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Actuality Entailments, negation, and free choice inferences *

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Abstract In some languages, (certain) root modals license Actuality Entailments (AEs) when they are perfective-marked. We discuss two puzzling properties of these constructions: (i) when AE-licensing modals are negated, the result entails the *negation* of actuality, and (ii) when AE-licensing modals embed disjunctions, no Free Choice inferences are available. We develop an account of (i) and show that, given an implicature-based view of Free Choice, (ii) follows as a consequence.

Keywords: actuality entailments, free choice, modality, aspect

1 Introduction

The literature on Actuality Entailments (AEs) has mainly been concerned with explaining their source: why is it that, in the relevant languages, perfective-marking on a given modal implies that the possibility/obligation was *actually* realized? I will have little to say about this in this paper. Instead, I focus on two facts that have received less attention. The first is that sentences in which an AE-licensing modal is negated give rise to what we might call an *anti*-AE, that is, an inference that the relevant possibility/obligation was not realized. The second, which to my knowledge has not been observed, is that AE-licensing modals do not permit Free Choice inferences (FC) when they embed a disjunction. This is puzzling given that the same modals *do* license FC when they take a non-AE-licensing form, e.g., under imperfective-marking.[1] The main claim of the paper is that solutions to the anti-AE puzzle can explain the absence of FC if we adopt an "implicature"-theory of FC.

We begin with a background of AEs and a brief review of two proposals: Bhatt's (1999) implicative account, and Borgonovo and Cummins's (2007) trivialization

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1 A related finding, reported in Bhatt 2006, is that Hindi Free Choice Items (FCIs) are licensed under IMP-marked modals but not under PFV-marked ones (Bhatt 2006: 172).

account. We focus on these analyses early on because they provide simple ways of capturing AEs and anti-AEs (section 2). We then look at challenges to the two views, and in section 3 consider two others: Hacquard's (2009) and Homer's (2011). These, I will argue, do not account for anti-AEs, but I will propose a (stipulative) reinterpretation of Homer's aspect-shift story that does. In section 4 we turn to FC data and show how the revision correctly predicts absence of FC inferences for (anti-)AE-licensing modals. Section 5 concludes.

2 AEs and anti-AEs

2.1 Background and two accounts

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

(1) a. Iti vimaan ur.aa sak-aa (#lekin us-ne vimaan nahĩĩ 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 nahĩĩ 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.'

(2) 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'

Bhatt's conclusion from these data was that ability verbs do not in fact make modal assertions of their own. Their meaning is similar to that of the implicative verb **manage**: like **manage**, ability verbs are assertorically equivalent to the VPs that they embed, but they are defined only if those VPs denote activities that require effort (Karttunen 1971; Karttunen & Peters 1979). Because "*able-to-X*" makes the same assertion as *X* (where *X* requires effort), "PFV-*able-to-X*" will assert PFV-*X*, which is the AE. But then why do AEs disappear under IMP-marking? Bhatt's answer is that IMP-marking brings non-actual generic semantics of its own, and it is this genericity that situates the (implicative) predicate in non-actual possible worlds.

Later work (e.g., Borgonovo & Cummins 2007; Hacquard 2009) showed that AEs are not limited to verbs of ability, and are licensed by root modals of varying flavors and quantificational force. Below we 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.[2]

(3) 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'

(4) 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"

(5) Ele (#pôde)/(✓podia) visitar seu amigo, mas ele não o visitou
He can.(#**PFV**)/(✓**IMP**) visit his friend, but he NEG him visit.PFV

(6) 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

As AEs appear to be licensed by modals of different flavors and force (with the exception of epistemic modals – not shown), we will hereafter use the symbols $\check{\Diamond}/\check{\Box}$ to refer to modals that license AEs, and the familiar $\Diamond/\Box$ to refer to those that do not. For our concerns the two symbol pairs correspond mostly (though not totally) to PFV- and IMP-marked modals. I should note that I will also use $\Diamond/\Box$ to write metalinguistic modal conditions. I will disambiguate the notation where needed.

In light of data like (3-6), Borgonovo and Cummins (B&C) proposed that AE-licensers have the same modal semantics as their non-AE-licensing counterparts. The difference is that the former operate on 'trivialized' modal bases, i.e., modal bases that consist solely of the evaluation world. This, as shown below, makes an AE-licenser equivalent to its propositional argument ($\Diamond/\Box$ are metalinguistic here):

(7) a. $\check{\Diamond}(p)=1$ iff $\Diamond_{\{w\}}(p)=1$
$=1$ iff $p(w)=1$

b. $\check{\Box}(p)=1$ iff $\Box_{\{w\}}(p)=1$
$=1$ iff $p(w)=1$

2 The 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 2.2), and agree that FC inferences are absent (section 4); speakers who disagree on AEs seem to simultaneously disagree with the anti-AE/FC judgements.

2.2 Anti-AEs

The equivalence in (7a-b) produces one important similarity between B&C's theory and Bhatt's implicative analysis. Not only are AEs predicted in positive uses; their negations, 'anti-AEs', are predicted in negative uses. And indeed the prediction is confirmed: negating $\check{\Diamond}p/\check{\Box}p$ quite strongly implies that p did not take place.

(8) a. Alors qu' il (#n'a pas pu)/(✓ne pouvait pas) rendre visite à son ami, il lui a rendu visite
while he (#NEG can.**PFV**)/(✓NEG can.**IMP**) visit his friend, 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

(9) a. Ele não (#pôde)/(✓podia) visitar seu amigo, mas ele visitou ele
He NEG can.(#**PFV**)/(✓**IMP**) 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

Note that the equivalence between $\check{\Diamond}/\check{\Box}p$ and p does not predict anti-AEs only when $\check{\Diamond}p/\check{\Box}p$ are overtly negated, but in all cases where the semantics requires their falsity. This prediction is confirmed as well: in (10-11) the BP particle **só** '*only*' embeds $\check{\Diamond}/\check{\Box}$, but its exclusive component produces anti-AEs for the salient contextual alternatives; and in (12-13) the verb **duvidar** '*doubt*' entails believing $\neg p$ when it embeds $\check{\Diamond}/\check{\Box}p$, but not when it embeds $\Diamond p/\Box p$:

(10) Só a Lu pôde comer torta, #mas a Pri comeu torta também
only Lu can-**PFV** eat cake, but Pri ate cake also

(11) 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

(12) Ele foi na festa, mas eu duvido que ele (#pôde)/(✓podia) ir
He went to.the party, but I doubt that he can.(#**PFV**)/(✓**IMP**) go

(13) Ele fez a prova, mas eu duvido que ele (#teve)/(✓tinha) que fazer
He did the test, but I doubt that he (#**PFV**)/(✓**IMP**) to do

Our findings so far may be summarized as follows (in (15), $\Diamond/\Box$ are non-AE-licensing modal expressions).

