

Actuality entailments and free choice*

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Abstract

This paper concerns connections between Actuality Entailments (AEs), negation, and Free Choice inferences (FC). The main empirical foci of the paper are (i) that negated AE-licensors entail the negation of the AE, and (ii) that AE-licensors do not give rise to FC inferences when they embed disjunctions. I derive challenges from the first finding to theories of AEs, and offer in conclusion a stipulative revision of Homer’s (2011) aspect-shift account of them. I then derive challenges from the second finding to theories of FC. I note first the consequences of the finding to implicature-theories of FC, where the first finding plays a crucial role, and discuss the assumptions needed to explain the AE/FC interaction. I also discuss how the interaction challenges theories of FC that derive the inference from the composition of modals with disjunctive prejacentes.

1 Introduction

Actuality Entailments (AEs) are inferences from premises that appear to be modal, like (1a), but their content is that the modality is effectuated in the evaluation world – (1b).

- (1) a. Pierre a dû prendre le train
 Pierre had.to.PFV take the train
 ‘Pierre had to take the train’
 b. *Inference*: Pierre took the train

AEs are surprising; if we assume that modals attribute their propositional argument to potentially non-actual worlds, something must be special to AE-licensors that leads to the inference of actuality.

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Whatever that special feature is, its effect is complex, and it interacts in nontrivial ways with other phenomena of theoretical interest. In this paper I expand on these points by focusing on three generalizations. They are AE-MODALITY, ANTI-AE, and NO-FC:

- (i) **AE-MODALITY:**
 An AE-licenser preserves the modality associated with its non-AE-licensing counterpart.
 (In notation that will be introduced shortly, $\check{\square}/\check{\diamond}p \models \square/\diamond p$)
- (ii) **ANTI-AE:**
 A negated AE-licenser gives rise to what we will call an *anti*-AE, that is, an inference that the relevant possibility/obligation was not realized.
 ($\neg\check{\square}/\check{\diamond}p \models \neg p$)
- (iii) **NO-FC:**
 An AE-licenser does not generate Free Choice inferences (FC) when its prejacent is disjunctive, in contrast to its non-AE-licensing counterparts, which do.
 ($\check{\square}/\check{\diamond}(p \vee q) \not\models \diamond p \& \diamond q$)

A correct theory of AEs must predict AE-MODALITY and ANTI-AE simultaneously. I will talk more about the difficulty of this desideratum when I review some of the existing accounts of AE-licensing. The third generalization, NO-FC, will inform a different discussion, one pertaining not to theories of AE-licensing, but to theories of FC disjunction. Here I look at two broad views. The first derives FC as a scalar implicature (SI, e.g. Kratzer and Shimoyama 2002, Fox 2007); the second as a product of the semantic composition of modality with disjunction (e.g. Simons 2005, Aloni 2007). The central question is whether the two views can predict NO-FC. For SI-theories the answer will depend crucially on ANTI-AE, given the essential role of negation (or negation-like inferences) in implicature generation. I will claim that NO-FC is predicted on theories of this kind, given ANTI-AE, provided that certain auxiliary assumptions are put in place. I will also claim that AE-MODALITY leads us to expect FC, incorrectly, if we adopt a view that generates the inference from the literal meanings of disjunction and modality. Nevertheless, I will present a stipulative way of getting around the problem, and leave it to future work to develop a more principled solution.

The discussion is organized as follows. In Section 2 I introduce AEs and demonstrate AE-MODALITY, ANTI-AE, and NO-FC. In Section 3 I discuss the challenges that AE-MODALITY and ANTI-AE jointly present, using four (very briefly described) accounts of AEs as examples. In Section 4 I discuss the relevance of the two findings to NO-FC, first from the perspective of SI-theories of FC, then from the perspective of semantic accounts of the inference.

2 Actuality Entailments

2.1 Background

The first report of Actuality Entailments came in Bhatt 1999, who noticed that in Hindi (among several other languages) perfective-marked ability modals imply that the ability was realized, while imperfective-marked ability modals do not (perfective and imperfective marking is abbreviated as PFV/IMP).¹ This asymmetry is shown below in Hindi (2) and Greek (3): PFV-ability (but not IMP-ability) is intuitively contradicted by subsequent denial of actuality.

- (2) a. Iti vimaan ur.aa sak-aa (#lekin us-ne vimaan nahĩ ur.aa-yaa)
Iti airplane fly able-PFV (but he-erg air-ship NEG fly-PFV)
'Iti could fly the airplane, but he didn't fly the airplane.'
- b. Iti vimaan ur.aa sak-taa thaa (lekin vo vimaan nahĩ ur.aa-taa thaa)
Iti airplane fly able-IMP was (but he airplane NEG fly-IMP was)
'Iti is/was able to fly airplanes but he doesn't/didn't fly airplanes.'
- (3) a. Boresa na tu miliso (#ala ðen tu milisa)
able.PAST.PFV.1sg NA him talk-PFV.1sg but NEG him talk.pst-PFV
'I could talk to him, but I didn't'
- b. Borusa na sikoso afto to trapezi ala ðen to sikosa
able.PAST.IMP.1sg NA lift-PFV.1sg this the table but NEG it lift-PFV
'I could lift this table, but I didn't'

On a simple semantic proposal within the Kratzerian tradition², these data present a challenge; one may reasonably analyze verbs of ability similarly to other root modals, namely as operators that make quantificational claims over sets of accessible possible worlds. In the case of ability the accessibility relation may be 'circumstantial': to say that John is able to fly is to say that the given laws of nature, combined with what is assumed about John's properties, do not rule out the possibility of him flying. But if quantification over *hypothetical* worlds underlies the meaning of ability, why does PFV-marking generate the inference of actuality?

The AE-paradigm became more complex when Hacquard (2006, 2009) and Bor-gonovo and Cummins (2007) noted that AEs are not limited to verbs of ability, but appear to be licensed by root modals of varying flavors and quantificational force. Below I show examples from French, and also from Brazilian Portuguese (BP) where both the existential modal **poder**, and the universal modal **ter que**, are unambiguously deontic.³

¹Though see von Wright 1963.

²Kratzer 1981, Kratzer 1991.

³The BP judgements vary: some speakers do not agree that PFV-marked **poder/ter que** license AEs. This, however, is not the main concern of the paper. We are interested in the connection between AEs, anti-AEs, and FC. As far as I can see, speakers who agree with the AE-judgements also agree with the anti-AE judgements (shown in section 2.3), and agree that FC inferences are absent (section 2.4); speakers who disagree on AEs seem to simultaneously disagree with the anti-AE/FC judgements. The judgements reported here are from speakers of a rural dialect of BP, spoken in the Brazilian state of Paraná.

- (4) Jane (#a pu)/(✓pouvait) aller chez sa tante (selon les ordres de son Jane can.(#PFV)/(✓IMP) go house her aunt (per the orders of her père), mais n' y est pas allée. father) but NE there has NEG gone
'Per her father's orders, Jane could go to her aunt's house, but didn't'
- (5) Pour aller à Londres, Jane (#a dû)/(✓devait) prendre le train, mais To go to London, Jane had.to.(#PFV)/(✓IMP) take the train but elle a pris l' avion she has taken the plane
'To go to London, Jane had to take the train, but she took the plane'
- (6) Ele (#pôde)/(✓podia) visitar seu amigo, mas ele não o visitou He can.(#PFV)/(✓IMP) visit his friend but he NEG him visit.PFV
'He was allowed to visit his friend, but he didn't'
- (7) Ele (#teve)/(✓tinha) que ir no dentista, mas ele não foi He had.to.(#PFV)/(✓IMP) go to-the dentist but he NEG go.PFV
'He had to go to the dentist but he didn't'

(4-7) show the same pattern observed by Bhatt, but with existential and universal *deontic* modals. So whatever the correct analysis of AEs turns out to be, it cannot be specific to modals of ability.

