

# How *many* maximizes in the Balkan Sprachbund\*

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## 1 Introduction.

In Romanian (as well as Bulgarian and Macedonian), the amount question-word *cît* can, but need not, occur with the word *mult* ('many'). I start by arguing that this fact, along with other data from French, demonstrates that *many* is not an existential quantifier over individuals. The rest of the paper is devoted to an analysis of the difference between Romanian amount questions with *cît* and those with *cît de mult*: the latter, but not the former, are infelicitous in upward- and non-scalar questions. This suggests that the semantic contribution of *mult* in Romanian amount questions results in a maximality effect (Dayal 1996, Beck & Rullman 1999). I derive this effect without postulating a maximality operator by analyzing *mult* as a predicate over sets of degrees.

As this paper involves cross-linguistic comparison, I'll adopt the term '*m-word*' to refer to the word *many* and its cognates: specifically *many* and *much* in English, Romanian's *mult*, Bulgarian's *mnogo* and Macedonian's *mnogu*. These words can occur with NPs ('much water,' 'many boys'), occur in the specifier of a comparative ('much better,') and associate the phrase they modify with a high degree.

## 2 Existential force in amount questions.

Amount questions like the one in (1-a) have the meaning in (1-b):

- (1) a. How much water did John drink?  
b.  $\lambda p \exists d. p = \lambda w \exists X. \text{water}(w)(X) \wedge \text{drink}(w)(j, X) \wedge \mu(X) = d$

I begin the paper by arguing that the individual quantifier  $\exists X$  is not introduced lexically but rather by an operator associated with the NP *water*. The final of three arguments for the source of the NP comprises the bulk of the talk.

### 2.1 $\exists X$ is not lexically encoded.

The existential quantifier over individuals in *How much water* isn't lexical.

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- It isn't introduced by the word *how* because there's no quantification over individuals in i.e. *How tall*.
- It isn't introduced by the *m*-word (contra i.e. Romero 1998, Hackl 2000) because there's no quantification over individuals in i.e. *Much better*, *much above the speed limit* or *loves too much*.
- It isn't introduced by the NP itself because there's no existential quantification in i.e. *no water*, *every boy*.

## 2.2 $\exists X$ is associated with the NP.

I follow Cresswell 1976 and Schwarzschild 2005 in associating the existential quantifier over individuals in (1) with a morpheme associated with the NP. I call this "PL"<sup>1</sup> after Cresswell (Schwarzschild's morpheme, MON, also requires that the measurement of sets be monotonic).

$$(2) \quad \llbracket \text{PL} \rrbracket = \lambda P \lambda d \lambda Q \exists X. P(X) \ \& \ Q(X) \ \& \ |X| = d$$

This is the meaning attributed to *m*-words by Hackl 2000 and used implicitly in Bresnan 1973 and syntactic reconstruction accounts like Romero 1998, Fox 2000 and Lahiri 2002.

There are three reasons that the individual quantifier should be attributed to an operator on the NP rather than to the word *many*.

### 2.2.1 Amount *wh*-phrases without *m*-words.

- Amount questions in many languages don't involve an *m*-word. Question words like *cît* in Romanian, *kolko* in Bulgarian and *kolku* in Macedonian, can't be obviously separated into a degree quantifier and an *m*-word.
- This fact alone isn't enough: one could argue that these words contain a covert *m*-word that provides existential quantification.
- But this explanation can't be extended to Romanian, where a) an *m*-word can be optionally added to the *cît* construction, and b) the addition of the *m*-word slightly changes aspects of the amount question's syntax and semantics.

- (3) a. Cîte femei cunoaște?  
*cît*-Fpl women know.3sg  
 b. Cît de multe femei cunoaște?  
*cît* of many-Fpl women know.3sg  
*How many women does he know?*

- Both the constructions in (3) are amount questions with number answers, both best translate as 'how many' in English. They behave the same when embedded, and neither construction is restricted to a D-linked or partitive reading (Pesetsky 1987, Enç 1991).

