Scope Splitting in Syrian Arabic

Peter Hallman[1]

Preprint

Appears in *Natural Language Semantics* 30:47-76, 2022

Abstract

Sentences like *Mary needs to make the fewest mistakes on the upcoming test* have a 'split scope' reading roughly paraphrasable as 'Mary exceeds all others in terms of how many mistakes she must *not* make', that is, her situation is the most precarious. The structural approach to this phenomenon attributes to such sentences a logical form resembling this paraphrase, in which the superlative component of the meaning of *fewest* scopes above the modal *need to* and the negative component scopes below it. This paper investigates analogous structures in Syrian Arabic, a language in which superlatives may appear at a distance from their scalar associates in the surface order. The syntax of such expressions in Syrian Arabic, and the range of interpretations available to the various syntactic permutations found there points to two different sources for split scope readings. While some split scope readings are derived by syntactic splitting of *fewest* across a modal verb, others arise from a semantic ambiguity in the modal verb itself, rather than from a syntactic distinction in logical form.

1 Introduction

Superlative *least* displays an ambiguity with respect to modal verbs like *need to* that has been analyzed as a syntactic ambiguity. Suppose that Mona has done relatively poorly in her class and a poor grade on an upcoming test will scuttle her chances of passing the class. In fact, she can afford to make no more than two mistakes on the upcoming test, fewer than anyone else in the class can afford to make. (1a) is judged true in this situation. On the model of decompositional analyses of the comparative (Rullmann 1995, Heim 2006, Büring 2007a), Stateva (2000) proposes that this reading of examples like (1a) has a logical form in which the superlative component of *fewest* has moved over the modal but the negative component, in the form of *few*, has stayed behind, as illustrated in (1b). I refer to this kind of analysis as a 'scope splitting' analysis.

[1]This research was supported by the Austrian Science Fund (FWF): P30409-G30. I extend my gratitude to two anonymous reviewers whose input substantially improved this work, and to the Syrian native speakers Mohammad Al-Kadamani, H. Al-Khaled, Samah Alouch, Bushra Al-Shalabi and Talal Al-Shlash, who provided the empirical facts reported here and spared no effort to ensure that I recorded them accurately. Any remaining errors are, accordingly, entirely my own.

(1) a. Mona needs to make the fewest mistakes.
b. Mona -est$_d$ needs to make *d*-few mistakes.

In this paper, I investigate the counterparts of such sentences in Syrian Arabic, which provides a unique window to the inner workings of the phenomenon because it allows a broader range of placement options for both the superlative and negation in the surface syntax. By manipulating these parameters, it is possible to test the generality of analyses of this phenomenon. The Arabic facts turn out to reveal an interesting dimension. Although the Arabic counterpart of *least* may also split across a modal verb, the universal modal *lāzim* 'must/need to' also displays an ambiguity between a universal and existential world-quantifier, which mimics a split scope interpretation of *least* without actual syntactic scope splitting.

After making some methodological remarks in section 2, section 3 presents an overview of how superlatives work in Syrian Arabic. Section 4 then turns to cases where a negative superlative that occurs in the scope of a modal in the surface structure may be interpreted in a way that implicates a scope splitting movement analysis along the lines of what has been proposed for English. But section 5 presents cases in which the negative superlative preceding a modal may show a split scope reading with respect to that modal that I argue in detail cannot be satisfactorily reduced to syntactic movement: sections 5.1 and 5.2 consider two movement-based analyses of these cases and show them to be unsatisfactory. I settle in section 5.3 on an analysis that reduces the effect to a semantic ambiguity in the interpretation of the modal verb itself.

2 Methodology

The empirical facts reported here were elicited from three female and two male native speakers of Syrian Arabic residing in the country the research was conducted in [not Syria; the non-anonymized version of this paper will provide more details]. Consultants are from the

city of Damascus and so the facts reported here pertain to Damascene Arabic. The consultants are between the ages of 33 and 50 at the time of this writing, and have lived in the country in which the research was conducted for between four and 18 years. All had lived in Syria prior to that. The consultants were recruited through public advertisements seeking Syrian Arabic speaking volunteers for participation in a linguistic fieldwork study. They act in the capacity of volunteers but received a cost offset of €20 per hour provided for this purpose by national funding agency that financed this research (grant number ...). All consultants have signed a consent form that acknowledges that they understand they are participating voluntarily and that they consent to the publication of the data they provide.

Elicitation sessions took place in the offices of the author's home institution. Interviews were conducted by the author in Arabic. The elicitation adhered to guidelines in semantic field work described in detail in Matthewson 2004: all the judgments reported here are judgments of grammaticality, of the truth and/or felicity of a sentence in a specific context, or of entailment or contradiction between Arabic sentences. The English translations of the example sentences presented here are the author's assessment of optimal equivalence in English. The consultants did not judge translational equivalence.

3 Superlatives in Syrian Arabic

Superlative adjectives are formed in Syrian Arabic by putting the base adjective into the elative prosodic template $aC_1C_2aC_3$, by mapping the root consonants of the adjective into the consonant slots C_1-C_3 of the template. In this manner, *aʔrab* 'nearest' is derived from *ʔarīb* 'near', *aṣʕab* 'most difficult' from *ṣaʕʷb* 'difficult', *abrad* 'coldest' from *bārid* 'cold', etc. On this model we also have *aktar* 'most' from *ktīr* 'much' and *aʔall* 'least' (underlyingly *aʔlal*, which a regular metathesis rule converts to *aʔall*) from *ʔalīl* 'little'. I refer to the morpheme expressed by this template as 'ACCAC' and gloss it as 'est'.

Unlike other adjectives, superlative adjectives typically precede the noun they modify

in Syrian Arabic (Cowell 1964, p. 313), as illustrated in (2). Such noun phrases are morphologically indefinite, and display the same 'absolute' and 'relative' readings the English counterparts display (Hallman 2016, Al-Bitar 2019). On the absolute reading of (2), Nadia has solved the hardest problem from some pre-given set of problems. On the relative reading, we compare Nadia to other individuals in terms of how hard the problems they solved were. Depending on who we are comparing, the problem she solved might not have been the absolute hardest problem in the context; the harder problems might not have been solved by anyone. See Szabolcsi (1986) and Heim (1999, 2001) for arguments that these two readings are represented by distinct logical forms. Heim relies for this purpose on so called 'upstairs de dicto' readings of superlatives described in detail below.

(2) nādiya ħall-it aṣʕab masʔale.
Nadia solved-3FS hardest problem
'Nadia solved the hardest problem.'

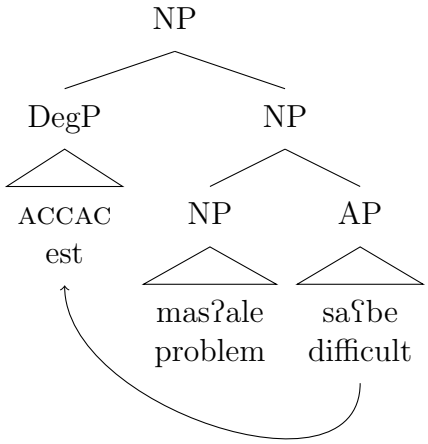
It is possible for the superlative morpheme to stand alone before the noun and associate with a scalar adjective in the usual post-nominal position for adjectives. In this case, the superlative template is morphophonologically instantiated with the base adjective *ktīr* 'much/many', deriving *aktar*, derivationally parallel to English *most* (Jespersen 1949, Bresnan 1973, Hackl 2009), as illustrated in (3). This example is judged synonymous with (2) and also supports both an absolute and relative reading.

(3) nādiya ħall-it aktar masʔale ṣaʕbe.
Nadia solved-3FS most problem hard
'Nadia solved the hardest problem.'

I follow structurally similar analyses of English (Heim 1999, Stateva 2000, Cinque 2010) in proposing that the superlative morpheme, consisting of the prosodic template ACCAC 'est', combines with an NP containing a gradable adjective in the noun-initial order that is canonical for Arabic. In the synthetic superlative seen in (2), the adjective raises and fuses with the superlative morpheme, providing the latter with a morphological host, as

schematized in (4). In the analytic superlative in (3), the adjective stays in situ and the superlative template is morphologically hosted by the base adjective *ktīr* by default.

(4) *aṣʕab masʔale* 'hardest problem'



The adverbial superlative corresponding to 'the most' in English is internally similar to adnominal superlatives; it is formed by combining a superlative adjective *aktar* 'most' with the noun *wāħid* 'one' or *waħd-e* 'one-FEM' (underlyingly *wāħide*) according to the gender of the subject of comparison.[2] The two sentences in (5) are unambiguous. (5a) is judged to be synonymous with (6a), which explicitly states that Nadia loves (the football star) Mohammad Sallah more than she loves anyone else. (5b) is judged to be synonymous with (6b), which explicitly states that Nadia loves Mohammad Sallah more than anyone else loves him; she is his greatest fan. In the first case, where *wāħid* occurs in the masculine form (5a), Mohammad Sallah is the subject of comparison, and in the second case, where *waħde* occurs in the feminine form (5b), Nadia is the subject of comparison.

(5) a. nādiya b-ᵊt-ħibb ᵊmħammad ṣallāħ aktar wāħid.
Nadia IND-3FS-love Mohammad Sallah most one
'Nadia loves Mohammad Sallah the most.'

b. nādiya b-ᵊt-ħibb ᵊmħammad ṣallāħ aktar waħd-e.
Nadia IND-3FS-love Mohammad Sallah most one-FS
'Nadia loves Mohammad Sallah the most.'

[2]When the subject of comparison is non-human, *ʃi* 'thing' replaces *wāħid(e)*, though particularly in rural dialects *ʃi* has generalized to humans as well.

(6) a. nādiya b-ᵊt-ħibb ᵊmħammad ṣallāħ aktar mim-ma bᵊ-t-ħibb ayy
Nadia IND-3FS-love Mohammad Sallah more than-that IND-3FS-love any
ħada tāni.
one other
'Nadia loves Mohammad Sallah more than she loves anyone else.'

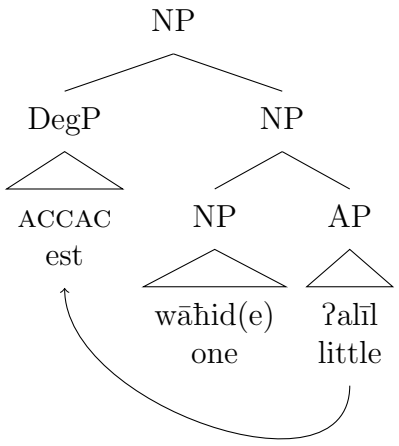
b. nādiya b-ᵊt-ħibb ᵊmħammad ṣallāħ aktar mim-ma ayy ħada tāni
Nadia IND-3FS-love Mohammad Sallah more than-that any one other
b-yi-ħibb-u.
IND-3MS-love-him
'Nadia loves Mohammad Sallah more than anyone else loves him.'

The Arabic counterpart of the negative adverbial superlative 'the least' is built by replacing *aktar* in *aktar wāħid(e)* with *ʔaʔall* 'least', itself the superlative form of the negative quantity adjective *ʔalīl* 'little/few', as (7) illustrates. Gender agreement on *wāħid(e)* determines the subject of comparison as before.

(7) nādiya b-ᵊt-ħibb ᵊmħammad ṣallāħ aʔall wāħid / waħd-e.
Nadia IND-3FS-love Mohammad Sallah least one / one-FS
'Nadia loves Mohammad Sallah the least.'

