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Gradable assertion speech acts*

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0. Introduction

This paper suggests integrating two lines of thought in the semantic-pragmatic literature, that are usually dealt with separately. The first line takes speech acts to be syntactically and compositionally active, as they can be negated, conjoined, embedded, modified by various operators etc. (e.g. Cohen & Krifka 2014, Thomas 2014, Beck 2016). We will concentrate here on assertion speech acts, and the covert speech act operator *ASSERT*. The second line suggests representing some epistemic modals (e.g. modal adjectives) similarly to gradable adjectives like *tall / clean*, i.e. as denoting degree relations, and in particular as relations between propositions and degrees of probability / belief / credence (e.g. Yalcin 2007, 2010; Lassiter 2015, 2017, cf. Farkas & Roelofsen 2017) rather than as denoting quantification over possible worlds (Kratzer 1981, 1991, and many others).

While in this paper we do not take a stand in the debates about whether this is the best analysis of modal adjectives (cf. Klecha 2012, Herburger & Rubinstein 2014, 2018), we will rely on the idea of graded epistemic modality and will integrate it with the view that assertion speech acts are compositionally active. In particular, we will suggest that the covert speech act operator *ASSERT* is itself gradable: It denotes a (credence) degree relation and is modifiable by overt and covert degree modifiers, manipulating the degree of credence towards the asserted proposition. We will show that such a view enables capturing newly observed parallels between overt and covert degree modification of adjectives at the propositional level and some overt and covert modifiers of assertion speech acts.

The paper is structured as follows: Section 1 reviews existing claims that Modal Adverbs (MADVs henceforth) differ from Modal Adjectives (MADJs henceforth) in being illocutionary modifiers which change the degree of credence in asserted propositions. Section 2 develops a compositional analysis of this view, where *ASSERT* denotes a

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credence degree relation modifiable by MADVs as overt degree modifiers, or by a covert *POS*. Section 3 examines how the new proposal can account for some newly observed parallels between degree modifications of adjectives and modifications of assertion speech acts. Section 4 concludes and examines some directions for further research.

1. Some background: Epistemic Modal Adverbs as illocutionary modifiers

An important motivation of our proposal is the behavior of MADVs, like *possibly / probably / necessarily,* etc. Many theories do not distinguish such expressions from their minimally contrasting modal adjectives (MADJs, henceforth) like *possible / probable / necessary* (e.g. Jackendoff, 1972; Jacobson, 1978; Kratzer, 1981; Yalcin 2010). However, other theories pointed out some interesting differences between them. For example, it has been pointed out that MADVs, unlike MADJs, have a strong speaker-oriented quality (cf. Jackendoff 1972), evident in e.g. the infelicity of B's reaction in (1b) vs. its felicity in (1a) (based on Nuyts, 2001), intuitively because with the MADV in (1b) it is clear that the opinion is A's. This is taken by Piñón 2006 to indicate that they are illocutionary, or speech act modifiers, which inherently integrate the point of the view of the assertion performer. In addition, Piñón 2006 points out that, similarly to other speech act modifiers, MADVs cannot be embedded in conditional antecedents, unlike their MADJs correlates (1c vs. 1d):

(1) a. A:It is probable that John is here. B: Whose opinion is this?
b. A:John is probably here B: #Whose opinion is this?
c. If it's possible/probable that John is here, I'll call the police
d. #/??If John is possibly/probably here, I'll call the police

If MADVs are indeed speech act modifiers, what is their semantic contribution as such modifiers? Following ideas in Piñón (2006), Wolf & Cohen (2009) and Wolf (2015) argue that MADVs change (lower / raise) the degree of speaker's subjective (Bayesian) probability (also known as credence) regarding the propositional content she asserts.[1]

To implement this idea, Wolf makes three specific claims: First, the speech act operator *ASSERT* involves a credence degree, (2a), where the speaker *x* asserts **φ** with a degree of credence *v*. Second, MADVs combine with *ASSERT* and change the degree of credence the assertion performer has towards the propositional content **φ**, (2b-d) for assertions with *possibly*, *probably* and *necessarily*, respectively. Third, the default credence degree in assertions is ≥ high, (2e) (cf. Davis et al 2011):[2]

