Universal Free Choice and Innocent Inclusion

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Overview. The goal of this paper is to provide a global account of universal Free Choice (FC) inferences (argued to be needed in Chemla 2009). We propose a stronger exhaustivity operator than proposed in Fox (2007), one that doesn't only negate all Innocently Excludable (IE) alternatives but also asserts all "Innocently Includable" (II) ones, and subsequently can derive universal FC inferences globally. We further show that Innocent Inclusion is independently motivated by considerations that come from the semantics of *only* (data from Alxatib 2014), as well as the FC inferences of *allowed... at most* (Buccola and Haida 2016).

Universal Free Choice. It is well known that (1) triggers the FC inferences in (1a-b).

(1) You are allowed to eat ice cream or cake. $\Diamond(a \vee b)$
  a. $\rightsquigarrow$ You are allowed to eat ice cream. $\Diamond a$
  b. $\rightsquigarrow$ You are allowed to eat cake. $\Diamond b$

Chemla (2009) presents evidence that when embedded under universal quantification as in (2), the universal FC inferences in (2a-b) are as robust as in the unembedded case (1).

(2) Every boy is allowed to eat ice cream or cake. $\forall x \Diamond (Px \vee Qx)$
  a. $\rightsquigarrow$ Every boy is allowed to eat ice cream. $\forall x \Diamond Px$
  b. $\rightsquigarrow$ Every boy is allowed to eat cake. $\forall x \Diamond Qx$

A prima facie plausible analysis of (2) may be that *every boy* takes scope over an enriched FC meaning, with whatever mechanism we might have for enriching (1) to (1a-b) applying in the scope of *every boy*.

However, as Chemla notes, this kind of analysis is of no use with comparable negative cases like (3) which give rise to the FC inferences in (3a-b). These inferences cannot be derived from embedding the mechanism we have for (1); they must be derived at the matrix level.

(3) No boy is required to solve (both) problem A and problem B. $\neg\exists x \Box (Px \wedge Qx)$
  a. $\rightsquigarrow$ No boy is required to solve problem A. $\neg\exists x \Box Px$
  b. $\rightsquigarrow$ No boy is required to solve problem B. $\neg\exists x \Box Qx$

If we can find an analysis that derives the FC inferences in (2) globally, it would also be applicable to (3). Therefore we focus from now on on providing a global derivation for (2):

(4) Desideratum: Provide a global derivation for universal FC.

Fox (2007)'s analysis of FC disjunction. Alonso-Ovalle (2005), following Kratzer and Shimoyama (2002), argues that the Free Choice inference from (1) to (1a)-(1b) should be derived as a scalar implicature, due to its disappearance under negation.

Fox (2007) shows that within the grammatical theory of scalar implicatures (1a)-(1b) is predicted to be derived with the recursive application of an exhaustivity operator, EXH^{IE}, that only negates Innocently Excludable (IE) alternatives (under the independently motivated assumption that $a \vee b$ has a and b as alternatives, see e.g. Sauerland 2004):

(5) $[\![\text{EXH}^{IE}]\!](C)(p) = \lambda w.p(w) \wedge \forall q \in IE(p,C)[\neg q(w)]$

(6) $IE(p,C) = \bigcap\{C' \subseteq C : C' \text{ is a maximal set in } C \text{ s.t. } \{\neg q : q \in C'\} \cup \{p\} \text{ is consistent}\}$

However, a global derivation for (2) is not readily available with EXH^{IE}: even if we consider alternatives where *every* is replaced with *some* (or, for (3), *no* with *not every*, as suggested by Chemla for other cases) and apply recursive EXH^{IE} to (2) we can only get the weak inferences $\exists x \Diamond Px$ and $\exists x \Diamond Qx$.

Proposal: Innocent Inclusion. Consider the set of alternatives we have for (2) (assuming that deriving weaker alternatives is possible, contra fn. 35 in Fox 2007):

(7) $Alt(2) = \{\forall x \diamond (Px \vee Qx), \underline{\forall x \diamond (Px \wedge Qx)}, \forall x \diamond Px, \forall x \diamond Qx,$
$\exists x \diamond (Px \vee Qx), \underline{\exists x \diamond (Px \wedge Qx)}, \exists x \diamond Px, \exists x \diamond Qx\}$

The red (underlined) alternatives are the IE-alternatives. No other alternative is IE, since given the prejacent $\forall x \diamond (Px \vee Qx)$, exclusion of $\forall x \diamond Px$ entails $\exists x \diamond Qx$ and vice versa (and analogously for $\forall x \diamond Qx$ and $\exists x \diamond Px$).

