Compositionality Questions: Quantifier Words And Their Multi-functional(?) Parts

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Comments are appreciated.

Abstract. Formal semantic analyses often take words to be minimal building blocks for the purposes of compositionality. But various recent theories of morphology and syntax have converged on the view that there is no demarcation line corresponding to the word level. The same conclusion has emerged from the compositional semantics of superlatives. In the spirit of extending compositionality below the word level, this paper explores how a small set of particles (Japanese *ka* and *mo*, Chinese *dou,* and Hungarian *vala/vagy*, *mind*, and *is*) form quantifier words and serve as connectives, additive and scalar particles, question markers, and existential verbs. The main question is whether the meanings of these particles across the varied environments are highly regular, or they are lexicalized with a variety of different meanings that bear a family resemblance. This paper does not reach definitive conclusions, but it raises analytical possibilities using Boolean semantics and the semantics of alternatives. It also draws attention to systematic similarities and some differences between *mo* and *dou* that have not been studied in the literature.

1 Compositionality

Research in semantics is guided by the principle of compositionality.

(1) The meaning of a complex expression is a function of the meanings of its parts and how they are put together.

What are the "parts" that the principle refers to? This question has been phrased in many ways and answered in many ways, depending on the semanticist's views on the theory of grammar. Are the relevant parts surface constituents? LF constituents? Only audible parts? Possibly also phonetically empty ones? How do type-shifting and coercion fit into the picture? This paper proposes yet another way of asking the question.

(2) Are (phonological) words the smallest parts that a compositional grammar should take into account? If not, what smaller parts are to be recognized?

Although there is no doctrine that says that word meanings are the minimal building blocks of sentence meanings, in practice semanticists often make that assumption. For example, we readily assign very complex interpretations to quantificational words without specifying how the semantic ingredients are anchored in the components of those words. That practice is probably motivated by the time-honored lexicalist tradition in syntax. It is therefore of some interest to observe that in the past two decades different lines of research have been converging on the view that words do not

have a distinguished status in morpho-syntax. If that is on the right track, then it does not go without saying that words are minimal building blocks for compositional semantics.

Section 2 of the paper briefly recapitulates some results pertaining to the continuity of morphology/lexicon and syntax. Expanding upon Szabolcsi (2010: Ch. 12), Sections 3 through 5 draw attention to a domain of data in which recognizing the components of quantifier words seems especially interesting from a semantic point of view. Focusing on Japanese, Chinese, and Hungarian we examine how a small set of operator particles (Japanese *ka* and *mo*, Chinese *dou,* and their Hungarian counterparts) form quantifier words and serve as connectives, additive and scalar particles, question markers, and existential verbs.

The main question is whether the meanings of these particles across the varied environments are highly regular, or are lexicalized with a variety of different meanings that bear a family resemblance. This paper does not reach a definitive conclusion, but it raises some analytical possibilities using Boolean semantics and Inquisitive Semantics (the semantics of alternatives and issue-raising). Rather than making sweeping generalizations, we strive to keep track and make sense of how the behavior of the particles varies across languages.

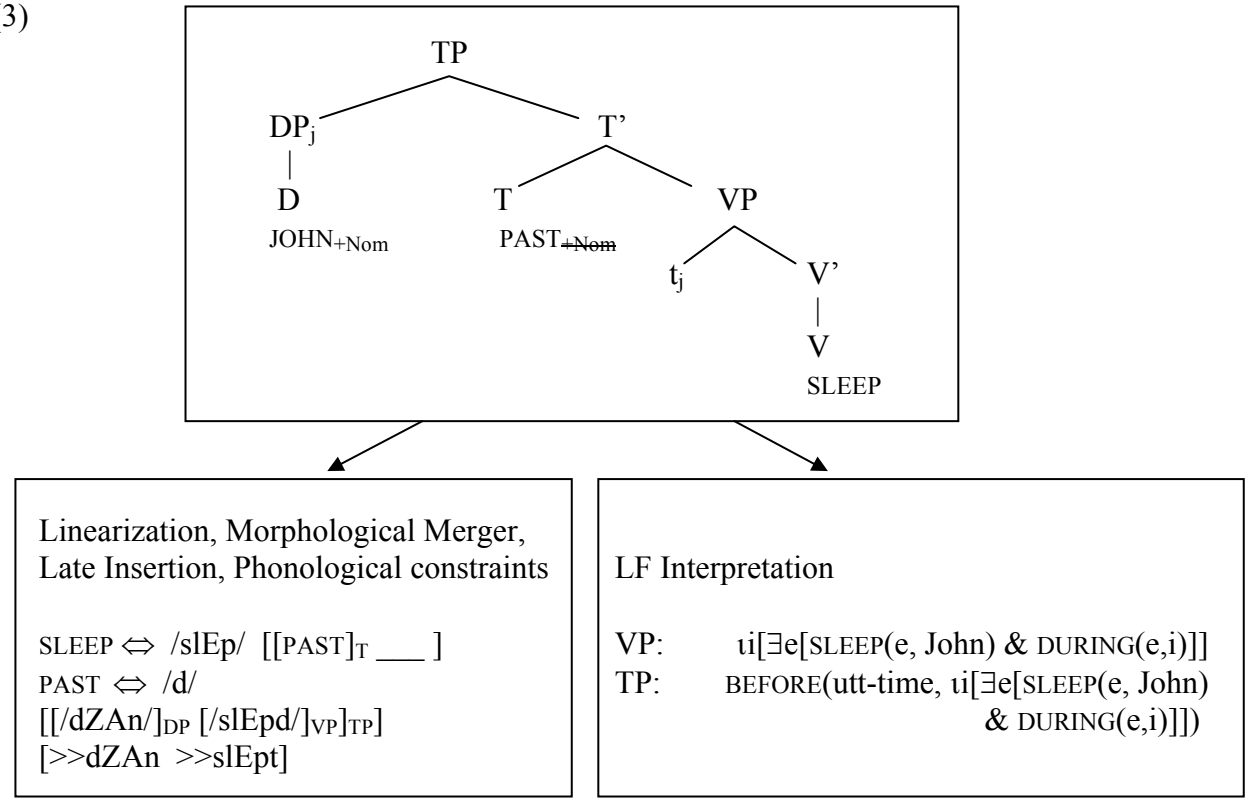
2 Lessons from Distributed Morphology, Minimalist Syntax, and formal semantics

2.1 Distributed Morphology

Two of the assumptions of Distributed Morphology (Halle & Marantz 1994) that are especially relevant to us are "Hierarchical syntactic structure all the way down" and "Late insertion of vocabulary items". DM builds syntactic structures of the usual sort out of morphosyntactic features of two types, l-morphemes (roots) and f-morphemes (e.g. plural, past). DM does not build sentences out of traditional lexical items like *destroy* (which has a causative meaning without overt causative morphology), *weaken* (causative meaning with causative morphology), *sleeping* (with regular inflection), or even *slept* (with somewhat irregular inflection). Lexical items in the traditional sense do not even exist in the theory. Once syntactic structure is built out of roots and abstract features, it is input to logical form operations, and to morphological and phonological operations, among others the insertion of phonological expressions dubbed vocabulary items. Logical Form, Phonological Form, and the Encyclopedia each feed the meaning of the sentence on their own. Given these assumptions, the typological differences between polysynthetic and isolating languages do not require the postulation of radically different combinatoric and compositional mechanisms in UG, and the phonological word has no special status in semantic interpretation. See Harley (2011) for detailed discussion of semantic interpretation in DM.

The diagram below summarizes Harley's discussion of an extremely simple example, *John slept*. It illustrates that even in the presence of a verb that has a special allomorph in the context of PAST, DM keeps the verb root and the inflectional morpheme separate in the syntactic derivation, and allows each to contribute to interpretation where it belongs.

(3)



2.2 **Minimalist Syntax**

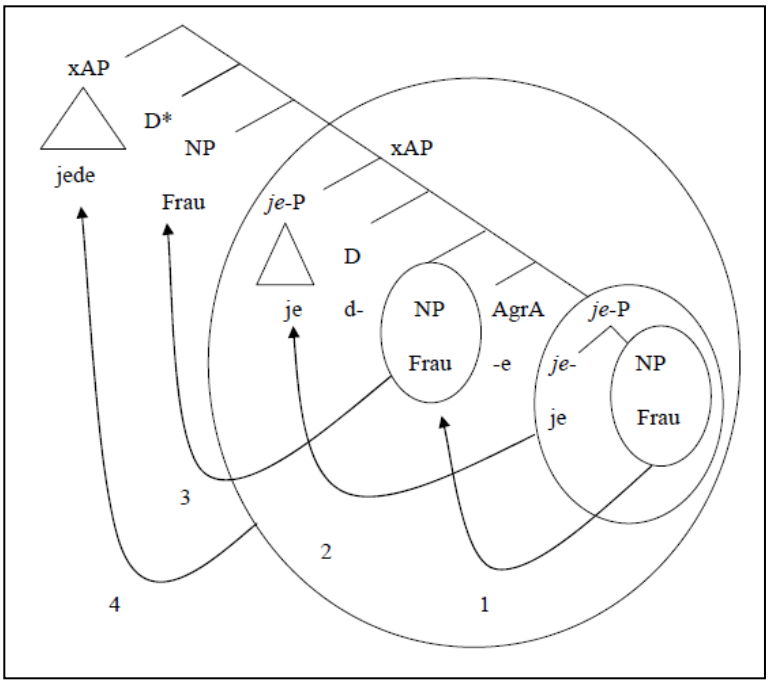
Some versions of Minimalist Syntax make assumptions that are rather similar in spirit to those of Distributed Morphology (see Julien 2002; Kayne 2005, 2010; Koopman 2005; Koopman & Szabolcsi 2000; Sigurðsson 2004; Starke 2009; and many others). One of these assumptions is that each syntactic head carries one and only one feature. It follows that phonological words correspond to potentially large chunks of syntactic structure. Especially when remnant movement is allowed, many words will not even correspond to complex heads assembled by head movement in syntax, because at least some of the building blocks are phrases.

For illustration let us consider the recent analysis of *jede Frau* `every woman' in Leu (2010), which builds on a theory of the internal structure of German adjectival phrases and determiners developed in Leu (2009). The semantic core of the phrase is formed by the distributive morpheme *je* and the NP *Frau*, which correspond to the traditionally recognized constituents of English *every woman*. In contrast to *every*, *jede* also contains *-d* and the agreement morpheme *-e*. One might assume that *-d* is the definite article, but that would predict that the choice of the agreement morphemes matches article agreement. Leu observes that, instead, it matches adjectival agreement. He argues that the *-d* in *jede* is the relative pronoun.

(4)	je – d – er Mann `every man'	gut-er Mann `good man'	vs. d-er Mann `the man'
	je – d – **e** Frau	gut-**e** Frau	vs. d-**ie** Frau
	je – d – **es** Kind	gut-**es** Kind	vs. d-**as** Kind

Therefore, the NP *Frau* must enter into a canonical specifier—head configuration with the Adjectival Agreement (AgrA) head. The sequence that is spelled out as *jede Frau* is a result of four phrasal movement steps.