(2) a. $A_x\ P(\boldsymbol{\varphi}) = v$ b. $A_x\ P(\boldsymbol{\varphi}) > 0$ c. $A_x\ P(\boldsymbol{\varphi}) > 0.5$
d. $A_x\ P(\boldsymbol{\varphi}) = 1$ e. $A_x\ P(\boldsymbol{\varphi}) \geq$ high

2. A compositional analysis

We follow the line of thought suggested in Wolf (2015) regarding assertions and MADVs. Notice, though, that as it is, this suggestion is still not compositional. For example, the

[1] In contrast Wolf (2015) takes MADJs to be propositional degree operators, involving non-Bayesian probability. This is a claim we put aside in this paper. Instead, we concentrate here on MADVs.
[2] Cf. a proposal in Farkas & Reolofsen 2017 regarding falling declarative. See section 4 for a comment.

connection between the semantics of assertions (2a) and the fact that their default credence degree is ≥ *high* (2e) is not derived in a systematic way. Similarly, the denotation of MADVs is not supplied, and it is not clear how to systematically derive their resulting effects (as in (2b-d)) from their meaning and the meaning of assertions.

We will now develop such a compositional analysis of assertions and of MADVs, and later on use it to account for some newly observed parallels between modification of assertions and modifications of gradable adjectives at the propositional level. To do that we will recast Wolf's (2015) suggestions in the following "general recipe" (3a-c):

(3) **A general recipe:** Take your favorite compositional entry for *ASSERT* and
   a. First move: Supplement this entry for *ASSERT* with a credence degree argument
   b. Second move: Take MADVs to function as overt degree modifiers over *ASSERT*
   c. Third move: Take apparently unmodified assertions to be modified by a covert *POS*

We call this a 'general recipe' since it is not dependent on any specific choice of an entry for *ASSERT*. To illustrate, we will take as a basis a dynamic entry for *ASSERT*, namely a simplified version of the entry in Krifka 2014 (cf. Thomas 2014, Becks 2016), as in (4):

(4) $[[\text{ASSERT}]]=\lambda p.\lambda c.\iota c'.\ c'=<c_{sp(eaker)}, c_{h(earer)}, c_t, C_w \cap \{w: \text{assert } (p)(c))\}>$

Given this entry *ASSERT* combines with a proposition *p* and a context c and yields the context c' (extending c) which differs from c only in that the CG is updated with Assert (p)(c), where Assert (p)(c) holds in w iff the speaker in c,[3] c_{sp} is committed to behave as though she believes in w that p at time c_t, and the hearer c_h is a witness to this commitment.

Applying now the first move in the 'general recipe' in (3a), i.e. supplementing this entry with a credence degree argument, we will end up with (5), where *ASSERT (p)(d)(c)* is true iff the output context c' differs from the input context c in that the speaker, c_{sp} is committed to behave as though she believes that *p* to a credence degree d, at the time c_t:

(5) $[[\text{ASSERT}]] = \lambda p.\lambda d.\lambda c.\ \iota c'.\ c'=<c_{sp}, c_t, C_w \cap \{w: d \in S_{cre.} \wedge \text{Assert } (p)\ (d)(c)\}>,$

Given such an entry, then, the second move in our 'general recipe' in (3b) will result in taking MADVs like *possibly* or *necessarily* to be illocutionary degree modifiers, which are similar to degree modifiers like *somewhat* or *completely* at the propositional level (as in *The glass is somewhat / half / completely full*). Following e.g. Kennedy & McNally 2005 (K&M henceforth), the latter have entries as in (6a,b), combining with a degree relation G (e.g. an adjective) and yielding predicates of individuals, type <e,t>. In a parallel way, we will model *possibly* and *necessarily* as in (7a,b), combining with a gradable speech act G and yielding a function from propositions and contexts to contexts :(<<s,t>, <c,c>>):

(6) a. $[[\text{completely}]]: \lambda G.\ \lambda x.\ \exists d = \text{MAX}\ (S_G) \wedge G(x)(d)$
   b. $[[\text{somewhat}]]: \lambda G.\ \lambda x.\ \exists d \in S_G\ d>0 \wedge G(x)(d)$

(7) a. $[[\text{necessarily}]]: \lambda G.\ \lambda p.\ \lambda c.\ \iota c'$: $c'=<c_{sp}, c_h, c_t, C_w \cap \{w: \text{MAX}(S_{cre}) \wedge G(p)(d)(c)\}>$

[3] Or more generally, the assertion performer (e.g. in embedded assertions).

b. [[possibly]]: λG. λp. λc. ιc': c'=<c_{sp}, c_h, c_t, C_w∩{w: ∃d d∈$S_{cre.}$ ∧ d>0 ∧ G(p)(d)(c)}>

E.g. asserting *John is necessarily / possibly a thief* yields the context c' which is like the input context c except that the speaker's degree of credence in "John is a thief" is maximal, i.e. 1 (for *necessarily*) or higher than 0 (for *possibly*).