(14) a. $\check{\Diamond}/\check{\Box}p \vDash p$
b. $\neg\check{\Diamond}/\check{\Box}p \vDash \neg p$

(15) a. $\Diamond/\Box p \nvDash p$
b. $\neg\Diamond/\Box p \nvDash \neg p$

2.3 Challenges to Bhatt and Borgonovo and Cummins

The fact that non-abilitative modals also license AEs (in addition to ability modals) appears to present a serious challenge to Bhatt, since his implicative analysis is intended for ability verbs only. Can this mean that all AE-licensers, e.g., the French **pouvoir**, are implicative? The answer is most likely no, for at least two reasons. First, assigning **pouvoir** an implicative meaning will necessarily apply to its epistemic use, and this is undesirable given that epistemic modals never license AEs, regardless of aspect.[3] Second, the analysis would effectively collapse the existential/universal distinction between AE-licensers, because under IMP-marking both $\Diamond p$ and $\Box p$ are predicted to have generic truth conditions, along the lines of $\text{GEN}(p)$. From this it follows that conjunctions like $\Diamond p \wedge \Diamond\neg p$ and $\Box p \wedge \neg\Box p$ will both mean $\text{GEN}(p) \wedge \text{GEN}(\neg p)$, and if GEN is treated as a universal-like quantifier, then $\Diamond p \wedge \Diamond\neg p$ will incorrectly come out inconsistent, and if GEN is treated as an existential-like quantifier, $\Box p \wedge \Box\neg p$ will incorrectly come out consistent.

Quantificational force also presents a challenge to B&C. By trivializing the modal base, B&C predict that existential and universal AE-licensers make identical assertions, and when one is judged true, the other should be as well. This is falsified by the French (16) and the BP (17): $\check{\Diamond} p \,\&\, \Diamond\neg p$ is consistent; $\check{\Box} p \,\&\, \Diamond\neg p$ is not.

(16) a. Il a pu prendre le train, (✓mais il aurait aussi pu ne pas le prendre).
He can.**PFV** take the train, but he have.cond.PAST also can NE 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 pas le prendre).
He must.**PFV** take the train, but he have.cond.PAST also can NE NEG it take.
"He had to take the train, but he could have also not taken it"[4]

(17) 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)

What (16-17) teach us is that, by generating inferences about the evaluation world,

3 See B&C and Hacquard for proposals about PFV-epistemic modals, and also footnote 7.
4 Judgements due to Guillaume Thomas (p.c.).

the AE-licensers $\check{\Diamond}/\check{\Box}$ do not lose the modality exhibited by their non-AE counterparts.[5] We may therefore update (14a), from our data summary, to (14′a) below.[6]

(14′) a. $\check{\Diamond}/\check{\Box}p \vDash p,\ \Diamond/\Box p$
b. $\neg\check{\Diamond}/\check{\Box}p \vDash \neg p$

(15) a. $\Diamond/\Box p \nvDash p$
b. $\neg\Diamond/\Box p \nvDash \neg p$

We will now move away from the implicative and the trivialization accounts. As we saw, both analyses correctly handle the negation data, but seem to fall short of preserving the modal semantics of $\check{\Diamond}/\check{\Box}$. When we turn our attention to alternatives that solve this problem, we will want to ensure that they can also account for anti-AE. I will argue that Hacquard's proposal cannot, and that a revision to Homer's can. I do not claim this as support for Homer's proposal, since admittedly the revision I will offer is stipulative. Rather, my goal is to find a way of capturing anti-AEs that retains modality, and test it against the FC data that we will see later.

One more note before we move on: if deontic $\check{\Diamond}/\check{\Box}$ express permission/obligation along with actuality, then clearly AEs can be truth-conditionally independent of the semantics associated with the licensing modal; permission/obligation does not by itself imply the content of the AE, and the AE does not imply either permission or obligation. This independence will form the basis of my argument against Hacquard.

3 Hacquard's and Homer's proposals

3.1 Hacquard (2009) and event similarity

Like B&C, Hacquard adopts Kratzer's treatment of modals, but unlike B&C, she assumes no difference in modal base between PFV- and IMP-marked modals. The key difference, she proposes, is that PFV introduces its event variable in the evaluation world, while IMP, owing to its generic meaning, introduces event variables in non-actual worlds. This is summarized below (I ignore tense/viewpoint details here):

(18) a. $[\![\textbf{PFV VP}]\!]^{w_0} = 1$ iff $\exists e(e$ is in w_0 and $[\![\textbf{VP}]\!]^{w_0}(e){=}1)$
b. $[\![\textbf{IMP VP}]\!]^{w_0} = 1$ iff $\text{GEN}_{w_0}([\lambda w'.\, \exists e(e$ is in w' and $[\![\textbf{VP}]\!]^{w'}(e){=}1)])$

5 These findings are contrary to Bhatt, who claimed that PFV-ability does not contribute any claim about ability. I do not review Bhatt's argument here. For details, see Bhatt (1999) section 5.3 and Hacquard section 4.2. Note that some of Hacquard's critique uses similar examples to (16-17) above.

6 The reader may wonder what happens to the *modality* of $\check{\Diamond}/\check{\Box}p$ under negation, i.e., whether there are data that suggest an update to (14′b). I do not yet have a clear answer to this question. My investigation of BP has revealed similar results to Hacquard's French findings: $\neg\check{\Diamond}p$ implies $\neg\Diamond p$, but the inference is cancellable (see Hacquard section 4.1). But surprisingly, the parallel inference from $\neg\check{\Box}p$ to $\neg\Box p$ does not appear to be equally cancellable, and I do not know why $\check{\Box}$ and $\check{\Diamond}$ should differ in this way. Since the issue does not affect the focus of this paper, I leave it for future work.