(5)



First, the NP *Frau* moves from *je*-P to the specifier of AgrA; second, the remnant *je*-P moves to a position above the relative D; third, the NP *Frau* moves out the phrase so formed, which Leu considers an adjectival projection xAP; lastly, a phonetically silent determiner D* is merged, and the remnant xAP *jede* moves to its specifier. The phonological word *jede* is dominated by a single xAP node, but xAP does not exclusively dominate *jede* in the course of the derivation, and *jede* could not be assembled purely by a sequence of head movements.

In this example the movements involving *je* and *Frau* are syntactically motivated; the semantically significant constellation is the initial one, where they form *je*-P. It is important to point out that remnant movement reconstructs, because the remnant contains a trace that needs to be bound by its antecedent. Therefore the movements listed above do not alter interpretation.

2.3 The semantics of superlatives

The determiner *most* is perhaps the best-explored example of a quantifier word that needs to be composed from smaller parts and whose smaller parts also reach beyond its boundaries, in order to obtain the correct interpretations in a compositional manner. As was observed in Heim (1985) and Szabolcsi (1986), sentences with superlative adjectives exhibit an ambiguity:

(6) Who climbed the highest mountain?
   (a) Absolute: Who climbed the highest among mountains?
   (b) Relative: Who climbed a higher mountain than how high a mountain anyone else climbed?

Both Heim (1985) and Szabolcsi (1986) described the ambiguity in terms of the scope of the superlative morpheme. On the absolute reading the scope of *-est* is DP-internal: the definition of the comparison class involves only DP-internal material. The highest mountain is understood to be the highest among mountains. On the relative reading *-est* takes sentence-level scope: the compari-

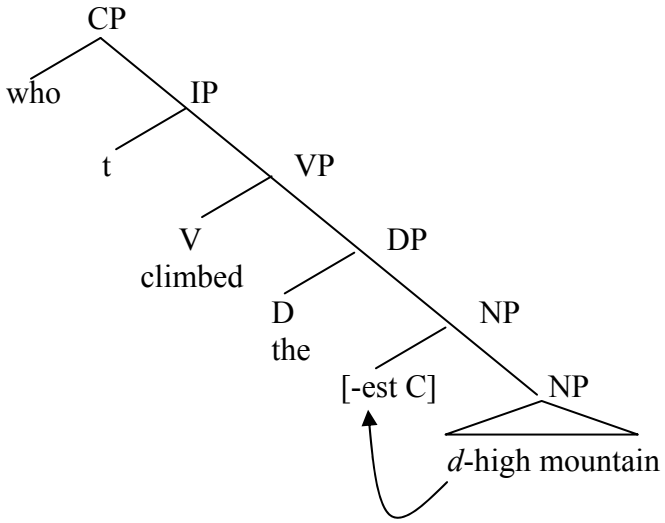
son involves who climbed what mountains. The syntax and semantics of comparatives and superlatives was perhaps the first domain where a part of a word was assumed to take scope over a larger chunk of the sentence, defying word boundaries – in this case, at LF.

Hackl (2009) represents the two readings as follows, adopting Heim's (1985, 1999) semantics. The variable C introduces a contextually relevant set of entities; mountains in (a), climbers in (b). *max* picks the maximal degree *d* in the set defined in *{d: ... d ...}*.

(7) Interpretation of NP-adjunction of [-est C]:
[[[-est C]$_i$ [d$_i$-high mountain]]] = $\lambda x.\forall y \in C\ [y \neq x \rightarrow$
max {d: x is a d-high mountain} > max {d: y is a d-high mountain}]

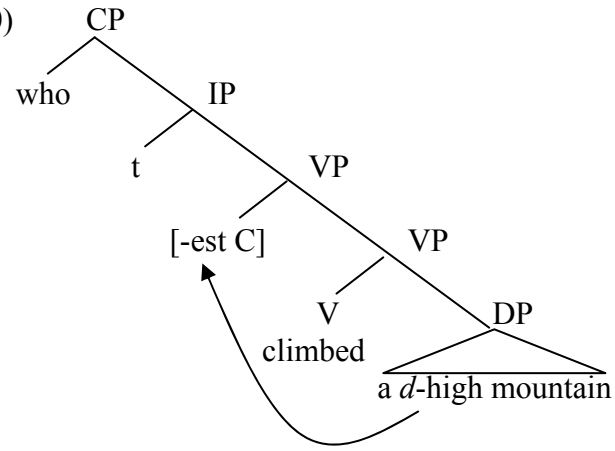
(8) Interpretation of VP-adjunction of [-est C]:
[[[-est C]$_i$ climbed [d$_i$-high mountain]]] = $\lambda x.\forall y \in C\ [y \neq x \rightarrow$
max {d: x climbed a d-high mountain} > max{d: y climbed a d-high mountain}]

(9)



Absolute reading

(10)



Relative reading

Amount superlatives exhibit a similar absolute/relative contrast. In English the two readings correspond to two slightly different constructions, *most (of the)* and *the most*, but other languages, German and Hungarian among them, have a single, ambiguous expression that completely parallels adjectival superlatives.

(11) Ki mászta meg a legtöbb hegyet? (Hungarian)
who climbed prt the most mountain-acc
(a) Absolute: Who climbed most (of the) mountains?
`Who climbed a set of mountains whose cardinality was greater than the cardinality of any competing set of mountains?' = `Who climbed a majority of the mountains?'
(b) Relative: Who climbed the most mountains?
`Who climbed more mountains than how many mountains anyone else climbed?'

The two readings of the amount superlative can be derived and interpreted in analogy to those of the adjectival superlative, replacing *d-high* with *d-many* (cf. *how many*).

Hackl (2009) argues that accounting for *most* in this way has conceptual and empirical advantages. The traditional treatment of the proportional determiner *most* (e.g. in Barwise & Cooper 1981) takes *most* to be a primitive. It does not recognize the fact that *most* is to *more* as *highest* is to *higher*, and an interpretation is assigned to *most* by a lexical stipulation. Hackl shows that proportional *most* is nothing other than the absolute reading of superlative *most*, in terms of both distribution and truth-conditional contribution. His approach furthermore offers an account of the fact that *fewest* and its cross-linguistic counterparts only support a relative reading.

(12) a. *Who climbed fewest (of the) mountains? (absolute)
b. Who climbed the fewest mountains? (relative)

Hackl observes that the compositional semantics that he proposes for the absolute reading of *most* simply does not yield a viable result when applied to the decreasing counterpart, although it works fine for relative *the fewest*. (For the details we refer the reader to his article.) This predicts the contrast in (12a,b). If both *most* and *fewest* were lexical primitives, and their interpretations were not derived compositionally, one could not even begin to ask why *fewest (of the)* is left without a meaning – for example, why it does not mean `a minority of the [NPs]'.

As a matter of fact, Bobaljik (to appear) observes that evidence from suppletion suggests that Hackl (2009) does not decompose *most* as much as needed. Cross-linguistically, positive, comparative, and superlative forms exhibit just two, rather than four, suppletive patterns:

(13) a.	ABC	bonus	melior	optimus
b.	ABB	good	better	best
c. *unattested*	ABA	good	better	*goodest*
d. *unattested*	AAB	good	*gooder*	best

Bobaljik proposes that fundamental assumptions of Distributed Morphology account for these data if superlatives are not formed directly from the positive base but, instead, properly contain the comparative. Now notice that comparative *more* and superlative *most* also represent the ABB pattern, whatever we take the positive form (*d-many*) to be. So, *most* needs to be broken down even more; but none of the general conclusions are threatened. Importantly, suppletion provides more evidence for "syntactic structure all the way down," and does not point to a need to return to a lexicalist position. For analyses of absolute and relative *most* in this spirit, see Szabolcsi (2012).

In sum, the case of *most* illustrates beautifully how useful it is to build a word from smaller parts using regular syntax and a matching compositional semantics, and to allow those parts to reach out to the higher regions of syntactic structure, as well. In other words, it illustrates how irrelevant the "wordhood" of *most* is.

2.4 Interim conclusion

The small sample that we have reviewed supports the following hypotheses:

(14) Words are not distinguished building blocks in syntax or morphology.
(15) Words are not distinguished building blocks for compositional semantics.

Caveat: The methodological question whether scope assignment is implemented using movement is orthogonal to present concerns. The important point is that empirical generalizations do not force us to recognize words as distinguished building blocks outside phonology. With an appropriate logical apparatus it is possible to assign correct interpretations to surface constituents, phonological words among them (cf. Jacobson's 2002 notion of direct compositionality).

For concreteness, it is well-known that the adjectives *same* and *different* have two readings that are similar to the absolute and the relative readings of superlatives in that one reading brings DP-external material within the definition of sameness/difference.

(16) You read "Ulysses". John and Mary read the same book (i.e. "Ulysses").
(17) John and Mary read the same book (i.e. the book that John read is the book that Mary read).

Barker (2007) and Solomon (2009) show that it is possible to assign interpretations to the DP *the same book* that deliver both readings without moving any of its parts. The relevant aspects of their analyses can be replicated in the case of the sentence-level scope of *-est.*

3 Quantifier words and their multi-functional(?) parts

3.1 The phenomenon and the basic questions

The results reviewed above are encouraging, but they do not immediately answer the bigger questions. What smaller (smallest) parts are quantifier words composed of? How systematic is the contribution of their discernible parts? Is "lexicalization" a major non-compositional threat to reckon with? Our hope is that we can make headway in this more ambitious project by looking for potentially illuminating new data. These sections point to a domain that seems especially rich and interesting, both intra-linguistically and cross-linguistically.

Many languages systematically compose their quantifier words from a set of particles and a set of bases, the latter often called indeterminate pronouns. Slavic languages are perhaps the best known for this. Below we provide a small sample from Hungarian, a language that belongs to the Finno-Ugric branch of the Uralic family.[1]

(18)	ki	vala-ki	minden-ki	bár-ki	akár-ki	sen-ki	a-ki
	PERSON	some-PRSN	every-PRSN	[may]-PRSN	[want]- PRSN	[even]-PRSN	that-PRSN
	`who'	`someone'	`everyone'	`anyone'	`anyone'	`no one'	`who,relative'

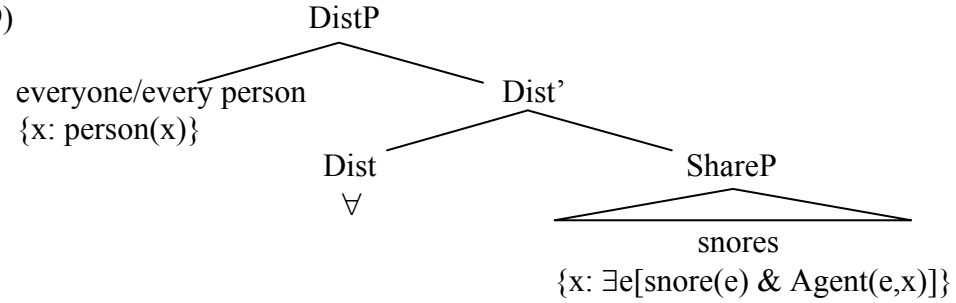
[1] A description of Hungarian quantifier words can be found in Csirmaz & Szabolcsi (2012), with many full-sentential examples. For a general discussion of Hungarian syntax and the syntax/semantics interface, the reader is referred to Kiss (2002).

hol	vala-hol	minden-hol	bár-hol	akár-hol	se-hol	a-hol
PLACE	some-PLACE	every-PLACE	[may]-PLACE	[want]-PLACE	[even]-PLACE	that-PLACE
`where'	`somewhere'	`everywhere'	`anywhere'	`anywhere'	`nowhere'	`where,relative'

Following Hamblin (1973) the bases are thought to be predicates, interpreted as {x: PERSON(x)}, or as sorted variables, x_{PERSON}. On both analyses they contribute sets of alternatives of a grammaticized kind to the sentence. They are not thought to have an inherent interrogative force, despite the fact that in their bare form they function as "question words".