I assume that here, too, the base adjective *ʔalīl* 'little' is generated as a modifier of the noun *wāħid(e)* and raises to and fuses with the superlative morpheme, as sketched in (8). Fusion of *ʔalīl* with the superlative template ACCAC derives *aʔall* (again, from *aʔlal* by a regular metathesis rule). This phrase is internally nominal, but has the distribution of an adverb. I discuss its semantic composition in more detail in section 4.

(8) *aʔall wāħid(e)* 'least one'



The adverbial superlative is used to build 'quantity superlative' constructions,[3] where the scalar associate of the superlative is a plural noun, as (9) illustrates. The term *aʔall* 'least' may replace *aktar* 'most' in the examples below with the appropriate change in meaning.

(9) nādiya ḥall-it masāʔil aktar waḥd-e.
Nadia solved-3FS problems most one-FS
'Nadia solved the most problems.'

Like other adverbs, the position of superlative *aktar wāḥid(e)* is flexible. It may occur before the verb, as the examples in (10) show, which are judged synonymous with (5b) and (9) respectively.

(10) a. nādiya aktar waḥd-e b-ᵊt-ḥibb ᵊmḥammad ṣallāḥ.
Nadia most one-FS IND-3FS-love Mohammad Sallah
'Nadia loves Mohammad Sallah the most.'
b. nādiya aktar waḥd-e ḥall-it masāʔil.
Nadia most one-FS solved-3FS problems
'Nadia solved the most problems.'

Example (10b) makes clear that like *aktar* 'most' itself, the adverbial superlative *aktar wāḥid(e)* 'most one', too, may be structurally separated from its scalar associate. Again, *aʔall wāḥid(e)* 'least one' has the same distribution as *aktar wāḥid(e)*. In the case of the adverbial superlative, the material intervening between the superlative and its scalar associate may

[3]The term 'quantity superlative' is due to Gawron (1995). Also following Gawron, I refer to the kind of superlative in (2)/(3), where the scalar associate of the superlative is a gradable adjective, as the 'quality superlative'.

include modal verbs and negation. This presents the opportunity to observe correlations between linear order and scope with respect to these quantificational terms.[4] The following section investigates these facts in detail.

Before proceeding, I note here that the dependency between the superlative and its scalar associate is not unrestricted. Among other restrictions, the dependency cannot cross over an NP boundary. The superlative may associate with the plurality of the noun projecting NP (plurality is presumably projected to the NP level by virtue of being morphologically inflected on the head N), but not with gradable material modifying that NP, that is, material properly contained in the NP. For this reason, adverbial *aktar wāħid-e* 'most one-FS' can associate with the plurality of the object *masāʔil* 'problems' in (9)/(10b) but not with an adjective modifying that object, as (11) shows. Being contained in the noun phrase *masʔale ṣaʕbe* 'problem difficult', the adjective *ṣaʕbe* is not accessible to the verb phrase-level adverb *aktar waħde*. Rather, you say (2) or (3), where the superlative morpheme is within the same NP as the adjective. For this reason, the discussion of scope splitting in Syrian Arabic below focuses on the quantity superlative, where the superlative can felicitously be separated from its scalar associate over material expressing polarity and modality.

(11) *nādiya aktar waħd-e ħall-it masʔale ṣaʕbe.
Nadia most one-FS solved-3FS problem difficult
('Nadia solved the most difficult problem.')

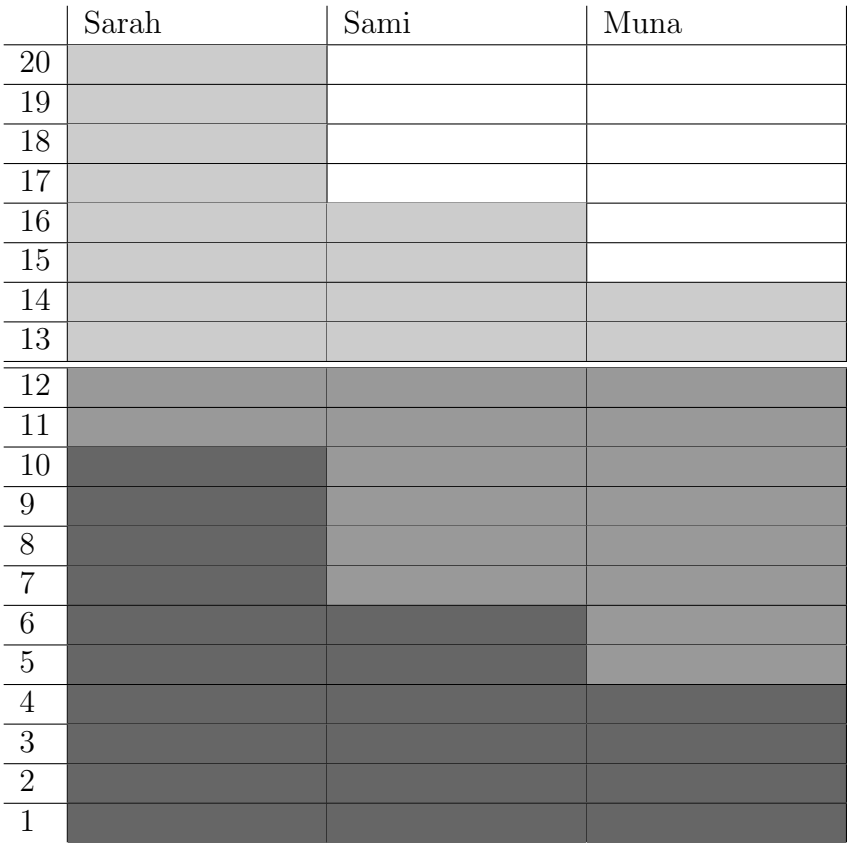
4 Scope Splitting

The occurrence of a modal verb between the adverbial superlative and its scalar associate in Syrian Arabic gives rise to an 'upstairs de dicto' reading of the superlative—'upstairs' because the superlative has scope over the modal but 'de dicto' because the property the associate

[4]This opportunity is relatively unique. The only other language I am familiar with that allows superlatives to occur at a distance from their scalar associate is Japanese, as reported by Aihara (2009). But as Aihara also remarks, Japanese does not have a counterpart of *least*, meaning that correlations between the distribution of *least* and of negation cannot be observed in that language, unlike in Arabic, as I show in detail below.

denotes is interpreted within the scope of the modal. Consider the following situation as illustration. Sarah, Sami and Muna are in a class where they have to take two tests with 10 questions each. They each need a combined score of at least 12 correct answers to pass the class, and have already taken the first test. The graph in (12) represents the results of the first test and their needs for the second test. The dark gray is the number of problems they solved correctly on the first test. The medium gray is the number of problems they have to solve on the second test in order to reach the 12 they need to pass. The light gray is the number of mistakes they can afford to make on the second test before they fall below the 12 point cutoff line (the medium and light grey together comprise the 10 questions on the second test).

(12)



Syrian Arabic speakers judge (13a) to be true in the context illustrated in (12), in which Muna is the 'least' of the students who can afford to make mistakes on the second test. To be exact, she can make exactly two mistakes before she falls below the 12 points she needs

to pass (the light grey cells in (12)), while Sami can make four mistakes and Sarah eight. Arabic speakers report that (13a) is synonymous with (13b), where *aktar waħde* 'most one' precedes the negation of the modal verb. The fact that (13a) and (13b) are synonymous suggests that are semantically compositionally uniform on some level. I present an analysis below that captures this synonymy.

(13) a. muna aʔall waħd-e b-ti-ʔdir t-sāwi axṭā b-l-faḥṣ t-tāni
Muna least one-FS IND-3FS-can 3FS-make mistakes on-the-test the-second
wa-maʕ hēk ti-nʒaħ b-ṣ-ṣaff.
and-with that 3FS-pass in-the-class
'Muna can make the fewest mistakes on the second test and still pass the class.'

b. muna aktar waħd-e mā b-ti-ʔdir t-sāwi axṭā b-l-faḥṣ
Muna most one-FS not IND-3FS-can 3FS-make mistakes on-the-test
t-tāni wa-maʕ hēk ti-nʒaħ b-ṣ-ṣaff.
the-second and-with that 3FS-pass in-the-class
'Muna can make the fewest mistakes on the second test and still pass the class.'

The readings available to (13a) and (13b) are 'upstairs de dicto' readings—the superlative has scope above the modal but the property providing the measurement scale is within the scope of the modal—we can utter (13a) and (13b) with no particular mistakes in mind (the term is due to Sharvit and Stateva 2002). Stateva (2000), building on a similar analysis of comparatives in Rullmann 1995, claims that English *fewest* is not just morphologically but semantically composed of the superlative morpheme *-est*, and the underlying adjective *few* which contributes negation. This claim is based on the observation that these two components of *fewest* may display differential scope, with the superlative component scoping above a modal verb and the negative component remaining in situ. The relevant observations can be replicated in Arabic and I turn to them shortly. First I discuss the the analysis of the simpler case of (13a) in these terms, though it does not involve scope splitting, and then introduce the scope splitting examples that vindicate the syntactic separation of the superlative from its adjectival base.

Heim (2006) and Büring (2007a,b) define English *little/few*, corresponding to Arabic *ʔalīl*, as the degree quantifier in (14a). It negates a degree predicate. Solt (2015) defines

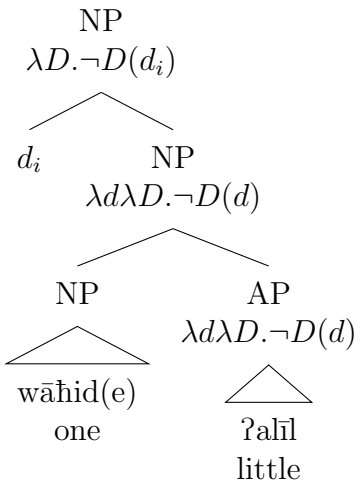
much/many, corresponding to *ktīr*, as its natural positive counterpart, shown in (14b). I adopt these definitions here for the Arabic counterparts. The definition for the superlative morpheme ACCAC in (14c) is modeled after Heim 2006. It asserts of a degree relation and an individual that the set of degrees the individual bears the relation to propertly contains the set of degrees that any alternative individual bears the relation to.

(14) a. $[\![\text{ʔalīl}]\!] = \lambda d_d \lambda D_{\langle d,t\rangle}.\neg D(d)$
b. $[\![\text{ktīr}]\!] = \lambda d_d \lambda D_{\langle d,t\rangle}.D(d)$
c. $[\![\text{ACCAC}]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle} \lambda x_e \ . \ \{d \mid R(x,d)\} \supset \{d \mid \exists x' \neq x \ R(x',d)\}$

As mentioned above, the adverbial superlative appears to have the same internal structure as the nominal argument superlative, with a pre-nominal superlative template being filled in by phonological material from an adjective modifying the head noun. In the case of *aktar/aʔall wāḥid(e)*, that adjective is *ktīr* or *ʔalīl* defined in (14b) and (14a) respectively. As also mentioned above, I take the head noun *wāḥid(e)* 'one' in the adverbial superlative to be vacuous,[5] so that the meaning of the modifying quantity adjective, *ʔalīl* 'little' in (15), projects to the immediately dominating NP. As Szabolcsi (1986), Heim (1999) and others propose for English, the superlative morpheme moves to a higher scope position, leaving a degree-denoting trace, so that the phrase *aʔall wāḥid(e)* composes ultimately as in (15), with the superlative component ACCAC 'est' in a higher position binding the degree variable d_i (more on this below). The same composition with *ktīr* yields the positive counterpart *aktar wāḥid(e)* 'most one'.