The next important detail is that root modals are interpreted below aspect heads. This means that PFV-marked root modals will have truth conditions that assign non-actual descriptions to *actual* events, while for IMP-marked modals the truth conditions will be about generic (thus non-actual) events. So, given a root modal $\Diamond$,

(19) a. $[\![\textbf{PFV } \Diamond\textbf{-VP}]\!]^{w_0} = 1 \text{ iff } \exists e(e \text{ is in } w_0 \text{ and } [\![\Diamond\textbf{-VP}]\!]^{w_0}(e){=}1)$
$= 1 \text{ iff } \exists e(e \text{ is in } w_0 \text{ and } \exists w'(w_0 R w' \;\&\; [\![\textbf{VP}]\!]^{w'}(e){=}1))$
b. $[\![\textbf{IMP } \Diamond\textbf{-VP}]\!]^{w_0} = 1 \text{ iff } \text{GEN}_{w_0}([\lambda w' . \exists e(e \text{ is in } w' \text{ and } [\![\Diamond\textbf{-VP}]\!]^{w'}(e){=}1)])$

(In this review of Hacquard I am suspending the notation I introduced earlier: $\Diamond$ above stands for a modal lexical root/stem). How does this matter for AEs? Hacquard conjectures that events in a world w that have *possible* descriptions, descriptions in worlds accessible from w, inherit those descriptions in w. This is stated in her Preservation of Event Descriptions principle:

(20) **The Preservation of Event Descriptions principle (PED)**:
For any two worlds w_1, w_2, event e, and property of events P, if e exists in w_1 and $w_1 R w_2$, then if $P(w_2)(e){=}1$ then $P(w_1)(e){=}1$.

The PED alone does not yet distinguish between PFV- and IMP-modals. A needed auxiliary assumption, implicit in Hacquard, is that the domain of eventualities is world-dependent: an event e may exist in w' (be in the domain of w') without existing w, even if w' is accessible from w. With this assumption and the PED in place, the following difference emerges: PFV-$\Diamond/\Box p$ asserts the existence of an event e in w_0, which has $\Diamond/\Box p$ as its description in w_0, and p as its description in some/all worlds accessible from w_0 (as in (19a)). By the PED this makes e a p-event in w_0, and the AE results. IMP-$\Diamond/\Box p$, on the other hand, asserts the existence of $\Diamond/\Box p$-events in generic worlds, not in w_0. Because the *existence* of these events in accessible worlds does not entail their existence in w_0, no implications about actuality follow.[7]

This, as I understand it, is the core of Hacquard's analysis. Let us see what it predicts about anti-AEs. Since PFV-$\Diamond p$ asserts the existence of an actual $\Diamond p$ event, $\neg$PFV-$\Diamond p$ should be true in w_0 iff there are no $\Diamond p$ events in w_0, i.e., if no event in w_0 is p in any accessible worlds. Now, if w_0 is itself accessible, then of course there cannot be any p events in w_0. So, whenever the accessibility relation is reflexive, as in abilitative/circumstantial modality, $\neg$PFV-$\Diamond p$ entails the anti-AE $\neg p$. But this prediction changes when we consider deontic modality, where accessibility is nonreflexive: the laws in w_0 are not necessarily *true* in w_0, so w_0 is not deontically-accessible from itself. There is therefore no consequence from $\neg$PFV-$\Diamond p$ on whether w_0 contains any p-events, hence no anti-AEs. Similar problems arise for $\neg$PFV-$\Box p$.

7 The difference is in some sense scopal: the *lexical* semantics of IMP is such that modal displacement 'outscopes' event introduction. A similar relation blocks AEs for PFV-epistemic modals, but its origin is syntactic: epistemic modality takes obligatory wide-scope and thus outscopes event introduction.

3.2 AEs as aspect-shift

The connection between aspect-shift and AEs is discussed in detail in Mari & Martin 2007 and Homer 2011. I cannot offer a comprehensive review of the supporting data here, so I will note two general findings. First, AEs are not specific to modal auxiliaries. As Homer notes, the French verb **coûter**, '*to cost*', gives rise to an AE-like inference when it is PFV-marked, meaning 'cost *X* and *sold* for *X*'. Second, there are cases where AEs are suspended, and replaced with inchoative readings, and with 'complexive' readings. The readings appear to be triggered by certain adverbs, and they arise not just for root modals but for other stative predicates as well: in (21), the stative predicate **être en colère**, '*be angry*', takes the meaning *become angry* when it co-occurs with the adverb **soudain**, '*suddenly*'. And the same (AE-less) inchoative reading results from combining PFV-**pouvoir** with **soudain** (22):

(21) Jean a soudain été en colère cet après-midi
Jean suddenly was.**PFV** angry this afternoon
'Jean suddenly became angry this afternoon'

(22) J a soudain pu soulever un frigo, ✓mais ne l'a pas fait
J suddenly able.**PFV** lift a fridge, but didn't do it
'J suddenly acquired the ability to lift a fridge, but didn't'

Similarly, combining statives with the adverb **a plusieurs reprises**, '*on several occasions*', produces what Homer calls 'complexive' readings (see also Bary 2009). These are re-interpretations of states as *maximal* episodes that verify the relevant state. The complexive reading is shown for the stative **être assis** in (23), and in parallel for PFV-**pouvoir** when it is modified by **a plusieurs reprises** (24):

(23) Aujourd'hui Jean a été assis à plusieurs reprises
Today J was.**PFV** seated on several occasions

(24) À plusieurs reprises J. a pu soulever un frigo, mais ne l'a pas fait
on several occasions J. able.**PFV** lift a fridge, but didn't do it
'On several occasions J. had the ability to lift the fridge, but didn't'

Because of this apparent competition between AEs and other shifted readings of statives, Homer proposed that AEs result from a process of aspect-coercion, triggered in these cases by combining PFV (which requires bounded event predicates) with statives (which are unbounded). It isn't obvious why AEs should ever serve as a repair to the otherwise problematic PFV+state configurations, given that the grammar makes other repairs available. Moreover, it is not obvious what factors determine the choice of one repair mechanism over another.[8] Whether different lexical items

8 In Palestinian Arabic, environments that produce inchoative readings for statives seem to uniformly produce AEs for the ability root. See Alxatib To appear for details.

are associated with different coercion operators, or whether context and information structure play a role, remains to be worked out. For now I want to show how Homer uses his syntactic operator **ACT** to implement the AE coercion mechanism. The operator occurs just below the PFV head, and conjoins its modal argument with the VP embedded in it. This effectively generates the meaning $\Diamond p$ & p.[9]

(25) $[\![\textbf{ACT } [\Diamond\textbf{-VP}]]\!]^w = [\lambda e_v \,.\, [\![\textbf{VP}]\!]^w(e){=}1 \;\&\; \exists e'([\![\Diamond\textbf{-VP}]\!]^w(e'){=}1 \,\&\, \tau(e){=}\tau(e'))]$

The important detail for us in (25) is that it is conjunctive. If a sentence contains a *negated* AE-licenser, its truth conditions will be satisfied if either of the modal/actual claims is false. Anti-AEs are therefore not predicted by the definition of **ACT** in (25). In the next section I offer a revision of (25) that captures both AEs and anti-AEs.