Among the quantificational elements, *every*, *minden* and their cross-linguistic counterparts, such as Chinese *dou* and Japanese *mo,* have received particular attention. Interestingly, Beghelli & Stowell (1997), Szabolcsi (1997a), Lin (1998), and Kratzer & Shimoyama (2002) all arrived at the conclusion that universal quantification, i.e. distributivity, is the contribution of a sentence-level functional head, not of the DP-internal determiner. Following Beghelli & Stowell, this functional head is often referred to as Dist. Dist may be spelled out as *dou* or *mo*, or it may be phonetically null. On this view, DP-internal *every, minden*, and *mei* signal association with the sentence-level Dist operator and are not distributive operators themselves.

(19)



The relationship between *every*/*minden* and Dist is likened to that between negative-concord markers and sentence-level negation. Negative-concord markers signal the association, rather than express negation themselves. See Szabolcsi (2010: Ch. 8) for detailed discussion.

Yatsushiro (2009) argues that *ka*, the Japanese counterpart of *vala* and *some*, is a choice-function variable, bound by existential closure.

But the quantificational particles themselves are not confined to the above quantifier words or contexts. Japanese presents especially extensive paradigms (Nishigauchi 1990; Shimoyama 2006, Kobuchi-Philip 2009, and others). The list of functions below is probably incomplete. [2]

(20)
a. dare-ka `someone'
b. gakusei-no dare-ka `some student (=one of the students)'
c. jyuu-nin-ka-no gakusei, gakusei jyuu-nin-ka `some ten students (=approx. ten)'
d. Tetsuya-ka Akira(-ka) `Tetsuya or Akira'
e. Dare-ga odorimasu ka `Who dances?'
f. Akira-ga odorimasu ka `Does Akira dance?'

[2] For example, Kobuchi-Philip (2010) discusses *gakusei-ga nan-nin-**mo** hashitta* `Many students ran' and proposes that this interpretation is due to a pragmatic effect. We set this use of *mo* aside.

(21) a. dare-mo `everyone/anyone' (depending on stress)
b. jyuu-nin-mo-no gakusei, gakusei jyuu-nin-mo `as many as ten students'
c. Tetsuya-mo Akira-mo `both Tetsuya and Akira'
d. Tetsuya-mo `also/even Tetsuya' (depending on stress)

Do such series represent etymological freak accidents? Are these particles multi-functional (whatever that might mean)? Do they admit of unified semantic analyses? If yes, what kind of semantic analyses?

3.2 Cross-linguistic significance

The cross-linguistically prevalent fact that the particles expressing `every', `any', `also', and `even' are related is well-known and has been studied from both a semantic and a typological perspective, most prominently by Gil (1995, 2008). What about `some', `or', and question markers? Haspelmath (1997) argues against the significance of that connection.

> "When we go beyond the Japanese data, the empirical evidence confirms that there is no direct formal connection between `or' and existential indefinites... First of all, although many languages have indefiniteness markers that are formally identical to disjunctive conjunctions, the situation in Japanese is quite exceptional. ... Most of the `or' indefinites in [Japanese, Kannada, Korean, Russian, Hungarian, Portuguese, Basque, Latvian, Romanian, Ossetic, Nanay, Hausa, and West Greenlandic] are primarily free-choice indefinites, not non-emphatic indefinites like Japanese WH-*ka*. The only exception[s] are Kannada and Nanay, which are specific (and partially Russian and West Greenlandic, insofar as these forms can also be used in irrealis-nonspecific functions). ... The Japanese situation does not even seem to represent a tendency. ...
>
> [W]hy is `or' used in indefinite pronouns at all? ... It could be that both `or' and the indefiniteness marker arise from the same source independently...
>
> (368) `want'/`it may be' → `or'
> → indefiniteness marker
> → *xot'*-type focus particle → indefiniteness marker"
>
> (Haspelmath 1997: 165-169)

Since Hungarian is one of the languages on which Haspelmath bases his conclusions, it is of some interest to take a closer look at Hungarian. Haspelmath's main source is Hunyadi (1987), an article that specifically aimed at explaining the behavior of the particles *mind* `every' and *akár* `any.' Hunyadi's claims are in line with Haspelmath's positive conclusion above. But there are other particles in Hungarian, highly relevant to Haspelmath's negative conclusion, that neither Hunyadi, nor Haspelmath's other sources happened to address. The data below come from the Historical-Etymological Dictionary of Hungarian (1967-1984).

The etymological dictionary supports Hunyadi's and Haspelmath's idea that free-choice *akár* (quantificational and connective) is related to *akar* `want', but it also presents a range of elements that are related to *vala-* `some', the component of non-emphatic, specific indefinites in (18). *Vagy* serves as the run-of-the-mill cross-categorial disjunction in Hungarian. In addition, *vagy* means `approximately, at least' when attached to a numeral. The dictionary relates *vala-* `some' and *vagy* `or; approximately, at least' to the participial stem *val-* of the existential verb and to its affricative finite allomorph *vagy-* (*vagyok, vagy, vagyon* > *van*, etc.), respectively. In other words, the func-

tions of Japanese *ka* are mirrored by Hungarian *vala/vagy*, except for its question-marker (interrogative clause-type indicator) function.

(22)	valaki	`someone'
	vala-mi diák	`some student (=whose identity is unknown or irrelevant)' [3]
	Kati vagy Mari	`Kate or Mary'
	vagy Kati, vagy Mari	`either Kate or Mary, not both'
	vagy tíz diák	`some ten students (=approx. ten)'
	vagy-, val-	allomorphs of `be' (existential, locative, predicative copula)
	vajon	`puzzlement' (optional modifier)

Moreover, the disjunctions *A vagy B* and *A-ka B* are positive polarity items of the same type as *something* (Szabolcsi 2002, Goro & Akiba 2004, Crain & Thornton 2006), which further supports their semantic relationship to indefinite pronouns. Contrary to Haspelmath's impression, Hungarian has a robust set of elements that exemplify those properties of Japanese *ka* that he deems cross-linguistically exceptional.

Hungarian has a clause-type indicator that is obligatory in embedded yes/no questions and is in complementary distribution with yes/no question intonation in matrix questions: the morpheme *-e,* suffixed to the finite verb; see (23). This suffix is not related to *vala/vagy*. Gärtner & Gyuris (2007) discuss *vajon*, which is related to *vala/vagy* and is not restricted to yes/no questions; see (24). However, *vajon* is just an optional modifier that expresses puzzlement. To save space, only embedded examples are given below.

(23) a. Kíváncsi vagyok / Tudom, hogy félnek-*(e).
curious be.1sg know.1sg SUBORD afraid.3pl-Y/N
`I am curious/Tell me whether they are afraid'

b. Kíváncsi vagyok / Tudom, hogy ki fél-(*e).
curious be.1sg know.1sg SUBORD who afraid.3sg-Y/N
`I am curious/I know who is afraid'

(24) a. Kíváncsi vagyok / * Tudom, hogy vajon félnek-e.
curious be.1sg know.1sg SUBORD VAJON afraid.3pl-Y/N
`I am curious whether they might be afraid'

b. Kíváncsi vagyok / * Tudom, hogy vajon ki fél.
curious be.1sg know.1sg SUBORD VAJON who afraid.3sg
`I am curious who might be afraid'

[3] English *some* leads a double life as a bound morpheme (as in *someone*) and as a determiner (as in *some doctor* `a doctor whose identity is unknown or irrelevant'). In the latter role it is probably accompanied by a silent element that surfaces in Hungarian and German. Compare:

(i)	vala-ki `someone'	vala-mi doktor `some doctor'	*vala doktor	Hungaria
	some-PERSON	some-THING doctor	some doctor	
(ii)	irgend-wer `someone'	irgend-ein Doctor `some doctor'	*irgend Doctor	German
	some-PERSON	some-ONE doctor	some doctor	

Valami doktor corresponds to Japanese *(to)aru isha* `some doctor,' not to *isha-no dare-ka*. The latter is specific in Enç's (1991) sense: it refers to an unspecified member of a previously mentioned group.

Many of the roles played by members of the *mo*-family are also replicated in Hungarian but, remarkably, by distinct elements, *mind* vs. *is, és*. Interestingly, *mind* and *is* overlap in interpretation (see the two expressions translated as `both Kate and Mary'). [4]

(25)		
	mindenki	`everyone'
	minden diák	`every student'
	A diákok mind VP.	`The students all VP'
	mind Kati, mind Mari	`both Kate and Mary'
	Kati is (és) Mari is	`both Kate and Mary'
	Kati is	`Kate too'
	(még) Kati is	`even Kate'
	tíz diák is	`as many as ten students'
	[... és] Kati is lett az első.	`[... and] indeed Kate came in first (=as was expected)' [5]
	Kati és Mari	`Kate and Mary'

Similar data have been discussed by Ramchand (1997) for Bengali; Jayaseelan (2001, 2011) for Malayalam; Amritavalli (2003) for Kannada; Borzdyko (2004) for Belorussian; Paul (2005) for Malagasy; Xiang (2008) for Mandarin; Zimmermann (2009) for Korean and Hausa. Bumford, Whang, & Zu (2011) observe systematic similarities in the behavior of Japanese *mo* and Chinese *dou*; we turn to these in section 5.

The moral, we believe, is that it is legitimate and potentially rewarding to investigate these data sets from the perspective of compositional semantics. But indeed, languages are not all alike. The task is to make sense of the shared patterns as well as the cross-linguistic differences, much like in syntax or phonology. This paper is an attempt to make some preliminary steps in that direction.

4 Unifying options

4.1 One unifying option: Boolean semantics

4.1.1 According to (20) and (22), Hungarian *vala/vagy* and Japanese *ka* both function as disjunctions and participate in the formation of existential/indefinite pronouns. In addition, *vala/vagy* is also the stem of the existential verb, and *ka* is a question-marker (clause-type indicator, Force head). According to (21) and (23), Hungarian *minden*, *és* and *is* jointly express conjunction, `also,' and `even,' and form universal pronouns; Japanese *mo* does all these single-handedly.

As is observed by Haspelmath (1997: 165) with reference to Reichenbach (1947: 92) and others, a natural starting point for unification is the fact that existential quantification is reducible to disjunction, and universal quantification to conjunction. Assume that we have a finite universe where all individuals have names, for example, U = {Kate, Mary, Joe}. Then, the expressions on the left-hand side are equivalent to those on the right-hand side:

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[4] Among the other operators in (18), *bár* is a concessive or optative complementizer (*Bár esik* `Although it rains,' *Bár(csak) esne* `If only it rained'). *Se(n/m)* is a negative concord (NC) marker that also surfaces as the NC counterpart of `also' and `even' (*(még) Kati se(m)* `nor Kate, not even Kate'). Etymologically *se(n/m)* is thought to be a combination of *is* and *nem* `not'.

