Exclusive Updates!
Brought to you by your local QUD

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Abstract. We propose a dynamic semantics within a variant of standard type theory (Ty3; Beaver 2001) in which contexts include not only a common set of beliefs, but also a question under discussion (QUD) whose answers are information states consisting of world-assignment pairs, along with a strength ranking over such answers. The proposed framework satisfies several desiderata arising from the behavior of exclusives (e.g. *only, just*, *mere* and *sole*), including: (i) the possibility of presupposing a question; (ii) quantificational binding into such presupposed questions; (iii) the expressibility of presuppositional constraints regarding the strength ranking over the answers to the question under discussion; (iv) compositional derivation of logical forms for sentences.

1 Introduction

This paper offers a dynamic framework in which the contexts that are changed by Context Change Potentials contain, in addition to a set of facts and discourse referents, a question under discussion and a ranking over the answers. Its main application is in the analysis of exclusives including *mere* and *only*.

Our proposal for exclusives is based on Beaver and Clark's (2008) (semantically) static analysis of *only*, according to which it is presupposed that the prejacent is the weakest of the true answers to the QUD and at-issue that the prejacent is the strongest of those (S stands for an information state):

(1) $\text{ONLY}_S = \lambda p.\lambda w : \text{MIN}_S(p)(w).\text{MAX}_S(p)(w)$,
where $\text{MIN}_S(p) = \lambda w.\forall p' \in \text{CQ}_S[p'(w) \rightarrow p' \geq_S p]$
and $\text{MAX}_S(p) = \lambda w.\forall p' \in \text{CQ}_S[p'(w) \rightarrow p \geq_S p']$

By extending this idea to other exclusives, as proposed by Coppock and Beaver (2011), we can account for the equivalences in (2) and (3).

(2) a. John is only an employee. $\Longleftrightarrow$ b. John is a mere employee.

(3) a. Only John is an employee. $\Longleftrightarrow$ b. John is the sole employee.

We can also account for the fact that all exclusives have paraphrases with *at least* (expressing MIN) and *at most* (expressing MAX). For example, (2) entails *John is at least/most an employee,* and (3) entails *At least/most John is an employee.*

Following Coppock and Beaver (2011), we propose that all exclusives express MAX/MIN and differ with respect to the question they presuppose. In (2), *mere* expresses upper and lower bounds on the true answers to the question *What properties does John have?*, and in (3), *sole* relates in the same way to the question *Who is an employee?*. This explains why when *mere* is paraphrased by *only*, focus goes on the nominal property (as in (2)); for *sole*, focus goes on the subject of predication (as in (3)). Such constraints on the QUD are *discourse presuppositions,* which constrain the discourse context, rather than the common ground. A framework that makes it possible to express such presuppositions is therefore needed; indeed, this conclusion was reached independently by Jäger (1996) and Aloni et al. (2007) based on the apparent presupposition of a QUD by focus, and effects of questions on *only*'s quantificational domain.

With adjectival exclusives in non-predicative constructions, these questions involve a variable that is bound by a quantifier outscoping the exclusive. For example, (4) relates to the question, *What properties does x have?* where x is the variable bound by the negative quantifier.

(4) No mere child could keep the Dark Lord from returning. [web ex.]

Evidence from NPI licensing shows, furthermore, that adjectival exclusives such as *mere* and *sole* typically take merely local scope. Generally, adjectival exclusives in e.g. the subject NP do not license NPIs in the VP: **A mere/sole child said anything*, although NPIs can be licensed within the noun phrase: *The *(sole/only) student who asked any questions got an A*. Coppock and Beaver (2011) explain this by analyzing typical adjectival exclusives as follows:

(5) $\text{G-ONLY}_S = \lambda P_{\langle e,p\rangle}.\lambda X_e.\text{ONLY}_S(P(X))$

This entry ensures that the adjective has scope limited to the NP. Because there are λ-bound variables appearing in the argument of ONLY_S, there are 'local' QUDs containing variables bound by quantifiers outscoping the exclusive. Binding into local QUDs is also necessary for *only* inside relative clauses:

(6) As a bilingual person I'm always running around helping *everybody who only speaks Spanish.* [web ex.]

The QUD that *only* relates to in (6) can be rendered as "What does x speak?", where x is bound by *everybody.* No extant compositional dynamic system allows for such questions, and the present work aims to fill that gap.