3.3 Aspect-coercion revised: AE-licensers as derived implicative predicates

My proposal bears some resemblance to Bhatt's implicative analysis, but it does not identify any AE-licenser as an implicative verb itself. Instead, the implicativity—the assertoric equivalence between the licensing modal and the VP below it—is mediated by the revised **ACT**. The output of **ACT**, I propose, is roughly the meaning of the VP embedded under the modal. But **ACT** also adds a requirement (underlined below) that its verifying event accompany a state of the relevant modality:

(26) $[\![\textbf{ACT } [\Diamond\textbf{-VP}]]\!]^w$
$= [\lambda e_v : \underline{[\![\textbf{VP}]\!]^w(e){=}1 \rightarrow \exists e'(t(e) \sqsubseteq t(e') \,\&\, [\![\Diamond\textbf{-VP}]\!]^w(e'){=}1)} \,.\, [\![\textbf{VP}]\!]^w(e){=}1]$

Both AEs and anti-AEs result from the revised entry in (26), because the semantics of **[ACT [modal VP]]** is assertorically identical to the semantics of **VP**. The difference is that the former is defined only for events that fall within a state that satisfies the provided modal description. Notice that, while (26) produces the anti-AE under negation, it does not negate (or assert) the modal claim. This is desirable in the case of existential root modals (see footnote 6), but too weak given the puzzling behavior of universal modals. I leave this detail for future work.

The effect of (26) can be written in simple terms as in (27a), where by $\check{\Diamond}/\check{\Box}$ we mean the ACT-$\Diamond/\Box$ combination. The AE/anti-AE products are shown in (27b).

(27) a. $\check{\Diamond}/\check{\Box}p$ is defined only if $p \rightarrow \Diamond/\Box p$. If defined, then $\check{\Diamond}/\check{\Box}p = p$
b. If $\check{\Diamond}/\check{\Box}p$ is defined, then $p \rightarrow \Diamond/\Box p$;
if $\check{\Diamond}/\check{\Box}p$ is true, then p and $\Diamond/\Box p$; if $\check{\Diamond}/\check{\Box}p$ is false, then $\neg p$.

9 The syncategorematic (25) is a gross simplification of Homer's. In the 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. Also, Homer's **ACT** delivers a *bounded* event predicate, a crucial detail given that unboundedness is what causes stative-PFV conflict, and triggers coercion. I skip these details for ease of presentation.

4 AEs and Free Choice disjunctions

We now turn to FC disjunctions and their interaction with AEs. After a brief review of FC disjunctions, we will see a difference between AE- and non-AE-licensing modals: the former do not license FC inferences when they embed disjunctions; the latter do. Once we discuss the data in detail, we will look at implicature-accounts of FC, and later apply them to constructions of the form $\check{\Diamond}/\check{\Box}(p \vee q)$. We will show that the data are handled correctly by combining the derived-implicative analysis developed in the previous section, together with an implicature theory of FC.

It is well-known that when a disjunction is embedded under a possibility modal, e.g., a modal of permission, the sentence is intuitively understood to imply possibility (or permission) for each disjunct.

(28) John is allowed to eat cake or ice cream
Inference: John is allowed to eat cake *and* John is allowed to eat ice cream

FC inferences are puzzling if we assume (as is standard) that a disjunction $p \vee q$ is verified by the truth of just one of p, q. This leads us to expect (28) 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 entails $\Diamond(p \vee q)$. The question, then, is why in these linguistic environments the individual disjuncts are intuitively 'distributed', that is, understood to *each* be possible in the relevant sense (e.g., permitted, epistemically possible, etc).

Note that FC is also implied by constructions of the form $\Box(p \vee q)$, e.g., (29):

(29) John needs to talk to Mary or Sue
Inference: John is allowed to talk to Mary *and* John is allowed to talk to Sue

While the obligation expressed in (29) is true in situations where John needs to talk to Mary ($\Box p$), the sentence intuitively implies that John has a choice. But in this case there is a likely straightforward explanation for FC:[10] having failed to say '*John needs to talk to Mary*' ($\Box p$), the (presumably) opinionated speaker must believe that John does not in fact *need* to speak to Mary ($\neg\Box p$). It is therefore possible for him not to ($\Diamond\neg p$). Similarly, by not saying '*John needs to talk to Sue*' the speaker must believe that John does not need to speak to Sue, and it follows that $\Diamond\neg q$. These two inferences, together with the utterance $\Box(p \vee q)$, imply that John needs to speak to one of Mary/Sue, but is allowed to speak to Mary and allowed to speak to Sue ($\Diamond p \,\&\, \Diamond q$). Note, importantly, that these steps cannot be used to derive FC for $\Diamond(p \vee q)$, e.g., (28), because in that case negating the alternatives $\Diamond p$ and $\Diamond q$ contradicts the utterance. We will return to an analysis of $\Diamond(p \vee q)$ in section 4.2.