Let me now pause to explain the notation I will use in the rest of this paper. I will write $\check{\diamond}/\check{\square}$ when I want to refer to modals that license AEs, and the familiar \diamond/\square when I want to refer to modals that do not. That is:

- (8) a. $\check{\diamond}/\check{\square}p \models p$
b. $\diamond/\square p \not\models p$

The examples seen so far suggest that the symbol pairs $\check{\diamond}/\check{\square}$ and \diamond/\square correspond roughly to PFV- and IMP-marked modals, but this is not a perfect match, as we will see later. Let me add that \diamond/\square will also be used to write metalinguistic modal conditions. The symbols will be disambiguated where necessary.

The next three subsections provide evidence for AE-MODALITY, ANTI-AE, and NO-FC. The properties are summarized using our current notation in (i'-iii') — note that \diamond/\square represent metalinguistic modal truth conditions here.

- (i') AE-MODALITY: $\check{\diamond}/\check{\square}p \models \diamond/\square p$
(ii') ANTI-AE: $\neg\check{\diamond}/\check{\square}p \models \neg p$
(iii') NO-FC: $\check{\diamond}/\check{\square}(p \vee q) \not\models \diamond p \ \& \ \diamond q$

2.2 AE-MODALITY: The modal inferences of AE-licensors

It is tempting at first glance to conclude from (8a) that AE-licensors simply assert the content of their prejacent; they otherwise say nothing about permission, obligation, etc. But there is evidence that this is not the case. For brevity I will offer only one kind of example to show this, and point interested readers to Hacquard 2009, Section 4.2, for further discussion.

Consider (9-10).

- (9) a. Il a pu prendre le train, (✓mais il aurait aussi pu ne
He can.PFV take the train but he have.cond.PAST also can NE
pas le prendre).
NEG it take
'He could take the train, but he could have also not taken it'
- b. Il a dû prendre le train, (#mais il aurait aussi pu ne
He must.PFV take the train but he have.cond.PAST also can NE
pas le prendre).
NEG it take
'He had to take the train, but he could have also not taken it'⁴
- (10) a. Ele pôde viajar, (✓mas também podia não ter viajado).
He can.PFV travel (but also can.IMP NEG have traveled)
'He could travel, but could have also not travelled'
- b. Ele teve que viajar, (#mas também podia não ter viajado).
He had.to.PFV travel (but also can.IMP NEG have traveled)

The (a) examples in (9-10) are of the form $\check{\diamond}p \& \diamond\neg p$, and they are both intuitively consistent; the (b) examples are of the form $\check{\square}p \& \diamond\neg p$, and they are intuitively inconsistent. This contrast is expected if $\check{\diamond}/\check{\square}$ generated existential/universal modal inferences of their own, and would not be expected if they did not. Moreover, the fact that in BP the expressions **pôde** and **teve que** are unambiguously deontic, in parallel to the non-AE-licensors **podia** and **tinha que**, demonstrates that AE-licensors make reference in their semantics to a specific modal flavor. This too would be unexpected on a semantics based solely on the evaluation world.

We conclude that AE-licensors give rise to modal inferences in addition to the AE.⁵

$$(11) \quad \check{\diamond}/\check{\square}p \models \diamond/\square p \quad (\text{AE-MODALITY})$$

2.3 ANTI-AE

Having now seen that AE-licensors generate both an actuality inference and a modal inference, we might ask whether their semantics can be characterized as conjoining the two, that is, whether $\check{\diamond}/\check{\square}p$ asserts $p \& \diamond/\square p$. Evidence that this is not the case comes from constructions where AE-licensors are negated. Hacquard (2009), for example, notes that negated AE-licensors robustly suggest that their prejacent is false in the evaluation world, and in addition, that the *modality* is false as well. The first of these findings is shown for French and BP in (12-13).

⁴Judgements due to Guillaume Thomas (p.c.).

⁵Bhatt (1999), building on Thalberg 1969, claimed that PFV-ability does not contribute any claim about ability. I do not review Bhatt's argument here. For details, see his section 5.3 and Hacquard section 4.2.

- (12) a. Alors qu’ il (#n’a pas pu)/(✓ne pouvait pas) rendre visite à son ami,
 while he (#NEG can.PFV)/(✓NEG can.IMP) visit his friend
 il lui a rendu visite
 he him visited
- b. Les Alliés (#n’ont pas dû)/(✓ne devaient pas) bombarder Nagasaki
 the Allies (#NEG had.to.PFV)/(✓NEG had.to.IMP) bomb Nagasaki
 ‘The allies did not have to bomb Nagasaki’
- (13) a. Ele não (#pôde)/(✓podia) visitar seu amigo, mas ele visitou ele
 He NEG can.(#PFV)/(✓IMP) visit his friend but he visited him
 ‘He was not allowed to visit his friend, but he visited him’
- b. Ele não (#teve)/(✓tinha) que ir no dentista, mas ele foi
 He NEG had.(#PFV)/(✓IMP) to go to-the dentist but he went
 ‘He did not have to go to the dentist, but he went’

The versions of (12-13) with the (negated) AE-licensors are infelicitous. This would not be expected if their truth conditions were conjunctive, because the negations of those conjunctive conditions would be met if either conjunct (the actual claim or the modal claim) is false. In fact the sentences (with the AE-licensors) seem to entail the negation of actuality, hence their status.

It is worth noting that this pattern is not specific to cases where the AE-licensor appears under overt negation. In (14), for example, the BP particle *só* ‘only’ embeds $\check{\diamond}/\check{\square}$, but its exclusive component produces anti-AEs for the salient (negated) contextual alternatives. And (15) shows that the verb *duvidar* (‘doubt’) entails doubt about *actuality* when it embeds an AE-licensor, but not when it embeds a non-AE-licensor.

- (14) a. Só a Lu pôde comer torta, #mas a Pri comeu torta também
 only Lu could-PFV eat cake but Pri ate cake also
 ‘Only Lu was allowed to eat cake, but Pri ate cake also’
- b. Só a Lu teve que fazer a prova, #mas a Pri fez a prova também
 only Lu had.to-PFV do the test but Pri did the test also
 ‘Only Lu had to do the test, but Pri did the test also’
- (15) a. Ele foi na festa, mas eu duvido que ele (#pôde)/(✓podia) ir
 He went to.the party but I doubt that he could.(#PFV)/(✓IMP) go
 ‘He went to the party, but I doubt that he was allowed to go’
- b. Ele fez a prova, mas eu duvido que ele (#teve)/(✓tinha) que
 He did the test but I doubt that he had.to.(#PFV)/(✓IMP) to
 fazer
 do
 ‘He did the test, but I doubt that he had to’

We learn so far, then, that $\neg\check{\square}/\check{\diamond}p$ entails $\neg p$. The finding is not trivial, because in the case of deontic modality the truth or falsity of the prejacent is independent of whether it is permitted or required; $\neg p$ cannot be derived from the negation of the modal claim. We will revisit this point briefly in Section 3.

Let us now turn to the second issue, of whether $\neg\check{\square}/\check{\diamond}p$ entails $\neg\diamond/\square p$. Here the facts are more subtle. We will discuss them briefly in the remainder of this section, but it should be noted from the start that this inference pattern, though crucial for any complete account of AEs, is not relevant to the main concerns of this paper. The AE-FC interaction, as we will see later, depends either on ANTI-AE (according to the SI-based view of FC) or on AE-MODALITY (according to what I called the ‘semantic’ theories of FC). On neither kind of account is the status of modal inferences of *negated* AE-licensors relevant. The issue is brought up here in the interest of completeness.

Hacquard has claimed that, while negated possibility AE-licensors suggest the falsity of the relevant possibility claim, as (16a) does, the inference appears to be defeasible, as is shown by the felicity of the continuation in (16b).⁶

- (16) a. Darcy n’a pas pu s’enfuir ‘Darcy wasn’t able to escape.’
 Darcy not can-pfv escape
- b. Darcy n’a pas pu s’enfuir. En fait, il en avait les moyens, mais il
 Darcy not can-pfv escape In fact he of.it had the means, but he
 n’a même pas essayé
 NE even neg try-pfv
 ‘Darcy wasn’t able to escape. In fact, he had the means to do so, but he
 didn’t even try.’