2 Framework

Because Beaver's (2001) dynamic semantics deals successfully with quantified presuppositions, we use this as starting point, and introduce QUDs and an answer strength ranking into the context.

Our ontological assumptions are as follows. We have three basic types, as in Ty_3 (hence the name Ty_3): d for discourse markers (variables: D, D'); e for individuals (x, y, z) w for worlds (w, w'). Complex types are built as follows:

– Relational types: If $\tau_1...\tau_n$ are types, then $(\tau_1, ..., \tau_n)$ is the type of an n-ary relation whose first element is of type τ_1, etc. Special case:
  - Set types: If τ is a type then (τ) is the type of sets (unary relations) containing elements of type τ.

– Functional types: If σ and τ are types then $\langle \sigma, \tau \rangle$ is the type of functions with domain elements type σ and range elements of type τ.

Certain complex types play an important role in the theory:

(7)

Variable	Type	Interpretation
f, g, h	$\sigma = (d, e)$	(extended) sequences (cf. Heim)
I, J, K	$\iota = (w, \sigma)$	information states
Q	(ι)	questions: sets of information states
R	(ι, ι)	rankings
S, S'	(ι, ι)	contexts
C, C'	$\Pi = ((\iota, \iota), (\iota, \iota))$	CCPs
P, P'	$\langle d, \Pi \rangle$	lifted dynamic properties

The three components of the context have the following types:

– INFO_S: type $\iota = (w, \sigma)$, a set of world-assignment pairs
– CQ_S: type (ι), a set of answers, where each answer is an information state
– $\geq_S$: type (ι, ι), a partial order over information states

Under the assumption that the strength ranking does not rank answers other than those in the QUD, the QUD is recoverable from the strength ranking; it is its field (the union of its domain and its range), notated here with FIELD:[3]

(8) $\text{FIELD}(R) = \{x | \exists y[yRx \vee xRy]\}$

So we define CQ_S as follows:

(9) $\text{CQ}_S = \text{FIELD}(\geq_S)$

Likewise, the common ground is recoverable from the QUD.[4] Since we are representing questions as sets of information states, we can recover the common ground by taking the union over all information states in the question:

(10) $\text{INFO}_S = \bigcup \text{CQ}_S = \bigcup \text{FIELD}(\geq_S)$

Since all of the information that the context must provide is contained in the strength ranking, we can identify the context with the strength relation; $\geq_S = S$.

[3] Krifka (1999) represents alternative semantic values as relations corresponding to 'strength' in the same sense (perhaps 'argumentative value'; Ducrot 1980), and points out that the ordinary alternatives can be derived as the field of the ranking, defined as in (8).

[4] Jäger (1996) represents questions and information states as equivalence relations over possible worlds, which may be partial. "Hence each state nontrivially determines a certain proposition, which can be thought of as the factual knowledge shared by the conversants." That is the domain of the information state (which is the same as the field, since the information state is an equivalence relation).

3 Theory of exclusives

Beaver and Clark's theory of *only* is formalized as follows (where infix notation is used for relations, with optional square brackets surrounding the relation):

(11) $\text{ONLY} = \lambda C.\{\langle S, S'\rangle \mid S[\text{MIN}(C)]S \wedge S[\text{MAX}(C)]S'\}$

In the static definition of MAX and MIN, the denotation of the prejacent is one of the answers in the CQ. Because the meanings of sentences are CCPs, but the answers to questions are information states, we cannot use the denotation of the prejacent directly as the answer to the CQ whose strength is being compared to the strength of others. We must extract an information state from the CCP. We do this first by defining a static context that corresponds to the CCP thus:

(12) $\downarrow C = \{\ \langle I, J\rangle \mid \{\langle I, J\rangle\}C\{\langle I, J\rangle\}\ \}$

The propositional content of the prejacent is the information state corresponding to the static context corresponding to the CCP: $\text{INFO}_{\downarrow C}$. We then define MAX as follows:[5]

(13) $\text{MAX} = \lambda C.\ \{\ \langle S, S'\rangle \mid S' \subseteq S \wedge \forall J \in \text{CQ}_{S'}[J \leq_{S'} \text{INFO}_{\downarrow C}]\ \}$

MIN is defined as follows:

(14) $\text{MIN} = \lambda C.\ \{\ \langle S, S'\rangle \mid S' \subseteq S \wedge \forall J \in \text{CQ}_{S'}[\text{INFO}_{\downarrow C} \leq_{S'} J]\ \}$

