Covert operators are picked to minimize QuD-ambiguity

The view from *pex* and *only*[1]

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SuB 30, Goethe University Frankfurt

[1] Thanks to Amir for suggesting this puzzle to me; it's TOO GOOD.

Scalar implicatures

(1) Jo ate some of the cookies.
⇝ Jo did **not** eat all of the cookies.

- **Scalar implicatures** (SIs) arise when a speaker chooses a weaker term on a scale of informational strength, implying that a stronger alternative does not hold.
- **Neo-Gricean view**:[1] SIs are pragmatic, i.e. post-compositional and based on core principles governing cooperative conversations.
- **Grammatical view**:[2] SIs stems from the syntax, specifically from a covert operator (*exh* for exhaustification) akin to *only*.

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[2] Chierchia et al. (2009, 2011), Magri (2011), Crnič (2012), Meyer (2013, 2016), Bar-Lev and Fox (2017), Fox (2018), and Bassi et al. (2021) i.a.

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Overt vs. covert exhaustification

- In both frameworks, SIs have an effect close to that of *only*.

(2) Jo ate some of the cookies.
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(3) Jo ate **only** some of the cookies.
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- Main, relatively uncontroversial difference: ***only* presupposes its prejacent while SIs assert it**.

(4) Jo ate some of the cookies.
Hey wait a minute! I did not know that Jo ate some of the cookies.

(5) Jo ate **only** some of the cookies.
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Presuppositional exhaustification

- A recent line of research[3] argues that *only* and SIs **trigger inferences at distinct levels**.
- *Only* **asserts** the negation of non-weaker alternative(s):

  (6) Jo ate **only** some of the cookies.
  # Hey wait a minute, I did not know Jo did **not** eat all!

- While SIs **presuppose** the negation of a non-weaker alternative.[4]

  (7) Jo is unaware that some cookies were eaten.
  ⇝ Jo doesn't hold the belief that some cookies were eaten, but in fact some but **not** all were.

- This is cashed out in the grammatical framework by positing the covert operator ***pex*** ("presuppositional" *exh*).

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Our puzzle

- Starting point: SIs and *only* do similar things but differently:
  - *only* presupposes its prejacent, and asserts extra inferences.
  - Under the *pex* view, SIs do the opposite.
- Why are things this way? Why don't we have:
  - An overt operator ***opex*** asserting its prejacent, and presupposing extra inferences.
  - SIs presupposing their prejacent, and asserting extra inferences, genuinely like a covert *only* (***conly***).

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Our goal and core assumptions

- Informal description of the attested pattern: *only*, by backgrounding its prejacent, does something **more “marked”** and so should be **overtly realized**.
- To better *explain* this intuition, we’ll adopt the grammatical view, and assume *pex*, which will eventually make our life easier.
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Proposal in a nutshell

- The difference between *pex* and *only* w.r.t. the presupposition/assertion divide, entails these operators are used to answer distinct overt Questions under Discussion. [5] In turn, **these operators evoke different QuDs**.
- Granted covert operators induce a **parsing ambiguity** (there may or may not be there), they also induce an ambiguity w.r.t. **which QuD to accommodate**.
- Covert operators can be **compared in terms of how much QuD ambiguity they generate**.
- A grammar with *only*/*pex* induces less QuD ambiguity overall, than a grammar with a covert *only* (**c***only*) and an overt *pex* (**o***pex*).

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pex, *only*, and the QuD

Take-home: pex and only answer and evoke different questions

Semantics of *pex* and *only*

- *Only* presupposes its prejacent and asserts the negation of non-weaker alternatives.

(8) a. $[\![\textit{only}]\!] = \lambda p : p. \forall q \in \mathcal{A}_p : \ p \not\Rightarrow q. \neg q$

b. $[\![\textit{only some}]\!] = \exists. \neg\forall$

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Assumptions on the QuD

- QuD as partitioned Context Set (**CS**[7]), whose cells define maximal answers, and non-exhaustive unions of cells non-maximal answers.
- A proposition is:
  - **relevant** if its intersection with the CS corresponds to a (non-)maximal answer.[8]
  - **overinformative** if its intersection with the CS entails a cell.
  - **irrelevant** otherwise.