If Hacquard’s characterization is right, then the correct analysis of AEs must not only make $\check{\diamond}/\check{\square}p$ entail both p and $\diamond/\square p$ —the AE and AE-MODALITY—but also make $\neg\check{\diamond}/\check{\square}p$ entail $\neg p$ (the ANTI-AE) without entailing $\neg\diamond/\square p$. There is, however, reason to believe that (16b) is not due to any inherent weakness in the negative modal inference of $\neg\check{\diamond}p$, but to a difference in the modal bases that are invoked by the expressions **n’a pas pu** (‘could.PFV not’) and **avait les moyens** (‘had the means’).⁷ To see this, consider (17), where the AE-licensor from (16b) is replaced with the (present-tensed) non-AE-licensor **ne peut pas** (‘cannot’).

- (17) Darcy ne peut pas s’enfuir. En fait, il en a les moyens, mais il n’essaye
 Darcy NE can not escape In fact he of-it has the means but he NE-tries
 même pas
 even not
 ‘Darcy was not able to escape. In fact he had the means but did not even try’

(17) is consistent, and its consistency suggests that the negated possibility modal in its first half is not about Darcy’s means; if it were, the second half of the utterance would contradict the first. But if it is possible in (17) for **ne peut pas** to reference a different modal base from **a les moyens**, there is no reason why the same can’t happen in (16b). So it may be true after all that negated AE-licensors *do* entail the negation of the relevant modality (in addition to generating the anti-AE), and that the reason why (16b) is consistent has to do with a shift in modal base, in parallel to cases like (17).

⁶See Hacquard 2009 Section 4.1.

⁷I owe this observation to an anonymous JoS reviewer.

The summary provided below is based on this conclusion. Negated AE-licensors have both a negative modal and a negative actual inference (the latter being the anti-AE). As I said, however, whether Hacquard is right that the inference from $\neg\check{\diamond}/\check{\square}p$ to $\neg\check{\diamond}/\square p$ is defeasible will not matter when we talk about theories of FC.

$$(18) \quad \begin{array}{l} \neg\check{\diamond}/\check{\square}p \models \neg p \\ \neg\check{\diamond}/\check{\square}p \models \neg\check{\diamond}/\square p \end{array} \quad (\text{ANTI-AE})$$

2.4 NO-FC

We now turn to our third and final property of AE-licensors: their failure to generate Free Choice inferences when they embed disjunctive prejacent. This, as is shown in the BP examples below, puts AE-licensors in sharp contrast to their non-AE-licensing forms, which do generate FC.⁸

(19) Ele pôde/teve que aprender inglês ou francês. #Então ele podia
 he could/had-to.PFV learn English or French Therefore he could.IMP
 aprender inglês, e ele podia aprender francês. $\check{\diamond}/\check{\square}(p \vee q) \not\models \check{\diamond}p \wedge \check{\diamond}q$
 learn English and he could.IMP learn French

(20) Ele podia/tinha que aprender inglês ou francês. ✓Então ele podia
 he could/had-to.IMP learn English or French Therefore he could.IMP
 aprender inglês, e ele podia aprender francês
 learn English and he could.IMP learn French
 ‘He could/had-to learn English or French. Therefore he had permission to
 learn English, and he had permission to learn French’ $\diamond/\square(p \vee q) \models \diamond p \wedge \diamond q$

A related test that shows a similar contrast comes from Truckenbrodt 2019. Truckenbrodt points out that **and**, but not **or**, can be used in what he calls a “list” (21a,b), unless the list follows a modal expression like **can** or **has permission to** (21c). The following examples are based on Truckenbrodt’s original (German) examples:

- (21) a. Mary brought the following: an apple, a pear, and a banana.
 b. ??Mary brought the following: an apple, a pear, or a banana.
 c. Mary could / had permission to bring the following: an apple, a pear, or a banana.

And in BP and French we find a similar contrast, between non-AE-licensing modals and AE-licensing ones: the former can introduce disjunctive lists; the latter cannot:⁹

- (22) a. o João podia comer o seguinte: uma maçã, uma pera, ou uma
 João could.IMP eat the following: an apple, a pear, or a
 banana.
 banana

⁸To my knowledge, this property of AE-licensors has not been observed or discussed before. A related point was made by Rajesh Bhatt about the incompatibility of Hindi FCI items with PFV-marked ability modals, but not extended to disjunction (see Bhatt 2006: 172).

⁹The French examples are modifications of Truckenbrodt’s test. They were suggested to me by Paloma Jeretič.

- b. ??o João pôde comer o seguinte: uma maçã, uma pera, ou uma banana.
 João could.**PFV** eat the following: an apple, a pear, or a banana.
 banana
 ‘João could eat the following: an apple, a pear, or a banana’
- (23) a. ✓Je vais te dire ce que Marie pouvait manger: une pomme, une poire ou une orange.
 I go you tell that which Marie could.**IMP** eat: an apple, a pear or an orange.
 ‘I will tell you what Marie could eat: an apple, a pear, or an orange’
- b. ??Je vais te dire ce que Marie a pu manger: une pomme, une poire ou une orange.
 I go you tell that which Marie could.**PFV** eat: an apple, a pear or an orange.
 ‘I will tell you what Marie could eat: an apple, a pear, or an orange’

Before proceeding, some points of clarification are in order. First, in (19) the intended (and reportedly faulty) inference is from a PFV-marked premise to an IMP-marked conclusion. The reader may wonder why we do not compare the valid IMP-to-IMP discourse in (20) to a PFV-to-PFV analog, instead of the PFV-to-IMP instance in (19). The reason is that (19) tests whether the PFV premise licenses a conclusion of *FC permission*. If we were to change it to include a PFV-marked conclusion, the result would test whether the premise leads to a conclusion of *actuality*.

Second, the correlation that we are interested in is not between PFV-marking and the availability of *FC*. Rather, it is between *AE-licensing* and *FC*. This is important, because there are PFV-marked modal constructions that do not license *AEs*, like PFV-marked epistemic modals and expressions of the form “have permission to VP”. As it turns out, these non-*AE*-licensors *do* give rise to *FC* when they embed disjunctions. I show *BP* examples of the latter kind below — (26) uses the Truckenbrodt/Jeretič test introduced above:

- (24) Ele teve permissão pra visitar a Ana, ✓mas ele não visitou ela
 He had.**PFV** permission to visit Ana but he *NEG* visited her
 ‘He had permission to visit João, but he didn’t visit him’ (no *AE*)
- (25) Ele teve permissão pra visitar a Lu ou a Ana. ✓Então ele teve
 He had.**PFV** permission to visit Lu or Ana Therefore he had.**PFV**
 permissão pra visitar a L, e ele teve permissão pra visitar a A.
 permission to visit L and he had.**PFV** permission to visit A
 ‘He had permission to visit Lu or Ana. Therefore he had permission to visit L, and he had permission to visit A’ (✓*FC*)
- (26) a. ✓o João teve permissão para comer o seguinte: uma maçã, uma pera, ou uma banana
 o João had.**PFV** permission to eat the following: an apple, a pear, or a banana
 banana
 ‘João had permission to eat the following: an apple, a pear, or a banana’

- b. \checkmark Deixa eu te falar o que o João teve permissão para comer: uma
 Let me you tell what João had.PFV permission to eat: an
 maçã, uma pera, ou uma banana
 apple, a pear, or a banana
 ‘Let me tell you what João had permission to eat: an apple, a pear, or a
 banana’

Third, though \checkmark/\checkmark do not license FC, they are compatible with FC scenarios. Sentence (27), taken from (19) above, can be uttered if the speaker knows that João had a choice between English/French, e.g. to get by in a place like Canada, but learned just one of the two. The same is true of the French (28).

- (27) O João teve que aprender inglês ou francês
 João had-to.PFV learn English or French
- (28) Il a dû apprendre l’anglais ou le français
 he had-to.PFV learn English or French

The compatibility of (27-28) with FC contexts shows that disjunction can take semantic scope below an AE-licenser. If it could not, a sentence of the form $\checkmark(p \vee q)$ would be synonymous with $\checkmark p \vee \checkmark q$, and would mean that p (or q) was realized and *required*, which makes the construction false in scenarios where neither p nor q is by itself a necessity.¹⁰

We now come to our final summary of the data: (i) AE-licensers generate AEs in addition to a modal inference; (ii) their negations generate anti-AEs, and negative modal inferences; and (iii) when they embed disjunctions, AE-licensers do not generate FC but are compatible with it.