In (11), ONLY is defined to take a CCP (C) and return another CCP (a relation between S and S'). The presuppositional nature of the MIN component is expressed by requiring that the input state S be a reflexive point with respect to MIN and C. In (14), MAX is defined to take a CCP C and provide another CCP relating contexts S and S', where the CQ in S' is a subset of the CQ in S containing only information states J such that J is as strong (according to the strength ranking in S) as the information state corresponding to C.[6]

We use a type-raised (Geached) version of (11) for VP-*only* and adjectival exclusives as in (15) (D is a variable over discourse referents, and P is a variable over dynamic properties, i.e. functions from discourse referents to CCPs):

(15) $\text{G-ONLY} = \lambda P \lambda D.\ \{\ \langle S, S'\rangle \mid S' \subseteq S' \wedge S[\text{ONLY}(P(D))]S'\}$

The lexical entry for *mere* further constrains G-ONLY by requiring a certain QUD:

(16) $\text{MERE} = \lambda P \lambda D.\ \{\ \langle S, S'\rangle \mid S[\text{ONLY}(P(D))]S' \wedge \text{CQ}_S \subseteq ?P'[P'(D)]\ \}$

(17) If ν is a variable of type α and ϕ is a CCP:
$?\nu\phi = \{I \mid \exists x \in \mathcal{D}_\alpha[I = \text{INFO}_{\downarrow \phi[\nu \to x]}]\}$

[5] The requirement that $S \subseteq S'$ makes this a *declarative update* in Jäger's (1996) sense. An *interrogative update* would not affect the information state of the context, but would change how it is divided up into smaller information states in the Current Question.

[6] We must also assume that there is at least one answer in the CQ in the output state in order to get the inference to the prejacent.

(18) $?P'[P'(D)] = \{I \mid \exists P \in \mathcal{D}_{\langle d,\Pi\rangle}[I = \text{INFO}_{\downarrow P(D)}]\ \}$

This entry ensures that in *mere herring*, *mere* ranges over a scale of properties, e.g. herring, octopus, caviar.[7]

4 Examples

4.1 Predicative example

Let us apply these ideas to the following examples:

(19) a. He_7 is a mere child.
     b. He_7 is only a child.

The meaning of *child* is fundamentally a function of type $\langle e, \langle w, t\rangle\rangle$; a function that returns true given an individual and a world if the individual is a child in the world. Call this $\langle e, \langle w, t\rangle\rangle$ function CHILD'. Following Beaver (2001, p. 180) in many respects, we can make this into a dynamic unary predicate as follows:

(20) $$\text{CHILD} = \lambda D.\{\ \langle S, S'\rangle \mid D \in \text{T-DOMAIN}(\text{INFO}_S) \wedge \text{INFO}_{S'} = \{\langle w, f\rangle \in \text{INFO}_S | \forall x[\langle D, x\rangle \in f \rightarrow \text{CHILD}'(x)(w)]\}\}$$

where (cf. Beaver 2001, p. 168, 170):

(21) $$\text{T-DOMAIN} = \lambda I.\{D | \forall w \forall f[\langle w, f\rangle \in I \rightarrow D \in \text{DOMAIN}(f)]\}$$

(22) $$\text{DOMAIN} = \lambda f.\{D | \exists x[\langle D, x\rangle \in f]\}$$

The subscript 7 on *he* indicates that the pronoun is associated with discourse referent 7. Thus the denotation of (19a) is (ignoring the presupposition that the referent is male):

(23) $$\begin{aligned} &\text{MERE}(\text{CHILD})(7)\\ &= \{\langle S, S'\rangle | S[\text{ONLY}(\text{CHILD}(7))]S' \wedge \text{CQ}_S \subseteq ?P'[P'(7)]\}\\ &= \{\langle S, S'\rangle | S[\text{MIN}(\text{CHILD}(7))]S \wedge S[\text{MAX}(\text{CHILD}(7))]S' \wedge \text{CQ}_S \subseteq ?P'[P'(7)]\}\end{aligned}$$

The denotation of (19b) is just slightly less specific, and it will turn out to be equivalent in this context: $\text{G-ONLY}(\text{CHILD})(7) = \text{ONLY}(\text{CHILD}(7))$.