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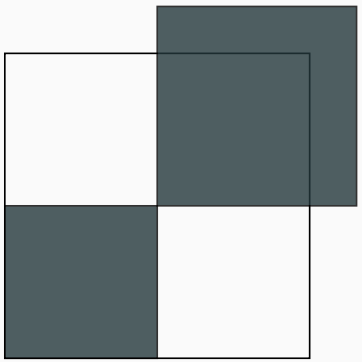

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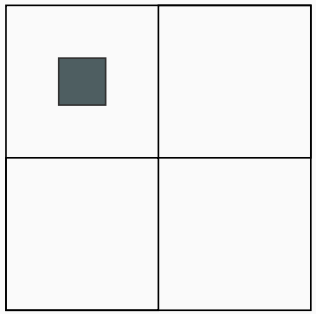

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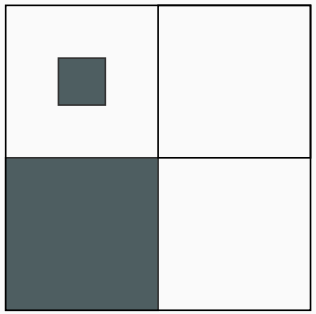

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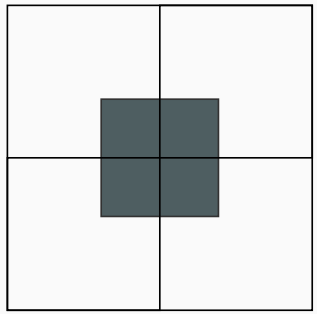

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Presuppositions and the QuD

- QuDs should **not be addressed presuppositionally**.[9]
- Systematic formalization: your assertion must remain relevant after you intersect your QuD (partitioned CS) with your presupposition.[10]
- Special case of interest: if your **presupposition identifies a cell**, the QuD becomes trivial regardless of the assertion, and # arises.
- Prediction:
  - *only some* should be # with a QuD involving a ∃-cell;
  - *pex some* should be # with a QuD involving a ¬∀-cell.

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Answering a whether-all question with *pex*/*only*

- Jo is taking an undergrad NLP class this semester. The class has small weekly assignments, and **Jo will pass iff Jo completes all of them**.

(10) *Context: NLP class*; QuD: | ∀ | ¬∀ |

–Did Jo complete **all** the assignments or not?
–Jo completed { all✓, some✗, only some✓, SOME? } assignments

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–Did Jo complete **all** the assignments of not?
–Jo completed { all✓, some✗, only some✓, SOME? } assignments.

- *all* is obviously relevant to the QuD.
- literal *some* is not; *pex*-ing it does not help: it leads to a trivial $\boxed{\neg\forall}$ QuD after accommodation.
- *only some* is fine because it leads to a $\boxed{\forall \mid \exists \wedge \neg\forall}$ QuD after ∃-accommodation, to which the assertion ¬∀ is relevant.
- *SOME*'s okay-ness can be explained by the idea that focus makes ¬∀ at-issue: *SOME* is thus "just" overinformative.

Pattern overall consistent with theories of relevance and presupposition accommodation.

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- literal *some* is not; *pex*-ing it does not help: it leads to a trivial $\boxed{\neg\forall}$ QuD after accommodation.
- *only some* is fine because it leads to a $\boxed{\forall \mid \exists \wedge \neg\forall}$ QuD after ∃-accommodation, to which the assertion ¬∀ is relevant.
- *SOME*'s okay-ness can be explained by the idea that focus makes ¬∀ at-issue: *SOME* is thus "just" overinformative.