[5] See Koopman & Szabolcsi (2000: 201) for discussion of so-called emphatic *is*. Emphatic *is* attaches to the main polarity projection of the clause (here, to the focus *Kati*), and expresses that the situation described by the clause is as was promised or expected.

(26)	**Some**one dances	iff	Kate dances, **or** Mary dances, **or** Joe dances (possibly all)
	∃x[dance(x)]		dance(kate) ∨ dance(mary) ∨ dance(joe)
	Everyone dances	iff	Kate dances, **and** Mary dances, **and** Joe dances
	∀x[dance(x)]		dance(kate) ∧ dance(mary) ∧ dance(joe)

The simple facts above may provide a unified semantics for our particles, because ∃/∨ can be seen as being at work in all uses of *ka* and its Hungarian counterparts, and ∀/∧ can be seen as being at work in all uses of *mo* and its Hungarian counterparts. Being "at work" means that the operator plays a major role in explicating the semantics of the given expression, although it may or may not exhaust its semantics. To demonstrate this, we have to go a little beyond the classical observations.

4.1.2 In the ∃/∨ family, especially the question-marker role of *ka* deserves some comment. Both Hamblin (1958, 1973) and Karttunen (1977) interpret a question as the set of propositions that serve as its possible answers. Unlike Hamblin, Karttunen also requires answers to be true; we set this aside for the moment. Neither theory requires answers to be exhaustive; *Kate dances* as well as *Mary dances* count as separate true answers if both individuals dance.

In the case of yes/no questions, there are just two possible answers, the positive and the negative ones. In the case of individual wh-questions there are as many possible answers as there are individuals in the universe.

(27) *Does Kate dance?* à la Karttunen [6]
{p: p = {w: dance(kate)(w)} ∨ p = {w: ¬dance(kate)(w)} }
`the set of propositions that are identical to "Kate dances" or to "Kate doesn't dance"'

(28) *Who dances?* à la Karttunen
{p: p= {w: dance(kate)(w)} ∨ p= {w: dance(mary)(w)} ∨ p= {w: dance(joe)(w)}}
`the set of propositions that are identical to "Kate dances," or to "Mary dances," or to "Joe dances"'

Above, the sets of possible answers are defined using the propositional disjunction schema {p: (p= ...) ∨ (p=...) ∨ ...}. The same definitions can be equivalently expressed in the following ways. (29a) defines the same set that is defined in (28), because it enumerates exactly those three atomic propositions that make the disjunction in (28) true. (29b) defines the same set as (28) and (29a), because it picks out all propositions of the form "α dances" where α is one of the persons in the universe.

(29) W*ho dances?*
a. { {w: dance(kate)(w)}, {w: dance(mary)(w)}, {w: dance(joe)(w)} }
b. {p: ∃x[person(x) ∧ p = {w: dance(x)(w)}]}

[6] Each proposition is identified with that set of possible worlds {w: ...w...} in which the sentence is true. Following Montague's notation, Karttunen wrote ^dance(kate) for what is written these days as {w: dance(kate)(w)}.

In other words, classical logical ∃/∨ is critically used in the definition of the set of propositions that questions denote. In that sense the question-marker role of *ka* is consistent with treating it as a member of the ∃/∨ family, even though questions do not make existential assertions or disjoin propositions, i.e. ∃/∨ is not the main operation in their semantics.

Recall, however, that Hungarian, for example, does not use *vala/vagy* as a question-marker. Is this an accidental gap? Or, does it raise a red flag and indicate that unifying all uses of *ka* in the particular way suggested above is wrong? Kobuchi-Philip (2010) proposes that *ka* forms questions together with a silent CHOOSE function, viz. `choose the true answer'. Something along these lines could be a natural refinement of the unification proposal because, as was pointed out right above, ∃/∨ is "at work," but not the sole or main operation, in questions. One could say that Hungarian differs from Japanese in that *vala/vagy* fails to team up with silent CHOOSE and so it does not participate in question formation; some other operator, or combination of operators, performs that complex job. Such a solution would rest on the following assumption:

(30) Not a bi-unique relation
It is possible for all occurrences of a particle P to share the same semantic value S without P being the only particle that has that semantic value S.

We come back to the *ka* vs. *vala/vagy* contrast in section 4.3. Whatever the ultimate answers may be, it is an advantage of the present approach that it brings the puzzles about the various guises of *ka* and other operators out in the open.

4.1.3 We now turn to **the ∀/∧ family**, with Gil's 2008 WALS article as our guide.

> "[S]ome semanticists have proposed deriving the interpretations of universal quantifiers from those of conjunctions. For example, in the Boolean Semantics of Keenan and Faltz (1986), conjunctions and universal quantifiers are both represented in terms of set-theoretic intersections.
>
> How well do such semantic representations correspond to the observable lexical and grammatical patterns of languages? ... [O]ne might suspect that they do not correspond at all well. Thus, in English, the conjunction *and* and the universal quantifier *every* are distinct words with quite different grammatical properties.
>
> However, a broader cross-linguistic perspective suggests that there are indeed widespread lexical and grammatical resemblances between conjunctions and universal quantifiers, thereby lending support to the logicians' analyses. ...
>
> For the purposes of the [WALS] map, conjunctions are taken to include not only forms with meanings similar to that of *and*, but in addition expressions that are sometimes characterized as **conjunctive operators** or **focus particles**, with meanings resembling those of *also*, *even*, *another*, *again*, and in addition the restrictive *only*. As for universal quantifiers, these are assumed to encompass not only forms with meanings such as those of *every*, *each* and *all*, but also expressions that are sometimes referred to as **free-choice**...
>
> While the connection between conjunctions and universal quantifiers is well-motivated semantically, it is still necessary to work out the detailed mechanisms by which the relevant complex expressions derive their meanings from those of their constituent parts."
>
> (Gil 2008)

For the purposes of the WALS classification Gil assumes that conjunctive (with another common term, additive) particles are natural members of the ∀/∧ family. This requires some comment.

Minimally, one has to say that Boolean conjunction ∧ is "at work" in `too, also' and `even' but does not exhaust their contribution. This weaker claim is intuitively correct, but its technical implementation is not easy. Both *Kate, too, dances* and *Even Kate dances* are thought to presuppose that someone other than Kate dances. Presuppositions are often treated as definedness conditions: the sentence containing *too* or *even* is neither true nor false if the presupposition is not satisfied. If a definedness condition is all that these particles contribute, then it is not justified to group them with `every' and `and'. In another approach, Schlenker (2008) proposes to treat presupposed propositions as conjuncts that are suppressed under appropriate pragmatic circumstances. This may be more of a justification for the assimilation of `too, also' and `even' to `and'.

(31) *Kate, too, dances*
Even Kate dances
both entail "someone other than Kate dances, **and** Kate dances"

But, this implementation overgenerates, because it predicts that all expressions that carry a presupposition of any kind are candidates for having a ∀/∧ marker, including definite descriptions, factive verbs, inchoative verbs, etc. This does not seem to be the case in any language we are aware of.

In sum, while the intuition that ∧ is part of the contribution of `too' and `even' seems correct, it is not obvious exactly how that intuition should be made precise. It is relevant to point out that although Japanese *mo* and Hungarian *mind(en)* each play many roles, neither functions as plain `and'. Japanese `and' is *-to* and Hungarian `and' is *és*. Hungarian *is* and *és* are etymologically related, but they are never interchangeable. Furthermore, the particle *mind-* that forms universals is entirely distinct from *és/is*, although the paired versions (*mind A, mind B* and *A is, B is*) coincide in meaning `both, as well as'; recall (25). As Gil says, the compositional analysis that unites these elements under the ∀/∧ roof requires much further work. It may involve the semantic decomposition of the particles and the postulation of various silent elements, somewhat in the spirit of Kobuchi-Philip's proposal for *ka*+CHOOSE.

4.1.4 Let us mention that Jayaseelan (2011) analyzes **full, nominally restricted quantifier phrases** in Malayalam in the denotational semantic spirit outlined in this section. It turns out that in Malayalam both the particle that expresses conjunction (*-um*) and the one that expresses disjunction (*-oo*) participate in the composition of the phrase meaning `every child*'*. The following examples employ Jayaseelan's own glosses; our impression from his other examples is that *–um*, like *–mo*, is `also, even,' not plain `and.'

(32) a. oor-oo kuTTi-(y)um `every child'
one-DISJ child-CONJ
b. *oru kuTTi-(y)oo-(w)um
c. *oru kuTTi-(y)um-oo

(33) a. oor-oo kuTTi-(y)uDe oor-oo rakSitaaw-inte oor-oo paraati-(y)um
one-DISJ child-GEN one-DISJ parent-GEN one-DISJ complaint-CONJ
'each child's each parent's each complaint'

b. oor-oo kuTTi-(y)uDe-(y)um oor-oo rakSitaaw-inte-(y)um oor-oo paraati-(y)um
one-DISJ child-GEN-CONJ one-DISJ parent-GEN-CONJ one-DISJ complaint-CONJ

Jayaseelan (2011: 281) summarizes the compositional interpretation as follows: "In a distributive universal quantifier like *oor-oo kuTTi-(y)um*... [the] result is a partition of the class of `child', such that each cell of the partition has just one member. The *–oo* forms the cells of the partition, and *-um* collects the disjuncts together and gives us a universal quantifier." Jayaseelan spells this out in terms of conjuction and disjunction applying to variables; this can be re-formalized a bit in the spirit of generalized quantifier theory. Notice the similarity between (34a) and (28).

(34) a. **oo**(one child) {P: P={child1} ∨ P={child2} ∨ P={child3}}
b. **um**(**oo**(one child)) {P: {child1}⊆P ∧ {child2}⊆P ∧ {child3}⊆P}
`the set of properties that every child has'

4.2 Making the logic more general

Recognizing the ∃/∨ and the ∀/∧ relationships does not really commit us to the assumption that the universe is finite and every one of its inhabitants has its own name. (The second assumption would be more devastating. Whether the infinity of the world is linguistically significant, the expressions *every fork* and *some fork* definitely do not require for each fork to have its own name.) These constraints stem from expressing the relationships using predicate logic and propositional logic, as we did for expository purposes. But it is easy to move to a more general domain that is not constrained that way. Existential quantification and disjunction both fall under the rubric of taking the set-theoretic union of more abstract semantic objects that we may use to interpret linguistic expressions; similarly, universal quantification and conjunction both fall under the rubric of taking their intersection; see especially Keenan & Faltz (1986). For example, if DPs are assumed to denote generalized quantifiers, i.e. sets of properties, then *dare-ka* denotes the union of the sets of properties that at least one person has in the possibly infinite and nameless universe; and *Akira-ga odorimasu ka* denotes the union of the set of propositions equivalent to "Akira dances" with the set of propositions equivalent to "Akira doesn't dance," and so on.