The $\langle S, S'\rangle$ such that $S[\text{MAX}(\text{CHILD}(7))]S'$ are those such that $S' \subseteq S \wedge \forall J \in \text{CQ}_{S'}[J \leq_{S'} \text{INFO}_{\downarrow \text{CHILD}(7)}]$. Likewise, the $\langle S, S'\rangle$ such that $S[\text{MIN}(\text{CHILD}(7))]S'$ are those such that $S' \subseteq S \wedge \forall J \in \text{CQ}_{S'}[\text{INFO}_{\downarrow \text{CHILD}(7)} \leq_{S'} 7]$. $\downarrow \text{CHILD}(7)$ is the set of world-assignment pairs such that the assignment maps 7 only to individuals that are children in the world.

(24) $$\begin{aligned} &\downarrow \text{CHILD}(7)\\ &= \{\langle I, J\rangle | \{\langle I, J\rangle\}[\text{CHILD}(7)]\{\langle I, J\rangle\}\}\\ &= \{\langle I, J\rangle | \text{INFO}_{\{\langle I,J\rangle\}}[\text{CHILD}(7)]\text{INFO}_{\{\langle I,J\rangle\}}\}\\ &= \{\langle I, J\rangle | \cup \text{FIELD}(\{\langle I, J\rangle\})[\text{CHILD}(7)] \cup \text{FIELD}(\{\langle I, J\rangle\})\}\\ &= \{\langle I, J\rangle | I \cup J[\text{CHILD}(7)]I \cup J\}\end{aligned}$$

[7] In contrast, the constraint placed by adjectival *only* requires the question to be *What things have property P?* where P is the property denoted by the modified noun.

This turns out to be $\{\langle I, J\rangle | \forall w \forall f[\langle w, f\rangle \in I \cup J \rightarrow \exists x[\langle 7, x\rangle \in f] \wedge \forall x[\langle 7, x\rangle \in f \rightarrow \textsc{child}'(x)(w)]]\}$. The information state corresponding to this is as follows:

(25) $\textsc{info}_{\downarrow \textsc{child}(7)} = \{\langle w, f\rangle | \exists x[\langle 7, x\rangle \in f] \wedge \forall x[\langle 7, x\rangle \in f \rightarrow \textsc{child}'(x)(w)]\}$

This is the information state that MIN and MAX require to be lower and upper bounds on the CQ, respectively.

Let us consider an example context. Assume that the CQ contains $\textsc{info}_{\downarrow \textsc{adult}(7)}$ in addition to $\textsc{info}_{\downarrow \textsc{child}(7)}$ (the former being set of world assignment pairs $\langle w, f\rangle$ such that f maps 7 to an adult in w). And the latter is stronger than the former. So the $\leq$ ranking of this state, and hence the state itself, is the following, where we abbreviate $\textsc{info}_{\downarrow \textsc{child}(7)}$ as $I_{\textsc{child}(7)}$, etc.

(26) $\{\langle I_{\textsc{child}(7)}, I_{\textsc{child}(7)}\rangle, \langle I_{\textsc{adult}(7)}, I_{\textsc{adult}(7)}\rangle, \langle I_{\textsc{child}(7)}, I_{\textsc{adult}(7)}\rangle\}$

This state satisfies MIN's criterion on the output state, because there are no answers in the CQ that are weaker than than $\downarrow$ CHILD(7). But it does not satisfy MAX's requirement on the output state, because there are stronger answers. So this state would be a possible input state for ONLY(CHILD(7)), but not a possible output state. In the output state, to satisfy MAX, the possibility of 7 being an adult would have to be removed, leaving only:

(27) $\{\langle I_{\textsc{child}(7)}, I_{\textsc{child}(7)}\rangle\}$

So, as far as MIN and MAX are concerned, (26) is a possible input state for *He is a mere child* and (27) is a possible output state.

Now the question is whether (26) and (27) as input and output contexts would also satisfy the CQ constraint: $\textsc{cq}_S \subseteq ?P'[P'(7)]$, which is, again: $\{I \mid \exists P \in \mathcal{D}_{\langle d, \Pi\rangle}[I = \textsc{info}_{\downarrow P(D)}]\}$. Since $\textsc{adult} \in \mathcal{D}_{\langle d, \Pi\rangle}$, $\textsc{info}_{\downarrow \textsc{adult}(7)}$ is in this set, so (26) is a possible input state for *mere*.