What about assertions of *p* which do not seem to be modified by any modal adverb? Our analysis of *ASSERT* in (5) predicts that such assertions cannot stay unmodified, since they denote degree relations, type <<s,t>, <d, <c,c>>>. Instead, given the third suggested move in the 'general recipe', in (4c) above, we propose that such apparently unmodified assertions are actually modified by a **covert** degree modifier over speech acts, and more specifically, by a speech-act level version of *POS* (cf. von Stechow 1984, K&M) as in (8):

(8) [[POS]]: λG. λp.λc. ιc': c'=<c_{sp}, c_h, c_t, C_w∩{w: ∃d d∈S_{cre} ∧ d>standard(G,C) ∧ G(p)(d)(c)}>

Thus, for example, asserting *John is a thief* in a context c will have the LF *POS (ASSERT) (John is a thief) (c),* and will yield the context c' which is just like c except that the speaker in c is committed at the time c_t to behave as though her credence in "John is a thief" is at least as high as the standard of credence for assertions in the context c.

3. Some empirical advantages of the compositional analysis: Accounting for novel parallels between modifiers of assertions and degree modifiers of adjectives

3.1 Parallel # 1: Inability to be modified by degree modifiers

Haegeman (2009) and others observe that unlike MADJs like *probable,* the MADV *probably* cannot be modified by degree *how*. The same holds for *possible / possibly,* as can be seen in (10a) vs. (11a). We further observe similar differences in the ability / inability to be modified by other degree modifiers like *that, so, completely* etc. (9b-c) vs. (10b-c):

(9) a. **How** possible / probable is it that John is here?
b. It is (not) **so** / **that** possible / probable that John is here
c. That John is here is (not) **completely** possible / probable

(10) a. #**How** possibly / probably is John here?
b. #John is (not) **so** / **that** possibly / probably here
c. #John is **completely** possibly / probably here

How can these differences be explained? Haegeman (2009) assumes that minimally contrasting epistemic MADJs and MADVs are semantically equivalent, so her explanation is syntactic. In particular, she attributes the infelicity of the *How probably…*? question to a constraint on movement (e.g. pied piping) of MADVs, which is not found with MADJs.

However, while this can explain the infelicity of (10a) it does not seem to work for (10b-c) with degree *so, that, completely,* which do not involve any movement. Instead, we suggest an explanation for the infelicity of MADVs with degree modifiers based on our proposal that MADVs are themselves degree modifiers of *ASSERT*. In particular, we

propose that as such these MADVs are subject to similar constraints as parallel degree modifiers at the propositional level. E.g. the 'existential' MADV *possibly*, which given the entry in (7b) indicates a credence degree higher than zero, can be taken to parallel the degree modifier *somewhat* (in (6b)). As to *probably*, this can be taken to parallel the degree modifier *half*, indicating a 'midpoint' degree or perhaps *mostly*, indicating a degree which is higher than the midpoint of the scale. Now, similarly to *possibly / probably*, these degree modifiers are also not compatible with degree *how / so / that / completely* either:

(11) a. #**How** somewhat / half / mostly is the glass full?
b. #The glass is (not) **so** / **that** somewhat / half / mostly full
c. #The glass is **completely** somewhat / half / mostly full

Explaining the reasons for this infelicity is beyond the scope of this paper. Our point at this stage is that the fact that *possibly* and *probably* in (10a-c) are similarly unable to be modified by degree modifiers can be taken to support the view that they have a similar contribution to the compositional interpretation as these degree modifiers. Crucially, if the MADVs were identical to their MADJs counterparts *possible* and *probable,* this would yield the wrong prediction that they would be as freely modifiable (as seen in (9a-c)).[4]

3.2. Parallel # 2: Contextual dependency regarding the standard

Above we claimed that apparently unmodified assertions are actually modified by a covert *POS* operator, (similarly to adjectives in the 'positive form'), involving a degree of credence which is at least as high as the standard degree of credence in the context.