The preliminary unification hypothesis in section 4.1 can be stated in terms of Boolean operations as follows:

(35) *ka, vala/vagy* are union operators.
(36) *mo, mind(en), és, is* are intersection operators.

Even more generally, disjunction and union are both special cases of the join operation of lattice theory that finds the least upper bound of two appropriate things, without restricting them to be propositions or sets. Likewise, conjunction and intersection are both special cases of the meet operation of lattice theory that finds the greatest lower bound. (See Landman 1991: Ch. 6 for a thorough introduction to lattices, and Szabolcsi 1997b for a very brief one.) We may want to use these more general notions if it turns out that *ka*, *mo*, and their brothers also operate on things that are not Boolean in nature. Events and collectives would be such. Furthermore, as Roelofsen (2012) points out, lattice theory provides an umbrella under which both the Boolean and the alternative-semantic views can be subsumed; see the next section.

4.3 Another unifying option: alternatives and issue-raising

4.3.1 Starting with Discourse Representation Theory (DRT) and Dynamic Semantics (DS) in the 1980s, semantic theories became attentive to aspects of meaning beyond plain truth-conditions. DRT and DS were specifically concerned with anaphora and presupposition projection. Roughly

at the same time, Rooth (1985) proposed a two-dimensional semantics, in which the role of focus is to introduce a set of contextually relevant alternatives. Focus alternatives either remain hanging in the air, or are used by operators, such as *only,* that quantify over them; if that happens, they get incorporated into the ordinary meaning of the expression. Rooth's set of focus alternatives and Hamblin's set of possible answers are the exact same set and, moreover, they are built and expanded in the same way in the course of assembling the sentence from its constituent parts (see Rooth 1992: 84 for discussion of the parallelism).

(37) *Who dances?* à la Hamblin:
{ {w: dance(kate)(w)}, {w: dance(mary)(w)}, {w: dance(joe)(w)} }

(38) *[KATE]$_F$ dances* à la Rooth:
ordinary meaning: {w: dance(kate)(w)}
focus alternatives: { {w: dance(kate)(w)}, {w: dance(mary)(w)}, {w: dance(joe)(w)} }

Formally speaking these sets of propositions are familiar semantic objects, but now a new intuition is attached to them.

Kratzer & Shimoyama (2002) proposed to recast semantic composition in general and quantification in particular in terms of Hamblin's semantics, also known as alternative semantics (i.e. semantics based on alternatives). On this proposal, all expressions denote sets of alternatives. The big difference is that expressions like *John* and *sleep* denote singleton sets of alternatives, {John} and {sleep}: no real choice is offered. In contrast, question words/indeterminate pronouns (*who/one*) introduce genuine, i.e. non-singleton sets of alternatives. Syntactic merge corresponds to merging alternatives; if there is a genuine choice, it projects up to the larger expression. Operators like *only* and *mo* assert that just one, or that every single one, of the alternatives is true. If no operator quantifies over the alternatives, silent existential closure is invoked to assert that at least one of the alternatives is true. [7]

Crucially to us, Alonso-Ovalle (2006) makes the case for a new treatment of disjunction, with reference to conditionals. He argues that *or* forms a set of propositions, as in (39), and **not** a single proposition whose truth may be guaranteed in multiple ways, as in (40a,b):

(39) *Kate dances, or Mary dances, or Joe dances* à la Alonso-Ovalle:
{ {w: dance(kate)(w)}, {w: dance(mary)(w)}, {w: dance(joe)(w)} }

(40) a. *Kate dances, or Mary dances, or Joe dances* in classical logic:
{w: dance(kate)(w)} $\vee$ {w: dance(mary)(w)} $\vee$ {w: dance(joe)(w)}
b. *Kate dances, or Mary dances, or Joe dances* in an alternative semantics that implements classical logic:
{ {w: dance(kate)(w)} $\vee$ {w: dance(mary)(w)} $\vee$ {w: dance(joe)(w)} }

Inquisitive Semantics (Mascarenhas 2009; Groenendijk & Roelofsen 2009; see also the Inquisitive Semantics Home Page) focuses on the cases in which neither a quantificational operator, nor existential closure applies to the set of alternatives. In that case the sentence is dedicated to raising an issue by presenting the set of alternatives and demanding that one of them be chosen. Central to Inquisitive Semantics is the observation that questions and "main" disjunctions share this basic

[7] See Abels & Martí (2011) for criticism of that aspect of Kratzer & Shimoyama's system that it quantifies over propositions, and Shan (2002) for another problem with their propositional logic.

feature of inquisitiveness. Notice that the interpretation of *Kate dances, or Mary dances, or Joe dances* in (39) is identical to that of *Who dances?* in (29). The same holds for indefinites, as pointed out especially by AnderBois (to appear):

(41) *Someone dances* à la AnderBois:
{ {w: dance(kate)(w)}, {w: dance(mary)(w)}, {w: dance(joe)(w)} }

These developments make it extremely natural for Japanese *ka* to feature in disjunctions, indefinites, and questions.

4.3.2 Let us now look back on the data regarding Hungarian *vala/vagy*, again. What we see is that although *ka* and *vala/vagy* overlap, each has an important role that the other lacks. [8]

(42)	*vala/vagy*		connective `or'	indefinite	existential verb
(43)	*ka*	question-marker	connective `or'	indefinite	

The fact that *vala/vagy* does not function as a question-marker but it does as a verb that asserts existence may suggest that the common denominator of its uses is the classical ∃/∨ discussed in 4.2. In contrast, the common denominator of the uses of *ka* is readily characterized as the formation of a set of alternatives, which excludes the assertion of existence. The overlaps can be accommodated in either way, and they should be. As far as we can see, Hungarian sentences involving `or' and `someone' do not differ substantially from their Japanese counterparts.

It may well be that *vala/vagy* and *ka* share a core and diverge in their surface functions, because they are aided by, or are conflated with, different silent operators. Such silent operators may map an appropriate Boolean operator to an alternative-introducing one, or conversely, an alternative-introducing operator to a Boolean one. Inquisitive Semantics already has an operator that performs the latter role: the ! (or, double-negation) operator that has the effect of unioning alternatives, and thus reduces a set of sets to a single set (e.g. a set of propositions to a single proposition). Operators like Kobuchi-Philip's silent CHOOSE might make yet another component.

Clarifying the relationship between the Boolean and the inquisitive interpretations of operators is a fundamental issue in its own right. It is not an artefact of the cross-linguistic compositional investigations that we are proposing to undertake. Instead, these investigations may put flesh on the bones and help address the theoretical questions in empirically motivated ways.

4.3.3 How different is the logical perspective of alternatives from the Boolean perspective? Roelofsen (2012) points out that, abstractly, the two are very similar. For example, on both perspectives *or* is interpreted as the join operation in a Heyting algebra.[9] But in the case of classical logic,

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[8] Recall that Hungarian has only an overt clause-type indicator for yes/no questions, the suffix *-e* that is not related to *vala/vagy*. For `be' in sentences that assert existence or possession, see (i-ii) and Szabolcsi (1994). The 3pl *vagynak* > *vannak* change happened in the last three hundred years.

(i)	Vannak	jó	filmek.		(ii)	Truffaut-nak	vannak	jó	filmjei.
	be.3pl	good	film.pl			Truffaut.dat	be.3pl	good	film.poss.3sg.pl
	`There are good films'					`Truffaut has good films'			

[9] See http://en.wikipedia.org/wiki/Heyting_algebra .

that Heyting algebra is also a Boolean algebra, whereas in the semantics of alternatives, it is not. Therefore, from a logical point of view, it would make sense if we found that operators like *ka* basically embody the more general notion, with special cases surfacing in different constructions; and it would also make sense if we found that the Boolean and the non-Boolean versions are separate items, and languages differ as to which of them they have. In the latter case the grand generalization would only obtain at some meta-level.

5 *Mo* and *dou*

The issue-raising perspective outlined in section 4.3 does not immediately suggest a comparable unifying principle for *mo* and its cross-linguistic relatives, beyond the general suggestion in Kratzer & Shimoyama that *mo* is a quantifier over alternatives.[10]

To lay some groundwork for further research, the present section sets out to compare Japanese *mo* and Chinese (primarily Mandarin) *dou*. Although there is an extensive literature pertaining to each of these particles, comparative studies are rare or non-existent. Bumford, Whang, & Zu (2011) find that the two particles have a highly similar distribution and support highly similar interpretations; but minor distributional and interpretive differences remain. Drawing on this work,[11] section 5.1 surveys the data, and 5.2 considers an account for each of *mo* and *dou* from the literature. The two accounts are based on quite different intuitions that correlate with certain descriptive differences between the two particles. In 5.3 we offer some new comparative data pertaining to distributivity and predicate types.

5.1.1 Similarities

[A] Both *mo* and (Cantonese, though not Mandarin) *dou* function as **focus-sensitive additive particles** (cf. *too, also*):[12]

(44) kare-**mo** sono-gakusei-wo tetsudatteage-ta
he-MO that-student-ACC help-PAST
`[He]$_F$ also helped that student'

(45) kare-ga sono-gakusei-**mo** tetsudatteage-ta
he-NOM that-student-MO help-PAST
`He helped [that student]$_F$ also'

[10] But are those the kind of alternatives that are introduced by *ka*? Although *-oo* (disjunction) and *-um* (conjunction) join forces to form restricted quantifiers in Malayalam, and *vala-* `some' and *is* `even' join forces to form negative polarity items in Hungarian (*valami is* `anything, NPI') and other languages, we are not aware of free choice pronouns being formed by the combination of a *ka*-like and a *mo*-like particle.

[11] We thank D. Bumford for his contributions to the 2011 paper.

[12] When a sentence has two F-marked phrases, they should be interpreted as alternative foci, not as simultaneous ones.

(46) [ngo^{5}]$_{F}$ **dou**^{1} [soeng^{2} sik^{6} syut^{3} gou^{1}]$_{F}$ (Cantonese)
I DOU want eat ice-cream
`[I]$_{F}$ also want to eat [ice-cream]$_{F}$'
[i] someone else wants to eat ice-cream
[ii] I want to do something else

(47) ngo^{5} [syut^{3} gou^{1}]$_{F}$ **dou**^{1} soeng^{2} sik^{6} (Cantonese)
I ice-cream DOU want eat
`I want to eat [ice-cream]$_{F}$ also'

[B] Both *mo* and *dou* function as **focus-sensitive scalar particles** (cf. *even*). See further comments on interpretation in (83)-(85).