<sup>1</sup>In Cresswell 1976, PL occurs with count nouns; a related operator, TOT, occurs with mass nouns and uses measurement of sets rather than the cardinality function. For simplicity, I'll restrict my discussion to amount questions with count nouns and thereby will refer only to the cardinality operator.

- The bulk of this talk will address the differences between the two constructions.

### 2.2.2 Quantifier scope in French split-NP constructions.

- Amount questions involving modals are ambiguous: the individual quantifier can either scope over or under the modal (see Kroch 1989, Heycock 1995).

- (4)
- How many books does John have to read?
  - For what number  $n$ : there are  $n$  books  $x$  st. John has to read  $x$ .
  - For what number  $n$ : it has to be the case that there are  $n$  books  $x$  st. John reads  $x$ .

- Context for (4-b): John is taking a syntax class for which he's required to read books A, B, and C.
- Context for (4-c): John is taking a speed-reading course for which he's required to read 5 books, any 5 books.
- Syntactic accounts of scope reconstruction like Romero 1998, Fox 2000 and Lahiri 2002 achieve the truth conditions here by reconstructing the *m*-word.
- In French degree questions, the NP modified by *combien* may but need not be raised with the *wh*-word.

- (5)
- Combien de livres faut-il que vous lisiez?  
how.many of books it's.necessary that you read
  - Combien faut-il que vous lisiez de livres?  
how.many it's.necessary that you read of books  
*How many books must you read?*

- The two differ in their available interpretations: while the individual quantifier can scope above or below the modal in (5-a), it can only be interpreted below the modal in (5-b) (Obenauer 1984, Rizzi 1990, Dobrovie-Sorin 1992, Heycock 1995).
- The following analysis follows straightforwardly under the assumption that the individual quantifier is associated with the NP:
  - When the NP is raised with *combien*, *wh*-movement allows it to escape its own clause. Here, it can either scope over the modal operator or under it.
  - When the NP is not raised with *combien*, it can only move via QR (assuming it moves as a quantified NP with PL), which is clause-bound. This prevents it from being able to scope outside of its own clause, leaving it under the scope of the modal operator.
- To assume that the individual variable is associated with an *m*-word component of the *wh*-phrase is to lose this explanation for the unambiguity of (5-b).

The next section outlines the third argument for associating the individual quantifier with PL rather than the *m*-word. It focuses on a major difference between the two constructions in (3): maximality effects.

### 3. Maximality and Balkan amount questions.

In this section, I argue that *m*-words are predicates over sets of degrees.<sup>2</sup>

$$(6) \quad \llbracket \text{mult} \rrbracket = \lambda d \lambda D. |D|=d$$

This characterization accounts for the behavior of *m*-words in comparatives, as Schwarzschild (2002) argues. It also accounts for observed maximality effects in *cît de mult* questions without requiring the postulation of a maximality operator (cf. Rullman 1995). Finally, the fact that a maximality effect can be added to a question construction lexically argues that i.e. Dayal 1996 and Beck & Rullman (1999) were right to suggest that the semantics of questions don't standardly involve a maximality operator.

#### 3.1 The data.

- One of the main differences between *cît* degree questions like (3-a) and *cît de mult* degree questions like (3-b) is that the former, but not the latter, are felicitous in upward-scalar (7) and non-scalar (8) contexts.

- A predicate *P* is downward-scalar iff  $\forall n, m, m \leq n: P(n) \Rightarrow P(m)$
- A predicate *P* is upward-scalar iff  $\forall n, m, m \leq n: P(m) \Rightarrow P(n)$
- A predicate *P* is non-scalar iff it is neither upward-scalar nor downward-scalar

(7) We have few eggs left in the house.