- (29) a. $\checkmark/\checkmark p \models p$, $\diamond/\square p$ (AE, AE-MODALITY)
 b. $\neg\checkmark/\checkmark p \models \neg p$ (ANTI-AE)
 $\neg\checkmark/\checkmark p \models \neg\diamond/\square p$
 c. $\checkmark/\checkmark(p \vee q) \not\models \text{FC}$ (NO-FC)
 $\not\models \neg\text{FC}$

For reference, the behavior of non-AE-licensers in these respects is schematized below.

- (30) a. $\diamond/\square p \not\models p$
 b. $\neg\diamond/\square p \not\models \neg p$
 c. $\diamond/\square(p \vee q) \models \text{FC}$

¹⁰This fact is made clearer when we compare two variants of the French **soit-soit** disjunction, which is said to overtly mark scope. In the scenario described above where either disjunct is possible but where one was realized, (1a) is true but (1b) is false. The disjunctive preajcent in (27) and (28) gives rise to a reading like (1a), not (1b).

- (1) a. Il a dû apprendre **soit** l’anglais **soit** le français
 he had-to.PFV learn either English or French
 b. **Soit** il a dû apprendre l’anglais **soit** le français

3 Significance of AE-MODALITY and ANTI-AE for theories of AEs

In this section I briefly demonstrate the challenge posed by AE-MODALITY and ANTI-AE to theories of AE-licensing. The theories I will consider are Bhatt’s (1999), Borgonovo and Cummins’s (2007), Hacquard’s (2009), and Homer’s (2011).

Bhatt treats ability verbs as implicative verbs (drawing on Karttunen 1971 and Karttunen and Peters 1979), and because implicative verbs are, at least on these accounts, assertorically equivalent to their prejacent, he predicts AEs as well as ANTI-AE.¹¹ But as Hacquard has pointed out, the account is not straightforwardly applicable to non-abilitative modals, putting in question its readiness in handling AE-MODALITY.¹²

Borgonovo and Cummins propose to derive AEs by narrowing the modal base of AE-licensors, abilitative and otherwise, to contain only the evaluation world. But this trivialization, though it predicts AEs and ANTI-AE, strips AE-licensors of their modality entirely, thus failing AE-MODALITY.

Hacquard predicts AE-MODALITY because she treats AE-licensors as bona fide modals. To derive AEs, she proposes a principle that she calls the Preservation of Event Descriptions (PED). The principle keeps event(uality) properties constant across worlds that are accessible to one another. So, if an eventuality e in w is a p -eventuality in some accessible world w' , then by the PED e is a p -eventuality in w itself. This generates AEs because, to Hacquard, PFV-marked modals introduce events in the evaluation world, and assigns them descriptions in accessible worlds. The PED guarantees that such events inherit whatever descriptions they take in accessible worlds. There is much more detail in Hacquard’s proposal than we can do justice to here, crucially including detail that prevents IMP-marked modals from licensing AEs. But to keep the discussion short we will focus only on the challenge that ANTI-AE presents to her account. Given that AE-licensors assert the existence of actual events, and assigns them descriptions in accessible worlds, it follows that when an AE-licenser is negated, the resulting semantics will deny the existence of such actual events. A negated form $\neg\check{\diamond}p$ should be true in w iff no event in w is *accessibly* a p -event, i.e. an event of p in any accessible worlds from w . If the accessibility relation is reflexive, as is arguably the case for abilitative/circumstantial modals, anti-AEs result straightforwardly; if there are no p -events in any of the worlds accessible from w , and if w is itself one of those accessible worlds, then there will be no p -events in w (see Hacquard 2009, Section 4.1). But this ploy will not generate anti-AEs when a *deontic* AE-licenser is negated, because deontic accessibility is not reflexive. In this case, $\neg\check{\diamond}p$ will deny the existence of events that are (deontically) *accessibly- p* events, but this does not preclude the existence of *actual* p -events; lack of permission/obligation does not entail lack of actuality.¹³

¹¹This classic picture of implicative verbs was questioned recently in Baglini and Francez 2016.

¹²A more detailed critique of Bhatt’s account is beyond the scope of this paper. Interested readers are referred to Hacquard 2009 and Hacquard 2014.

¹³The issue is more complicated than this, and ultimately rests on whether one assumes the domain of events to be constant across worlds. To Hacquard the assumption has to be that the domain is

Finally, Homer (2011) builds on findings from Mari and Martin 2007 and Bary 2009 and proposes that AE-licensing results from a mechanism of aspect-shift. His implementation makes use of a covert shifting operator ACT, which co-occurs with modals (and other stative verbs) in certain conditions, and generates a derived predicate that conjoins the modal VP with its prejacent. An entry for ACT, simplified from Homer, is shown in (31).¹⁴

$$(31) \quad \llbracket \text{ACT} [\diamond \text{VP}] \rrbracket \\ = [\lambda e . \llbracket \text{VP} \rrbracket(e) \ \& \ \exists e'(\tau(e) \sqsubseteq \tau(e') \ \& \ \diamond(\llbracket \text{VP} \rrbracket(e')))]$$

By its definition, (31) generates both the AE and the modal inference, but because of its conjunctive truth conditions, it is clear that the entry cannot account for ANTI-AE. It should be noted, however, that Homer need not commit to the specific conjunctive conditions in (31) in his attempt to relate AE-licensing to aspect shift. A revision that would capture both AEs and anti-AEs is the following:

$$(32) \quad \llbracket \text{ACT} [\diamond \text{VP}] \rrbracket \\ = [\lambda e : \llbracket \text{VP} \rrbracket(e) \leftrightarrow \exists e'(\tau(e) \sqsubseteq \tau(e') \ \& \ \diamond(\llbracket \text{VP} \rrbracket(e')))] . \llbracket \text{VP} \rrbracket(e)]$$

Here, unlike in (31), ACT in effect *asserts* the (non-modal) VP, but presupposes a biconditional connection between that VP and the relevant modality: $\llbracket \text{ACT} [\diamond \text{VP}] \rrbracket$ is defined for an eventuality e only if e 's satisfaction of $\llbracket \text{VP} \rrbracket$ is tied to the existence of another contemporaneous eventuality, one that satisfies $\llbracket \text{VP} \rrbracket$ in some/all accessible worlds, depending on the force/ flavor of the given modal. Of the events in its domain, $\llbracket \text{ACT} [\diamond \text{VP}] \rrbracket$ maps to True those events that satisfy $\llbracket \text{VP} \rrbracket$, and to False those events that do not. It follows from (32) that both the AE and the modality of its licenser will be entailed when the licenser is asserted, and that their negations will be entailed when the AE-licenser appears under negation.¹⁵ This seems to work, but its plausibility *qua* a description of an aspect-shift mechanism must be left to future work.

Having demonstrated the challenge presented by AE-MODALITY and ANTI-AE to theories of AE-licensing, we now consider the relevance of the two desiderata to theories of FC disjunction, crucially given the NO-FC property of AE-licensers.

4 AEs and Free Choice disjunctions

The problem of free-choice disjunction is well known. Sentences where a possibility modal embeds a disjunction are intuitively understood to imply the relevant possibility for each disjunct.

not constant, so that events are allowed to exist in some worlds without existing in others. This is the crucial detail that stops AEs from arising for IMP-marked modals. For reasons of space we cannot elaborate on this point (see Hacquard 2009 Section 3.2.2). We simply note that, with this assumption in place, it becomes possible for $\neg \diamond p$ to hold in a world, and for there to simultaneously be a p -event in that same world. This is why the proposal fails ANTI-AE.

¹⁴In Homer's original (compositional) entry, ACT is assumed to accompany an unpronounced VP-“pronoun”, which (in AE examples) is coindexed with the embedded VP. ACT generates the AE by conjoining the pronoun with the modal VP.

¹⁵The case of negation is a little complicated, since it requires additional assumptions about how presuppositions project across (negated) existential quantification. On this, see (a.o.) Heim 1983, Beaver 2001, Schlenker 2008, George 2008, Charlow 2009, Fox 2012, and Sudo 2012.