10 See Sauerland 2004.

4.1 Data

In BP, FC inferences arise when **poder/ter que** are IMP-marked, as shown in (30), but not when they are PFV-marked, (31):

(30) Ele podia/tinha que aprender Inglês ou Alemão. ✓Então ele
he could/had-to.**IMP** learn English or German. Therefore he
podia aprender Inglês, e ele podia aprender Alemão.
could.IMP learn English, and he could.IMP learn German
'He could/had-to learn English or German. Therefore he had permission to learn English, and he had permission to learn German'

(31) Ele pôde/teve que aprender Inglês ou Alemão. #Então ele
he could/had-to.**PFV** learn English or German. Therefore he
podia aprender Inglês, e ele podia aprender Alemão.
could.IMP learn English, and he could.IMP learn German

These data require some clarification. First, in (31) 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 (30) to a PFV-to-PFV analog, instead of the PFV-to-IMP instance in (31). The reason is that (31) 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 an important difference, because there are PFV-marked modal constructions that do not license AEs, e.g., PFV-marked epistemic modals, and expressions like "have permission to VP". As it turns out, these non-AE-licensers *do* give rise to FC when they embed disjunctions. I show BP examples of the latter kind below:[11]

(32) 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*)

(33) 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 o 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)

11 I thank an anonymous SALT abstract reviewer for asking about this.

There is, of course, an important challenge to the aspect-shift view here: if **ter permissão** is stative, why does shifting it under PFV-marking not generate AEs? Perhaps the verb **ter** ('*have*') undergoes different kinds of shifts from the expressions **poder/ter que**. But in any case the question is not of direct concern to us. The important point is that AE-licensing, not PFV-marking, is the relevant FC blocker.[12]

Third, though $\check{\Diamond}/\check{\Box}$ block FC inferences, they seem to be compatible with FC scenarios. Sentence (34), taken from (31) above, can be uttered if the speaker knows that João had a choice between English/German, but learned just one of the two.

(34) O João teve que aprender Inglês ou Alemão
João had-to.**PFV** learn English or German

The compatibility of (34) with FC is significant, because it shows that disjunction takes scopes below the AE-modal. It may not seem necessary to look for evidence for this, given that the scopal relation is reflected in the surface form, but we must take note of the logical possibility that in (34), there is a deleted occurrence of $\check{\Box}$ in the second disjunct. If so, the sentence would underlyingly be a plain disjunction, and thus would (arguably) not generate FC. But if this is right, then (34) would mean that p (or q) was realized and *required*, which makes (34) false in FC scenarios, where neither p nor q is by itself a necessity. In other words, if disjunction took scope above $\check{\Box}$, then (34) should not only block FC, but should also imply its negation.

We now come to our final summary of the data: AE-licensers generate AEs, and their negations generate anti-AEs. When they embed disjunctions, AE-licensers do not generate FC inferences but seem compatible with FC:

(35) a. $\check{\Diamond}/\check{\Box}p \vDash p, \Diamond/\Box p$
b. $\neg\check{\Diamond}/\check{\Box}p \vDash \neg p$
c. $\check{\Diamond}/\check{\Box}(p \vee q) \nvDash \text{FC}$
$\nvDash \neg\text{FC}$

(36) a. $\Diamond/\Box p \nvDash p$
b. $\neg\Diamond/\Box p \nvDash \neg p$
c. $\Diamond/\Box(p \vee q) \vDash \text{FC}$

In the next two sections we show how (35a,b), which result from the 'derived-implicative' analysis (section 3.3), conspire to predict (35c) under an implicature-based theory of FC. The proposal effectively makes $\check{\Diamond}/\check{\Box}(p \vee q)$ behave as if it were an unembedded disjunction as far as the FC-algorithm is concerned. This, we will see, is the reason why $\check{\Diamond}/\check{\Box}(p \vee q)$ does not generate FC, while $\Diamond/\Box(p \vee q)$ does.

4.2 FC as an implicature: Recursive exhaustification

In this section we outline the basics of Fox's (2007) recursive exhaustification account of FC. Because of space I will not be able to discuss the differences between

12 For more discussion of the *have permission/ability* family of constructions, see Homer section 5.4.

Fox's (grammatical) theory and its (non-grammatical) precursors in, e.g., Kratzer & Shimoyama 2002 and Alonso-Ovalle 2006.[13] Readers familiar with this literature, specifically with Fox 2007, may proceed directly to section 4.3.

Crucial to the implicature-view of FC is the distributional similarity between FC inferences and scalar implicatures (SIs). Both types of inference are typically available in upward monotone environments, but are significantly weakened (or blocked) in downward monotone ones. For example, while (37) implies that John did not finish writing his paper, its negation in (38) does not intuitively include a negation of *finishing* the paper.

(37) John started writing his SALT paper $\rightsquigarrow$ *start* & ¬*finish*

(38) John did not start writing his SALT paper $\rightsquigarrow$ ¬*start*
$\not\rightsquigarrow \neg(start \& \neg finish)$

Similarly, (39) implies FC, but its negation (40) appears to be stronger than merely negating the conjunctive FC; it implies that *neither* cake nor ice cream is permitted.[14]

(39) John is allowed to eat cake or ice cream $\rightsquigarrow \Diamond cake \ \& \ \Diamond ice\text{-}cream$

(40) John is not allowed to eat cake or ice cream $\rightsquigarrow \neg\Diamond(cake \vee ice\text{-}cream)$
$\not\rightsquigarrow \neg(\Diamond cake \ \& \ \Diamond ice\text{-}cream)$

The same difference appears in the case of disjunction-embedding universal modals:

(41) John needs to talk to Mary or Sue $\rightsquigarrow \Box(m \vee s) \ \& \ \Diamond m \ \& \ \Diamond s$

(42) John does not need to talk to Mary or Sue $\rightsquigarrow \neg\Box(m \vee s)$
$\not\rightsquigarrow \neg(\Box(m \vee s) \ \& \ \Diamond m \ \& \ \Diamond s)$

On the standard (neo-)Gricean view, the inference from **start** to ¬**finish** in (37) comes from a form of counterfactual reasoning that listeners are assumed to engage in. In (37), the listener attributes to her speaker the belief that the **finish**-alternative, **John finished writing his SALT paper**, is relevant, and assumes that the speaker is committed to providing all of the information that they could on the matter. If—the listener reasons—the **finish**-alternative were believed true by the (informative and honest) speaker, they would have uttered it in place of (37). So, having uttered (37) instead, it follows that the speaker is in no position to communicate the content of the **finish**-sentence. The listener thus concludes that the speaker believes that John did not finish the paper.[15]

13 For discussion, see Fox 2007, Chierchia, Fox & Spector 2012, and Schlenker 2016.

14 These illustrations are intended without prosodic prominence on **or** or **start**, though note that accenting the scalar items seems to change the judgements in parallel: accenting **or** in (40) can be understood to negate FC, and accenting **start** in (38) can suggest that John finished the paper.

15 Note that the same reasoning does not apply to the negated (38), because its alternative **John did not finish his paper** is weaker (i.e., less informative) than the utterance.