- a. Cîte ouă ajung ca să iasă prăjitura bună?  
*cît*-Fpl eggs are.enough compl Subj come.out cake good
- b. \*Cît de multe ouă ajung ca să iasă prăjitura bună?  
*cît* of many-Fpl eggs are.enough compl Subj come.out cake good  
*How many eggs are sufficient so that the cake comes out good?*

(8) A basketball team can consist of 5 or 7 players.

- a. Ion știe câți jucători pot forma o echipă de baschet.  
 John knows *cît*-Mpl players can form a team of basketball
- b. \*Ion știe cît de multi jucători pot forma o echipă de baschet.  
 John knows *cît* of many-Mpl players can form a team of basketball  
*John knows how many players can form a basketball team.*

- These are the same contexts that Beck & Rullman (1999) argue are incompatible with a maximality operator (previously argued by Rullman (1995) to be in the semantics of question words).

#### 3.2 The analysis.

I account for the maximality effects in (7) and (8) by analyzing *cît* as a [+wh] degree quantifier and by incorporating the meanings of the *m*-word and PL in (6) and (2).

<sup>2</sup>In further analyses of *m*-words and gradable predicates, I add a conjunct to this definition stating that *d* exceeds some contextually-set standard *c*. I eliminate it here because it does not crucially factor into an analysis of NP amount questions.

- *Cît* is a [+wh] Deg head whose semantics contain an existential quantifier over degrees.

(9)  $[[cît]] = \lambda D \lambda p \exists d. D(d)$

- The same word is used to question the degree of adjectival predicates (10):<sup>3</sup>

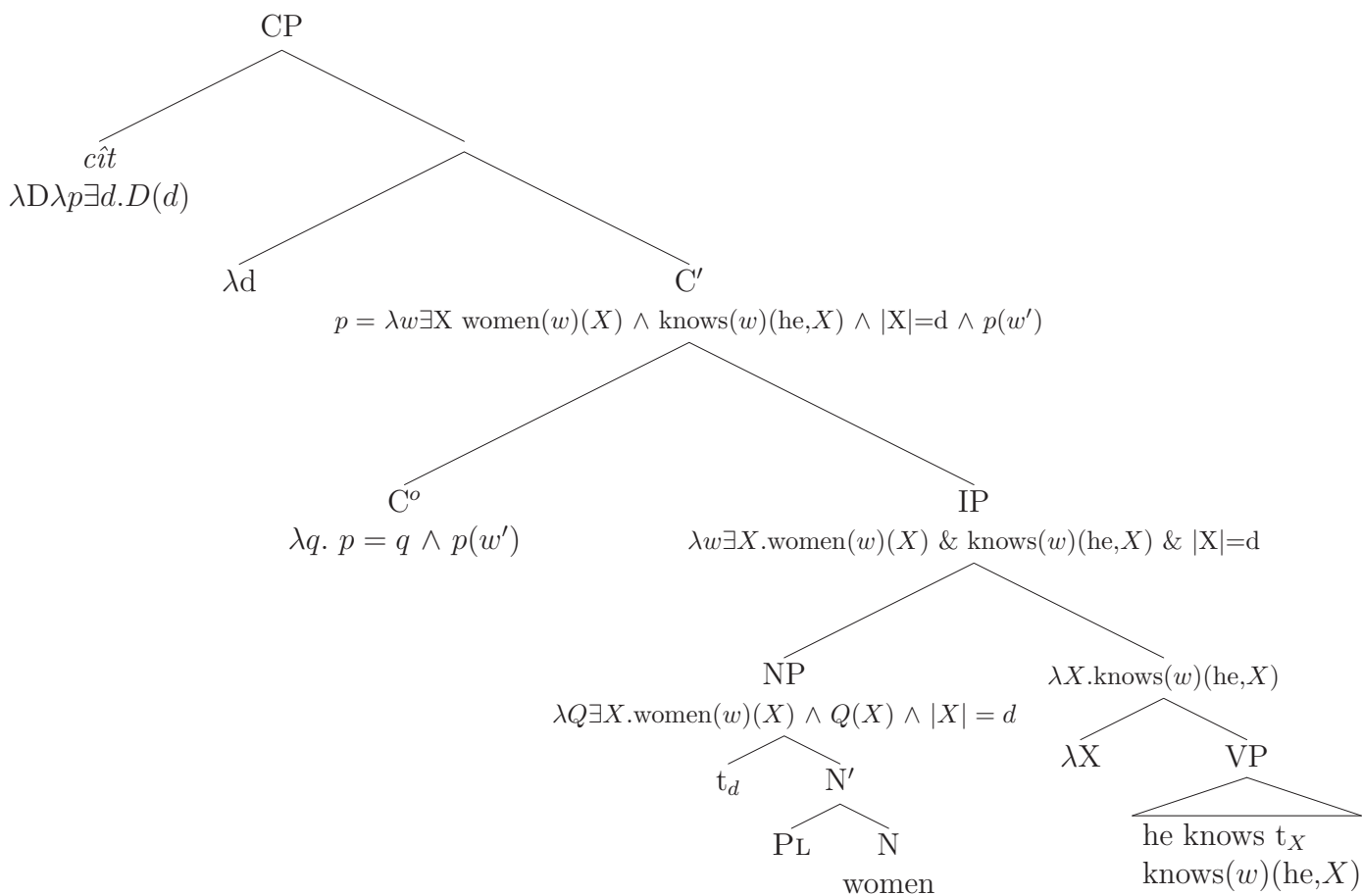
(10) Cît de înaltă este?  
*cît* of tall-Fsg is.she?  
*How tall is she?*