But what is this standard of credence? How is it exactly determined? And do we really want to claim that it is as contextually dependent as the standard with relative adjectives in the positive form, as in *John is tall / This is expensive* (see e.g. K&M)?

Our answer to the last question is negative. Instead, we argue that apparently unmodified assertions seem to be more similar in their contextual dependency to U(pper)-closed adjectives in the positive form. In particular, K&M suggest that, unlike relative (open scale) adjectives, the standard with Upper-closed adjectives, as in *The room is clean / The rod is straight*, is at the maximal endpoint of the scale. K&M themselves, however, point out that there are contexts in which such sentences are truthfully used although the degree of e.g. cleanness / straightness is lower than maximum.

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[4] Notice that we do not make the stronger claim that degree modifier can never be modified by other degree modifiers. Clearly, there are 'gradable' degree modifiers, like *much* and *-er,* which can be modified, as in *The glass is so much full / John is 6 inches taller than Bill* (thanks to Stephanie Solt (p.c.) for this comment). Another such degree modifier is *completely,* which seems to be more easily modified by other degree modifiers than *somewhat, mostly* and *half*. This is seen in many attested examples in Google (e.g. *Why is Beethoven's allegretto so completely captivating? / Her method might not succeed so completely*). (Notice that this modifiability of *completely* may mean that it does not indicate an endpoint degree on the relevant scale (as in (6a), from K&M), but one which is close to the endpoint. This requires further examination).

While explaining the reason for this difference between *completely* and *somewhat / mostly / half* is beyond the scope of this paper, we can now predict that if MADVs are indeed degree modifier, a MADV which parallels *completely*, e.g. *necessarily*, will be more easily modified by degree modifiers than the existential *possibly* and the midpoint *probably.* Preliminary results of a Google search seem to indicate that this prediction is borne out, though more research is needed here.

While there are still debates as to how this fact should be captured (cf. K&M, Burnett 2014 among others), it is important to note that the contextual dependency of upper-closed adjectives is still more constrained than that of open-scale adjectives, in two ways: First, unlike open scale adjectives here contextual variability is limited to contexts where precision / tolerance considerations are relevant (cf. Burnett 2014). In particular, higher degrees with e.g. *The room is clean* are acceptable with more precise / strict contexts (e.g. if uttered by a lab worker about the lab), and lower degrees are acceptable with less precise / more tolerant contexts (e.g. if uttered by a teenager about his room).

The second constraint is that, unlike the situation with relative adjectives, the standard with the positive form of Upper-closed adjectives cannot be too low. For example, *The room is clean / The rod is straight* will not be considered true if the room is 50% dirty, or if the rod is 45 degrees bent. I.e. the standard should still be at the upper part of the scale.

The crucial observation we want to make now is that, no matter how this constrained contextual variability of Upper-closed adjectives is eventually captured, apparently unmodified assertions behave similarly in these respects. To the extent that this is correct, this seems to support our proposal since this is what we would predict if assertions involve degrees on a credence scale, and if as e.g. Lassiter (2015, 2017) suggests, the credence scale is fully (hence, upper) closed (but cf. Klecha 2012).

Here are, then, the similarities between 'positive form' U-closed and apparently unmodified assertions: First, credence degree wrt the asserted proposition is not necessarily 1. This has been already pointed out in Potts (2006) and Davis et al. (2007), who bserve that speakers do not always assert propositions with complete certainty, Second, they point out that the subjective probability (what they call 'the quality threshold') corresponding to assertions is contextually dependent:

"The Gricean imperative would ….be that a speaker should confine himself to utterances such that PS([[U]]) = 1 .In practice, though, we are not nearly this strict. We can be lax on quality, as when we brainstorm new ideas or participate in bull sessions (Frankfurt,1986). Conversely, we can be quite strict on quality, as when we maneuver to land rockets on the moon or instruct our students (perhaps)….. Therefore, I propose that each context comes with a quality threshold Cτ. This is a numerical value in the real interval [0,1]" (Potts 2006, p. 208)

We adopt this view. But, crucially, we also observe that this contextual dependency wrt the certainty / quality threshold of asserted propositions is strikingly similar to the one pointed out above for Upper-closed adjectives, and different from the one found with relative adjectives in that it is constrained in two ways. The first constraint is that lower degrees of credence are found in less precise / more tolerant contexts (or where what is at stake is less important). E.g. in asserting *John stole the money* as part of a testimony in court, the assertion performer is expected to have higher credence in the asserted proposition than if this proposition is asserted as part of a casual conversation in a bar.