(15) *aʔall wāḥid(e)* 'least one'

[5]The idea here is that *wāḥid(e)* is a kind of inflection that signals the subject of comparison by virtue of agreement. Consequently, it plays a role in determining the logical form of the sentence but does not contribute semantic content to that logical form.



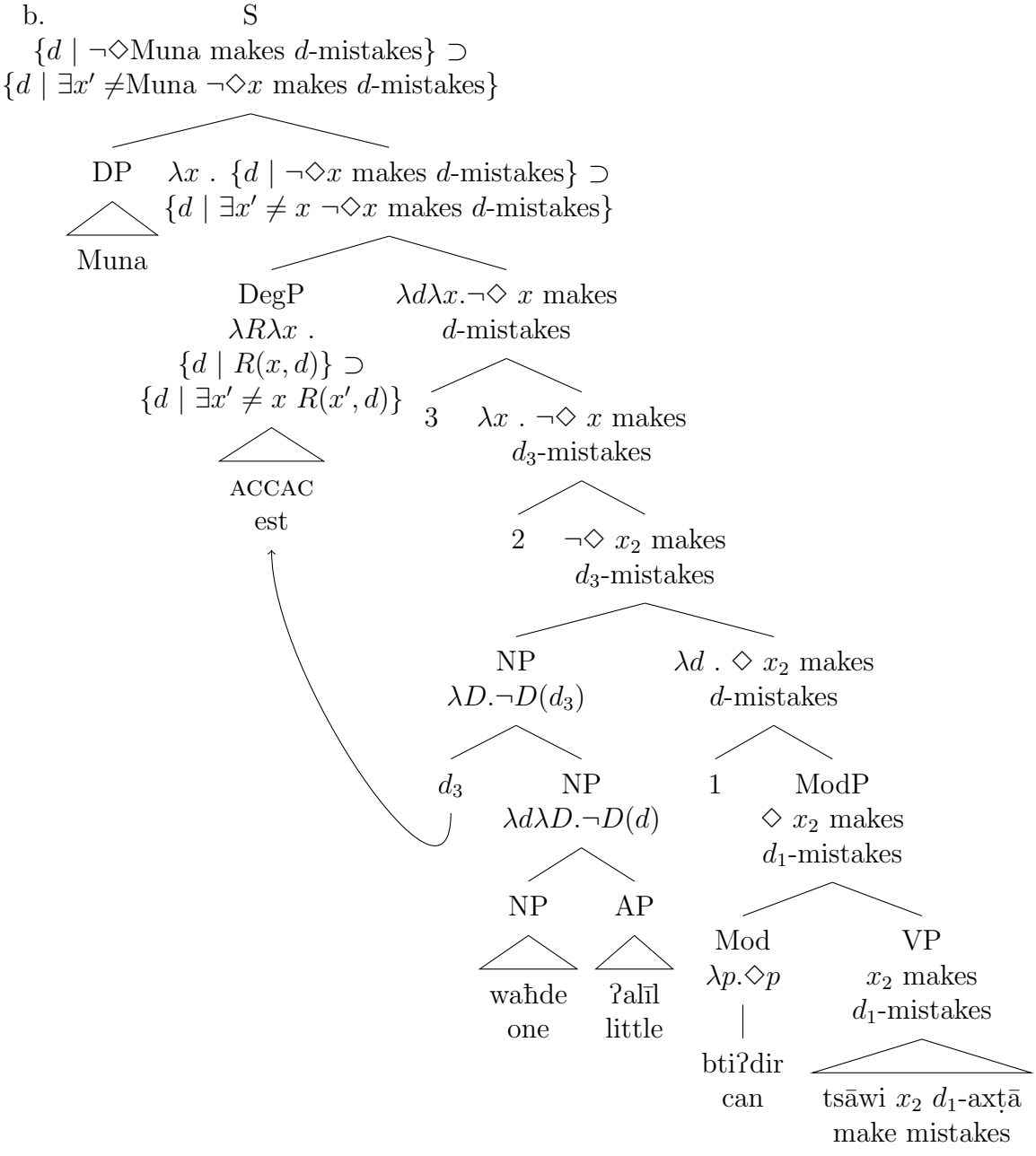
On these premises, the derivation of the logical form of (13a), where *aʔall waḥde* 'least one' precees the modal *ʔidir* 'can', repeated in (16a), looks like (16b). The numeral '3' is a degree-abstraction index accompanying movement of the superlative morpheme ACCAC to its scope position. '2' is an individual-abstraction index accompanying movement of the subject *Muna* to its scope position.[6] '1' is a degree-abstraction index that derives the degree predicate that is negated by *ʔalīl* 'little'. It appears that this abstraction process does not accompany movement of the superlative adverb itself. This conclusion is based on the observation that superlatives in Arabic may never be interpreted lower than their surface position. I present data supporting this generalization where it is crucial to my argument in section 5.1. Non-argument chains typically display reconstruction effects—the possibility of interpreting the moved element in the possition it moved from. If this extends to degree-quantifier movement chains, then the impossibility of interpreting the superlative in a position lower than its surface position indicates that superlatives, including adverbial superlatives, are base generated in their surface position. Yet, superlatives may occur on the surface at a distance from their scalar associate. This in turn means that Arabic has at its disposal a process that derives a degree predicate over a constituent containing a gradable term, perhaps involving movement of a covert operator, but not movement of the superlative

[6]It is a typical combinatorial facet of movement analyses of the superlative that the superlative morpheme and its abstraction index are interpolated between the moved subject of comparison and its abstraction index. See Bhatt and Takahashi (2007) and Lechner (2017) for discussion.

itself. That process inserts the abstraction index '1' in the tree below.[7]

(16) a. muna aʔall waħd-e b-ti-ʔdir t-sāwi axṭā.
Muna least one-FS IND-3FS-can 3FS-make mistakes
'Muna can make the fewest mistakes.'

b.



[7]Erlewine (2018) proposes that Mandarin has gradable lexical items (with a degree argument) but not abstraction over degree variables. As a result, degree quantifiers must occur in the local argument-licensing domain of the degree predicate. This is not the case in Arabic, where the dependency between a degree quantifier and the degree variable it binds is not local, as many of the examples to follow show, or even clause bound, as example (i) in footnote 7 shows. For that reason, Arabic does appear to have a degree predicate abstraction process at its disposal, unlike Marndarin.

According to the denotation derived in (16b), (16a) (=(13a)) is true if the set of degrees such that there is no accessible world in which Muna makes that many mistakes is a superset of the set of degrees such that there no accessible world in which anyone else makes that many mistakes. The existential quantifier over worlds '◇' is restricted by a contextually determined accessibilty relation which for readability's sake I leave implicit in the formulas I present here. In this case and the other examples below, the modal verb ranges over the set of worlds in which the students pass the class—we are discussing what they need to do to pass. In the situation depicted in (12), Muna can make two mistakes on the second test and still pass the class. So there is a possible world in which she passes the class and makes one or two mistakes. But there is no possible world in which she passes the class and makes three mistakes, or four or five, etc. So the set of degrees such that there is no possible world in which she makes that many mistakes and nonetheless passes the class starts at '3'. It is the set {3, 4, 5, 6, 7, 8, 9, 10}. The corresponding sets for Sami and Sarah are {5, 6, 7, 8, 9, 10} and {9, 10} respectively. Since Muna's set is indeed a superset of the other sets, the sentence is predicted to be true in the situation in (12), which accords with the intuitions of native speakers. Note lastly that the order of operators we see in the denotation for (16a) (at the top of the tree in (16b)), namely *est*>¬>◇, is the same as what we see overtly in the synonymous counterpart in (13b), with the string *aktar waħde*>*mā*>*bti?dir* (literally *est*>*not*>*can*), explaining the synonymy of (16a) (=(13a)) and (13b).

Turning now to the cases of scope splitting in Arabic, the example in (17a) seems to require an analysis in which the superlative component of *a?all* 'least' scopes above the modal and the negative component below it. In (17a), the negative superlative adverb *a?all waħde* occurs within the subordinate clause, like English *fewest* in the translation. If only a surface scope reading were available to the superlative, (17a) should make the claim that it is possible for Sarah to be the one who solves fewer problems than anyone else solves. This interpretation does not make sense in the context of the continuation *wamaʕ hēk tinʒaħ bṣṣaff* 'and still pass the class', since solving fewer problems than anyone else would not

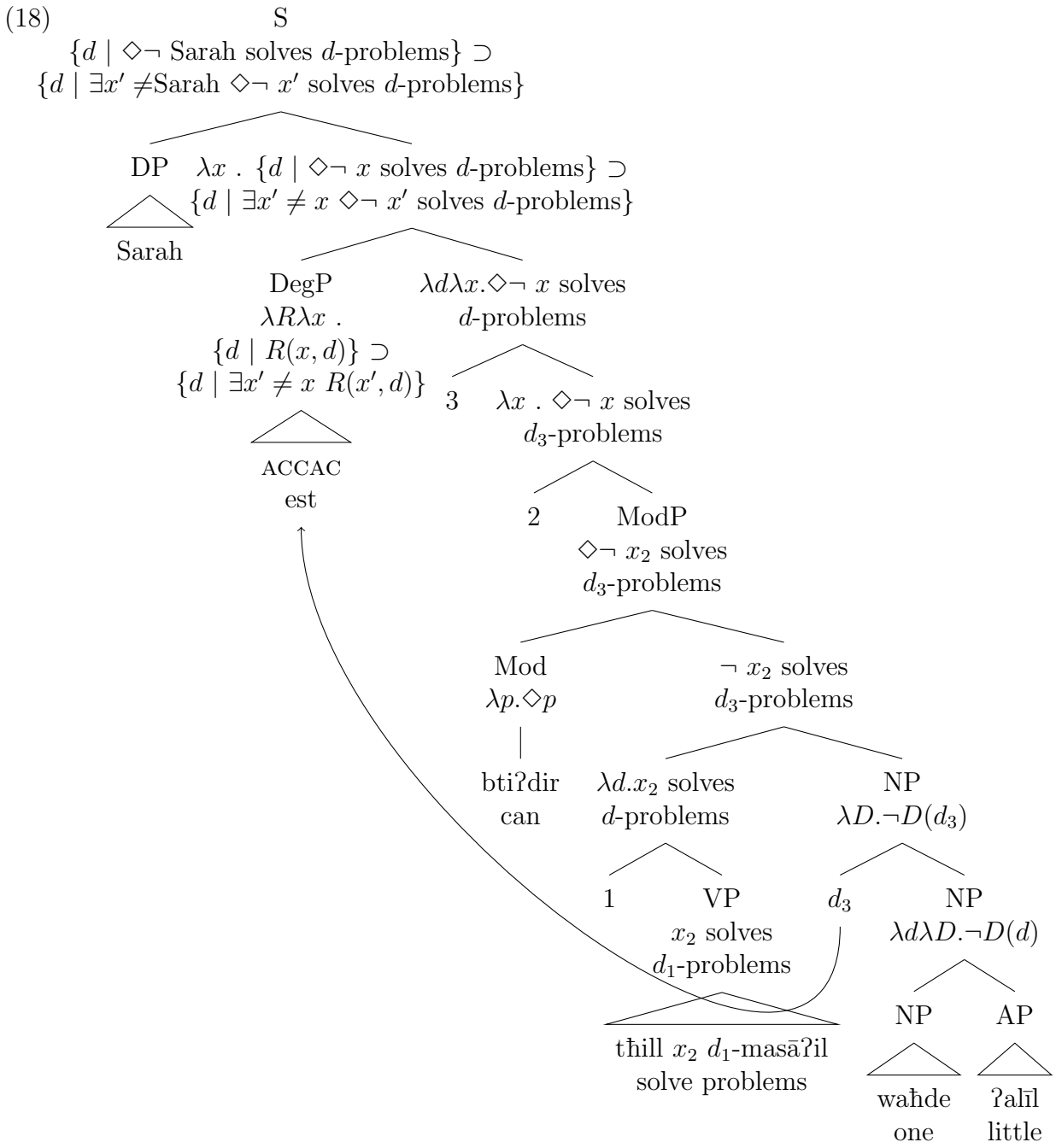
normally be a criterion for success. Yet, example (17a) is judged by native speakers to be felicitous and true in the context in (12). In this context, Sarah has the greatest margin for error on the second test, having done well on the first. The felicity of (17a) in that context would make sense if it could be interpreted to assert that Sarah is 'most' in terms of the number of problems she is able to *not* solve and yet still pass the class. In fact, (17a) is judged by native speakers to be synonymous with (17b), where the positive superlative *aktar waħde* occurs above the modal and negation below it, as in the just-mentioned paraphrase for (17a).