Pattern overall consistent with theories of relevance and presupposition accommodation.

Answering a whether-some question with *pex*/*only*

- Jo is taking a grad semantics class this semester. The class has larger biweekly assignments, and **Jo will pass iff Jo completes at least one**.

(11) *Context: Semantics class*; QuD: | ∃ | ¬∃ |

–Did Jo complete **some** assignments or not?
–Jo completed { all[?], some✓, only some✗, SOME✗ } assignments.

Answering a whether-some question with *pex*/*only*

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- *only some* is degraded because it leads to a trivial $\boxed{\neg\exists}$ QuD after $\exists$-accommodation.
- *SOME*'s badness is slightly puzzling (should just feel overinformative).

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What Q/A pairs tell us about implicit questions

- In the absence of an overt question/clear context, a QuD gets **implicitly accommodated**.[11]
- If we don't know the class' grading system and hear that *Jo did (not) do all of the assignments*, we'll probably infer the $\forall/\neg\forall$ distinction is relevant.
- Of course, other questions may come to mind, depending on how exactly focus gets assigned.
- But at a first level of approximation, we can assume *all* evokes $\boxed{\forall \mid \neg\forall}$ and literal *some* evokes $\boxed{\exists \mid \neg\exists}$
- What about *pex some* and *only some*?

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Incorporating presuppositions into implicit QuDs

- Recall presuppositions can be seen as **shrinking the partitioned CS** that constitutes the QuD.
- We take that an utterance A_p asserting A and presupposing p evokes **a QuD evoked by A on a CS intersected with p**.
- *pex some* then evokes the QuD literal *some* evokes, but on a CS entailing $\neg\forall$, i.e. $\boxed{\exists \wedge \neg\forall \mid \neg\exists}$
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- Key observation: **literal *some* and *pex some* share the same evoked QuD "structure"** (*whether-some*) , while *some* and *only some* do not.

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Parsing ambiguities, QuD ambiguities

Take-home: covert operators like pex induce an ambiguity w.r.t. which QuD to accommodate.

Covert operators

- We assume covert operators are optionally merged.
- We'll consider *pex* (**c**overt) and *only* (**o**vert), but also their putative (c)overt counterparts, ***o****pex* and ***c****only*.
- *pex*/*opex* (resp. *only*/*conly*) have same semantics and thus evoke the same QuDs.
- We will focus cases in which one of the two operators is covert. Our goal is to explain why the grammar favors *pex*/*only* as opposed to *opex*/*conly*.

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Parses of *(only) some/all* utterances and their evoked QuDs

Parse	Assertion	Presupposition	QuD
$\forall$	$\forall$	-	$\{\forall, \neg\forall\}$
$\exists$	$\exists$	-	$\{\exists, \neg\exists\}$
(o)pex($\exists$)	$\exists$	$\neg\forall$	$\{\exists \wedge \neg\forall, \neg\exists\}$
(c)only($\exists$)	$\neg\forall$	$\exists$	$\{\forall, \neg\forall \wedge \exists\}$

- This Table maps parses to implicit QuDs... but certain utterances can have more than one parse!
- We'll focus first on the attested case in which *pex* induces a parsing ambiguity; then, on the unattested case in which *conly* does so.

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Attested grammar: QuDs evoked by *all*, *some*, and *only some*

- In the **attested grammar** with *pex*/*only*, *pex* is covert, and leads to a parsing ambiguity: *some* can be parsed as *pex*(∃) or ∃. *Only* does not lead to any such ambiguity.

Utterance	Parse	QuD
all	∀	∀ | ¬∀
some	∃	∃ | ¬∃
	pex(∃)	∃ ∧ ¬∀ | ¬∃
only some	*only*(∃)	∀ | ¬∀ ∧ ∃

- Key observation: in the ambiguous *some* case, **the two possible evoked QuDs share a cell (the ¬∃ one).**

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Covert operators minimize QuD ambiguity

Take-home: semantically similar operators compete for covertness, the decisive criterion being their potential for QuD ambiguity.