Suppose that the alternative were, instead of ADULT(7), CHILD(8), where CHILD(8) is stronger than CHILD(7). This would yield input and output contexts that would satisfy the MAX and MIN requirements, but it would not satisfy *mere*'s constraint on the CQ. Note, however, that such input and output contexts would be appropriate for adjectival *only*, as in *She is the only child (in the room).*

4.2 Argument NP example

Now let us consider an example in which *mere* occurs within an argument NP:

(28) A mere child succeeded.

For this example, we need a theory of existential quantification. We will use the following definition of *some* (cf. Beaver 2001 p. 185), which needs to be complicated in order to deal with "internal dynamism" but is complicated enough for the present discussion.

(29) $\textsc{some} = \lambda D \lambda P \lambda P'.\{\langle S, S'\rangle | \exists S_{in} \exists S_{res} S[+i] S_{in}[P(D)] S_{res}[P'](D)] S'\}$

where (Beaver 2001):

(30) $+ = \lambda D. \{\langle S, S' \rangle \mid \neg D \in \textsc{p-domain}(\textsc{info}_S) \wedge \textsc{info}_{S'} = \{\langle w, f\rangle | \exists g \langle w, g\rangle \in \textsc{info}_S \wedge g[\textsc{add}(D)]f\}\}$

(31) $\textsc{p-domain} = \lambda I. \{D | \exists w \exists f [\langle w, f\rangle \in I \wedge D \in \textsc{domain}(f)]\}$

(32) $\textsc{add} = \lambda D \{\langle f, g\rangle | \exists x\ [g = \{\ \langle D', y\rangle \mid D' = D \rightarrow x = y \wedge (\neg D' = D) \rightarrow \langle D', y\rangle \in f\}]\}$

So the meaning of (28) is:

(33) $\textsc{some}(7)(\textsc{mere}(\textsc{child}))(\textsc{succeeded})$
$= \{\langle S, S'\rangle | \exists S_{in} \exists S_{res} [S[+7]S_{in}[\textsc{mere}(\textsc{child})(7)]S_{res}[\textsc{succeeded}(7)]S']\}$

Suppose that the model contains the individuals Alice (a), Bob (b), Charlie (c), and Dave (d) and one world w, where Alice and Bob are children and Charlie is an adult and Dave is frog, and Alice and Charlie succeeded.

(34) $\textsc{adult}'(c)(w), \textsc{child}'(a)(w), \textsc{child}'(b)(w), \textsc{frog}'(d)(w),$
$\textsc{succeeded}'(a)(w), \textsc{succeeded}'(c)(w)$ *and nothing else holds in w*

The sentence is true in w, because there is a mere child, Alice, who succeeded.

The input to $\textsc{mere}(\textsc{child})(7)$ must be a context in which 7 is mapped to some individual. This is satisfied in S_{in}, because 7 is added in the course of the first update. The +-formula requires that 7 is not defined in $\textsc{info}_S$, and makes $\textsc{info}_{in}$ the set of world-sequence pairs such that the sequence maps 7 to some object. If $\textsc{info}_S$ consists of one pair: w and the empty sequence, then $\textsc{info}_{in}$ contains the following pairs: $\langle w, [7 \mapsto a]\rangle$, $\langle w, [7 \mapsto b]\rangle$, $\langle w, [7 \mapsto c]\rangle$, $\langle w, [7 \mapsto d]\rangle$.

But we have a problem. MIN requires that there are no answers to the CQ that are weaker than $I_{\textsc{child}(7)}$. The addition of the discourse referent says nothing directly about the CQ, but we have set things up so that taking the union of its elements must yield $\textsc{info}_{in}$ as just described. Any cover of that set of world-assignment pairs will satisfy that condition. The constraint on the CQ imposed by *mere* is that every answer to the CQ is an answer to the question, "what properties does 7 have?" so one possible cover would be: "7 is a child" (so 7 is mapped to a or b), "7 is an adult" (so 7 is mapped to c), "7 is a frog" (so 7 is mapped to d). If these answers are ranked in such a way that frogs and adults are at least as strong as children, then MIN's criterion is satisfied. But in most contexts, frogs are weaker than children.

The problem can be stated this way: the discourse referent is required to be new, so nothing can be known about it, but MIN requires it to be at least a child. A related problem is that we need to account for discourses like:

(35) A: Who succeeded?
B: A mere child did.

Here the CQ for B's utterance as a whole would appear to be *Who succeeded?*. We need to have a separate local CQ for the NP. A third, related problem is that we need to account for the focus sensitivity of *mere*:

(36) a. A mere PAPER by Beaver would not suffice (though a book by him would be OK).
b. A mere paper by BEAVER would not suffice (though a joint paper with Coppock would be an improvement).