The second constraint is that the degree of credence a speaker has of the proposition she asserts cannot be too low, i.e. it is not anywhere between 0 and 1, but has to be at the upper part of the credence scale. This can now explain Wolf & Cohen's (2009) and Wolf's (2015) observation that with (apparently) unmodified assertions the default degree of credence is *high* / ≥ *high* (cf. Farkas & Roelofsen's 2017 similar claim about falling declaratives). Our proposal, then, can now help derive this fact from the upper-closeness of the credence scale with assertions *ASSERT* associates with, instead of stipulating it.

To conclude, the similarity of the constrained contextual dependency of credence standards in apparently unmodified assertions on the one hand, to standards of Upper-closed adjectives in the positive form on the other hand, supports a parallel compositional analysis of the two constructions, as the one suggested above.

3.3 Parallel #3: Degree modifiers functioning as response particles

In some cases, degree modifiers of adjectives at the propositional level can be used as response particles. One example of such a degree modifier is the Hebrew *le-gamrey*. This particle is the default intensifying degree modifier in Hebrew (translated as *completely / entirely / totally*). It felicitously modifies Upper-closed adjectives (cf. K&M) but is odd with relative (open scale) ones, and non-gradable expressions (13):

(13) ha-agartal le-gamrey male / #yakar / #nafal
"The vase (is) completely full / #expensive / #fell down"

However, *le-gamrey* can also function as a response particle (*le-gamery*$_{resp.}$ henceforth), where, crucially, it is felicitous even when responding to sentences with relative adjectives or non-gradable expressions (14). In this case it expresses an intensified response (paraphrased as "*I completely believe in what you asserted*"):

(14) A: ha-agartal male / yakar / nafal ("The vase (is) full / expensive / fell down)
B: le-gamery$_{resp}$ ("I completely agree with you / You are completely right")

One can, of course, try to give two lexical entries of *le-gamrey*. However, relying on the proposal in section 2 above we can arrive at a more unified direction. Adopting Krifka's 2013 view of response particles as anaphoric, for example, we can propose that *le-gamery*$_{resp}$ is an illocutionary degree modifier, anaphoric to a previous assertion, with an entry similar to that of the MADV *necessarily* in (8a) above. Given this analysis, *le-gamery*$_{resp}$ responds to an assertion of a proposition made in the previous discourse move and re-asserts it with a degree of credence which is raised to the maximum possible.

Take for example A's assertion of "The vase fell down" in (14), and B's response *le-gamrey*$_{resp}$. Given our analysis A's apparently unmodified assertion is modified by the *POS*, so it yields the context c' which differs from c in that A's degree of credence in the proposition is at least as high as the standard of credence in the context. Then B's response-*le-gamrey*$_{resp}$ - acts as a degree modifier of B's re-assertion of *The vase fell down* (from A's move) and yields a context c' which differ from c in that B's degree of credence in this proposition is now at the maximal endpoint of the credence scale.

The proposal above, then, allows us to keep a basically unified analysis of *le-gamrey* in both its uses. In both *le-gamrey* is a degree modifier, modifying a degree relation, and raising the degree to the maximum endpoint of the scale. The only differences concern the nature of the scale (a scale of e.g. fullness in (13) vs. a scale of credence in (14)) and what the modified degree relation relates (individuals and degrees in (13), or propositions,degrees in (14)).[5] Moreover, *le-gamrey*$_{resp}$ modifies *ASSERT*, which, as

[5]Thus, our proposal differs from Beltrama's 2018 for *totally*. Indeed, *le-gamrey*$_{resp}$ seems to only express complete credence, and does not have some of the other discourse effects observed by Beltrama for *totally*.