(33) John is allowed to eat cake or ice cream

Inference: John is allowed to eat cake *and* John is allowed to eat ice cream

The FC inference is surprising if we assume a boolean definition of disjunction, and a representation of possibility as existential quantification over accessible worlds. On such assumptions we expect (33), more generally $\diamond(p \vee q)$, to be true in a scenario where John is allowed to eat cake but not ice cream ($\diamond p \& \neg \diamond q$), because $\diamond p$ alone is sufficient to make the premise $\diamond(p \vee q)$ true. Why, then, is the modality felt to be *distributed* among the disjuncts?

One kind of answer derives FC as a scalar implicature. Another derives it from the semantic composition of disjunction and modals, using a non-boolean semantics of disjunction, and a non-existential representation of possibility. We will discuss these two kinds of theories in light of the NO-FC property of AE-licensors, given also AE-MODALITY and ANTI-AE.

4.1 FC as a scalar implicature

In this section I show with minimal detail how FC is derived as an SI, and show that the relevant mechanisms are predicted not to produce FC with AE-licensing modals. This is done in Sections 4.1.1 and 4.1.2, respectively. In Section 4.1.3 I discuss two assumptions that the prediction depends on.

To be concrete, I will adopt the perspectives of Alonso-Ovalle (2005) and Klinedinst (2007) when dealing with necessity modals, and Fox (2007) when dealing with possibility modals.¹⁶ The first two views derive FC by exhaustifying $\Box(p \vee q)$ relative to the alternatives $\{\Box p, \Box q, \Box(p \wedge q)\}$; the third view derives FC from *recursively* exhaustifying $\diamond(p \vee q)$, that is, from exhaustifying $\text{Exh}(\diamond(p \vee q))$ relative to the alternatives $\{\text{Exh}(\diamond p), \text{Exh}(\diamond q), \text{Exh}(\diamond(p \wedge q))\}$.

These accounts, as I will now show, predict the absence of FC if the form $\check{\Box}(p \vee q)$ is exhaustified given the alternatives $\{\check{\Box} p, \check{\Box} q, \check{\Box}(p \wedge q)\}$, and if $\text{Exh}(\check{\diamond}(p \vee q))$ is exhaustified given $\{\text{Exh}(\check{\diamond} p), \text{Exh}(\check{\diamond} q), \text{Exh}(\check{\diamond}(p \wedge q))\}$. The reasons for this are explained in more detail below, but in a nutshell they are as follows. In the case of $\check{\Box}(p \vee q)$, negating the alternatives $\check{\Box} p$ and $\check{\Box} q$ would entail $\neg p$ and $\neg q$ (by ANTI-AE), and would therefore contradict the disjunctive AE ($p \vee q$) of the utterance itself. This makes the alternatives non-excludable, and consequently keeps them from participating in generating FC, in contrast to their analogs in the case of $\Box(p \vee q)$. For $\check{\diamond}(p \vee q)$, recursive exhaustification does not generate the inferences $\check{\diamond} p$ and $\check{\diamond} q$ — again in contrast to the case of $\diamond(p \vee q)$ where it generates $\diamond p$, $\diamond q$ — because the AEs of $\check{\diamond} p$, $\check{\diamond} q$ would jointly entail the conjunction $p \& q$, and would therefore contradict the exclusive inference of the embedded exhaustification of $\check{\diamond}(p \vee q)$. Here too, then, the alternatives paralleling those of non-AE-licensors are made inactive by their non-excludability, and prevented from producing FC, as desired.

In the next two sections I provide a more detailed description of SI-accounts of FC, and of how they lead to this prediction.

¹⁶I do not discuss pragmatic approaches to the problem of FC, e.g. Eckardt 2007 and Schulz 2007.

4.1.1 FC by exhaustification and recursive exhaustification

Theories that derive FC as an SI standardly include at least these two assumptions:

- A1. A(n embedded) disjunction $p \vee q$ has its disjuncts p , q and their conjunction $p \wedge q$ as alternatives;¹⁷
- A2. SI-calculation targets only alternatives whose participation does not lead to inconsistency.¹⁸

A1 produces FC straightforwardly in the case of $\Box(p \vee q)$: replacing $(p \vee q)$ with p, q gives us the alternatives $\Box p$ and $\Box q$, and from these we derive the SIs $\neg\Box p$ and $\neg\Box q$, which are equivalent to $\Diamond\neg p$ and $\Diamond\neg q$, respectively. These two inferences, together with the utterance, entail $\Diamond p$ and $\Diamond q$. (Note that the SI $\neg\Box(p \wedge q)$ adds nothing in this case.)

A2 keeps the SI-mechanism from targeting the alternatives p , q in the case of $p \vee q$, since the SIs that would otherwise result, $\neg p$ and $\neg q$, would contradict the disjunction. The only predicted SI in the case of $p \vee q$ is the exclusive inference $\neg(p \wedge q)$. In Section 4.1.2 we will see a similar outcome in the case of the AE-licensing $\tilde{\Box}(p \vee q)$.

Let us turn to the case of $\Diamond(p \vee q)$. Here the alternatives $\Diamond p$, $\Diamond q$ have falsity conditions that jointly contradict $\Diamond(p \vee q)$, so by A2 they cannot participate in calculating its SIs. The conjunctive alternative $\Diamond(p \wedge q)$ can participate, however, and as a result we get only the exclusive inference $\neg\Diamond(p \wedge q)$. The way to derive FC, according to Fox (2007), is to apply exhaustification recursively.¹⁹ Assume a pre-exhaustified $\Diamond(p \vee q)$, hereafter $\text{Exh}(\Diamond(p \vee q))$. By A1, this pre-exhaustified form has $\text{Exh}(\Diamond p)$ and $\text{Exh}(\Diamond q)$ as its alternatives, in addition to the conjunctive $\text{Exh}(\Diamond(p \wedge q))$ — the latter plays no role. The alternative $\text{Exh}(\Diamond p)$ says that p is possible but not q , and the alternative $\text{Exh}(\Diamond q)$ says that q is possible but not p . The falsity of these two alternatives requires, respectively, that if p is possible then so is q , and if q is possible then so is p . Therefore, exhaustifying $\text{Exh}(\Diamond(p \vee q))$ with respect to $\text{Exh}(\Diamond p)$ and $\text{Exh}(\Diamond q)$ will generate the joint inference that if one of p, q is possible, then so is the other: $\Diamond p \leftrightarrow \Diamond q$. This inference, together with the literal meaning of $\Diamond(p \vee q)$, produces $\Diamond p, \Diamond q$, i.e. FC.²⁰

¹⁷Sauerland 2004 and many since.

¹⁸A2 is vague. It can be replaced with Fox's (2007) condition of Innocent Excludability: an alternative S' is innocently-excludable given a sentence S and a set of alternatives A iff, for any sub-selection of alternatives from A whose negations are jointly consistent with S , adding the negation of S' does not lead to inconsistency. Formally:

- (1) S' is innocently-excludable given S and set of alternatives A iff
 $\forall A'(A' \subseteq A \ \& \ A'^{\neg} \wedge S \not\perp \rightarrow A'^{\neg} \wedge S \wedge \neg S' \not\perp)$
 where for any set B , $B^{\neg} = \bigwedge\{\neg\psi : \psi \in B\}$

A related idea can be found in Sauerland's (2004) condition on promoting Primary Implicatures to Secondary ones.

¹⁹This builds on insights from Kratzer and Shimoyama 2002. See Bar-Lev and Fox 2017 for a recent proposal that does not involve iteration of Exh.

