative may extend to English *every/all*, a conjecture I must leave for another occasion.

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Competing Interests

The author declares that he has no competing interests.

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