Generalizing our previous key observations

- The “ambiguity” of a set of potential questions depends on how close these questions are to each other.
- Closeness is understood in terms of **sets of matching cells**: “close” questions have a lot of cells in common.

(12) **Matching cells**. Let $\mathcal{Q}$ be a set of questions. $\mathcal{M}(\mathcal{Q}) = \{c | \forall Q \in \mathcal{Q}.\ c \in Q\} = \bigcap_{Q \in \mathcal{Q}} Q$

(13) **Relative QuD-ambiguity between sets of questions**. A set of questions $\mathcal{Q}$ is less ambiguous than another set $\mathcal{Q}'$ ($\mathcal{Q} \prec \mathcal{Q}'$) iff $\mathcal{M}(\mathcal{Q}) \supseteq \mathcal{M}(\mathcal{Q}')$. $\prec$ is a **partial order**.

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QuD ambiguity induced by covert operators

- Given U and U' two utterances, U is less QuD-ambiguous than U', if the questions evoked by (the different parses of) U are less ambiguous, than those evoked by U'.
- (14) relativizes this to covert operators.

(14) **Questions induced by a covert operator.**[13] Let U be an utterance, Φ a covert operator insertable in Φ. Let U' be the result of the insertion of Φ in U. The questions induced by the covertness of Φ in U, noted $\mathcal{Q}(U, \Phi)$ is the **set of questions evoked by either U or U'.**

- (14), together with the relative QuD ambiguity relation $\prec$ (13), allow us to compare covert operators in terms of their potential for QuD ambiguity.
- Let's see how this applies to a single *some* utterance, optionally involving *pex* vs. *conly*

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Questions induced by *pex*'s covertness

- Let's first see how (14) applies to a bare *some* utterance which may be *pex*-ed.
- The set of questions induced by *pex*'s covertness in that simple utterance contains exactly the questions evoked by ∃ and those evoked by *pex*(∃).

$$\mathcal{Q}(some, pex) = \left\{ \underbrace{\boxed{\exists} \boxed{\neg\exists}}_{\text{evoked by } \exists}, \underbrace{\boxed{\exists \wedge \neg\forall} \boxed{\neg\exists}}_{\text{evoked by } pex(\exists)} \right\}$$

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Comparing *pex*'s and *conly*'s potential for QuD ambiguity

- We have $\mathcal{M}(\mathcal{Q}(\mathit{some}, \mathit{pex})) = \{\exists\}$, $\mathcal{M}(\mathcal{Q}(\mathit{some}, \mathit{conly})) = \emptyset$ and $\emptyset \subseteq \{\exists\}$.
- So $\mathcal{Q}(\mathit{some}, \mathit{pex}) \prec \mathcal{Q}(\mathit{some}, \mathit{conly})$ according to (13).

pex minimizes QuD ambiguity, when compared to *conly* against a simple *some* utterance.

Generalizing to the grammar

- Intuition: languages attempt to **minimize overall QuD ambiguity** when "deciding", between semantically similar covert operators.
- A covert operator leading to comparatively less QuD ambiguity (according to $\prec$) should be preferred.
- $\prec$ being a partial order, the optimal operator may not be better than its other covert competitor for all the sentences in which they could be both inserted.
- Rather, an optimal covert operator should ***sometimes* be better and *never* be worse** than its covert competitor when it comes to covertness-induced QuD ambiguity.

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Covert operators are picked to minimize QuD ambiguity

(15) **Minimize QuD ambiguity**. Let Φ and Ψ be two covert operators s.t. for any utterance U, inserting Φ or Ψ at the same site, leads to the same CS after presupposition and assertion have been processed. Then, Ψ should be preferred iff:

(i). Ψ sometimes induces less QuD-ambiguity than Φ, meaning, there is an utterance U in which Φ or Ψ can be inserted, s.t. $\mathcal{Q}(U, \Psi) \prec \mathcal{Q}(U, \Phi)$.