(17) a. sāra b-ti-ʔdir t-ħill masāʔil aʔall waħde b-l-faḥṣ t-tāni
Sarah IND-3FS-can 3FS-solve problems least one in-the-test the-second
wa-maʕ hēk ti-nʒaħ b-ṣ-ṣaff.
and-with that 3FS-succeed in-the-class.
'Sarah can solve the fewest problems on the second test and still pass the class.'

b. sāra aktar waħde b-ti-ʔdir mā t-ħill masāʔil b-l-faḥṣ t-tāni
Sarah most one IND-3FS-can not 3FS-solve problems in-the-test the-second
wa-maʕ hēk ti-nʒaħ b-ṣ-ṣaff.
and-with that 3FS-succeed in-the-class
'Sarah can solve the fewest problems on the second test and still pass the class.'

The possibilty already seen in (16b) of moving the superlative morpheme ACCAC 'est' to a scope position independently of its base adjective *ʔalīl* 'little' makes an analysis of (17a) in the same terms possible, where the superlative moves to a scope position above the modal and the negative base adjective gets stranded below the modal, as illustrated in (18). This process derives an LF for (17a) that mimics the order of quantificational elements in (17b), capturing the synonymy of the two examples.

(18)



The denotation of the 'S' node in the tree in (18) is true if the set of degrees such that there is some world (in the modal base of worlds in which Sarah passes the class) in which Sarah fails to solve that number of problems, is a superset of the set of degrees such that someone else fails to solve that many problems in some world in which they pass. According to the diagram in (12), Sarah will fail the class if she fails to solve more than eight problems.

So there are worlds in which she passes where she fails to solve one, two, three, or up to eight problems, but none where she fails to solve nine or 10 problems. So the set of degrees such that there is a world in which she passes the class while not solving that number of problems is {1, 2, 3, 4, 5, 6, 7, 8}. The corresponding sets for Sami and Muna are {1, 2, 3, 4} and {1, 2} respectively. Since Sarah's set is a superset of the others, we expect this sentence to be true in the situation in (12), which accords with native speaker judgments.

Thus, the hypothesis that superlative component of *a?all wāħid(e)* can split apart from from its negative component and move to a higher scope position presents an effective analysis of the range of interpretations available to the sentences discussed above, and in Arabic in fact derives structures that tightly mimic independently attested variation in the placement of the positive superlative adverb *aktar wāħid(e)* and clausal negation *mā* 'not'.

In what follows, I investigate so-called 'at most' and 'at least' upstairs de dicto readings of *a?all wāħid(e)* in the context of the universal modal *lāzim* 'must/need to'. Unexpectedly, this ambiguity arises even when *a?all wāħid(e)* precedes the modal, where we expect it to be scopally intransigent, undermining a scope splitting analysis along the lines of what we see in (18) for such cases, for reasons described below in detail.

5 'At Most' and 'At Least' Upstairs de Dicto Readings

Syrian Arabic speakers judge (19) to be true in the context illustrated in (12), in which Muna is 'greatest' in terms of how many problems she needs to solve on the second test in order to get a total of 12 or more correct answers and pass the class. To be exact, she needs to solve at least eight questions, and no one else needs to solve that many. Consequently, (19) has what Sharvit and Stateva (2002) call an 'at least' upstairs de dicto reading. It is 'at least' because we are talking about the least number of problems each participant must solve, 'upstairs' because the superlative is interpreted above the modal, i.e., we are comparing the participants' needs, and 'de dicto' because there are no particular problems the participants

have to solve, only a particular quantity.

(19) muna aktar waħd-e lāzim t-ħill masāʔil b-ˤl-faħṣ t-tāni.
Muna most one-FS must 3FS-solve problems on-the-test the-second
'Muna needs to solve the most problems on the second test.'

Example (20) represents a sketch of the semantic composition of (19) based on the meaning of the superlative in (14c) and other premises discussed above, and the assumption that *lāzim* contributes a universal quantifier over worlds '□', again restricted by an accessibility relation, here as before the set of worlds in which the students pass the class in question. The superlative morpheme (together with vacuous *waħd-e* 'one-FS') applies to the relation between a degree d and individual x with the truth condition that x must answer d questions correctly. This combination results in a predicate of individuals, which is true of Muna in the situation in (12).

(20) muna [ACCAC waħde] $\lambda d \lambda x$ lāzim tħill x d-masāʔil
Muna est one must solve problems

This LF composes as the formula in (21).

(21) $\{d \mid \Box$ Muna solves d-problems$\} \supset \{d \mid \exists x \neq$Muna $\Box$ x solves d-problems$\}$

This formula is true when the set of degrees such that Muna solves that many problems in all possible worlds in which she passes the test is a superset of the set of degrees such that anyone else solves that many problems in all the worlds in which they pass. The set of degrees meeting the description 'Muna solves that many problems in all the worlds in which she passes the class' is the set {1, 2, 3, 4, 5, 6, 7, 8}. The corresponding sets for Sami and Sarah are {1, 2, 3, 4, 5, 6} and {1, 2} respectively. Muna's degree set is indeed a superset of each of the others, and so the claim comes out true in the context in (12), which matches native speaker judgments for (19).

The same remarks apply to *aʔall waħde* in (22). Native speakers judge (22) to be true in the situation illustrated in (12), like the sentence with *aktar* in (19). While (19) describes Muna's situation, (22) describes Sarah's situation.

(22) sāra aʔall waħde lāzim t-ħill masāʔil b-ᵊl-faħṣ t-tāni.
Sarah least one-FS must 3FS-solve problems on-the-test the-second
'Sarah needs to solve the fewest problems on the second test.'

This sentence asserts that the number of problems Sarah needs to solve is less than the number of problems anyone else needs to solve, the same as the salient reading of its English translation above. This sentence has an upstairs de dicto reading; there are no specific problems that Sarah needs to solve, only a specific number. And this is a minimal number; she is of course free to solve more problems than the minimum she needs to. Like its counterpart with *aktar* in (19), therefore, (22) has an 'at least' upstairs de dicto reading.

However, this same format, in which *aʔall wāħid(e)* precedes *lāzim*, may also be used to express what Sharvit and Stateva (2002) call an 'at most' upstairs de dicto reading, illustrated by the sentence in (23). Native speakers judge (23) to be true in the same situation as (19) and (22), illustrated in (12). The informativeness of (23) in the context in (12) makes sense if (23) asserts that Muna is 'least' in terms of how many mistakes she can make *at most* on the second test, before she falls below 12 correct answers and fails the class, which is the case in the situation in (12). This reading is 'at most' because we are comparing the classmates in terms of the *maximum* number of mistakes they can afford to make.

(23) muna aʔall waħde lāzim t-sāwi axṭā b-ᵊl-faħṣ t-tāni.
Muna least one-FS must 3FS-make mistakes on-the-test the-second
'Muna needs to make the fewest mistakes on the second test.'

Revealingly, the 'at least' and 'at most' readings of *aʔall wāħid(e)* can be replicated using *aktar wāħid(e)* and clausal negation. The 'at least' upstairs de dicto sentence in (22) with *aʔall waħde* 'least one', repeated in (24a), is judged by native speakers to be synonymous with the sentence in (24b) with *aktar waħde* and negation over the modal verb *lāzim*. Here, *aktar waħde mu lāzim* 'most one not must' expresses what *aʔall waħde lāzim* 'least one must' expresses in (24a). Note that negation manifests itself in (24b) as *mū* rather than *mā* as in the examples above. This is an allomorphic alternation; negation is pronounced *mā* when it directly precedes a verb, and *mū* elsewhere (Cowell 1964, p. 386). The modal

lāzim ‘must/need to’ is morphologically an active participle and therefore is usually negated with *mū*, though its distribution is similar to a verb and accordingly is negated by some speakers with *mā*, an apparent case of grammaticalization-in-progress. When referring to clausal negation in general, I use the term *mā*, though again this commonly manifests itself as *mū*, depending on the morphological form of the predicate.

(24) a. sāra aʔall waħde lāzim t-ħill masāʔil b-ᵊl-faħṣ t-tāni.
Sarah least one-FS must 3FS-solve problems on-the-test the-second
‘Sarah needs to solve the fewest problems on the second test.’
b. sāra aktar waħde mū lāzim t-ħill masāʔil b-ᵊl-faħṣ t-tāni.
Sarah most one-FS not must 3FS-solve problems on-the-test the-second
‘Sarah needs to solve the fewest problems on the second test.’

The ‘at most’ upstairs de dicto reading seen in (23), repeated in (25a) below is judged by native speakers to be synonymous with the sentence in (25b) with *aktar wāħid(e)* above the modal and negation below the modal; both are grammatical and describe the situation in (12). Here, *aktar waħde lāzim mā* ‘most one must not’ in (25b) expresses what *aʔall waħde lāzim* ‘least one must’ expresses in (25a).

(25) a. muna aʔall waħd-e lāzim t-sāwi axṭā b-ᵊl-faħṣ t-tāni.
Muna least one-FS must 3FS-make mistakes on-the-test the-second
‘Muna needs to make the fewest mistakes on the second test.’
b. muna aktar waħd-e lāzim mā t-sāwi axṭā b-ᵊl-faħṣ t-tāni.
Muna most one-FS must not 3FS-make mistakes on-the-test the-second
‘Muna needs to make the fewest mistakes on the second test.’

In both cases above, the b-examples can be directly composed to yield the respective interpretation. Assuming once again that ACCAC *wāħid(e)* is base generated in its surface position and that Arabic has a covert degree predicate abstraction mechanism, then the LF for (24b), parallel to (20) for (19), is shown in (26).

(26) sāra [ACCAC waħde] $\lambda d \lambda x$ mū lāzim tħill x d-masāʔil.
Sarah est one not must solve problems

This LF yields the denotation in (27).

(27) $\{d \mid \neg \Box$ Sarah solves d-problems$\} \supset \{d \mid \exists x \neq$Sarah $\neg \Box$ x solves

d-problems}

Recall that in the situation in (12) there are ten problems on the second test. It is necessary for Sarah to solve two problems correctly on the second test to pass the class. It is not necessary for her to solve three problems, or four or five, or all ten. So the set of degrees such that it is not necessary for her to solve that number of problems is the set {3, 4, 5, 6, 7, 8, 9, 10}. The set of degrees such that it is not necessary for Sami to solve that number of problems is {7, 8, 9, 10}, and for Muna {9, 10}. Since Sarah's set is a superset of the other two, the claim in (27), representing the meaning of (24b), is true.

As for (25b), composing the sentence in the order of elements that occur there yields the LF in (28).