On the grammatical theory of implicatures, as formulated in Fox, SIs are generated by an unpronounced exhaustification operator, hereafter Exh, which takes a clausal argument and asserts it together with the negation of its excludable alternatives. The semantics of Exh, as the reader may have noted, is a lot like that of the particle **only**, though the operators do differ in at least one respect: Exh *asserts* its propositional argument, while **only** arguably presupposes it.[16] When Exh is applied to a case like (37), it asserts the sentence and adds the negation of its **finish**-alternative, but when applied to (38), Exh does nothing; the only available alternative is the negation of the **finish** alternative, and because this alternative is weaker than (38), it is not excludable (we will say more about excludability shortly).

Note that, if Exh is free to appear at any syntactic level, we expect a representation of (38) where Exh appears *under* negation. The resulting reading in this case is the unattested reading shown earlier: that it is false that John started but did not finish his paper, i.e., that either John did not start the paper, or he started *and finished* it. Because the reading does not seem to be available with unmarked intonation, the grammatical theory of SIs has to include a principle that keeps Exh from appearing under negation (more generally in DE contexts), or at least explain the apparent preference for parses where Exh is absent from DE environments. To this end, Chierchia et al. (2012) propose that the preference is driven by a preference for stronger readings: since Exh strengthens the meaning of its complement, strengthening under a DE operator results in weakened truth conditions above the operator. Parses where Exh is absent are therefore stronger in these cases, and hence preferred.[17]

Being a syntactic operator, Exh may take as its argument a "pre-exhaustified" clause, i.e., a clause that already contains an occurrence of Exh. We will now see how iterated exhaustification produces $\Diamond p \,\&\, \Diamond q$ (i.e., FC) when applied to $\Diamond(p \vee q)$, but does not produce $p \,\&\, q$ when applied to $p \vee q$, nor FC for $\check{\Diamond}(p \vee q)$.

We assume that the set of alternatives to a sentence S contains sentences that result from replacing the scalar items in S with their alternatives. The alternatives to a disjunction $p \vee q$ are the disjuncts p and q and the conjunction $p \wedge q$. Let S be of the form $\Diamond(p \vee q)$. Then the alternatives to S are the sentences shown in set A below:

(43) $A = \{\Diamond p, \Diamond q, \Diamond(p \wedge q)\}$

We write $\text{Exh}_A(S)$ to mean the result of exhaustifying S with respect to the alternatives in A. Exhaustifying with respect to a set of alternatives A, on Fox's proposal, is not equated with negating all of the elements that appear in A. Rather, Exh negates only those elements of A that are 'Innocently-Excludable' (IE) with respect to S:

(44) $\text{Exh}_A(S) = S \,\&\, \bigwedge\{\neg S' : S' \in \text{IE}_A(S)\}$

16 For a review of semantic analyses of **only**, see Ippolito 2008 and Beaver & Clark 2008.
17 Though see Magri 2011 for a revision.

Before we see what it means to be Innocently-Excludable, let us quickly introduce the term "set-negation": the set-negation of a set of sentences B, $B^{\neg}$, is the conjunction of negating all of B's members:

(45) Given a set of sentences B, the 'set negation' of B, $B^{\neg}$, is defined as follows: $B^{\neg} = \bigwedge\{\neg S' : S' \in B\}$

Now to IE. To start, observe that the set-negation of A, i.e., negating all of the elements of A, contradicts S; S says that one of p,q is permitted, but negating the members of A amounts to saying that p is not permitted, q is not permitted, and p and q together are not permitted. But on a closer look, we find that this contradiction has a narrower origin; while it is true that A's set-negation contradicts S, there is a *proper subset* of A whose set-negation also contradicts S, namely $\{\Diamond p, \Diamond q\}$. Call this set A_2. Unlike A, A_2 has no proper subsets whose set-negation contradicts S, so we can call A_2 *non-innocent*: a set of sentences B is *non-innocent* w.r.t. sentence S iff B's set-negation contradicts S, and there is no proper subset C of B whose set-negation contradicts S:

(46) B is non-innocent w.r.t. S iff $B^{\neg} \vDash \neg S$ and $\neg\exists C(C \subset B \;\&\; C^{\neg} \vDash \neg S)$

We now say that $\text{IE}_A(S)$ is A, minus the non-innocent sets (w.r.t. S) that it contains:

(47) $\text{IE}_A(S) = A - \bigcup\{B : B \subseteq A \text{ and } B \text{ is non-innocent w.r.t. } S\}$

In our example this gives us:

(48) $\text{IE}_A(S) = A - \{\Diamond p, \Diamond q\} = \{\Diamond(p \wedge q)\}$

The result so far is that exhaustifying $\Diamond(p \vee q)$ with respect to its alternatives A delivers the exclusive inference $\neg\Diamond(p \wedge q)$:

(49) $\text{Exh}_A(\Diamond(p \vee q)) = \Diamond(p \vee q) \;\&\; \neg\Diamond(p \wedge q)$

Consider now the recursively-exhaustified $\text{Exh}(\text{Exh}_A \Diamond(p \vee q))$. The outer Exh takes a clausal argument of the form $\text{Exh}_A S$, and because of our assumptions about alternative sentences, the alternatives to $\text{Exh}_A S$ should be of the form $\text{Exh}_A S'$, where S' is the result of changing the scalar items in S. In our examples the item of concern is disjunction, so the alternatives to $\text{Exh}_A \Diamond(p \vee q)$ are those in A' below.

(50) $A' = \{\text{Exh}_A \Diamond p, \text{Exh}_A \Diamond q, \text{Exh}_A \Diamond(p \wedge q)\}$

The members of set A' mean, respectively, that p is permitted but not q, that q is permitted but not p, and that p,q are permitted. Now, to determine the value of $\text{Exh}_{A'}(\text{Exh}_A \Diamond(p \vee q))$, we need to find from A' the innocently-excludable alternatives to the sentence $S' = \text{Exh}_A \Diamond(p \vee q)$. As stated earlier, we do this by subtracting from A' the non-innocent sets, i.e., the (minimal) sets whose negations contradict S'. But in this case there aren't any. Negating all elements of A' is consistent with $\text{Exh}_A \Diamond(p \vee q)$, as the reader may verify by checking the final line in (52), the value of $A'^{\neg}$, next to (49), the value of $\text{Exh}_A \Diamond(p \vee q)$.