Our solution is to temporarily introduce a new CQ that takes scope only within the restrictor of *some*, and remove it and restore the CQ to normal once we are "done," so to speak, with the restrictor, modulo any information that we have gained in the process of processing the restrictor. We propose a special mode of interpretation ν 'new', and propose the following definition for the special case where the expression (F) is type $\langle d, \Pi\rangle$:

(37) $$[\![F]\!]^{\nu} = \lambda D.\{\langle S, S'\rangle \mid \exists S'', S''' \\ \textsc{info}_{S''} = \textsc{info}_{S} \wedge \\ \geq_{S''} \subseteq [\![F]\!]^{A} \cdot D \wedge \\ S''[[\![F]\!](D)]S''' \wedge \\ \geq_{S'} = \textsc{restriction}(\geq_{S}, \textsc{info}_{S'''})\}$$

where:

- $[\![F]\!]^{A}$ is the alternative semantic value of the expression F. We assume, following Krifka (1999), that the alternatives associated with words and phrases are (potentially) ranked, and represent them as the relations constituting the ranking. Thus, for example, $[\![\text{child}]\!]^{A}$ might be $\{\langle[\![\text{frog}]\!], [\![\text{frog}]\!]\rangle, \langle[\![\text{frog}]\!], [\![\text{child}]\!]\rangle, \langle[\![\text{child}]\!], [\![\text{child}]\!]\rangle, \langle[\![\text{child}]\!], [\![\text{adult}]\!]\rangle, \langle[\![\text{adult}]\!], [\![\text{adult}]\!]\rangle\}$. We assume a compositional mechanism for deriving alternative semantic values similar to the one proposed by Krifka (1999).
- The dot notation '·' denotes distributive function application; $[\![F]\!]^{A} \cdot D$ is the set of CCPs obtained by applying a member of $[\![F]\!]^{A}$ to D.
- RESTRICTION is a function that takes a ranking and an information state and returns a new ranking that is as similar as possible to the input ranking while incorporating the information in the information state. The information state will contain a subset of the worlds in the information state of the input ranking, but it might contain new variable assignments. The result should not contain any worlds that are not in the given information state, but it should include the new assignments.

The meaning of (28) becomes:

(38) $\textsc{some}(7)(\textsc{mere}([\![\text{child}]\!]^{\nu}))(\textsc{succeeded})$

During the processing of the scope of *some*, the CQ temporarily becomes the question of what properties 7 has, and is then restored to the root-level question, presumably *Who succeeded?*

Updating with MAX produces a state *res* where stronger alternatives to $I_{\text{CHILD}(7)}$ are ruled out. So $\textsc{cq}_{res}$ consists only of $I_{\text{CHILD}(7)}$, and $\textsc{info}_{init'}$ consists of pairs whose first member is w and whose second member is a or b. Updating with the restrictor eliminates $\langle w, [7 \mapsto b]\rangle$ from the information state, since b did not succeed. Hence, updating with B's response in (35) results in a state where 7 is mapped to a child (not a frog or an adult) who succeeded,.

5 NPI licensing

Exclusives generally license NPIs within their semantic scope, but differ in scope, hence NPI licensing. Subject-modifying *only* takes scope over the sentence as a whole and hence licenses NPIs there, while *mere* has NP-scope.

(39) a. **Only** a child said **anything**.
b. *A **mere** child said **anything**.

The adjectival exclusives *only* and *exclusive* do not license NPIs in the VP either, although they do license NPIs in their syntactic scope:

(40) a. *The **only** author got **any** royalties.
b. The *(**only**) student who asked **any** questions got an A.

(41) a. *The exclusive supplier of gas energy got **any** new contracts.
b. We are the *(**exclusive**) supplier of **any** drink served here.

In order to account for these contrasts, we must establish that ONLY as defined above is an NPI-licesning environment. To do so, we define a dynamic notion of Strawson Downward Entailment (von Fintel, 1999) as follows:

(42) If $x \Rightarrow y$ and $f(x)$ and $f(y)$ are CCPs, then f is **dynamically Strawson downward-entailing** iff $f(y)$ dynamically Strawson-entails $f(x)$.