(ii). Φ never induces less QuD-ambiguity than Ψ, meaning, for no utterance U in which Φ or Ψ can be inserted $\mathcal{Q}(U, \Phi) \prec \mathcal{Q}(U, \Psi)$.

Proof of concept

- Putting (15) to use is hard because it requires a precise and productive model of evoked questions, and to define how it interacts with presupposition projection, in order to cover all critical utterances of the language.
- Here are however some core intuitions applying to the *pex* vs. *conly* case across utterances:
  - *pex* retains the QuD structure(s) evoked by its prejacent, and simply intersects it with its presupposition. Cells that are not "shrunk" in that process will **automatically be shared between the questions evoked the by pex-less and the pex-ed parse–inducing comparatively little QuD ambiguity**.
  - *conly* does not retain the QuD structure(s) evoked by its prejacent; instead it builds on the QuD structure evoked by an alternative to the prejacent. Cells are **less likely to be shared between the questions evoked by a conly-less and conly-ed parse of the sentence–inducing comparatively more QuD ambiguity**.

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Introducing QuD optionality

- This line of reasoning extends to a slightly more elaborate model of implicit QuDs involving optionality, whereby an utterance of *some* may evoke either a $\boxed{\exists \mid \neg\exists}$, or a $\boxed{\forall \mid \exists \wedge \neg\forall \mid \neg\exists}$ QuD.
- We only have to assume that the two covert operators' potential for QuD ambiguity are compared by keeping fixed across the two operators whatever QuDs were inferred from the bare parse, and its non-weaker alternatives.
- Even more generally, this would trivially extends to any "weaker" scalemate p, which may evoke $\boxed{p \mid \neg p}$, or a $\boxed{p^{+} \mid p \wedge \neg p^{+} \mid \neg p}$ QuD.

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Conclusion and outlook

Recap

- Semantically similar objects, like *pex* and *only*, **“compete” for covertness**: none, or only one of these operators may be covert in a given language.
- The covert operator, if any, **is chosen by the grammar to mimimize the QuD ambiguity induced by its covertness.**

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- The covert operator, if any, **is chosen by the grammar to mimimize the QuD ambiguity induced by its covertness.**

Conceptual advantages of a QuD-based approach

- *pex* and *only* were compared w.r.t. how their insertion in any given utterance "shifts" the original QuD evoked by that utterance; ***pex* was shown to be less of a QuD "shifter"** than *only*.
- This difference can be traced back to how *pex* and *only* divide up the work between presupposition and assertion: ***only* backgrounds its prejacent while *pex* does not**.
- In that sense, our account constitutes an **indirect argument for *pex***. Getting the target pattern with *exh* or Neo-Gricean SIs would have required another panoply of formal tools.
- Relating the difference between *pex* and *only* to their implicit QuDs (and the concept of QuD ambiguity), made way for a more explanatory account of the observed pattern.

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Typological implications

- If *pex*/*opex* is real and present in every single language, no language should display a covert variant of *only* (*conly*). We definitely exclude the *opex*/*conly* configuration.
- Some languages may display *pex*, some others, *opex*, and some languages may in fact display both simultaneously.
- The exact inventory of exhaustifiers displayed by a language, given these constraints, **is a function of the language's tolerance for ambiguity, and sensitivity to prolixity.**

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Further questions

- Why do so many languages[14] display ***pex* instead of *opex*** (along with *only*)? Is this dominant pattern solely due to cost-related considerations (avoid prolixity)?
- Relatedly, what treatment should be assigned to **more complex (and hence costly!) constructions** sharing similarities with *pex*, e.g. clefts in English?
- Lastly, if this approach is on the right track, it should be expected to apply to **other sets of (c)overt operators with similar-enough semantics**. A domain to explore may for instance be that of (bare) plurals?

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Thank you!

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