proposed above, is inherently gradable, and is associated with the fully closed credence scale (Lassiter (2017)). Thus, the proposal explains why it is felicitous even if the asserted proposition itself doesn't contain an upper-closed gradable expression (14). Finally, since the job of *le-gamrey*$_{\text{resp}}$ is to raise the credence of the previously asserted proposition to the maximum, we end up with a paraphrase "I completely believe in what you asserted".[6]

4. Conclusion and directions for future research

In this paper we pointed out several parallels between modified and apparently unmodified assertion speech acts on the one hand and degree-based constructions at the propositional level on the other hand. To capture these parallels, we proposed a compositional analysis of the assertion speech act operator *ASSERT* as gradable, denoting a (credence) degree relation, which is modifiable by overt MADVs as degree modifiers or by a covert *POS* when appearing in the 'positive form'. One general implication of the analysis is that the parallels between assertions and degree-based constructions seem to support the view that assertion speech acts are compositionally active and should be syntactically represented.

The proposal still leaves a number of open questions and directions for future research. First, what is, after all, the systematic connection between MADVs and MADJs (e.g. *possibly / possible*)? Second, how can we account for cases of embedded MADVs as in (15a-b) (cf. Krifka 2014 on embedded *ASSERT*), or in questions (15c)?[7]

(15) a. I believe that John is probably a thief
b. Every student who possibly saw the exam must walk out of the room
c. Did she possibly leave ? / Why did he possibly do that?

A third question is whether there are other kinds of degree modification of *ASSERT* besides MADVs and *POS*, e.g. some cases of metalinguistic / epistemic comparatives in various languages (cf. Kratzer & von Fintel, Herburger & Rubinstein 2014, 2018 Goncharov & Irimia 2017). A fourth one is whether there are motivation / advantage for modeling other speech acts (e.g. imperatives, exclamatives) as gradable and as varying in degrees as well.

A final family of questions[8] concerns how the boosting / lowering of credence degrees encoded by MADVs can be integrated with other - intonational or syntactic - means for manipulating levels of certainty / credence, as in rising declaratives, tags, etc. Such constructions were analyzed in e.g. Malamud & Stephenson 2015, Jeong 2018 as involving special discourse conventions (e.g. attributing commitment to the addressee

[6] In addition, the analysis can be used to explain why when responding to a negated sentence, *le-gamrey*$_{resp}$, can confirm a negative sentence, unlike the standard response particle *ken* ('yes'), which can confirm both the 'negative' or 'positive' sentence (see e.g. Farkas & Bruce 2010, Krifka 2013):

(i) A: *Dani lo balshan* *B: ken / le-gamrey*
Danny is not a linguist. Yes (he is / he isn't) / *le-gamery*$_{resp}$(~~he is~~ / he isn't)

Adopting Krifka's 2013 idea that *yes* can have access to either the propositional discourse referent introduced by the TP *John is a linguist* or by the TP *Neg John is a linguist*, we can assume that since given our proposal *le-gamrey*$_{resp}$ can only modify the previously made assertion in its entirety, it does not access the TP and hence it can only confirm the maximal proposition asserted by A, which in (iA) is only the negated one. (In this sense *le-gamrey*$_{resp}$ is similar to *right* under Krifka's 2013 analysis).

[7] A direction to explore here is adopting an analysis of questions as in Krifka 2015, where questions include a request for an assertion (commitment) of *p and* insert the MADV above this commitment operator.

[8] Thanks to Todd Snider for an insightful discussion concerning this family of questions.

instead of the speaker, turning commitment from actual to 'projected' etc.). A theory that our proposal is closer to in this sense is Farkas & Roelofsen 2017, which suggest to capture lower certainty in rising declaratives using a lower credence intervals than the one used with falling declaratives (in addition to other discourse moves). While these theories are not couched as constraints on the speech act operator *ASSERT*, as is done above, it will be interesting to examine whether the frameworks can be integrated. Are changes in degrees of credence encoded by intonational / syntactic means should be always modeled differently from those which are lexically encoded by e.g. MADVs? And what happens when the two types of means interact, as in (16b)?

(16) a. It's Ann? / It's Ann, is it? / It's Ann, isn't it?
b. It's probably Ann? / It's probably Ann, is it? / It's probably Ann, isn't it?

We leave all these, and other questions raised by the proposal above, to future research.

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