### 3.2.1 The semantics of *cît* questions.

- Given PL as it's defined in (2), we have the right meaning for the question in (11).

(11) a. Cîte femei cunoaște?  
*cît* women know.3sg  
*How many women does he know?*  
 b.  $[_{CP} cît_{d1} [ t_{d1} PL \text{ women} ]_X [_{IP} \text{ he knows } t_X ]]$

$\lambda w' \lambda p \exists d. p = \lambda w \exists X. \text{women}(w)(X) \wedge \text{knows}(w)(\text{he}, X) \wedge |X| = d \wedge p(w')$



<sup>3</sup>Although the phrases composed of an amount *wh*-word and an *m*-word in Macedonian and Bulgarian (*kolku mnogu* and *kolku mnogo*) can take adjectives, this is not true for *cît de mult* in Romanian. See Rett *in prep* for a discussion of these constructions.

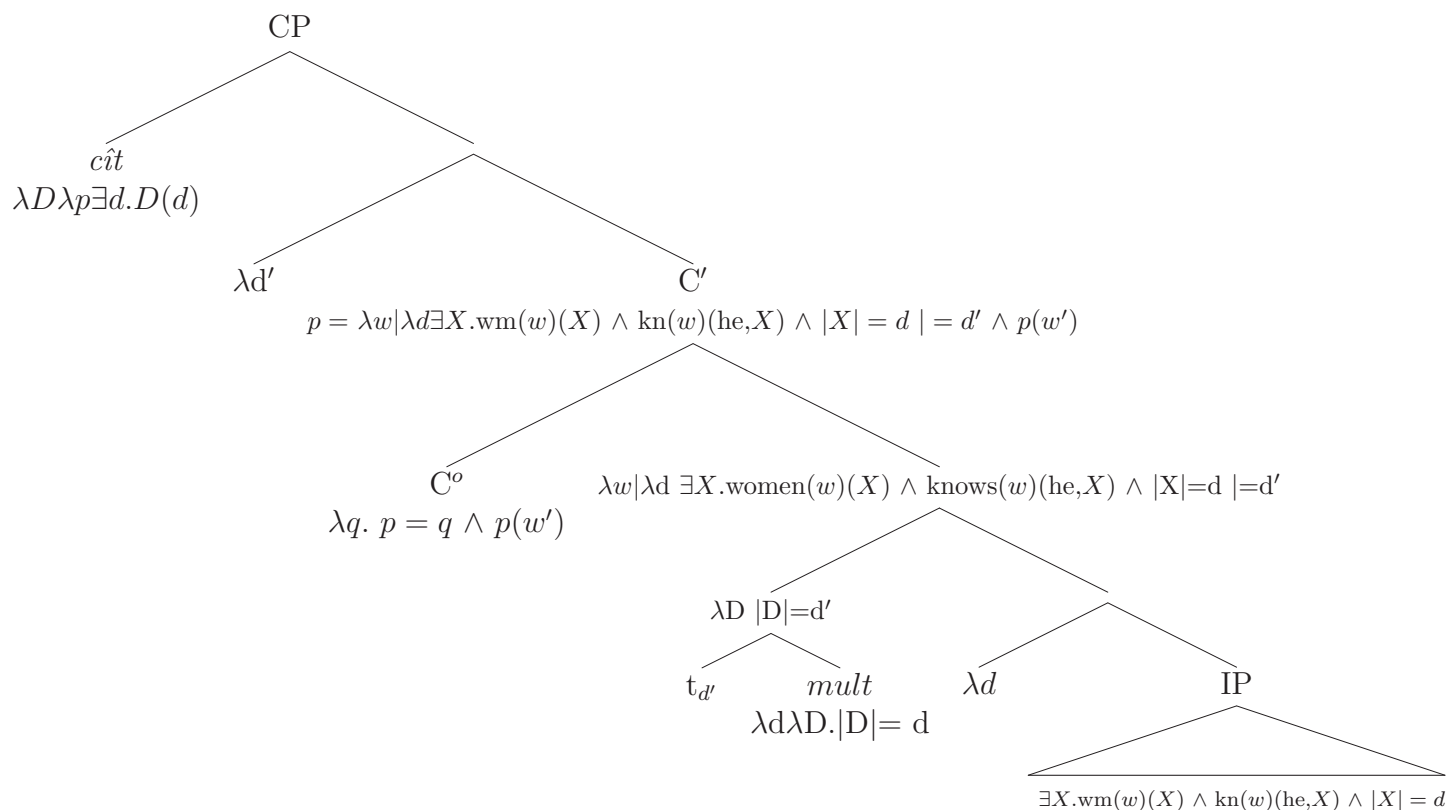
- Let's say that John knows 5 women in world  $w_a$ . Then the question in (11) is a function that maps  $w_a$  onto the set  $\{\lambda w$  John knows 1 woman in  $w$ ,  $\lambda w$  John knows 2 women in  $w$ ,  $\lambda w$  John knows 3 women in  $w$ ,  $\lambda w$  John knows 4 women in  $w$ ,  $\lambda w$  John knows 5 women in  $w\}$ .
- Following Dayal 1996 and Beck & Rullman 1999, a pragmatic requirement for maximal informativeness is what picks out the 'maximal' proposition 'John knows 5 women'.

### 3.2.2 The semantics of *cît de mult* questions.

- The semantics of *cît de mult* constructions work differently (12):<sup>4</sup>

- (12) a. *Cît de multe femei cunoaște?*  
*cît* of many women know.3sg  
*How many women does he know?*
- b.  $[_{CP} \hat{c}i\hat{t}_{d'} [t_{d'} \textit{multe}]_d [t_d \textit{PL women}]_X [_{IP} \textit{he knows } t_X]]$

$$\lambda w' \lambda p \exists d'. p = \lambda w |\lambda d \exists X. \textit{women}(w)(X) \wedge \textit{knows}(w)(\textit{he}, X) \wedge |X| = d| = d' \wedge p(w')$$



- Let's say again that John knows 5 women in world  $w_a$ . Then the question in (12) is a function that maps  $w_a$  onto the set  $\{\lambda w$  The size of the set of amounts of women John knows in  $w$  is 5 $\}$ .
- But it's clear that this question isn't only used to ask about sizes of the set of amounts, it's used to ask about the amounts themselves (or, specifically, the maximum amount).