(28) muna [ACCAC waħde] $\lambda d \lambda x$ lāzim mā t-sāwi x d-axṭā.
Muna est one must not make mistakes

This LF derives the formula in (29).

(29) {d | □ ¬ Muna make d-mistakes} ⊃ {d | ∃x ≠Muna □ ¬ x make d-mistakes}

The formula in (29) is true in the situation in (12). Muna can make one or two mistakes and still pass the class. But if she makes three mistakes, she fails. So in every possible world in which she passes, she does *not* make 3 mistakes, nor 4, 5, etc., through ten. Consequently, the set of degrees such that Muna does *not* make that many mistakes in any world in which she passes the class is the set {3, 4, 5, 6, 7, 8, 9, 10}. The corresponding sets for Sami and Sarah are {5, 6, 7, 8, 9, 10} and {9, 10}. Muna's set is a superset of the others, so the claim comes out true in this context, which accords with the intuitions of native speakers.

In light of the correspondence between the 'at least' and 'at most' upstairs de dicto readings of *aʔall wāħid(e)* in (24a) and (25a) respectively and the 'high' and 'low' position of negation in the corresponding sentences with *aktar wāħid(e)* in (24b) and (25b) respectively, it is tempting to seek to reduce the 'at least' vs. 'at most' distinction to variation in the position of negation at LF. That is, if the a-examples in (24) and (25) can be viewed

as transforms of the b-examples, then their interpretation reduces to the straightforward interpretation of b-examples.

In what follows, I discuss and reject two ways of reducing the meaning of the a-examples to the LF represented overtly by the b-examples. Both are 'scope splitting' analyses of the 'at most' upstairs de dicto reading, where negation scopes below the modal at LF but the superlative scope above it. The first is entirely parallel to similar analyses of 'at most' readings in English, but falls victim to both the fact mentioned in passing above that superlatives do not reconstruct in Arabic as well as to additional facts surrounding the distribution of negation in Arabic described in more detail in section 5.2. Those facts point in turn to a neg-lowering analysis which, however, fails to predict variation in the admissibility of split scope across modals and across dialects of Arabic. In section 5.3, I settle on an analysis that localizes the source of the ambiguity in the modal itself.

5.1 Hypothesis 1: Superlative Raising

We have seen evidence above that *ʔaʔall* consists of a superlative and a negative component that can be syntactically separated. One potential approach to the 'at most' upstairs de dicto construction seen in (25a) is that the superlative adverb *ʔaʔall waħde* 'least one' is actually base generated within the scope of the modal, and the superlative component ACCAC 'est' raises in the surface structure to a position above the modal, vacuously pied piping the negative component *ʔalīl* 'little'. This gives rise at LF to the scopal order *est*>□>¬, but in the surface structure the whole adverbial *ʔaʔall waħde* precedes the modal. Pied piping affects the surface representation but not the semantic representation. This approach is one way of reducing the meaning of (25a) to (25b).

However, this approach suffers from two substantial problems, one of which I describe here and the other of which I elaborate on in the following section. The first problem is that superlatives are never interpreted lower than their surface position. On the premise that A′-movement chains may reconstruct, that is, the moved element may be interpreted

as if it had not moved, then it should be possible to construe (25a) as asserting that what Muna needs is to make fewer mistakes than anyone else makes. Suppose that the teacher of the class Muna, Sami and Sarah are in decides to give a prize to the student who makes the fewest mistakes, regardless of whether they even manage to pass the class or not, and Muna is particularly keen to win this prize. In this context, (25a), repeated in (30a) below, cannot be used as a continuation of 'in order to win the prize...'. Only (30b) can be used felicitously here, where *aʔall waħde* occurs below the modal in the surface order.

(30) la-ti-rbaħ l-ʒāʔize...
to-3FS-win the-prize
'To win the prize...'

a. #muna aʔall waħd-e lāzim t-sāwi axṭā b-ᵊl-faḥṣ.
Muna least one-FS must 3FS-make mistakes on-the-test
'Muna needs to make the fewest mistakes on the test.'

b. muna lāzim t-sāwi axṭā aʔall waħd-e b-ᵊl-faḥṣ.
Muna must 3FS-make mistakes least one-FS on-the-test
'Muna needs to make the fewest mistakes on the test.'

If (30a) is derived from a stucture in which *aʔall waħde* occurs below the modal, we would expect that interpretation to still be accessible to the surface structure in (30a), by virtue of the possibility of reconstruction of the superlative.[8] That no such reading is available militates against this analysis of (25a)/(30a). Even if superlative raising in Arabic is a kind

[8]Hallman (2016) makes this same point in connection with (i). Consider a context in which Professor Fareed states that his student has memorized 400 verses of the Quran, Professor Rashid states that his student memorized 300 verses, and Professor Ahmad states that his student memorized 200 verses, but also (mistakenly) that this student memorized more verses than any other student.

(i) l-istāz aħmad aktar wāħid ʕāl innu ṭālb-u ħafaẓ āyāt qurʔāniyye.
the-professor Ahmad most one said that student-his memorized verses quranic
'Professor Ahmad said his student memorized the most verses of the Quran.'

In the situation described above, (i) is judged false by native speakers, because Professor Ahmad said his student memorized 200 verses, and 200 is not more than the number of verses the other professors said their students memorized. But if *aktar wāħid* 'most one' were interpreted in the subordinate clause, where its scalar associate is found, it would constitute part of the description of what Professor Ahmad *said*. Then the sentence would express that Professor Ahmad said his student memorized more verses than any other student did. The sentence would be true on this reading, since Prof. Ahmad did in fact say that (mistakenly). The fact that the sentence is judged unequivocally false means that it has no true reading, and therefore that the adverbial superlative cannot reconstruct, which in turn militates against the idea that the adverbial superlative is base generated lower than its surface position.

of A′-movement that does not display reconstruction effects, another consideration militates against the analysis of (25a)/(30a) that invokes syntactic scope splitting. I expand on this consideration in the following section.

5.2 Hypothesis 2: Vacuous Neg-Raising

In this section, I show that the 'at most' upstairs de dicto reading of (25a) is an instance of a general pattern of inverse scope between a modal and negation in Syrian Arabic, and this pattern both excludes the superlative movement analysis described in the preceding section and points to a different analysis, albeit with deficiencies of its own, as I describe in what follows.

Clausal negation may precede or follow the modal *lāzim* 'must/need to' (in the form of *mū* when preceding). But there is an asymmetry in its interpretation depending on its position. When negation precedes the modal, it may be interpreted optionally either above the modal, i.e., in situ, or below the modal. But when negation follows the modal, it may only be interpreted in situ, below the modal. The 'low' reading of negation preceding *lāzim* in the surface structure is quite salient. In his detailed descriptive grammar of Syrian Arabic, Cowell (1964) remarks on the effect: "Logically, *mū lāzim* should mean 'needn't' or 'it is not necessary', while 'mustn't' or 'shouldn't' would be expressed as *lāzim mā*... Actually, however, *mū lāzim* usually means 'mustn't, shouldn't, ought not to'" (p. 387).

For example, (31a) is naturally understood to mean that $75,000 is the upper limit on your income to take the tax deduction in question, and is judged to be synonymous—on this interpretation—with (31b) with negation below the modal in the surface order. This example shows that the negative particle *mū* in (31a) may have scope below the modal, as seen overtly in (31b).

(31) a. mū lāzim yi-kūn daxl-ak aktar min $75,000 mʃān t-āxud
not must 3MS-be income-your more than $75,000 to 2S-take
ha-l-iʕfā ḍ-ḍarībi.
this-the-exemption the-tax

(i) 'Your income must not be more than $75,000 to take this tax exemption.'
(ii) #'It is not necessary that your income be more than $75,000 to take this tax exemption'

b. lāzim mā yi-kūn daxl-ak aktar min $75,000 mʃān t-āxud
must not 3MS-be income-your more than $75,000 to 2S-take
ha-l-iʕfā ḍ-ḍarībi.
this-the-exemption the-tax
'Your income must not be more than $75,000 to take this tax exemption.'

In principle, another reading of (31a) is available corresponding to the surface order of negation and modal, that asserts that it is not necessary for your income to be over $75,000 to take the exemption. This reading is pragmatically awkward because it is generally not necessary for your income to be *over* a certain amount to receive a tax exemption. However, we can tell this scopal order is available because it gives us the salient reading of (32a) below, which asserts that it is not necessary to have advanced degree to take the job in question. Cowell's assessment that the order NEG>MODAL 'usually' has inverse scope should therefore not be construed to imply that there is anything marginal about the surface scope reading. Of course, we can infer on the basis of the naturalness of (31a) that another reading is available for (32a) that asserts that it is necessary to *not* have an advanced degree to take the job, as (32b) asserts unambiguously, though this is pragamatically militated against because there are generally not upper limits on the kind of degree necessary to do a job.

(32) a. mū lāzim yi-kūn ʕand-ak ʃahāde ʕālye mʃān t-āxud ha-l-waẓīfe.
not must 3MS-be at-you degree advanced to 2S-take this-the-job
(i) #'You need to not have an advanced degree to take this job.'
(ii) 'You don't need to have an advanced degree to take this job.'

b. #lāzim mā yi-kūn ʕand-ak ʃahāde ʕālye mʃān t-āxud ha-l-waẓīfe.
must not 3MS-be at-you degree advanced to 2S-take this-the-job
#'You need to not have an advanced degree to take this job.'

When negation appears overtly below the modal, things are more restricted. Example (31b) is a pragmatically natural sentence putting an upper bound on one's income to take a certain tax exemption. Though an inverse reading meaning that it is not necessary to earn so much to take the exemption is unnatural, the interpretation of (32b) shows that this

potential reading is truely semantically unavailable. (32b) has *only* the unnatural reading corresponding to the surface scopal order of modal and negation, the reading asserting that having a higher degree disqualifies you from taking the job. The pragmatically natural potential inverse scope reading—that it is not necessary to have a higher degree—is not available here.

This means that negation cannot scope above the modal when it follows the modal in the surface order, but can scope below the modal if it precedes the modal in the surface order (in addition to its in situ reading above the modal). Accordingly, the negation that occurs below the modal in the 'overt splitting' example in (25b), repeated in (33a) below, can be placed above negation with the same meaning, as in (33b). (33a) and (33b) both describe the situation in (12) equally well. But so does (25a), repeated in (33c), with *aʔall* 'least' instead of *aktar... mā* 'most... not'. All the sentences in (33) have an 'at most' upstairs de dicto reading in common, that is felicitous and true in the context in (12). It appears that the possibility for negation to precede the modal but be interpreted below it correlates with the availability of an 'at most' upstairs de dicto reading.

(33) a. muna aktar waħde lāzim mā t-sāwi axṭā.
Muna most one-FS must not 3FS-make mistakes
'Muna needs to make the fewest mistakes.'

b. muna aktar waħde mū lāzim t-sāwi axṭā.
Muna most one-FS not must 3FS-make mistakes
'Muna needs to make the fewest mistakes.'

c. muna aʔall waħde lāzim t-sāwi axṭā.
Muna least one-FS must 3FS-make mistakes
'Muna needs to make the fewest mistakes.'

Additional facts support this correlation. Modals other than *lāzim* are not transparent to negation, and also do not support 'at most' upstairs de dicto readings of pre-modal *aʔall wāħid(e)*. The existential modal verb *ʔidir* 'can' discussed in section 4 does not allow a preceding negative particle to be interpreted in its scope. For example, (34a) is judged by native speakers to be contradictory; it asserts that participation is prohibited yet optional. This is the interpretation that corresponds to the surface order of negation and the modal

verb. If negation could scope below the modal in this sentence, then (34a) could have the meaning attributed by native speakers to (34b), which is not contradictory; it asserts that one is able to not participate in the project, since participation is voluntary.