(48) [kare]$_{F}$-**mo** sono-gakusei-wo tetsudatteage-ta
he-MO that-student-ACC help-PAST
`Even [he]$_{F}$ helped that student'

(49) kare-ga [sono-gakusei]$_{F}$-**mo** tetsudatteage-ta
he-NOM that-student-MO help-PAST
`He helped even [that student]$_{F}$'

(50) [wǒ]$_{F}$ **dōu** xiǎng chī [xuěgāo]$_{F}$
I DOU want eat ice-cream
[i] `Even [I]$_{F}$ want to to eat ice-cream'
[ii] `I even [want to to eat ice-cream]$_{F}$'

(51) wǒ [xuěgāo]$_{F}$ **dōu** xiǎng chī
I ice-cream DOU want eat
`I want to eat even [ice-cream]$_{F}$'

In the environment of a **numeral**, `even' amounts to `as many as':

(52) kare-ga ringo-jyuugo-ko-**mo** tabeta
he-NOM apple-fifteen-CL-MO eat-PAST
`He ate as many as fifteen apples' (after Kobuchi-Philip 2008: 497)

(53) tā shíwǔ-gè píngguǒ **dōu** chī-le
he fifteen-CL apple DOU eat-ASP
`He ate as many as fifteen apples'

Similarly in a **negative** environment (cf. *not even*):

(54) hito-ri-**mo** hohoem-ana-katta
one-CL-MO smile-NEG-PAST
`Not a single person smiled' (after Kobuchi-Philip 2009: 172)

(55) yí-gè-rén **dōu** méi xiào
one-CL-person DOU not smile
`Not a single person smiled'

[C] Both form **universal quantifiers** with indeterminate pronoun bases (cf. *everyone*) and with *which*-phrases (cf. *every professor*), although *dou* is not morphologically attached and, when in subject position, it may require a generic context (Henry Chang, p.c.):

(56) dare-**mo**-ga hohoen-da
who-MO-NOM smile-PAST
`Everyone smiled'

(57) doko-**mo** chuugoku-da
where-MO China-DECL
`Everywhere is China'

(58) dono-kyouju-**mo** hohoen-da
which-professor-MO smile-PAST
`Every professor smiled'

(59) ? shéi **dōu** xiào-le vs. zhè gè wèntí, shéi **dōu** huì huídá
who DOU smile-ASP this CL question who DOU be.able answer
`Everyone smiled' `Everyone can answer this question'

(60) tā nǎr **dōu** qù-guo
he where DOU go-EXP
`He's been everywhere'

(61) tā nǎ-gè xuéshēng **dōu** xǐhuān
he which-CL student DOU like
`He likes every student'

[D] Both *mo* and *dou* produce **strictly distributive** readings, but do not necessarily distribute to atomic individuals. See further comments on interpretation in section 5.3.

(62) dare-**mo**-ga ichi-dai-no kuruma-wo katta
who-MO-NOM one-CL-GEN car-ACC bought
`Everyone bought a car (*together)'

(63) dono akachan-**mo** niteiru
which baby-MO look alike
`All babies look alike'

(64) tāmen **dōu** mǎi-le yì-bù chēzi
they DOU buy-ASP one-CL car
`They all (each) bought a car (*together)' (Lin 1998: 201)

(65) nàxiē rén **dōu** shì fūqī
those person DOU be husband-and-wife
`Those people are all couples' (Lin 1998: 227)

[E] Both *mo* and *dou* help form **free relatives** that carry a positive expectation (here: that there will be people calling), in contrast to *if*-clauses.

(66) dare-ga denwa-shite-**mo** ore i-nai-tte it-te
who-NOM phone-do-MO I be-NEG-CLAUSE say-REQ
`Whoever calls, (I request that you) say that I'm not here'

(67) moshi dare-ka denwa-shi-tara ore i-nai-tte it-te
(if) who-KA phone-do-COND I be-NEG-CLAUSE say-REQ
`If anyone calls, (I request that you) say that I'm not here'

(68) (wúlùn) nă-gè rén dă-diànhuà, wŏ **dōu** bú zài
(no matter) which-CL person call I DOU not be
`Whoever calls, I'm not here' (Giannakidou & Cheng 2006: 174)

(69) (rúguŏ) nă-gè rén dă-diànhuà, jiù shuō wŏ bú zài
(if) which-CL person call then say I not be
`If anyone calls, say I'm not here' (Giannakidou & Cheng 2006: 173-4)

5.1.2 Differences

[F] Only *dou* functions as a **floated quantifier** associated with a plural (cf. floated *each, all*), although together with a wh-base, *mo* also functions as an adjunct:

(70) gakusei-ga dono-hito-**mo** hashitta
student-NOM which-person-MO ran
`Every student ran' (Kobuchi-Philip 2009: 179)

(71) zhè-xiē háizi wŏ **dōu** xìhuān
this-PL child I DOU like
`I like all these children'

(72) zhè-gè háizi wŏmen **dōu** xìhuān
this-CL child we DOU like
`We all like this child'

[G] Only in Mandarin do various quantifier phrases require the **support** of *dou*. Japanese *subete* (distributive) and *minna* (collective) appear prenominally without *mo*.

(73) subete-no-kyouju-ga subete-no-gakusei-wo tetsudatteage-ta
every-LK-professor-NOM every-LK-student-ACC help-PAST
`Every professor helped every student'

(74) dàduōshù / měi-gè rén *(**dōu**) mǎi-le shū
most every-CL person DOU buy-ASP book
`Most people / Every person smiled' (Lin 1998: 219)

[H] **Adverbs of quantification** are compatible with *mo*, but not with universals formed with the aid of *dou*:

(75) dare-ga kai-ta ronbun-**mo** taitei shuppan-sare-ta
who-NOM write-PAST paper-MO usually publish-PASS-PAST
`People's papers were usually published' (Tancredi 2004: 4)

(76) shéi xiě de lùnwén hěnkuài /*jīngcháng **dōu** fābiǎo-le
who write REL paper quickly/*usually DOU publish-ASP
`The papers that anyone wrote were quickly/usually published'

[I] Only *mo*, but not *dou*, functions as a **conjunction**. Then, unlike English *and*, it is strictly distributive (the sentences below do not describe a single event).

(77) John-**mo** Peter-**mo** hohoen-da
John-MO Peter-MO smile-PAST
`John as well as Peter smiled; John smiled and Peter did too'

5.2 Theories and subtle interpretive differences

5.2.1 The above survey indicates that the overall distribution and interpretation of *mo* and *dou* are extremely similar. How do those profiles come about?

Most of the literature pertaining to *dou* and *mo* concentrate on smaller subsets of the data. We briefly consider two accounts that strive to be relatively comprehensive, Xiang (2008) and Kobuchi-Philip (2008, 2009, 2010). Xiang, building on Lin (1998) and Giannakidou & Cheng (2006), places **maximality** in the center of her account of *dou*. In contrast, Kobuchi-Philip's starting point is the **additive** (`also') interpretation of *mo*. Clearly, the two approaches are quite different. We focus on how their basic intuitions correlate with the slight distributional and interpretive differences between the two particles.

5.2.2 Kobuchi-Philip (2009) starts from examples such as the following:

(78) (gakusei-ga) John-**mo** hashitta
`(Among the students,) John also ran'

(79) (gakusei-ga) [John-to Mary]-**mo** hashitta
`(Among the students,) John and Mary also ran'

(80) (gakusei-ga) John-**mo** Mary-**mo** hashitta
`(Among the students,) both John and Mary ran'

(81) (gakusei-ga) dono-hito-**mo** hashitta
`(Among the students,) every person ran'

Just like its English version, (78) requires for there to be a salient individual other than John who ran. This individual must be drawn from the set of students, if the subject *gakusei-ga* is present, or from a contextually given set if the sentence has a null subject. The same holds for (79); it requires for someone beyond John and Mary to have run. But (80) and (81) do not have a similar requirement. (80) is perfectly true and felicitous if no one besides John and Mary ran. Kobuchi-Philip's elegant proposal is that *mo* plays the same role in all these examples. The difference between (78)--(79) and (80)--(81) is due to the fact that in (80), where *mo* attaches both to *John* and to *Mary*, John's running satisfies the requirement posed by *Mary-mo*, and Mary's running satisfies the requirement posed by *John-mo.* (81) works analogously to (80), with the different elements in the set of students satisfying the "other runner" requirement for each other.

Kobuchi-Philip distinguishes quantificational *mo*, as above, from what she dubs the focus particle *mo*, and builds the scalar interpretations of the latter using focus and a likelihood-scale, similarly to the literature on English *even*.

5.2.3 Prior to moving on to *dou*, let us recall from (25) that Hungarian covers the distribution of *mo* with two distinct elements: *mind* and *is*. Of these two, only *mind* forms universal quantifiers, and only *is* functions as an additive (`also') and scalar (`even') particle. They overlap in that both paired *mind, mind* and paired *is, is* express strictly distributive conjunction. Just like Japanese *mo*, neither *mind* nor *is* corresponds to plain English *and*. Kobuchi-Philip's analysis of (78), (79), and (80) captures the intuition for non-scalar *is* very well. Given the overlap between *is, is* and *mind, mind*, the analysis may be seen to extend to the universal quantifier *mind(en).*

(82)	a. Kati **is**	`Kati-**mo**'
	b. [Kati és Mari] **is**	`[Kati-to Mari]-**mo**'
	c. Kati **is** (és) Mari **is**	`Kati-**mo** Mari-**mo**'
	d. **mind** Kati, **mind** Mari	`Kati-**mo** Mari-**mo**'
	e. **mind**-en-ki	`dono-hito-**mo**'

Yet, the fact that Hungarian uses two entirely distinct particles to cover these grounds gives us pause. The division of labor between *mind* vs. *is* gains significance from Shimoyama's (2006) suggestion that *mo* as a universal and *mo* as an additive particle are distinct. Shimoyama bases this on the fact that the intervention of the additive particle *mo* between quantificational *mo* and its target wh-word does not block the quantificational link.

One would also like to better understand the relation between the additive and the scalar versions of *mo*. Given that English *too* and *also* are not morphologically related to *even*, the two interpretations certainly can be built independently; but it is cross-linguistically not unusual for the same particle to have both additive and scalar interpretations.

5.2.4 Given that the key element of Kobuchi-Philip's analysis is the additive use of *mo*, it is important to recall that although Cantonese has additive *dou*, Mandarin does not. We do not know whether the gap in Mandarin is due to the blocking effect of *ye* `also, even' or, conversely, *dou* spills over to fill a vacant spot in the absence of *ye* in Cantonese. For the time being we regard the Mandarin situation as representative. Furthermore, both Mandarin and Cantonese *dou* lack the "conjunction" function exemplified in (82c,d). Therefore, if the above analysis of *mo* is on the right track, then *dou*'s whole profile, however similar it may be to that of *mo*, must be built on a different foundation.

Indeed, Xiang (2008) approaches *dou* quite differently. The key element of her account is **maximality**, following Giannakidou and Cheng (2006). She proposes that *dou* "gives rise to dif-

ferent meanings by applying maximality to a contextually determined plural set. This could be a set of covers, a set of focus-induced alternatives, or a set of degrees ordered on a scale [with the aid of *lian*]" (Xiang 2008: 227).