²⁰Klinedinst (2007) derives FC for possibility modals using the same mechanism as for necessity modals. He holds the view that both are universal in their force, but differ in the domain of worlds

In principle nothing prevents exhaustification from applying recursively to unembedded disjunctions also. However, A1 and A2 guarantee that no additional (and unwanted) inferences follow in this case. Take the alternatives $\text{Exh}(p)$ and $\text{Exh}(q)$ to the pre-exhaustified $\text{Exh}(p \vee q)$. These alternatives mean, respectively, $p \& \neg q$ and $q \& \neg p$. The SIs that would result from negating them would jointly say $p \leftrightarrow q$. But this contradicts the exclusive disjunctive meaning of $\text{Exh}(p \vee q)$. (A1 plays a key role here: the exclusive meaning of $\text{Exh}(p \vee q)$ requires that the conjunctive $p \wedge q$ be an alternative to $p \vee q$.) Because of this, $\text{Exh}(p)$ and $\text{Exh}(q)$ are blocked from participating in SI-generation. It follows that, unlike in the case of $\diamond(p \vee q)$, recursive exhaustification of $p \vee q$ does not generate additional inferences. In Section 4.1.2 we will see a similar outcome in the case of the AE-licensing $\check{\diamond}(p \vee q)$.

4.1.2 NO-FC under the Scalar Implicature view of FC

Now consider the AE-licensing construction $\check{\square}(p \vee q)$. By A1 above, we get the alternatives $\{\check{\square}p, \check{\square}q, \check{\square}(p \wedge q)\}$, but by A2, the alternatives $\check{\square}p$ and $\check{\square}q$ are kept out of SI-generation. This is because, by ANTI-AE, the falsity of the two alternatives entails $\neg p$, $\neg q$, and this would conflict with the AE of the sentence $\check{\square}(p \vee q)$, $p \vee q$. Nothing is left that can generate FC.

In the case of $\check{\diamond}(p \vee q)$ recursive exhaustification also falls short of producing FC. The pre-exhaustified form $\text{Exh}(\check{\diamond}(p \vee q))$ has both the inference $\check{\diamond}(p \vee q)$ and the exclusive inference $\neg\check{\diamond}(p \wedge q)$. The first entails the AE $(p \vee q)$, and the second entails the anti-AE $\neg(p \wedge q)$. By A1, this pre-exhaustified form has the alternatives $\{\text{Exh}(\check{\diamond}p), \text{Exh}(\check{\diamond}q), \text{Exh}(\check{\diamond}(p \wedge q))\}$. It can now be shown that, because of its exclusive inference, exhaustifying the form further will not target the alternatives $\text{Exh}(\check{\diamond}p)$ and $\text{Exh}(\check{\diamond}q)$, because if it did, a contradiction would follow: $\neg\text{Exh}(\check{\diamond}p)$ means $\check{\diamond}p \rightarrow \check{\diamond}q$, and $\neg\text{Exh}(\check{\diamond}q)$ means $\check{\diamond}q \rightarrow \check{\diamond}p$. But this means that either $\check{\diamond}p$ and $\check{\diamond}q$ are both false, or they are both true. If they are false, then by ANTI-AE it follows that p and q are false, which conflicts with the AE $(p \vee q)$; if they are true, then by their AEs it follows that p and q are true, which conflicts with the exclusive inference of $\text{Exh}(\check{\diamond}(p \vee q))$. Given these conflicts, A2 blocks $\text{Exh}(\check{\diamond}p)$ and $\text{Exh}(\check{\diamond}q)$ from participating in SI-generation, and no other alternatives remain that can generate FC.

Thus, given some additional assumptions that we turn to below, the result is that the SI-view of FC predicts the NO-FC property of AE-licensors, as long as it is combined with a theory of AE-licensing that satisfies the ANTI-AE desideratum. This is because FC, on the SI-view, results not from the literal semantics of the modal, nor that of disjunction, but from the negation (or exclusion) of the suitable formal alternatives in conjunction with the inferences of the disjunctive utterance. The absence of such alternatives in the cases of $\check{\square}(p \vee q)$ and $\check{\diamond}(p \vee q)$ is the reason why AE-licensing obviates FC.

they quantify over (see also Rullmann et al. 2008 for related findings from the Salish language St'at'imcets). As far as I can see, Klinedinst's account of FC is compatible with the points made in this paper.

4.1.3 Auxiliary assumptions in obviating FC

The result reported in the last section hinges on at least two nontrivial assumptions. My goal in this section is to identify them, and to discuss their role and plausibility.

The first assumption has to do with the formal alternatives to disjunction-embedding AE-constructions, like $\check{\square}(p \vee q)$. (The points made in this section apply equally to $\check{\diamond}(p \vee q)$.) The alternatives to $\check{\square}(p \vee q)$ were assumed above to be $\{\check{\square}p, \check{\square}q, \check{\square}(p \wedge q)\}$, i.e. the results of replacing the disjunctive prejacent with its disjuncts and with their conjunction. We did not consider alternatives where, in addition, $\check{\square}$ is replaced with its non-AE-licensing counterpart \square . This would add $\square p$, $\square q$, and $\square(p \wedge q)$ to the set. But with this expansion, FC will again be incorrectly predicted; the reader may verify that both $\square p$ and $\square q$ can be targeted by SI-generation without leading to inconsistency, and will produce the FC inference: By AE-MODALITY, $\check{\square}(p \vee q)$ entails $\square(p \vee q)$, and together with the implicatures $\neg\square p$, $\neg\square q$, it follows that $\diamond p$ and $\diamond q$.

To prevent this outcome, we need to keep $\square p$, $\square q$ out of the set of formal alternatives to $\check{\square}(p \vee q)$. There are two technical ways of achieving this. The first is to keep \square from being an alternative to $\check{\square}$, that is, to assume that AE-licensors do not have non-AE-licensing constructions as scalemates (in the sense of Horn 1972). I do not think this is right, at the very least because existential (deontic) AE-licensors, like the BP **p**ode and the French **a** pu, imply that their prejacent is not required. This could not be derived if $\check{\diamond}$ did not have the non-AE-licensing \square as a formal alternative — note that the alternative $\check{\square}$ would not help, because its anti-AE would contradict the AE of $\check{\diamond}$. The second way is to constrain the alternative-generation mechanism so that only one subpart of the given construction is replaced at a time. Take for example the algorithm in Katzir 2007, where alternatives result from substitutions and/or structural simplification of the prejacent. If the algorithm is constrained, so that only one operation is permitted in generating any given alternative, we will allow $\check{\square}p$ and $\check{\square}q$, because these result from replacing the disjunction in $\check{\square}(p \vee q)$ with its disjuncts, but we will block $\square p$ and $\square q$, because these require *two* substitutions: $\check{\square}$ must be replaced with \square , and $(p \vee q)$ must be replaced with p/q . I think this possibility receives some independent support from a closely related case. Consider $\diamond(p \wedge q)$, e.g. **John is allowed to talk to Mary and Sue**. In such cases there does not seem to be an implicature that $\neg\square p$, e.g. **John is not required to talk to Mary**. If this is right, it means that the alternative $\square p$ is not generated for $\diamond(p \wedge q)$, despite the fact that \square elsewhere serves as an alternative to \diamond , and that conjuncts typically serve as alternatives to the conjunction they appear in. The absence of $\square p$ as an alternative to $\diamond(p \vee q)$ would follow if alternative generation is constrained in the way described above.²¹

²¹Similarly, **some of our students know Mary and Sue** does not implicate **not all of our students know Mary**. The restriction entertained here relates to a problem noticed by Romoli (2013). The problem concerns the implicatures of sentences like **John is not required to come**. If alternatives can be generated by multiple replacement/simplification operations, then we expect the alternatives in this case to include **John is not allowed to come** and also **John is allowed to come**. But negating both alternatives is contradictory, so by A2 they are predicted to be kept out of SI-generation. To capture intuitions, we want only the former to belong to the alternative set. The unwanted alternative may be kept out on the same grounds as $\square p$ and $\square q$ above, since it

The second necessary assumption relates to the internal structure of AE-licensing constructions. Recall that Hacquard and Homer derive AEs from the composition of a (non-AE-licensing) modal item with some external element (PFV for Hacquard, and ACT for Homer). The relevant structures on both views have the specific property that a non-AE-licensing modal item forms a syntactic unit with the prejacent, which in turn composes with the piece that generates the AE (either PFV or ACT). Any view that adopts a similar structural assumption, where a *non-AE-licenser* and the prejacent form a constituent on their own, will allow exhaustification to apply to that constituent before it is combined with the remaining ingredients. In the case of a disjunctive prejacent (as in (34)), this runs the risk of generating the undesirable FC inference.

$$(34) \quad [\text{PFV}/\text{ACT}/\dots \text{ [(Exh) } [\Box (p \vee q)]]]$$

Thus, the predicted obviation of FC, on SI theories, holds only if configurations like (34) are blocked. A possibility that immediately suggests itself is that AE-licensing auxiliaries form morphosyntactic units of their own, that is, units consisting of the modal root/stem and the AE-generating element (whatever it may be) without the prejacent. In that case, there would be no constituent for exhaustification to derive FC from in the case of disjunctive prejacentes.