<sup>4</sup>I've been using a Karttunen 1977 semantics of questions here to help simplify my discussion of the denotation of questions. However, I'm not committed to the requirement that the propositions denoted by a question being true in the actual world. Thanks to Angelika Kratzer (p.c.) for discussion here.

- Given that the question in (11) is downward-scalar, the size of the set of degrees that are true of cardinality of the predicated plurality will always be the same as the maximal degree true of the cardinality of the plurality.
- This means that there is a one-to-one correspondence between the *cît de mult* answers (“The size of the set of amounts of Xs...”) and *cît* answers (“The amount of Xs...”). In downward-scalar questions, the hearer can always infer from one to the other.
- There’s evidence that the sets of propositions mapped onto by *cît de mult* questions refer to the size of amounts (whereas those mapped onto by *cît* questions refer to the size of pluralities).

– In Romanian, the accusative marker *pe* can only occur with animate complements:

- (13) a. Pe câte femei le cunoaște?  
*pe cît-Fpl women CL know-3sg?*  
 b. \*Pe cît de multe femei le cunoaște?  
*pe cît of many women CL know-3sg?*  
*How many (of the) women does he know?*

– A difference also arises based on what’s being questioned. When it’s clear that it’s an amount that’s being questioned, in (14) below, both constructions are possible.

- (14) Speaker A: I was in a speed-reading class in college. I came in second place, though, because I was only able to read [*fourteen*] books.  
 B: Câte cărți ai citit?  
*cît-Fpl books have read-2sg*  
 B’: Cît de multe cărți ai citit?  
*cît of many-Fpl books have read-2sg*  
*How many books did you read?*

However, when it’s clear that a set of individuals is being questioned, as in (15), *cît de mult* is infelicitous.

- (15) Speaker A: I just started learning about linguistics so I haven’t had much time to read the literature. I have managed to read [*Aspects of the Theory of Syntax and Semantics in Generative Grammar*], though.  
 B: Câte căști ai citit?  
*cît-Fpl books have read-2sg*  
 B’: \*Cît de multe căști ai citit?  
*cît of many-Fpl books have read-2sg*  
*How many books did you read?*

– In *cît* constructions, the individual quantifier can take wide or narrow scope with respect to a modal operator; in *cît de mult* constructions, the individual quantifier can only take narrow scope. This difference corresponds to those made between arguments and predicates (Huang 1993) or referential and nonreferential phrases (Heycock 1995).

- (16) a. Cîte femei vrea să angajeze?  
*cît-Fpl women want-3sg she hire-3sg*  
 b. Cît de multe femei vrea să angajeze?  
*cît of many-Fpl women want-3sg she hire-3sg*  
*How many women does she want to hire?*

### 3.2.3 The unacceptibility of *mult* in upward- and non- scalar questions.

- The reason *cît de mult* constructions were felicitous with downward-scalar predicates is because there is a one-to-one correspondence between the *cît de mult* answer and the corresponding *cît* answer: when the predicate is downward-scalar, one can always infer the size of the set of Xs from the size of the set of amounts of Xs. *This is not true for either upward- or non-scalar questions.*
- In upward-scalar questions, if  $n$  is a true value of  $d$ , then all  $m$ ,  $m > n$  are also true values of  $d$ , and the set of  $ds$  is always infinite for every upward-scalar predicate. In a *cît de mult* question, the value of  $d'$ , the size of the set of amounts, is always  $\aleph_0$ . This means it's impossible to infer from a *cît de mult* question the answer of its corresponding *cît* question.
- The same explanation holds for non-scalar questions. If the set of degrees that are true amounts of Xs is  $\{2,3,4\}$ , then the size of the set of amounts of Xs is 3. When a *cît de mult* question involves a non-scalar predicate, it's impossible to infer from the answer of a *cît de mult* question to the answer of its corresponding *cît* question.