A subtle interpretive difference between *dou* on the one hand and *even* and *mo* on the other pertains to how unlikely an alternative has to be to satisfy the particles' scalar requirements. Although Xiang (2008: 230) says that *even* and *(lian) ... dou* are alike in requiring the most unlikely alternative to be true, it appears that neither *even* nor *mo* is that demanding: they are satisfied with an alternative that falls within the unlikely range but is not the most unlikely. To fix the contextual alternatives, imagine an old lady who is not used to eating anything but meat and potatoes. She is invited to a buffet dinner that offers, among many other things, plain rice, asparagus soufflé, and exotic seafood. Someone says,

(83) [The old lady enjoyed the dinner!] She even tried the ...
(84) (kanojo-wa) …-mo tabe-ta
(she-TOP) …-MO eat-PAST
'She even ate/tried the…'
(85) tā (lián) … **dōu** chī-le
she FOC DOU eat-ASP
`She even ate …'

What did the old lady have to eat to make these claims true and felicitous? For *even* and *mo*, it suffices if she tries the asparagus soufflé, which is already very unusual for her, whereas for *dou*, she has to try exotic seafood. This is in line with Xiang's claim that maximality is a crucial component in the interpretation of *dou*.[13]

Xiang relates the distributivity properties of *dou* to its being a maximality operator:

"(16) Tamen dou mai-le fangzi
they dou buy-Perf house
a. `They each bought a house/houses'
b. `They bought houses'

This sentence couldn't mean that all the people bought a house together. In other words, there has to be some kind of distributivity involved. But it is ambiguous as to how to distribute the house-buying event. It could have a strong distributive reading such that each individual bought houses separately, as shown in (16a). But it could also mean something vague like (16b). Essentially (16) only says that each individual participated in some house-buying event, but we don't know who bought a house by himself, and who bought a house/houses with other people collectively. ... This flexibility makes the generalized distributor analysis very attractive (Lin 1998). The original motivation of using generalized distributors (Schwarzschild 1996) is exactly to account for the vagueness problem in the interpretation of plurals. ... The concept of covers is needed in interpreting plural nouns. *Dou*, as a maximality operator, operates at the level of a set of covers and outputs a maximal plural individual that consists of all the covers. ... [T]his ensures that every individual in the set is included. I will also suggest that being a maxi-

[13] On the other hand, in none of the three languages does it seem to be required for the old lady to have tried all the dishes that are more likely than the one named, contrary to claims by both Xiang and Kobuchi-Philip. When one property logically entails another, e.g. *eat at least five apples* entails *eat at least four apples*, then this follows automatically; but it is not required in the absence of a logical entailment.

mality operator, *dou* has a plural presupposition, such that the domain on which it operates has to contain more than one cover. It is this presupposition that in general rules out the single-cover reading." (Xiang 2008: 232-237)

5.2.5 *Mo* vis-à-vis *dou* raise a strategic question. We have seen one proposal for each that is basically successful in accounting for a range of properties exhibited by the given particle. The two proposals have different key elements (additivity vs. maximality), and that does not seem arbitrary: it correlates with certain differences in both distribution and interpretation.

So what is the status of the great similarities in the behavior of *mo* and *dou*? It is possible that the similarities are simply consequences of the semantic content that arises in two different ways. On the other hand, methodologically *mo* vs. *dou* is reminiscent of question formation vs. topicalization in early generative grammar. Question formation and topicalization exhibit great similarities and also important differences. The response back then was to factor out the similarities in the shape of wh-movement, and to account for the differences with reference to other factors. One wonders whether the same approach could be applied here. If it is viable, then the two approaches can be evaluated with reference to which of them enables the *mo* and *dou* type data to fit into a bigger picture that also accommodates the *ka* type data.

5.3 Distributivity and predicate types

5.3.1 It is an important observation by Lin (1996, 1998) that *dou* does not demand distribution to atomic individuals. It is based on the fact that *dou* can modify predicates like *be couples* and *look alike*; we noted that *which-NP-mo* can also serve as the subject of such predicates. The claim that *dou* relies on a contextually relevant cover is more specific than just allowing non-atomic distributivity; it is especially motivated by the vagueness of distributivity.[14] But, predicates are not equally vague in this respect. The presence of numerals and aspectual marking makes predicates more discriminating. Consider:

(86) John bought houses and Mary bought houses
*entails:*John and Mary each bought houses (*distributive reading*)
John and Mary bought houses between them (*cumulative reading*)

(87) John bought two houses and Mary bought two houses
entails: John and Mary each bought two houses (*distributive*)
doesn't entail: John and Mary bought two houses between them (*cumulative*)

(88) John and Mary together ate up [=finished] a cake (*collective/cumulative, telic*)
entails: John and Mary each ate from [=partook of] a cake (*distributive, atelic*)
doesn't entail: John and Mary each ate up [=finished] a cake (*distributive, telic*)

[14] A cover of the set/plurality P is a set of non-empty and possibly overlapping subsets/subpluralities of P, such that everything in P belongs to at least one of the subsets/subpluralities. Let α be a variable over predicates, D a distributive operator, and P and S variables over pluralities in the relevant domain of discourse. Then $P \in ||D(Cov)(\alpha)||$ if and only if $||Cov||$ is a cover of P, and every S in $||Cov||$ has the property α (Schwarzschild 1996).

(89) John and Mary each ate from [=partook of] the cake (*distributive, atelic*)
doesn't entail: John and Mary each ate up [=finished] the cake (*distributive, telic*)
John and Mary ate up [=finished] the cake together/between them
(*collective/cumulative, telic*)

Xiang's remarks regarding her example (16), quoted above, indicate that the vagueness of *tamen dou mai-le fangzi* is facilitated (i) by the fact that the predicate is cumulative, due to the unmarkedness of *fangzi* for singular/plural and definite/indefinite, and (ii) by the fact that the same predicate can be used in a telic (completive) and an atelic (incomplete or participation) sense. As the English examples above show, the addition of a numeral (interpreted as `exactly *n*') to the direct object discriminates between collective/cumulative and distributive readings. Regarding completive vs. participation readings, (88) is especially illustrative. For a predicate to qualify as distributive, the exact same predicate must hold of a plurality and its parts. If John and Mary together "finished a cake", then that same predicate does not hold of John by himself and of Mary by herself; only a related but distinct predicate, namely, "participate in finishing, or partaking of a cake" does. The claim that these are distinct predicates is justified by the fact that many languages distinguish the two senses, either in all occurrences of the predicate or at least in some occurrences. For example, in Hungarian the presence vs. absence of a perfective prefix and/or accusative vs. oblique case on the internal argument will distinguish the two senses; in Japanese the completive suffixes *-oeru, -kiru,* and *-shimau*, in contrast to the progressive suffix *-iru* do the same; see also Mandarin completive *chī-wán*. (*-shimau* and *-iru* have additional modal senses that are irrelevant to us.) Exactly how a distributive particle like *mo* or *dou* contributes to the meaning of the sentence can be better judged when the predicate is a discriminating one and it is easy to hold its interpretation constant.

The verbs *buy*, *eat of/from*, and *eat up* are all neutral as to whether their agents are atomic individuals or pluralities, unlike verbs like *be alike,* which require pluralities as themes. The same holds for the VPs they form with the various direct objects. Thus they serve as a lexically neutral testing ground. But notice that a situation in which *John, Mary and Bill (together) ate up a cake* is true **cannot** be built from sub-situations in which *John and Mary (together) ate up a cake*, *Mary and Bill (together) ate up a cake*, etc. are true. In contrast, a situation in which *John, Mary and Bill are alike* is true **can** be built from sub-situations in which *John and Mary are alike*, *Mary and Bill are alike*, etc. are true. So consideration of the *buy/eat* type predicates may shed new light on how various readings may come about.

5.3.2 In this section we consider **sentences with *mo* and *dou* with respect to the same set of situations.** Since *mo* and *dou* are syntactically different, the examples cannot be real minimal pairs: for example, *tamen dou VP* `they DOU VP' cannot be directly replicated in Japanese. In Japanese, we tested two constructions, with DP-internal *mo* (*dono-gaka-mo* `every painter') and with floated *mo* (*kono yo-nin-ga dono hito-mo* `these people, each'); we found no differences. Below only the latter one is exemplified. The J1 and the J2 examples differ in the form of the numeral expressions (J1 with, J2 without the linker *no*).

(90) J kono yo-nin-ga ie-o kat-ta
this four-CL-NOM house-ACC buy-PAST
`These four people bought houses/a house'
M zhèi sì gè rén mǎi-le fángzi
this four CL person buy-ASP house
`These four people bought a house/houses'

(91) J kono yo-nin-ga dono hito-**mo** ie-o kat-ta
this four-CL-NOM which person-MO house-ACC buy-PAST
`Each of these four people bought houses/a house'
M zhèi sì gè rén **dōu** mǎi-le fángzi
this four CL person DOU buy-ASP house
`These four people all bought a house/houses'

(92) J1 kono yo-nin-ga ni-ken-no ie-o kat-ta
this four-CL-NOM two-CL-LNK house-ACC buy-PAST
`These four people bought two houses'
J2 kono yo-nin-ga ie-ni- ken-o kat-ta
this four-CL-NOM house-two-CL-ACC buy-PAST
`These four people bought two houses'
M zhèi sì gè rén mǎi-le liǎng tào fángzi
this four CL person buy-ASP two CL house
`These four people bought two houses'

(93) J1 kono yo-nin-ga dono hito-**mo** ni-ken-no ie-o kat-ta
this four-CL-NOM which person-MO two-CL-LNK house-ACC buy-PAST
`Each of these four people bought two houses'
J2 kono yo-nin-ga dono hito-**mo** ie-ni-ken-o kat-ta
this four-CL-NOM which person-MO house-two-CL-ACC buy-PAST
`Each of these four people bought two houses'
M zhèi sì gè rén **dōu** mǎi-le liǎng tào fángzi
this four CL person DOU buy-ASP two CL house
`These four people all bought a house/houses'

(94) J1 kono yo-nin-ga hitotsu-no keeki-o tabe-ta
this four-CL-NOM one-LNK cake-ACC eat-PAST
`These four people ate a cake'
J2 kono yo-nin-ga keeki-hitotsu-o tabe-ta
this four-CL-NOM cake-one-ACC eat-PAST
`These four people ate a cake'
M zhèi sì gè rén chī-le yí kuài dàngāo
this four CL person eat-ASP one CL cake
`These four people ate a cake'

(95) J1 kono yo-nin-ga dono hito-**mo** hitotsu-no keeki-o tabe-ta
this four-CL-NOM which person-MO one-LNK cake-ACC eat-PAST
`Each of these four people ate a cake'
J2 kono yo-nin-ga dono hito-**mo** keeki-hitotsu-o tabe-ta
this four-CL-NOM which person-MO cake-one-ACC eat-PAST
`Each of these four people ate a cake'
M zhèi sì gè rén **dōu** chī-le yí kuài dàngāo
this four CL person DOU eat-ASP one CL cake
`These four people all ate a cake'

(96) J1 kono yo-nin-ga hitotsu-no keeki-o tabe-kit-ta
this four-CL-NOM 1-LNK cake-ACC eat-finish-PAST
`These four people ate up a cake'
J2 kono yo-nin-ga keeki-hitotsu-o tabe-kit-ta
this four-CL-NOM cake-one-ACC eat-finish-PAST
`These four people ate up a cake'
M zhèi sì gè rén chī-wán-le yí kuài dàngāo
this four CL person eat-finish-ASP one CL cake
`These four people ate up a cake'

(97) J1 kono yo-nin-ga dono hito-**mo** hitotsu-no keeki-o tabe-kit-ta
this four-CL-NOM which person-MO one-LNK cake-ACC eat-finish-PAST
`Each of these four people ate up a cake'
J2 kono yo-nin-ga dono hito-**mo** keeki-hitotsu-o tabe-kit-ta
this four-CL-NOM which person-MO cake-one-ACC eat-finish-PAST
`Each of these four people ate up a cake'
M zhèi sì gè rén **dōu** chī-wán-le yí kuài dàngāo
this four CL person DOU eat-finish-ASP one CL cake
`These four people all ate up a cake'

In the description of the test situations below, the "+" sign indicates that the individuals acted collectively. In house-buying this means that they pooled money and became collective owners; in cake-eating, it means that they finished the cake together.