Note that the green (non-underlined) alternatives, and specifically $\forall x \diamond Px$ and $\forall x \diamond Qx$, are consistent with the prejacent taken together with the negation of all IE-alternatives. Asserting the green alternatives corresponds to the attested meaning in (2). But as we mentioned above, applying $\textsc{exh}^{IE}$ recursively yields a weaker meaning.

We take this to suggest that $\textsc{exh}^{IE}$ is too weak. We therefore propose a modification of Fox's exhaustivity operator, $\textsc{exh}^{II+IE}$, which doesn't only negate the Innocently Excludable alternatives like $\textsc{exh}^{IE}$ does, but also asserts the Innocently Includable (II) alternatives. The II alternatives are those whose assertion is (i) consistent with the prejacent, (ii) consistent with the exclusion of the IE alternatives, and (iii) the choice to assert them isn't arbitrary given other non-IE alternatives (the prejacent p is always II, so we omit $p(w)$ from (8a)):

(8) a. $[\![\textsc{exh}^{II+IE}]\!](C)(p) = \lambda w.\forall r \in II(p,C)[r(w)] \wedge \forall q \in IE(p,C)[\neg q(w)]$

b. $II(p,C) = \bigcap\{C'' \subseteq C : C''$ is a maximal set in C s.t.
$\{r : r \in C''\} \cup \{p\} \cup \{\neg q : q \in IE(p,C)\}$ is consistent$\}$

The II alternatives of (2) are all the non-IE (green) alternatives. Universal FC is thus derived:

(9) $\textsc{exh}^{II+IE}(Alt(2))((2)) \Leftrightarrow \forall x \diamond (Px \vee Qx) \wedge \forall x \diamond Px \wedge \forall x \diamond Qx \wedge \neg\exists x \diamond (Px \wedge Qx)$

Unembedded FC is also derived with one application of $\textsc{exh}^{II+IE}$, since $\diamond a$ and $\diamond b$ are II:

(10) If $p = \diamond(a \vee b)$ and $C = \{\diamond(a \vee b), \diamond a, \diamond b, \diamond(a \wedge b)\}$,
then $\text{IE}(p,C) = \{\diamond(a \wedge b)\}$ and $\text{II}(p,C) = \{\diamond(a \vee b), \diamond a, \diamond b\}$

Importantly, it is not always the case that all non-IE alternatives are II; Without an existential modal, the disjunctive alternatives are neither IE nor II, as desired:

(11) If $p = a \vee b$ and $C = \{a \vee b, a, b, a \wedge b\}$, then $\text{IE}(p,C) = \{a \wedge b\}$ and $\text{II}(p,C) = \{a \vee b\}$

Connection with *only*. We argue that Innocent Inclusion is at play not only with $\textsc{exh}$ but with *only* too. The difference is minimal: whereas $\textsc{exh}^{II+IE}$ asserts that all II alternatives are true, *only* presupposes it:

(12) $[\![only]\!](C)(p) = \lambda w : \forall r \in II(p,C)[r(w)].\forall q \in IE(p,C)[\neg q(w)]$

The entry in (12) then predicts that when FC disjunction is embedded under *only*, the FC inference would behave like *only*'s prejacent:

(13) You are only allowed to eat [ice cream or cake]$_F$.

Alxatib (2014) argues at length that the FC inference of (13) indeed behaves like *only*'s prejacent: It survives negation and is difficult to cancel, as he shows for sentences like (14):

(14) John doesn't think that we are only allowed to eat [ice cream or cake]$_F$.

Allowed... at most. Buccola and Haida (2016) show that to get the FC inference in (15a) for (15) it does not suffice to apply $\textsc{exh}^{IE}$ recursively with respect to the set of alternatives in (15b). Doing that would only result in the too-weak inference that for any number in [0,3], if this number is allowed then another number is allowed. But this is weaker than (15a).

(15) You are allowed to draw at most three cards. $\diamond[\leq 3]$

a. $\rightsquigarrow$ You are allowed to draw any number of cards between 0 and 3.

b. $\{\Diamond[\leq n] : n \in [0,3]\} \cup \{\Diamond[= n] : n \in [0,3]\}$.

However, since all alternatives in (15b) are II, applying $\textsc{exh}^{II+IE}$ derives the desired inference. Buccola and Haida suggest closing the set of alternatives under disjunction, which turns out not to work for (2) or when embedding (15) under *every*, and is unnecessary given $\textsc{exh}^{II+IE}$.

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