### 3.2.4 More on the meaning of *m*-words.

The meaning of the *m*-word given in (6) needs to be augmented to account for one further aspect of the Romanian data and to accord with our intuitions about the meaning of *m*-words, given that it's part of the meaning of *m*-words that the value of  $d$  be one that counts as large in the given context.<sup>5</sup>

$$(17) \quad \llbracket m\text{-word} \rrbracket = \lambda d \lambda D. |D| = d \wedge d > c$$

- $c$  in (17) is supplied a high variable by context, giving *m*-words an intensifier meaning.
- This definition is important to account for one other difference between *cît* and *cît de mult* constructions (as well as their Macedonian and Bulgarian counterparts): *cît de mult* questions presuppose that the amount being questioned is significantly large.

- (18) a. Cîți musafiri s-au așezat pe canapea?  
*cît-Mpl guests themselves have sat on couch*  
 b. #Cît de multi musafiri s-au așezat pe canapea?  
*cît of many-Mpl guests themselves have sat on couch*  
*How many guests sat on the couch?*

<sup>5</sup>See Chen 2004 and Kennedy 1999 for similar meanings for the word *dou* in Chinese and the positive adjectival form crosslinguistically, respectively.



The *cît de mult* construction (18-b) is infelicitous since a couch cannot accommodate a number of guests that's large enough to be an answer to a *cît de mult* question.

- This presupposition is true in Macedonian for both NP and adjectival degree questions:

(19) a. Kolku lugje imaše na zabavata?  
 how people had at party-the  
*How many people were there at the party?*

b. ✓20, ✓several, ✓few

(20) a. Kolku mnogu lugje imaše na zabavata?  
 how many people had at party-the  
*How many people were there at the party?*

b. ✓20, ✓several, \*few

(21) a. Kolku e visoka?  
 how be-3sg tall-Fsg

b. Kolku mnogu e visoka?  
 how *m*-word be-3sg tall-Fsg  
*How tall is she?*

- The question in (21-a) can be asked of anyone, but (21-b) is infelicitous when it's asked of anyone the speaker knows to be below average in height.

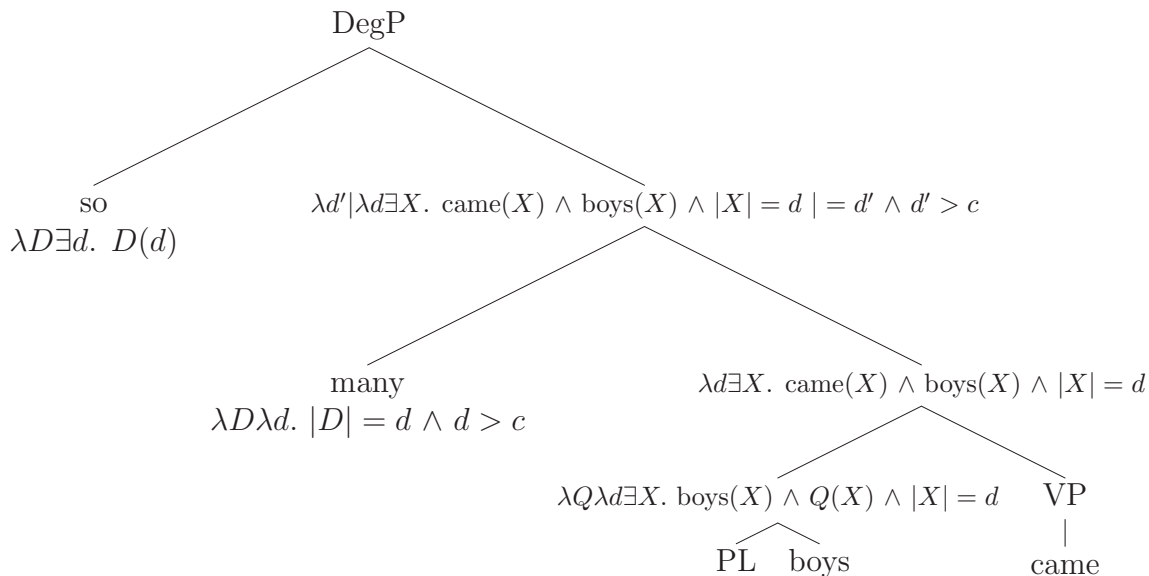
## 4 Amount questions in English.