(51) $A' = \{\text{Exh}_A \Diamond p, \text{Exh}_A \Diamond q, \text{Exh}_A \Diamond(p \wedge q)\}$
$= \{\Diamond p \& \neg\Diamond q,\ \Diamond q \& \neg\Diamond p,\ \Diamond(p \wedge q)\}$

(52) $A'^{\neg} = \bigwedge\{\neg(\Diamond p \& \neg\Diamond q),\ \neg(\Diamond q \& \neg\Diamond p),\ \neg\Diamond(p \wedge q)\}$
$= \bigwedge\{(\Diamond p \rightarrow \Diamond q),\ (\Diamond q \rightarrow \Diamond p),\ \neg\Diamond(p \wedge q)\}$
$= (\Diamond p \leftrightarrow \Diamond q)\ \&\ \neg\Diamond(p \wedge q)$

Because $A'^{\neg}$ is compatible with $\text{Exh}_A \Diamond(p \vee q)$, there are no non-innocent sets to be removed from A' in determining the IE-alternatives. In other words, the IE-alternatives from A', w.r.t. $\text{Exh}_A \Diamond(p \vee q)$, are exactly the elements of A' itself. This means that the outer Exh in $\text{Exh}_{A'}(\text{Exh}_A \Diamond(p \vee q))$ will conjoin its clausal argument $\text{Exh}_A \Diamond(p \vee q)$ with the negations of all elements of A'. This produces FC:

(53) $\text{Exh}_{A'}(\text{Exh}_A \Diamond(p \vee q)) = \text{Exh}_A(\Diamond(p \vee q))\ \&\ (52)$
$= \text{Exh}_A(\Diamond(p \vee q))\ \&\ (\Diamond p \leftrightarrow \Diamond q)\ \&\ \neg\Diamond(p \wedge q)$
$= \Diamond(p \vee q)\ \&\ \neg\Diamond(p \wedge q)\ \&\ (\Diamond p \leftrightarrow \Diamond q)\ \&\ \neg\Diamond(p \wedge q)$
$= \Diamond p\ \&\ \Diamond q\ \&\ \neg\Diamond(p \wedge q)$

Let us apply the same derivation to the unembedded $p \vee q$. We will see that here the exclusive inference derived from negating the conjunctive alternative, $p \wedge q$, blocks the individuated derivations of p and of q, thus preventing the incorrect FC-like inference from arising. First, assuming the alternatives in A below, the value of singly-exhaustifying $p \vee q$, given A, produces only the negation of $p \wedge q$:

(54) $A = \{p, q, p \wedge q\}$

(55) $\text{IE}_A(p \vee q) = A - \{p, q\} = \{p \wedge q\}$

(56) $\text{Exh}_A(p \vee q) = p \vee q\ \&\ \bigwedge\{\neg S' : S' \in \text{IE}_A(p \vee q)\}\ \ \underline{= p \vee q\ \&\ \neg(p \wedge q)}$

Now consider $\text{Exh}_{A'}(\text{Exh}_A(p \vee q))$. The contents of A', following the same recipe used earlier, are shown below together with their meanings.

(57) $A' = \{\text{Exh}_A p,\ \text{Exh}_A q,\ \text{Exh}_A(p \wedge q)\} = \{(p \& \neg q),\ (q \& \neg p),\ (p \wedge q)\}$

Of these alternatives, only the third is innocently-excludable w.r.t. the sentential argument $\text{Exh}_A(p \vee q)$. The reason is that $\text{Exh}_A p$ and $\text{Exh}_A q$ form a non-innocent set by themselves, because their negations are together equivalent to the biconditional $p \leftrightarrow q$, and $p \leftrightarrow q$ contradicts $\text{Exh}_A(p \vee q)$ (i.e., (56)). So, exhaustifying $\text{Exh}_A(p \vee q)$ does not negate all of the elements in A'; it only negates the (exhaustified) conjunctive alternative, which is already part of the meaning of $\text{Exh}_A(p \vee q)$:

(58) $\mathrm{IE}_{A'}(\mathrm{Exh}_A(p \vee q)) = A' - \{\mathrm{Exh}_A p,\ \mathrm{Exh}_A q\} = \{\mathrm{Exh}_A(p \wedge q)\}$

(59) $$\begin{aligned} \mathrm{Exh}_{A'}(\mathrm{Exh}_A(p \vee q)) &= \mathrm{Exh}_A(p \vee q)\ \&\ \bigwedge\{\neg S' : S' \in (58)\} \\ &= \mathrm{Exh}_A(p \vee q)\ \&\ \neg\mathrm{Exh}_A(p \wedge q) \\ &= \mathrm{Exh}_A(p \vee q)\ \&\ \neg(p \wedge q)\ \ \underline{= (p \vee q)\ \&\ \neg(p \wedge q)} \end{aligned}$$

As a final example, we show the result of singly-exhaustifying $\Box(p \vee q)$, and leave it to the reader to confirm that further applications of Exh produce no further inferences:

(60) $$\begin{aligned} \mathrm{Exh}_{\{\Box p,\, \Box q,\, \Box(p\wedge q)\}}(\Box(p \vee q)) &= \Box(p \vee q)\ \&\ \bigwedge\{\neg S : S \in (61)\} \\ &= \Box(p \vee q)\ \&\ \neg\Box p\ \&\ \neg\Box q \&\ \neg\Box(p \wedge q) \\ &\vDash\ \Box(p \vee q)\ \&\ \Diamond p\ \&\ \Diamond q \end{aligned}$$

(61) $\mathrm{IE}_{\{\Box p,\, \Box q, \Box(p\wedge q)\}}(\Box(p \vee q)) = \{\Box p,\ \Box q,\ \Box(p \wedge q)\}$

4.3 Recursive exhaustification and (anti)AE-licensers

In the first three sections of this paper we saw that $\check{\Diamond}/\check{\Box}$ entail actuality, and that $\neg\check{\Diamond}/\neg\check{\Box}$ entail anti-actuality. Now we will see how these two properties interact with the exhaustification mechanism described above. Let us start with the universal AE-licenser. While both $\Box p$ and $\Box q$ are innocently excludable w.r.t. $\Box(p \vee q)$, the same is not true of $\check{\Box}p$, $\check{\Box}q$ and $\check{\Box}(p \vee q)$; negating $\check{\Box}p$ and $\check{\Box}q$ entails the anti-AEs $\neg p$ and $\neg q$, and these jointly contradict $p \vee q$, which is the AE of the utterance $\check{\Box}(p \vee q)$. The set $\{\check{\Box}p, \check{\Box}q\}$ is therefore non-innocent w.r.t. $\check{\Box}(p \vee q)$, giving us the IE alternatives in (62), and the FC-less exhaustification in (63):