(34) a. #mā b-ti-ʔdir t-ʃārik b-ᵊl-maʃrūʕ liʔannu l-muʃārake
not IND-2MS-can 2MS-participate in-the-project since the-participation
xtiyāriyye.
optional
#'You can't participate in the project, since participation is optional.'

b. b-ti-ʔdir mā t-ʃārik b-ᵊl-maʃrūʕ liʔannu l-muʃārake
IND-2MS-can not 2MS-participate in-the-project since the-participation
xtiyāriyye.
optional
'You are able to not participate in the project, since participation in optional.'

The example in (35a) presents a context in which the order *not>can* is felicitous. The inverse order shown in (35b) is judged infelicitous. The latter asserts that Sami's ability to not eat peanuts is due to an allergy, but having an allergy would seem to warrant the stronger claim that he is not able to eat peanuts. That is just the claim that the inverse scope reading would make, corresponding to the surface order seen in (35a), which is felicitous. The fact that (35b) is infelicitous means that it cannot be read as asserting what (35a) means. In summary, all the sentences in (34) and (35) with the modal verb *ʔidir* display only the surface scope reading of the negation and the modal verb.

(35) a. sāmi mā b-yi-ʔdir y-ākul l-fustaʔ liʔannu b-yi-tħassas
Sami not IND-3MS-can 3MS-eat the-peanuts because IND-3MS-be.allergic
minn-u.
from-them
'Sami can't eat peanuts since he is allergic to them.'

b. #sāmi b-yi-ʔdir mā y-ākul l-fustaʔ liʔannu b-yi-tħassas
Sami IND-3MS-can not 3MS-eat the-peanuts because IND-3MS-be.allergic
minn-u.
from-them
#'Sami is able to not eat peanunts because he is allergic to them.'

Accordingly, though (36a) and (36b) are both grammatical, they are not synonymous. The sentence in (36a) (=(17b) discussed in section 4) is judged true in the situation in

(12), while (36b) implies that the speaker has a poor opinion of Sarah's ability to pass the upcoming test, which does not rhyme together with the situation in (12), which depicts Sarah as the best student. The fact that (36b) is not compatible with what (12) depicts means that the negative component of *aʔall* cannot be interpreted below the modal in (36b) on analogy to (36a).

(36) a. sāra aktar waħd-e b-ti-ʔdir mā t-ħill masāʔil.
Sarah most one-FS IND-3FS-can not 3FS-solve problems
'The number of problems that Sarah can afford to not solve is greater than the number of problems that anyone else can afford to not solve.'

b. sāra aʔall waħd-e b-ti-ʔdir t-ħill masāʔil.
Sarah least one-FS IND-3FS-can 3FS-solve problems
'The number of problems Sarah is able to solve is less than the number of problems anyone else is able to solve.'

Rather, (36b) is synonymous with (37) (=(13b) discussed in section 4), where *aktar... mā* 'most... not' occurs above the modal. This confirms that just as *ʔidir* does not allow clausal negation preceding it to be interpreted in its scope, it also does not allow the negative component of *aʔall* preceding it to be interpreted in its scope. The fact that (36a) and (36b) are not synonymous shows that the availability of an 'at most' upstairs de dicto reading for *aʔall* tracks the transparency of the modal to negation.

(37) sāra aktar waħd-e mā b-ti-ʔdir t-ħill masāʔil.
Sarah most one-FS not IND-3FS-can 3FS-solve problems
'The number of problems Sarah is not able to solve is greater than the number of problems anyone else is not able to solve.'

Furthermore, the transparency of *lāzim* 'must/need to' to negation is not universal to the Arabic dialects. Dr. Rashid Al-Balushi, a linguist and native speaker of Omani Arabic, has reported to me that he and other native speakers of the Omani dialect he surveyed do not perceive ambiguities in the scopal order of *lāzim* 'must' and negation in that dialect, and this scopal rigidity extends to *ʔaqall* 'least' (=Syrian *aʔall*).[9] For example, (38a) in Omani Arabic does not have a pragmatically felicitous reading, unlike its Syrian counterpart

[9]The glottal stop in Syrian *aʔall* corresponds to a uvular stop [q] in Classical Arabic which is preserved in Omani. Also in Omani, negative *mā* has no alternative form.

in (31a). The only reading available is the surface scopal order which asserts that it is not necessary for your income to be over $75,000 to take the tax exemption in question. This statement is puzzling because it denies something that would not normally be the case anyway—a tax exemption for earners over $75,000. The inverse scope reading—found in Syrian but not Omani—asserts that it is necessary for your income to not be over $75,000 to take the exemption. The fact that the sentence is judged odd in Omani Arabic means that the pragmatically informative scopal order with the modal over negation is not available in that dialect. Similarly, (38b) is judged pragmatically infelicitous because it makes the unusual claim that you have to not have an advanced degree to take the job in question. The other scopal order would make more pragmatic sense, but that reading is unavailable. The case of (38b) is as in Syrian, where the order MODAL>NEG is not reversible at LF. The main difference between Omani and Syrian is that in Omani Arabic, the order NEG>MODAL is also not reversible. That is, negation never displays inverse scope with respect to a modal.

(38) a. #mā lāzim yi-kūn daxl-ak ʔakθar min $75,000 ʕaʃān t-ħaṣṣil
not must 3MS-be income-your more than $75,000 to 2S-get
ha-l-iʕfāʔ ð-ðarībi.
this-the-exemption the-tax
#'It is not necessary for your income to be more than $75,000 to take this tax exemption'. [Omani]

b. #lāzim mā yi-kūn ʕand-ak ʃahāda ʕālya ʕaʃān t-ħaṣṣil ha-l-waðīfah.
must not 3MS-be at-you degree advanced to 2S-get this-the-job
#'You need to not have an advanced degree to take this job.' [Omani]

In Omani, the distribution of the superlative is the same as in Syrian, but the exact counterpart of example (23) with the 'at most' upstairs de dicto reading in Syrian does not have the 'at most' upstairs de dicto reading in Omani, illustrated in (39). Rather, it asserts that Muna is obligated to make a certain number of mistakes, which is pragmatically implausible.

(39) #muna ʔaqall wāħida lāzim t-sāwi ʔaxṭāʔ f-ᵊl-imtiħān θ-θāni.
Muna least one-FS must 3FS-make mistakes in-the-test the-second
#'The number of mistakes Muna is obligated to make on the second test is less than the number of mistakes anyone else is obligated to make.' [Omani]

These observations mean that the possibility of an 'at most' upstairs de dicto reading for *a?all* 'least' tracks the transparency of the modal to negation across modals and across dialects. This means that the possibility of interpreting negation in (31a) below the modal and the possibility of the 'at most' upstairs de dicto reading of (25a) have the same source. The analysis proposed in section 5.1 does not characterize the contrast between 'at most' and 'at least' upstairs de dicto readings for *a?all* 'least' in terms of the locus of negation, but rather—seemingly tangentially—in terms of the base position of the superlative. According to that analysis, the 'at most' upstairs de dicto reading of (23) arises in the following way. Both the superlative morpheme ACCAC 'est' and negation in the form of *?alīl* 'little' are generated below the modal, then the superlative component raises, leaving the negative component behind. Negation only appears to precede the modal because it is superficially but vacuously pied piped with the superlative. The possibility of the 'at most' upstairs de dicto reading is not encoded as a property of the modal or of negation, but rather as a property of the superlative—that the superlative may raise in the surface structure in Arabic, vacuously pied piping the negative base adjective. But the superlative may appear before the existential modal *?idir* 'can' as well, as for example (36a) shows, with the superlative above *?idir* and negation below it. But if that configuration is grammatical, we expect the corresponding construction with *a?all* 'least' to be grammatical, where the superlative is base generated together with *?alīl* under the modal then raises above the modal, only superficially pied piping the underlying adjective *?alīl* and generating (36b) with the meaning of (36a). But we have observed that this is not possible, above and beyond the lack of reconstruction effects for the superlative.

We desire a unified analysis of the possibility of an 'at most' upstairs de dicto reading of *a?all* and the possibility of interpreting negation occurring above a modal in the surface order below it in the semantic representation. We have seen that clausal negation can be generated either above or below a modal verb in Syrian Arabic—it may always have scope in its surface position. Suppose now that when the negative particle is base generated below the modal, it

may optionally but vacuously raise to a position above the modal, appearing then to the left of the modal but being interpreted in its scope, generating (33b) with the same meaning as (33a). Suppose further that when structurally adjacent to ACCAC 'est', the negative particle may fuse with the template ACCAC in the form of the adjective *ʔalīl*, augmenting the *mā/mū* allomorphy for the negative particle. Then, the mechanism that vacuously raises the negative particle to a position before the modal in (33b),[10] deriving (33b) (with *mū*) from (33a) (with *mā*), in turn may feed fusion of negation with the superlative, deriving (33c) (with *ʔalīl*), but with the same interpretation as the base in (33a).

Whatever the details of this approach, it is clear that it captures the availability of the 'at most' upstairs de dicto reading of *aʔall* 'least' in the same terms as the availability of low scope readings clausal negation when it precedes the modal. But it connects these things in the form of a stipulation: that negation may vacuously cross *lāzim* and not other modals. But what is it about *lāzim* 'must' that makes it transparent to negation in contrast to other modals? I do not see any obvious answer to this question. It appears that this analysis, though not empirically objectionable,[11] lacks explanatory power, in that it restates the question of why *lāzim* but not *ʔidir* allows 'at most' upstairs de dicto readings as the question of why *lāzim* 'must/need to' but not *ʔidir* 'can' is transparent to vacuous displacement of negation. As far as this analysis goes, it could have been the other way around. This raises the question of whether any aspect of this phenomenon can be connected to any other respect in which universal modals behave differently from existential modals. I describe below a potential connection.

[10]This mechanism might take the form of a lambda abstractor with the same semantic type as negation itself, as illustrated in (i). Lowering will then be a result of lambda reduction, which will effetively put negation 'back' into the position it moved from (X in (i)).

(i) Muna [ACCAC waħde] $\lambda d \lambda x$ [$\text{mū}_{\langle t,t\rangle}$ $\lambda X_{\langle t,t\rangle}$ lāzim [X tsāwi x d-axṭā]].
Muna est one not must make mistakes

[11]My remarks here leave open the question of how the morphological fusion of ACCAC 'est' with *ʔalīl* 'few/little' proceeds on this account, which could very well end up posing empirical problems. But I take the question of why only *lāzim* 'must/need to' allows an 'at most' upstairs de dicto reading for *aʔall* 'least' to be more significant.

5.3 Hypothesis 3: Modal Ambiguity

Suppose that the modal *lāzim* is ambiguous between an existential interpretation and a universal interpretation, and the universal interpretation occurs obligatorily by default, whenever the modal fails to occur in an environment that allows the existential interpretation. The ambiguity arises in the scope of *mā/mū* 'not' and *ʔalīl* 'little' (the latter in the form of *aʔall* 'least'). Below, I refer to *mā/mū* and *ʔalīl* collectively as NEG. I hypothesize that *lāzim* has the meaning in (40) (again ignoring the fact that the world quantifiers '$\Diamond$' and '$\Box$' are restricted by a modal base). According to this definition, NEG optionally selects the existential reading, while the universal reading occurs elsewhere, including under NEG when the existential option is not taken.