In this section, I show that amount questions in English, which require pronunciation of an *m*-word, nevertheless pattern with *cît* rather than with *cît de mult* constructions. It would be wrong to say that the *m*-word in (17) is not present in English, though: it's the same word used in sentences like *Many boys came to the party*. I conclude that the *m*-word in English amount questions is semantically inert.

- English amount questions pattern with *cît* questions rather than *cît de mult* questions because they:
  - Can take either wide or narrow scope with respect to a modal operator;
  - Are compatible with upward- and non-scalar questions; and
  - Do not presuppose that the amount in question is significantly large.
- Does this mean that the meaning of English *m*-words differ from the meaning of *mult* in Romanian (and *mnogu* and *mnogo* in Macedonian and Bulgarian)? No: this meaning is the right one for quantified NP phrases like the one in (22-b).<sup>6</sup>

<sup>6</sup>Various ambiguities previously attributed to the word *many* (see Partee 1989 and Westerstahl 1985), most notably the proportional reading, can be accounted for by varying the measurement function built into PL,  $\mu$ , with context (a move that is independently needed to account for, in the very least, the difference between dense and non-dense scales). See Rett (in prep).

- (22) a. So many boys came (to the party).  
 b.  $\exists d'. |\lambda d \exists X. \text{came}(X) \wedge \text{boys}(X) \wedge |X| = d| = d' \wedge d' > c$



- The analysis for *m*-words in (17) holds for English, then, but this meaning is not incorporated into the semantics of English amount questions.
- The *wh*-phrases in ‘*How many* boys went to the party?’ and ‘*How* tall is she?’ mean the same thing: they’re both [+wh] degree quantifiers (as in (9)). The only difference between the two is that *how many* subcategorizes for NPs while *how* subcategorizes for APs. The *many* in *how many* is semantically inert, then, its only function is to signify this difference.<sup>7</sup>

## 5 Conclusions.

- The existential individual quantifier present in amount questions isn’t lexical, there are lots of reasons to think it’s not associated with the *m*-word, contra Hackl 2000:
  - Many languages have amount question words without an obvious *m*-word;
  - When the NP complement of an amount question is stranded in French, the individual quantifier must be interpreted low, indicating that the quantifier is associated with the NP, rather than with the *m*-word; and
  - When an *m*-word is optionally added to amount questions in i.e. Romanian, it induces a maximality effect.<sup>8</sup> An account of these facts falls out of an analysis in which *m*-words are scalar predicates, rather than comparative determiners.
- *cît de mult* questions have in their denotations propositions about the size of the set of amounts of Xs (rather than the amounts of Xs themselves, as in *cît* questions).

<sup>7</sup>See Corver 1997 for an analysis in which this *many* might be construed as a last-resort insertion.

<sup>8</sup>See Comorovski 1996 for a similar argument that maximality is lexically induced in *which*-questions.

- When the predicate in the question is downward-scalar, this effectively means that the answer to a *cît de mult* question is the maximal one.
- This is not the case with upward- and non-scalar predicates, whose denotations do not uniquely correspond to the maximal answer in the denotation of a *cît* question.
- The definition of the *m*-word used in the analysis of Romanian questions is the same for the word *many* in English as it occurs in quantificational NPs like *so many boys*. But this definition of *m*-word is not semantically active in English *how many* questions; if it were, English *how many* questions would exhibit the same properties as *cît de mult* questions, and they do not.

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