The finding is therefore this: any theory of AEs that satisfies ANTI-AE is predicted to also satisfy NO-FC under the SI-view of Free Choice inferences, as long as (i) constructions of the form $\Box(p \vee q)/\Diamond(p \vee q)$ are assumed not to have $\Box p, \Box q/\Diamond p, \Diamond q$ as formal alternatives, and (ii) AE-licensing modals are assumed to make their own morphosyntactic units. To the extent that (i) and (ii) can be independently motivated, this result lends tentative support to the view of FC inferences as SIs.

4.2 FC as semantic distribution of the disjuncts

By ‘semantic distribution of disjuncts’ I intend a property, common to a number theories of FC, by which the semantics of modals and the semantics of disjunction together produce truth conditions that ‘distribute’ the individual disjuncts across the given modal base. The question raised in this section is whether these accounts predict NO-FC, considering AE-MODALITY and the finding that AE-licensers can take disjunctive prejacentes.

An example of this class of theories, which I will take to be representative, is Aloni 2007.²² For reasons of space, I will minimize discussion of the technical details of the account and keep to the essentials. A key assumption in Aloni is that a disjunctive expression **[A or B]** corresponds to two semantic representations, which in unembedded cases have identical satisfaction conditions. One representation is boolean, essentially the union of the propositional denotations of the disjuncts. The other quantifies existentially over the disjuncts, amounting to a satisfaction condition that requires at least one of them to hold in the evaluation world. This is similar to

results from simultaneous simplification of, and substitution into, the original sentence.

²²See also Simons 2005.

assigning disjunctions non-singleton, focus-like denotations, and making available an interpretive mechanism that existentially closes those denotations.

Another key assumption in Aloni’s proposal is that possibility modals quantify universally over the retrievable alternatives of the prejacent, and anchors each of them in at least one accessible world. A construction of the form $[\diamond(\mathbf{A} \text{ or } \mathbf{B})]$ is thus ambiguous, owing to the two possible representations of $[\mathbf{A} \text{ or } \mathbf{B}]$: on the boolean representation, the satisfaction conditions of $[\diamond(\mathbf{A} \text{ or } \mathbf{B})]$ require at least one accessible world to verify the sole disjunctive alternative; on the non-boolean representation, the conditions require at least one world to verify \mathbf{A} , and at least one world to verify \mathbf{B} . This is FC.

Consider now the case of $[\check{\diamond}(\mathbf{A} \text{ or } \mathbf{B})]$. From AE-MODALITY, we expect the inference to $[\diamond(\mathbf{A} \text{ or } \mathbf{B})]$ to follow, and if the disjunctive prejacent in the premise is given a non-boolean representation, then FC should follow, contrary to NO-FC. Note that there is nothing inconsistent about the predicted (but unattested) meaning here: the sentence would say that one of A/B happened (the AE), but that each was permitted/possible (FC via AE-MODALITY).²³

One way of obviating this outcome is to assume that AE-licensors encode a ‘flattening’ mechanism, so that the inferences they generate (AEs and AE-MODALITY) are never based directly on their prejacent, but on the grand-union—i.e. flattening—of the prejacent’s alternatives.²⁴ If this is assumed, then in the case of $[\check{\diamond}(\mathbf{A} \text{ or } \mathbf{B})]$ the content of the AE would be the boolean disjunction $\mathbf{A} \text{ or } \mathbf{B}$, and the modal inference (thanks to flattening) would not have the alternatives that the modal needs to generate FC. I leave it to future work to test the predictions of this move.

5 Conclusion and remaining issues

This paper highlighted three properties of AE-licensors: AE-MODALITY, ANTI-AE, and NO-FC. The first two were used to evaluate four accounts of AE-licensing, while the third was used to evaluate two kinds of theories of FC disjunction. It was shown that any theory of AE-licensing that captures ANTI-AE is predicted to capture NO-FC on views of FC as a scalar implicature. This finding, however, was shown to depend on necessary auxiliary assumptions about (a) the alternatives to AE-licensors, and (b) the structural relation between AE-licensors and their prejacent. We then showed that on other “semantic” theories of FC, AE-MODALITY is predicted to incorrectly lead to FC, a point that was illustrated using Aloni’s (2007) analysis of FC-disjunctions.

²³The issue is relevant not just to Aloni’s account, but to any view where FC is seen as a consequence of the semantic interaction between modality and disjunction. In Aher 2012, for example, the assertion ‘that ϕ is permitted’ is taken to be equivalent to the conditional assertion that ‘if ϕ then no violation’ (See also van Rooij 2006). On such an account, FC inferences follow simply from the logic inherent to the conditional assertion: from the premise that ‘if $p \vee q$, then no violation’ it follows that ‘if p , then no violation’, and that ‘if q , then no violation’. If these conditional truth conditions constitute the semantics of permission, and if permission follows from the semantics of deontic AE-licensors, we predict that FC follow from statements of the form $\check{\diamond}(p \vee q)$, again incorrectly.

²⁴In inquisitive semantics, flattening is encoded in the semantics of negation. See e.g. Ciardelli et al. 2017.

of $\check{\diamond}(p \vee q)$. The key detail has to do with the embedded implicature mentioned above. Single exhaustification of $\neg\check{\square}(p \wedge q)$ produces the inference $\neg\neg\check{\square}(p \vee q)$, assuming that the disjunctive form is a relevant alternative. If it is, and if this instance of double-negation leads with sufficient strength to the conclusion that $\check{\square}(p \vee q)$, and to the AE $(p \vee q)$, we predict no further inferences to result from recursive exhaustification; the AE $(p \vee q)$ of the embedded implicature is not consistent with the simultaneous falsity of $\check{\square}p$ and $\check{\square}q$, because the falsity of these alternatives entails $\neg p \ \& \ \neg q$. It follows that the form $\neg\check{\square}(p \wedge q)$, unlike $\neg\check{\square}(p \vee q)$, will not be predicted to imply $\neg\check{\square}p$ and $\neg\check{\square}q$.

I have so far found it difficult to test this prediction. The French/BP speakers that I consulted seem to agree that sentences of this form are hard to process. To some speakers of French, **n’a pas dû** strongly favors an epistemic reading, which makes the examples irrelevant for our purposes. To other speakers, both of French and of BP, the deontic reading is available, but there are still differences among the speakers. Some find the sentences not to give rise to FC, as predicted. Others get the inferences that *neither* of the conjuncts was realized. For example, the French sentence in (36) implies that the subject did not take either English or German, and similarly, the BP sentence in (37) suggests that the subject did not make food, and did not clean the house.²⁷

- (36) Quand il était au lycée, il n’a pas dû prendre anglais et
 When he was in high school, he NEG have.to.PFV take English and
 allemand
 German
 ‘When he was in high school, he did not have to take English and German’
- (37) Ele não teve que fazer comida e limpar a casa
 He NEG had.to-PFV make food and clean the house
 ‘He did not have to make food and clean the house’

I do not know what explains the conjunctive anti-AEs here. Perhaps the embedded implicature $\neg\neg\check{\square}(p \vee q)$ does not introduce an AE, and therefore does not block further exhaustification. If the AE $(p \vee q)$ is indeed absent, recursive exhaustification would produce the inferences $\neg\check{\square}p$ and $\neg\check{\square}q$ after all, which in e.g. (37) would license the inferences that the subject did not make food, did not clean the house, and did not have to make food, and did not have to clean the house. I leave closer study of these cases to future work.