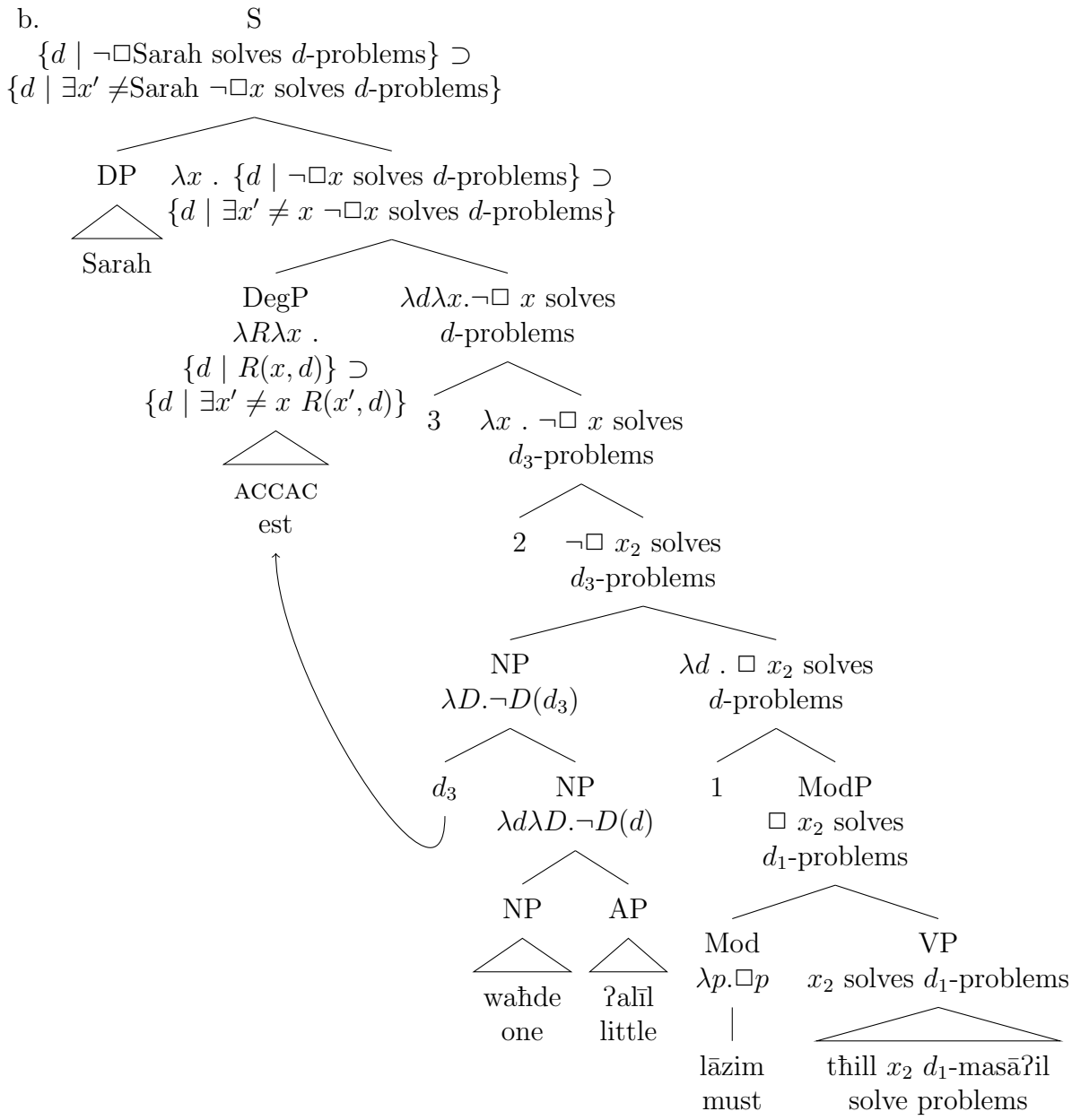
(40) $[\![\text{lāzim}]\!] =$

a. $\lambda p.\Diamond p$ optionally when locally c-commanded by NEG

b. $\lambda p.\Box p$ elsewhere

According to this analysis, the 'at most' upstairs de dicto reading in (25a), has the same syntactic structure as the 'at least' reading in (24a), repeated in (41a) below, namely the tree in (41b), in which ACCAC 'est' and *ʔalīl* 'little' both scope above the modal.

(41) a. sāra aʔall waħde lāzim t-ħill masāʔil.
Sarah least one-FS must 3FS-solve problems
'Sarah needs to solve the fewest problems.'



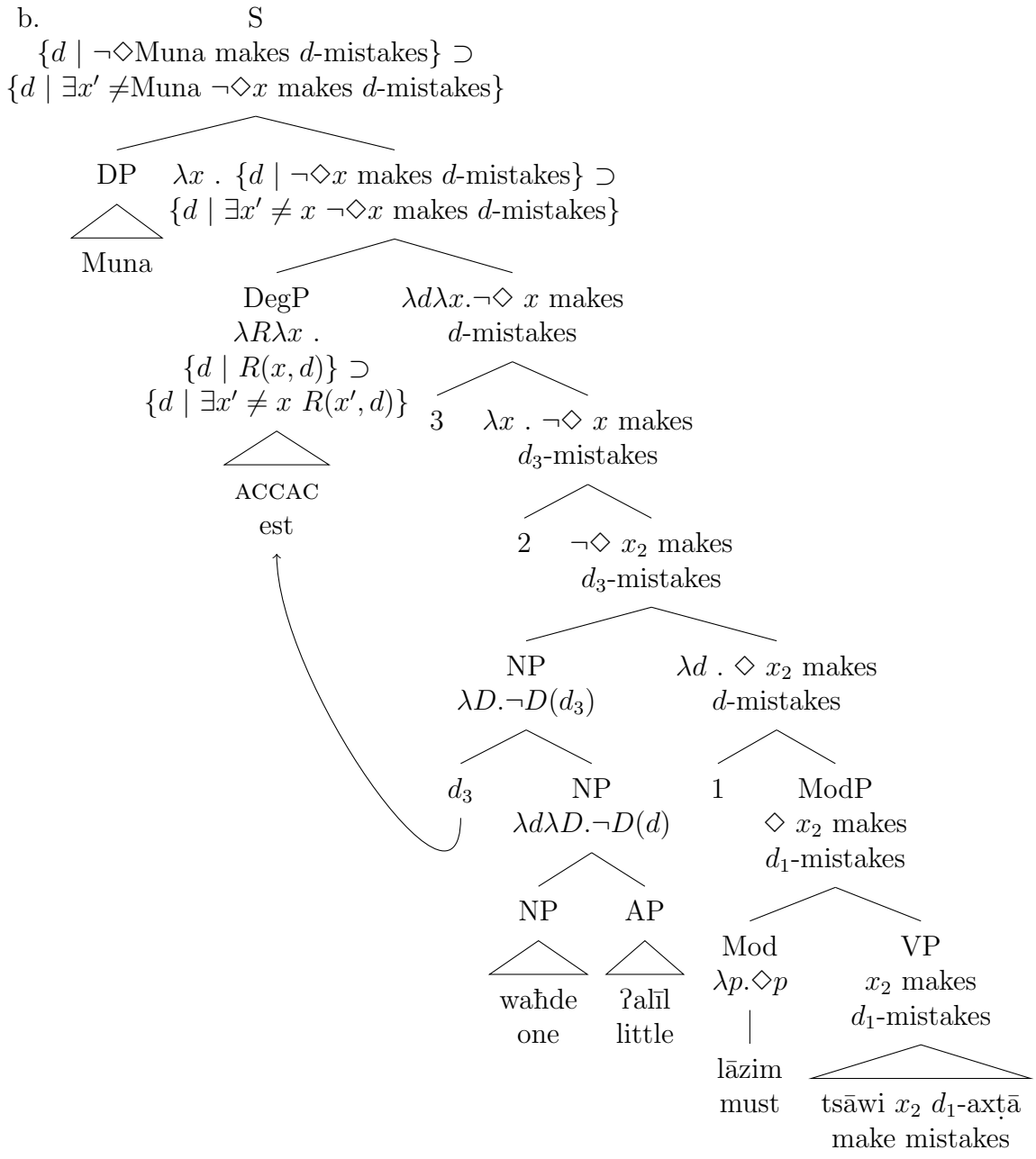
The formula so derived holds when the set of degrees such that it is not necessary for Sarah to solve that many problems to pass the class is a proper superset of the set of degrees such that anyone else doesn't necessarily have to solve that many problems. The set of degrees such that Sarah does not necessarily answer that many questions correctly in *all* the worlds in which she passes is {3, 4, 5, 6, 7, 8, 9, 10} (she must get two questions right, but not necessarily more). The corresponding sets for Sami and Muna are {7, 8, 9, 10} and {9, 10} respectively. Since Sarah's set is a superset of the others, this claim comes out as true

as well in the context in (12), as desired.

According to the modal ambiguity hypothesis, the puzzling 'at most' upstairs de dicto reading of sentences like (25a), repeated in (42a) below, is derived from the same structure, by employing the existential interpretation of the modal *lāzim*, as illustrated in (42b).

(42) a. muna aʔall waħd-e lāzim t-sāwi axṭā.
Muna least one-FS must 3FS-make mistakes
'Muna needs to make the fewest mistakes.'

b.



The formula derived by this composition holds when the set of degrees such that there is no world in which Muna passes the class and makes that many mistakes is a proper superset of the degrees such that there is someone else for whom there is no world in which they pass the class and make that many mistakes. In the situation in (12), Muna will fail if she makes more than two mistakes. So the set of degrees such that it is not possible for Muna to make that number of mistakes and still pass the class starts at three; it is the set {3, 4, 5, 6, 7, 8, 9. 10}. The set of degrees such that it is not possible for Sami to make that many mistakes and still pass is {5, 6, 7, 8, 9, 10}. Sarah's set is {9, 10}. Since Muna's set is a superset of the others, the formula under the top node in (42b) comes out true, as desired.

In this and other cases, this analysis matches the predictions of the vacuous NEG-raising analysis sketched in section 5.2. The two differ in the source of the 'at most' upstairs de dicto reading of *a?all* 'least'. In the NEG-raising analysis, NEG can raise vacuously around *lāzim*, to be heard but not interpreted to the left of the modal, generating 'at most' upstairs de dicto readings in the same manner as the inverse scope reading for *mū lāzim* 'not must'. On the modal ambiguity approach, the modal may be interpreted as an existential quantifier over worlds in the immediate context of NEG, also explaining the 'at most' reading for *a?all* and 'inverse scope' for *mū lāzim* in terms of the same generalization.

Two things speak in favor of the modal ambiguity analysis over the vacuous NEG-raising analysis. Both analyses raise the question of why the universal modal allows this ambiguity and not the existential modal. It is also clear that this is not a universal property of universal modals, even within the Arabic dialects. Iatridou and Zeijlstra (2013) and Zeijlstra (2017) point out that in many languages, some deontic universal modals are positive polarity items (PPIs); they are blocked from negative environments and if they occur with negation at all, they obligatorily scope above the negation. English *must* is such an element: *She must not leave* cannot mean that it is not necessary for her to leave (cf. *She cannot leave*, which displays the same word order but means she is not able to leave). Iatridou and Zeijlstra remark that there are no existential modals that are PPIs, i.e., which, in a negative context,

must scope above negation. The Arabic modal *lāzim* is not a PPI (and in this respect is more like English *need to* than *must*), since *mū lāzim* is grammatical and systematically may mean that *It is not necessary that...*. But there is nonetheless an abstract resemblance between Iatridou and Zeijlstra's generalization and the behavior of *lāzim*: when *lāzim* occurs in the scope of negation, it may optionally weaken to an existential quantifier. In doing so, it avoids a configuration in which a universal modal occurs in the scope of negation by converting the universal quantifier into an existential one. The modal ambiguity analysis makes the phenomenon an instance of the generalization 'avoid $\neg\forall$' in the domain of modals, which manifests itself elsewhere as a polarity sensitivity on some universal modals in some languages. Existential modals are not subject to this condition in any form, and accordingly do not accommodate split scope readings of *a?all* 'least' in Arabic, as the discussion of (35) and (36) showed.