(98)

	House-buying situations			Cake-eating situations		
(a)	J+M+B+S	bought	H1, H2	J+M+B+S	shared and ate up	C1
(b)	J+M	bought	H1, H2	J+M	shared and ate up	C1
	B+S	bought	H3, H4	B+S	shared and ate up	C2
(c)	J+M	bought	H1, H2	J+M	shared and ate up	C1
	M+B	bought	H3, H4	M+B	shared and ate up	C2
	B+S	bought	H5, H6	B+S	shared and ate up	C3
(d)	J	bought	H1, H2	J	ate up	C1
	M	bought	H3, H4	M	ate up	C2
	B	bought	H5, H6	B	ate up	C3
	S	bought	H7, H8	S	ate up	C4
(e)				J	ate from	C1
				M	ate from	C2
				B	ate from	C3
				S	ate from	C4
(f)	J	bought	H1	J	ate up	C1
	M+B+S	bought	H2	M+B+S	shared and ate up	C2
(g)				J	ate from	C1
				M+B+S	shared and ate up	C2

(99)

	a	b	c	d		f	
90 J: these 4 people house bought	Yes	Yes	Yes	Yes		Yes	
M: these 4 people bought house	Yes	Yes	Yes	Yes		Yes	
91 J: these 4 people **MO** house bought	Yes	Yes	Yes	Yes		Yes	
M: these 4 people **DOU** bought house	Yes	Yes	Yes	Yes		Yes	
92 J1: these 4 people 2-NO house bought	Yes	Yes	**NO**	Yes		Yes	
J2: these 4 people 2 house bought	Yes	?Yes	**NO**	Yes		Yes	
M: these 4 people bought 2 house	Yes	**NO**	**NO**	**NO**		Yes	
93 J1: these 4 people **MO** 2-NO house bght.	Yes	Yes	**NO**	Yes		**NO**	
J2: these 4 people **MO** 2 house bought	Yes	Yes	**NO**	Yes		**NO**	
M: these 4 people **DOU** bought 2 house	Yes	Yes	**NO**	Yes		**NO**	

(100)

	a	b	c	d	e	f	g
94 J1: these 4 people one-NO cake ate	Yes	**NO**	**NO**	Yes	Yes	**NO**	**NO**
J2: these 4 people one cake ate	Yes	**NO**	**NO**	Yes	Yes	**NO**	**NO**
M: these 4 people ate one cake	Yes	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
95 J1: these 4 people **MO** one-NO cake ate	Yes	**NO**	**NO**	Yes	Yes	**NO**	**NO**
J2: these 4 people **MO** one cake ate	**NO**	**NO**	**NO**	Yes	Yes	**NO**	**NO**
M: these 4 people **DOU** ate one cake	**NO**	**NO**	**NO**	Yes	?Yes	**NO**	**NO**
96 J1: these 4 people one-NO cake ate **CPL**	Yes	**NO**	**NO**	Yes	**NO**	**NO**	**NO**
J2: these 4 people one cake ate **CPL**	Yes	**NO**	**NO**	Yes	**NO**	**NO**	**NO**
M: these 4 people ate **CPL** one cake	Yes	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
97 J1: these 4 people **MO** one-NO cake ate **CPL**	Yes	**NO**	**NO**	Yes	**NO**	**NO**	**NO**
J2: these 4 people **MO** one cake ate **CPL**	**NO**	**NO**	**NO**	Yes	**NO**	**NO**	**NO**
M: these 4 people **DOU** ate **CPL** one cake	**NO**	**NO**	**NO**	Yes	**NO**	**NO**	**NO**

5.3.3 The main generalizations that emerge are as follows:

(101) The main differences are **not** between *mo* vs. *dou*, nor between sentences with vs. without *mo/dou*, nor between sentences with vs. without completive constructions. These factors do matter,[15] but the main differences have to do with factors other than these three.

(102) Whether a sentence with *mo/dou* is judged true in a particular situation overwhelmingly correlates with whether the version without *mo/dou* is judged true in the same situation.

[15] *Mo/dou* eliminates the cumulative reading when that is not equivalent to a distributive one, see (93) in situation (c), as opposed to (91) in situation (c). The completive forms in (96) and (97) distinguish between (d) and (e).

(103) Whether a sentence without *mo/dou* is judged true in a particular situation varies significantly with predicate types, and to some extent it varies between Japanese and Chinese.

To start with the Japanese/Chinese distinction, Chinese sentences without *dou* primarily support collective and cumulative readings, but not distributive ones (Lin 1998). To take some uncontroversial examples, the Chinese sentences in (92), (94), and (96), i.e. `These four people bought two houses / ate a cake' are judged false in the (d) situations, when each of the four performed that action separately. The corresponding Japanese sentences are judged to be true in (d), just as the corresponding English and Hungarian ones are. One way to put this is that the presence of *dou* endows Chinese sentences with readings that the corresponding Japanese ones would have even without *mo.*

Regarding predicate types, we find three main categories:

[i] House-buying, in both Japanese and Chinese
[ii] Buying two houses, in both Japanese and Chinese (modulo the above)
[iii] Cake-eating, eating one cake, in both Japanese and Chinese (modulo the above)

The [i]-[ii] contrast is not difficult to understand. `Buy' is a lexically cumulative verb (if x bought y and z bought v, then it is true that x and z bought y and v), and the direct objects in the relevant sentences, not being marked for singular/plural or definite/indefinite, do not eliminate cumulativity at the verb phrase level. So all the house-buying examples (90)-(91) are either collective or cumulative. When the direct object is quantized (has a numeral interpreted as `exactly *n*'), then collective, distributive, and cumulative readings become distinguishable. We see for example that the sentences in (93) are all false in situation (f), where people bought two houses between them – *mo* and *dou* associated with the subject eliminate the cumulative reading. But the sentences in (93) are true in situation (d), where each person bought two houses – *mo* and *dou* are happy with the fully distributive reading.

Before going further, we have to ask what kind of distributive readings are attested here. We propose that both languages allow for `bought exactly two houses on his/her own' as well as `participated in a collective purchase of exactly two houses'. When the `two houses' sentences are true in (a), (b), or (c), that is so because the participation reading is true of each of the four individuals. Using (93) again as an example, `These four people each/all bought two houses' is true in situation (a), where a single fully-collective purchase happened, not because the sentence has a collective reading but because it has a distributive participation-reading: each of J, M, B, and S participated in buying exactly two houses. They are also true in (b), where the pair J and M bought two houses and, independently, the pair B and S did too, so again, each of the four individuals participated in buying exactly two houses. And they are all false in situation (c), because in (c) the individuals M and B participated in buying four houses, not two.

Note that both English sentences below are false in situation (b) as well as (c):

(104) These four people bought two houses.
(105) These four people each/all bought two houses.

If our reasoning is correct, then some readings that the literature would attribute to "distribution to pairs, triples, etc." are in fact cases of distribution to atoms, but relying on participation. Otherwise it would be difficult to explain why overlaps among the pairs matter, see (b) versus (c), especially in a cover-based theory, which is specifically designed to allow overlaps.

Our assumption that distributing participation-readings to atomic individuals is at stake is confirmed by the fact that both the Japanese and Chinese sentences below are judged true in situation (a), in which individual J did not buy anything on his/her own. Thus the examples can only be true in a participation sense.

(106) J John-ga ni-ken-no ie-o kat-ta
John-NOM two-CL-LNK house-ACC buy-PAST
`John bought (=participated in buying) two houses'
M Zhāngsān mǎi-le liǎng tào fángzi
Zhangsan buy-ASP two CL house
`Zhangsan bought (=participated in buying) two houses.'

What we observe is not necessarily in conflict with Lin's (1998) findings. Lin (1998) primarily examined predicates that simply cannot distribute to atomic individuals, e.g. `meet' and `be classmates'. Probably something like the Strongest Meaning Hypothesis (Dalrymple et al. 1998 and much further work) will explain this: predicates distribute to the smallest units they can distribute to. Accordingly, the sentences below are ungrammatical in the intended sense (although the Chinese version is good in the object pro-drop sense: `John met a contextually salient person'):

(107) J # John-ga at-ta
John-NOM meet-PAST
Intended `There is an x such that John participates in the meeting-relation with x'
M # Zhāngsān yùjiàn-le
Zhangsan meet-ASP
Intended `There is an x such that John participates in the meeting-relation with x'

Turning to [i]-[ii] versus [iii], at present we do not understand why cake-eating and eating one cake pattern together and differ from both house-buying and buying two houses. We can point to the fact that the consumption verb `eat' has an incremental Theme and `buy' does not, but we do not yet see how this explains the data. The data can be summarized by saying that our sentences with incremental Themes (cake, one cake) lack participation readings. They only have collective, cumulative, and `VP on his/her own' style distributive readings. Again, this is confirmed by the fact that the sentences below are judged false in the (a) situation:

(108) J John-ga hitotsu-no keeki-o tabe-ta
John-NOM one-LNK cake-ACC eat-PAST
`John ate a cake'
M Zhāngsān chī-le yí kuài dàngāo
Zhangsan eat-ASP one CL cake
`Zhangsan ate a cake.'

There are further minor differences that we do not yet understand. Our Japanese examples come in two varieties, varying the shape of the measure-phrase. Neither measure-phrase is split (we avoided split so as not to induce distributivity, cf. Nakanishi 2007). But even the non-split constructions with and without the linker *no* differ slightly; we do not know why.

5.4 Wrapping up *mo* and *dou*

This section compared the distribution and interpretation of *mo* and *dou*, in their roles as additive and scalar particles, connectives, components of free relatives, and universal/distributive quantifiers. The overall cross-linguistic comparison and many of the specific language-internal observations are new contributions to the literature. We observed that from a bird's eye perspective *mo* and *dou* are extremely similar. How their compositional analyses should account for the similarities as well as the remaining differences is an important open question that we hope to take up in future work.

6 Summary

This paper pointed out a trend in recent research that questions the assumption that there is a dividing line between morphology and syntax, as well as the assumption that multi-morphemic units are simply lexicalized with idiosyncratic properties. The emerging view naturally leads to a notion of compositionality that operates on the smallest bits that sentences and words can be analyzed into and assumes that they contribute to meaning in a systematic fashion.

We highlighted a set of cases, especially pertaining to some particles that build quantifier words and also attach to phrases, which may serve to test and refine the new view. We argued that it is plausible that their contribution is compositional. But many questions arise, due to gaps in the system and due to our currently incomplete understanding of how the exact range of meanings we find arise and relate to each other. We believe that these questions are productive ones and they should not scare us away.

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