(43) A CCP C **dynamically Strawson-entails** another CCP C' iff for all S, S', $[S[C]S' \wedge S'$ ADMITS $C' \rightarrow S'[C']S']$

The notion of admittance is defined thus:

(44) $\text{ADMITS} = \{\langle S, C\rangle | \exists S' S[C]S'\}$

So our claim that ONLY produces a DSDE environment amounts to:

(45) If $x \Rightarrow y$ and $\text{ONLY}(x)$ and $\text{ONLY}(y)$ are CCPs, then for all S, S':
$S[\text{ONLY}(y)]S' \wedge S[\text{ADMITS}]\text{ONLY}(x) \rightarrow S'[\text{ONLY}(x)]S'$

We must also define $\Rightarrow$ in order to evaluate this claim. Because the x and y in our example are CCPs, we use a dynamic notion of entailment:

(46) $\text{ENTAILS} = \{\langle P, P'\rangle | \forall S \forall S'[S[P]S' \rightarrow S'[\text{SATISFIES}]P']\}$

(47) $\text{SATISFIES} = \{\langle S, P\rangle | S[P]S\}$

So what we want to show is:

(48) If $P[\text{ENTAILS}]P'$, then for all S, S':
$S[\text{ONLY}(P)]S' \wedge S[\text{ADMITS}]\text{ONLY}(P') \rightarrow S'[\text{ONLY}(P')]S'$

Let us consider two CCPs such that one ENTAILS the other: one for *He*$_7$ *likes kale,* and another for *He*$_7$ *likes vegetables.* Intuitively what we want to prove is that if he likes kale (the presupposition of *Only he likes kale*), then *Only he likes vegetables* implies *Only he likes kale.* In order to simplify things, let us represent the meaning of *likes kale* and *likes vegetables* as the $\langle e, \langle w, t\rangle\rangle$ predicates LIKES-KALE$'$ and LIKES-VEGGIES$'$, where $\forall x, w[\text{LIKES-KALE}'(x)(w) \rightarrow \text{LIKES-VEGGIES}'(x)(w)]$. The CCPs corresponding to *He likes kale* and *He likes vegetables* are LIKES-KALE(7) and LIKES-VEGGIES(7).

(49) LIKES-KALE(7) ENTAILS LIKES-VEGGIES(7) iff:
$\forall S \forall S'[S[\text{LIKES-KALE}(7)]S' \rightarrow S'[\text{LIKES-VEGGIES}(7)]S']$

It follows from what we have said above that this universal implication holds.

So if ONLY is DSDE, it should be the case that:

(50) For all S, S': $S[\text{ONLY}(\text{LIKES-VEGGIES}(7))]S' \wedge S[\text{ADMITS}]\text{ONLY}(\text{LIKES-KALE}(7)) \rightarrow S'[\text{ONLY}(\text{LIKES-KALE}(7))]S'$

The contexts that admit ONLY(LIKES-KALE(7)) are those contexts S such that $S[\text{MIN}(\text{LIKES-KALE}(7))]S$, i.e. those S such that $\forall J \in \text{CQ}_S[I_{\text{LIKES-KALE}(7)} \leq_S J]$. Whether or not this holds of S depends of course on the strength ranking over the alternatives. Because there is focus on the subject, the alternatives must correspond one-to-one with the set of individuals, and the ranking must be isomorphic to the part-of relation over individuals; so $a < a \oplus b$, etc. So stronger answers correspond to larger groups containing whatever individual 7 is mapped to. Now we learn that this individual is the only one who likes vegetables; the answers to the question of who likes vegetables are no stronger than the one corresponding to this individual. This means that there are no answers to the question of who likes kale that are stronger than the one corresponding to this individual.

Hence, ONLY as in (11) produces a dynamically Strawson Downward-Entailing environment in the sense of (42). In combination with an account of lexical type restrictions on different exclusives, which in turn predicts differences of scope, this explains differences among exclusives with respect to NPI licensing.

6 Conclusion

To summarize, we have proposed (i) that the meanings of sentences are CCPs that operate on contexts containing questions under discussions with ranked answers, making it possible for questions to be presupposed and for presuppositional constraints on questions and the rankings over their answers to be expressed; (ii) a mechanism for temporarily introducing ‘local’ questions under discussion, which enables quantificational binding into local questions; (iii) a dynamic notion of Strawson Downward Entailment, which makes it possible to capture the NPI licensing properties of exclusives. The framework is furthermore compositional, allowing for the compositional derivation of logical forms for sentences containing non-root-level question-sensitive operators.

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