A further consideration in favor of the analysis in (40) is that the weakening of *lāzim* to an existential quantifier in the context of negation has the effect of strengthening the meaning of the sentence as a whole, and is therefore an instance of the 'Strongest Meaning Hypothesis' developed by Dalrymple et al. (1998), drawing on elements of Grice's (1975) 'Maxim of Quantity' and Heim's (1991) 'Maximize Presupposition'. Dalrymple et al. present an analysis of reciprocals in which these are lexically ambiguous between several readings, and the reading that is attested in any given context is the strongest meaning compatible with that context, where a meaning A is stronger than a meaning B is A entails B. Sauerland et al. (2005), Spector (2007), Farkas and de Swart (2010), and others apply variations on this theme to the interpretation of plurals. The behavior of *lāzim* differs from reciprocals and plurals in that the ambiguity of *lāzim* is not always resolved: *lāzim* remains ambiguous between an existential and universal reading in the scope of NEG; it is only unambiguous in positive environments. And there, it is indefeasibly unambiguous. This suggests that the forces governing the interpretation of *lāzim* are not pragmatic in nature, but grammatical. The conditions on the interpretation of *lāzim* in (40) are a kind of grammaticalized strongest

meaning pattern. The pattern is incomplete, since strengthening in negative contexts remains optional. Yet the interpretation of *lāzim* partially mimics the effect of the Strongest Meaning Hypothesis: where the optionality is obligatorily resolved, namely in positive contexts, it is the stronger, universal, reading that is attested, and the existential reading that is available in negative environments represents, in combination with negation, a strengthening of the meaning of the sentence as a whole vis a vis the universal reading of *lāzim*. Here, again, the analysis of *lāzim* in (40) relates the Arabic facts to these other phenomena.

The vacuous NEG-raising analysis does not connect the 'at most' reading of *aʔall* 'least' and inverse scope for *mū lāzim* 'not must' to any other phenomena. The fact that *lāzim* 'must' but not *ʔidir* 'can' allows vacuous NEG-raising bears no relation to the fact that cross-linguistically, some universal modals must not occur in the scope of negation, nor to other cases in which lexical ambiguities resolve in the direction that strengthens the meaning of the sentence. The fact that existential modals permit neither an 'at most' reading for *aʔall* 'least' nor inverse scope for *mū lāzim* 'not must' is a coincidence from this perspective. I take this point to support the modal ambiguity analysis.

In summary, I have claimed that the superlative morpheme ACCAC 'est' moves to a scope position at LF in Arabic as in English, but also that this is not the source of the 'at most/at least' upstairs de dicto ambiguity seen for the order *aʔall wāħid(e) lāzim* 'least one must'. Rather, the source of that ambiguity is located in the interpretation of the modal *lāzim*. I note here before concluding that the ambiguity in the modal verb *lāzim* makes it impossible to observe syntactic scope splitting in the context of *lāzim*. The reason is that split scope of ACCAC 'est' and *ʔalīl* 'little' around the modal *lāzim must/need not*, resulting in the scopal configuration *est*>□>¬ is truth conditionally indistinguishable from LF movement of the whole negative adverb *aʔall wāħid(e)* to a position above the modal, in concert with the existential reading of the modal, which would be licensed by the preceding negation (*ʔalīl*), giving rise to the scopal configuration *est*>¬>◇. Since both raising of ACCAC 'est' and of the whole adverbial *aʔall wāħid(e)* 'least one' are covert processes, they are semantically

indistinguishable. It is nonetheless clear that Arabic has scope splitting, since this derives the observed interpretation of (17a), where the superlative raises above the existential modal *ʔidir* 'can' leaving its negative adjectival base *ʔalīl* 'little' in situ under the modal. Thus, Arabic has both syntactic scope splitting at LF and an ambiguity between the universal and existential interpretation of the modal verb *lāzim* that mimics scope splitting but is not the result of syntactic displacement at LF.

6 Conclusion

In Arabic, the superlative terms *aktar* 'most' and *aʔall* 'least' consist morphologically of the superlative template ACCAC 'est' and the quantity adjectives *ktīr* 'much/many' and *ʔalīl* 'little/few' respectively. In some contexts, the superlative morpheme ACCAC is observed to have scope distinct from the underlying adjective. Specifically, we observed in section 4 that *aʔall* 'least' may have split scope around the existential modal verb *ʔidir* 'can', as the relevant interpretation of examples like (17a) show. I analysed this as a case of movement of ACCAC above the modal, leaving the underlying negative quantity adjective *ʔalīl* in situ within the scope of the modal, along the lines of Stateva's (2000) analysis of similar facts in English. That is, Arabic displays scope splitting like English.

However, the movement analysis of scope splitting does not easily account for an additional semantic ambiguity that arises in Syrian Arabic. In Syrian Arabic, the superlative may precede a modal verb and in this case may not be interpreted in the scope of the modal. A superlative may be interpreted higher than its surface position (it may undergo covert movement) but cannot be interpreted lower than its surface position, from which I concluded that superlatives are base generated in their surface position. However, the negative component of the negative superlative *aʔall* 'least' does display the possibility to be intepreted beneath the modal verb *lāzim* 'must/need to', even when it precedes the modal in the surface structure. This turns out to be a subcase of a general possibility for negation

preceding *lāzim* to be interpreted in the scope of the modal. This does not extend to other modals nor to all dialects of Arabic. An analysis that makes the pre-modal occurrence of *a?all* a case of vacous pied piping with movement of the superlative contradicts the conclusion that superlatives do not move to their surface position. An analysis that lowers negation (in the form of *mā* 'not' or *?alīl* 'little') leaves unanswered the question of why only *lāzim* allows lowering and not other modals. An analysis that mimics negation lowering in the form of a universal/existential ambiguity in the meaning of this particular modal both explains why the effect is limited to this modal verb and also folds the phenomenon into independent observations about the interaction of negation and quantification: converting universal to existential quantification under negation aligns with a cross-linguistic tendency for universal modals to resist negation and results in a strengthening of the meaning of the sentence as a whole that aligns with prevailing theories of ambiguity resolution.

References

Aihara, Masahiko. 2009. The scope of *-est*: evidence from Japanese. *Natural Language Semantics* 17:341–367.

Al-Bitar, Ahmad. 2019. The superlative in English and Arabic. Master's thesis, Universität Tübingen, Tübingen.

Bhatt, Rajesh, and Shoichi Takahashi. 2007. Direct comparisons: Resurrecting the direct analysis of phrasal comparatives. In *Proceedings of SALT XVII*, ed. by T. Friedman and M. Gibson, 19–36. Ithaca, NY: Cornell University.

Bresnan, Joan. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4:275–343.

Büring, Daniel. 2007a. Cross-polar nomalies. In *Proceedings of semantics and linguistic the-*

ory 17, ed. by Tova Friedman and Masayuki Gibson, 37–52. Washington, D.C.: Linguistic Society of America.

Büring, Daniel. 2007b. More or less. *Proceeding from the Annual Meeting of the Chicago Linguistic Society* 43:3–17.

Cinque, Guglielmo. 2010. *The syntax of adjectives: A comparative study*. Cambridge, Mass.: MIT Press.

Cowell, Mark. 1964. *A reference grammar of Syrian Arabic*. Washington, D.C.: Georgetown University Press.

Dalrymple, Mary, Makoto Kanazawa, and Yookyung Kim, and Sam Mchombo, and Stanley Peters. 1998. Reciprocal expressions and the concept of reciprocity. *Linguistics and Philosophy* 21:159–210.

Erlewine, Michael Yoshitaka. 2018. Clausal comparison without degree abstraction in Mandarin Chinese. *Natural Language and Linguistic Theory* 36:445–482.

Farkas, Donka, and Henriëtte de Swart. 2010. The semantics and pragmatics of plurals. *Semantics and Pragmatics* 3:1–54.

Gawron, Jean Mark. 1995. Comparatives, superlatives, and resolution. *Linguistics and Philosophy* 18:333–380.

Grice, Paul. 1975. Logic and conversation. In *Syntax and semantics, vol. 3: Speech acts*, ed. by Peter Cole and Jerry Morgan, 41–58. New York: Academic Press.

Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: *most* vs. *more than half*. *Natural Language Semantics* 17:63–98.

Hallman, Peter. 2016. Superlatives in Syrian Arabic. *Natural Language and Linguistic Theory* 34:1281–1328.

Heim, Irene. 1991. Artikel und Definitheit. In *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, ed. by Arnim von Stechow and Dieter Wunderlich, 487–535. Berlin: De Gruyter.

Heim, Irene. 1999. Notes on superlatives. Ms., University of Texas, Austin.

Heim, Irene. 2001. Degree operators and scope. In *Audiatur vox sapientiae. a festschrift for Arnim von Stechow*, ed. by Caroline Fery and Wolfgang Sternefeld, 214–239. Berlin: Akademie Verlag.

Heim, Irene. 2006. *Little*. In *Proceedings of SALT 16*, ed. by Masayuki Gibson and Jonathan Howell, 35–58. Washington, D.C.: Linguistic Society of America.

Iatridou, Sabine, and Hedde Zeijlstra. 2013. Negation, polarity, and deontic modals. *Linguistic Inquiry* 44:529–568.

Jespersen, Otto. 1949. *A modern English grammar on historical principles, part II*. København: Munksgaard.

Lechner, Winfried. 2017. Phrasal comparatives and parasitic scope. *Wiender Linguistische Gazette* 82:181–191.

Matthewson, Lisa. 2004. On the methodology of semantic fieldwork. *International Journal of American Linguistics* 70:369–415.

Rullmann, Hotze. 1995. Maximality in the semantics of *wh*-constructions. Doctoral Dissertation, University of Massachusetts at Amherst.

Sauerland, Uli, and Jan Anderssen, and Kazuko Yatsushiro. 2005. The plural is semantically unmarked. In *Linguistic evidence: Empirical, theoretical and computational perspectives*, ed. by Stephan Kepser and Marga Reis, 413–434. Berlin: Mouton de Gruyter.

Sharvit, Yael, and Penka Stateva. 2002. Superlative expressions, context, and focus. *Linguistics and Philosophy* 25:453–504.

Solt, Stephanie. 2015. Q-adjectives and the semantics of quantity. *Journal of Semantics* 32:221–273.

Spector, Benjamin. 2007. Aspects of the pragmatics of plural morphology: On higher-order implicatures. In *Presuppositions and implicatures in compositional semantics*, ed. by Uli Sauerland and Penka Stateva, 243–281. New York: Palgrave Macmillan.

Stateva, Penka. 2000. In defense of the movement theory of superlatives. In *Proceedings of the Eastern States Conference on Linguistics (ESCOL) 1999*, ed. by Rebecca Daly and Anastasia Riehl, 215–266. Ithaca, NY: CLC Publications.

Szabolcsi, Anna. 1986. Comparative superlatives. In *MIT working papers in linguistics, vol. 8*, ed. by Naoki Fukui, 245–265. Cambridge, Mass.: MIT Press.

Zeijlstra, Hedde. 2017. Universal quantifier PPIs. *Glossa* 2:91. 1–25.