The second note I want to make is that NO-FC, according to the implicature view, depends crucially on the anti-AEs that come with participation in implicature calculation. It is the anti-AE that accompanies the falsity of $\check{\square}p$ and $\check{\square}q$ that prevents the two alternatives from being innocently excludable, and hence from contributing to the implicatures of the form $\check{\square}(p \vee q)$ and leading to FC. Anti-AEs play the same role in the case of $\check{\diamond}(p \vee q)$ too: the anti-AE of the embedded implicature $\neg\check{\diamond}(p \wedge q)$ blocks the alternatives $\text{Exh}(\check{\diamond}p)$ and $\text{Exh}(\check{\diamond}q)$ from adding the inferences that their counterparts, $\text{Exh}(\diamond p)$ and $\text{Exh}(\diamond q)$, add in the case of $\diamond(p \vee q)$. The prediction,

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then, is that if we find an AE-licenser modal whose falsity/negation does *not* give rise to anti-AEs, we expect that modal to license FC inferences when it embeds a disjunctive prejacent. I do not know of any AE-licensing modal that does not also license anti-AEs when negated, so I leave this prediction to future work also.

References

- Aher, Martin. 2012. Free choice in deontic inquisitive semantics (DIS). In *Amsterdam Colloquium 18*, ed. Maria Aloni, Michael Franke, and Floris Roelofsen. Amsterdam: ILLC.
- Aloni, Maria. 2007. Free choice, modals, and imperatives. *Natural Language Semantics* 15:65–94.
- Alonso-Ovalle, Luis. 2005. Distributing the disjuncts over the modal space. In *Proceedings of the 35th meeting of the North East Linguistic Society*, ed. Leah Batema and Cherlon Ussery, 75–86. Amherst, MA: GLSA Publications.
- Baglini, Rebekah, and Itamar Francez. 2016. The implications of managing. *Journal of Semantics* 33:541–560.
- Bar-Lev, Moshe E., and Danny Fox. 2017. Universal free choice and innocent inclusion. In *SALT XXVII*, ed. Dan Burgdorf, Jacob Collard, Sireemas Maspong, and Brynhildur Stefánsdóttir, 95–115.
- Bary, Corien. 2009. Aspect in Ancient Greek. A Semantic Analysis of the Aorist and Imperfective. Doctoral Dissertation, Radboud University.
- Beaver, David. 2001. *Presupposition and Assertion in Dynamic Semantics*. Stanford: CSLI.
- Bhatt, Rajesh. 1999. Covert Modality in Non-finite Contexts. Doctoral Dissertation, University of Pennsylvania.
- Bhatt, Rajesh. 2006. *Covert Modality in Non-Finite Contexts*. Berlin: Mouton De Gruyter.
- Borgonovo, Claudia, and Sarah Cummins. 2007. Tensed modals. In *Coreference, Modality, and Focus: Studies on the Syntax-Semantics Interface*, ed. Luis Eguren and Olga Fernández Soriano. Amsterdam: John Benjamins.
- Charlow, Simon. 2009. “Strong” predicative presuppositional objects. In *Proceedings of ESSLLI 2009 Workshop: New Directions in the Theory of Presupposition*, ed. Nathan Klinedinst and Daniel Rothschild.
- Ciardelli, Ivano, Floris Roelofsen, and Nadine Theiler. 2017. Composing alternatives. *Linguistics and Philosophy* 40:1–36.
- Eckardt, Regine. 2007. Licensing ‘or’. In *Presupposition and Implicature in Compositional Semantics*, ed. Uli Sauerland and Penka Stateva. Houndmills: Palgrave Macmillan.
- Fox, Danny. 2007. Free choice and the theory of scalar implicatures. In *Presupposition and Implicature in Compositional Semantics*, ed. Uli Sauerland and Penka Stateva, 71–120. Houndmills: Palgrave Macmillan.
- Fox, Danny. 2012. Presupposition projection from quantificational sentences: trivalence, local accommodation, and presupposition strengthening. Unpublished manuscript.

- George, Ben. 2008. Presupposition repairs: a static, trivalent approach to predicting projection. Master's thesis, UCLA.
- Hacquard, Valentine. 2006. Aspects of Modality. Doctoral Dissertation, MIT.
- Hacquard, Valentine. 2009. On the interaction of aspect and modal auxiliaries. *Linguistics and Philosophy* 32:279–312.
- Hacquard, Valentine. 2014. Actuality entailments. In *A Companion to Semantics*, ed. Lisa Matthewson, Cécile Meier, Hotze Rullmann, and Thomas Ede Zimmermann. Oxford: Wiley.
- Heim, Irene. 1983. On the projection problem for presuppositions. In *WCCFL 2*, ed. D. Flickinger. Stanford, CA: Stanford University Press.
- Homer, Vincent. 2011. Polarity and Modality. Doctoral Dissertation, UCLA.
- Horn, Laurence R. 1972. On the semantic properties of logical operators in English. Doctoral Dissertation, University of California, Los Angeles.
- Karttunen, Lauri. 1971. Implicative verbs. *Language* 47:340–358.
- Karttunen, Lauri, and Stanley Peters. 1979. Conventional implicature. In *Presupposition*, ed. Choon-Kyu Oh and David A. Dinneen, volume 11 of *Syntax and Semantics*. New York, San Francisco, and London: Academic Press.
- Katzir, Roni. 2007. Structurally-defined alternatives. *Linguistics and Philosophy* 30:669–690.
- Klinedinst, Nathan. 2007. Plurality and possibility. Doctoral Dissertation, UCLA.
- Kratzer, Angelika. 1981. The notional category of modality. In *Words, Worlds, and Contexts*, ed. Hans J. Eikmeyer and Hannes Rieser. London: Routledge. Reprinted as Chapter 2 of Kratzer 2012.
- Kratzer, Angelika. 1991. Modality. In *Semantik: ein internationales Handbuch der zeitgenössischen Forschung*, ed. Arnim von Stechow and Dieter Wunderlich, volume 6 of *Handbücher zur Sprach- und Kommunikationswissenschaft*. Berlin: Walter de Gruyter.
- Kratzer, Angelika. 2012. *Modals and Conditionals*. Oxford, UK: Oxford University Press.
- Kratzer, Angelika, and Junko Shimoyama. 2002. Indeterminate pronouns: The view from Japanese. In *Proceedings of the 3rd Tokyo Conference on Psycholinguistics*, ed. Yuiko Otsu, 1–25. Tokyo: Hituzi Syobo.
- Mari, Alda, and Fabienne Martin. 2007. Tense, abilities and actuality entailment. In *Amsterdam Colloquium 16*, ed. Maria Aloni, Paul Dekker, and Floris Roelofsen. Amsterdam: ILLC/University of Amsterdam dept. of Philosophy.
- Romoli, Jacopo. 2013. A problem for the structural characterization of alternatives. *Snippets* 27:14–15.
- van Rooij, Robert. 2006. Free choice counterfactual donkeys. *Journal of Semantics* 23:383–402.
- Rullmann, Hotze, Lisa Matthewson, and Henry Davis. 2008. Modals as distributive indefinites. *Natural Language Semantics* 16:317–357.
- Sauerland, Uli. 2004. Scalar implicatures in complex sentences. *Linguistics and Philosophy* 27:367–391.
- Schlenker, Philippe. 2008. *Be articulate*: a pragmatic theory of presupposition projection. *Theoretical Linguistics* 34:157–212.

- Schulz, Katrin. 2007. Minimal models in semantics and pragmatics: Free choice, exhaustivity, and conditionals. Doctoral Dissertation, University of Amsterdam, ILLC.
- Simons, Mandy. 2005. Dividing things up: the semantics of *or* and the modal/*or* interaction. *Natural Language Semantics* 13:271–316.
- Sudo, Yasutada. 2012. On the Semantics of Phi Features on Pronouns. Doctoral Dissertation, MIT.
- Thalberg, Irving. 1969. Austin on abilities. In *Symposium on JL Austin*, ed. K. T. Fann. New York: Humanities Press Inc.
- Truckenbrodt, Hubert. 2019. A note on extraposition of case-marked arguments in German. Ms. ZAS, Berlin.
- von Wright, Georg Henrik. 1963. *Norm and Action: A Logical Inquiry*. London: Routledge & Kegan Paul.