(62) $$\begin{aligned} \mathrm{IE}_{\{\check{\Box}p,\, \check{\Box}q,\, \check{\Box}(p\wedge q)\}}(\check{\Box}(p \vee q)) &= \{\check{\Box}p,\ \check{\Box}q,\ \check{\Box}(p \wedge q)\} - \{\check{\Box}p, \check{\Box}q\} \\ &= \{\check{\Box}(p \wedge q)\} \end{aligned}$$

(63) $$\begin{aligned} \mathrm{Exh}_{\{\check{\Box}p,\, \check{\Box}q,\, \check{\Box}(p\wedge q)\}}(\check{\Box}(p \vee q)) &= \check{\Box}(p \vee q)\ \&\ \neg\check{\Box}(p \wedge q) \\ &\vDash\ p \vee q\ \&\ \neg(p \wedge q) \end{aligned}$$

Notice that the mechanism produces neither FC *nor the negation of* FC. We therefore expect $\check{\Box}(p \vee q)$ to be compatible with FC, even if the inference is not deducible from the sentence. This matches the judgement reported in section 4.1.

The reader will likely notice that this result parallels the result of exhaustifying $p \vee q$, where the conflict between $\neg p/\neg q$ and $p \vee q$ renders the disjuncts non-innocent. In (62) the same conflict arises, but it does so through the anti-AEs of $\neg\check{\Box}p/\neg\check{\Box}q$ and the AE of $\check{\Box}(p \vee q)$.

(Anti-)AEs also prevent double-exhaustification from producing FC in the case of $\check{\Diamond}(p \vee q)$, again in parallel to the case of $p \vee q$, whose double-exhaustification produces no FC-like inferences.

(64) Let $A = \{\check{\Diamond}p,\ \check{\Diamond}q,\ \check{\Diamond}(p \wedge q)\}$. Then:

a. $\text{IE}_A(\check{\Diamond}(p \vee q)) = A - \{\check{\Diamond}p, \check{\Diamond}q\} = \{\check{\Diamond}(p \wedge q)\}$

b. $\text{Exh}_A(\check{\Diamond}(p \vee q)) = \check{\Diamond}(p \vee q)\ \&\ \neg\check{\Diamond}(p \wedge q)$ $\quad (\vDash p \vee q\ \&\ \neg(p \wedge q))$

Now, let $A' = \{\text{Exh}_A\check{\Diamond}p,\ \text{Exh}_A\check{\Diamond}q,\ \text{Exh}_A\check{\Diamond}(p \wedge q)\}$. Then:

(65) $\text{IE}_{A'}(\text{Exh}_A\check{\Diamond}(p \vee q)) = A' - \{\text{Exh}_A\check{\Diamond}p, \text{Exh}_A\check{\Diamond}q\} = \{\text{Exh}_A\check{\Diamond}(p \wedge q)\}$

$\text{Exh}_A\check{\Diamond}p$ and $\text{Exh}_A\check{\Diamond}q$ are non-innocent because their joint negation comes to mean $\check{\Diamond}p \leftrightarrow \check{\Diamond}q$. This biconditional is met either when $\check{\Diamond}p$ and $\check{\Diamond}q$ are true, which entails p, q and therefore contradicts the exclusive inference in (64b), or when $\check{\Diamond}p$ and $\check{\Diamond}q$ are false, which entails $\neg p$, $\neg q$ and contradicts the disjunction in (64b). The conjunctive $\text{Exh}_A(\check{\Diamond}(p \wedge q))$ is therefore the only IE-alternative for the upper Exh:

(66) $\text{Exh}_{A'}(\text{Exh}_A(\check{\Diamond}(p \vee q))) = \text{Exh}_A(\check{\Diamond}(p \vee q))\ \&\ \neg\text{Exh}_A(\check{\Diamond}(p \wedge q))$

5 Conclusion and further issues

This paper described a connection between (anti-)AEs, and the inability of their licensers to imply Free Choice inferences. The connection is transparent in an implicature-based perspective of FC: deriving FC as an implicature hinges on negating excludable alternatives. In the case of $\Box(p \vee q)$ these are the alternatives $\Box p$, $\Box q$, and in the case of $\Diamond(p \vee q)$ they are the 'pre-exhaustified' $\text{Exh}\Diamond p$, $\text{Exh}\Diamond q$. But when the relevant modal expression licenses (anti-)AEs, as in $\check{\Box}/\check{\Diamond}(p \vee q)$, none of the analogous alternatives are excludable, because of the interaction between their anti-AEs with the AEs of the uttered expressions. Exhaustification in these cases fails to generate FC inferences, as desired, but stops short of negating FC, also as desired.

There is more work to be done. I focused on two aspects of $\check{\Diamond}/\check{\Box}$—anti-AEs and FC-blocking—but I left out a third. Imagine that John, because of a medical condition, is given permission to smoke marijuana. Imagine also that John is forbidden from smoking tobacco. Now suppose that John actually smoked tobacco. Then it is true that John smoked, and it is also true that John was given permission to smoke. Yet it is infelicitous in this (Gettier-like) scenario to say that John $\check{\Diamond}$-smoked. From this we learn that $\check{\Diamond}(p \vee q)$ cannot be satisfied in situations where p happened but not q, and where q was permitted but not p. But nothing in our analysis captures this. So, what amendment might we add to the semantics that could solve this problem, and importantly, will the amendment bring with it a solution to the FC-blocking puzzle? To see how these two issues might be related, recall the proposal (discussed and dismissed in section 4.1) where disjunction takes scope above $\check{\Diamond}/\check{\Box}$: at LF, $\check{\Diamond}(p \vee q)$ takes the form $\check{\Diamond}p \vee \check{\Diamond}q$. On this story, the Gettier-like problem (for disjunction) does not arise, and FC is arguably blocked. As I said earlier, I do not think that this one idea is promising, but it is possible that something like it might get around the Gettier issue, and explain FC-blocking on the way.

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