

THE SOUND OF EXH*

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1 Introduction

This paper tackles the following puzzle: if scalar implicatures (henceforth **SI**) are “grammatical”, as championed by Fox (2007), then why is the exhaustification operator triggering them silent? We propose that this “silence” is tied to a form of competition with *only*. This competition, we argue, is guided by how much ambiguity is created by the putative covertness of an operator, when it comes to implicit Questions under Discussion (henceforth **QuD**; Roberts, 2012 i.a.). In brief, SIs are silent because, according to that metric, they trigger less QuD-related ambiguity than a covert *only* would. The paper is organized as follows. The current Section sketches two prominent approaches to SIs, and introduces the key puzzle raised by both of them: that SIs are drawn silently, and (relatedly) that there is no covert *only*. Building on the idea that overt and covert exhaustifiers differ in how they divide presupposition and assertion, Section 2 argues that speakers tend to infer different implicit QuDs from parses involving such operators. Section 3 then argues that covert operators, if optional, induce an ambiguity as to which implicit QuD should be inferred from an utterance licensing them. A relative definition of QuD ambiguity is introduced. Section 4 shows that a language with a covert *only* and an overt SI-triggering operator would be suboptimal according to this measure. Section 5 discusses the general implications of this approach and concludes the paper.

We start by briefly introducing SIs. SIs arise when a speaker chooses a weaker term on a scale of informational strength, implying that a stronger alternative does not hold.

- (1) Jo ate **some** of the cookies.
 $\leadsto$ Jo did **not** eat **all** of the cookies.

Prejacent
Scalar Implicature

SIs were originally thought to be drawn by the pragmatic module (i.e. post-compositionally), based on core principles governing cooperative conversations: truthfulness, informativeness (Horn,

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1972, Grice, 1975, Gazdar, 1979, Horn, 1984, Sauerland, 2004, i.a.). This is known as the Neo-Gricean framework. By contrast, the grammatical view of SIs, put forth by Fox (2007) and much subsequent work, posits a covert operator *exh*, active in the syntax. Semantically, *exh* is assumed (simplifying a bit) to conjoin its prejacent with the negation of non-weaker alternatives (see (2-3)). The meaning of *exh* is thus close to that of *only*. We will refer to both operators as *exhaustifiers*.

- (2) $\llbracket exh \rrbracket = \lambda p. p \wedge \forall q \in \mathcal{A}_p : p \not\leq q. \neg q$
 (3) $\llbracket exh(\text{Jo ate some of the cookies}) \rrbracket$
 $\equiv \llbracket \text{Jo ate some of the cookies} \rrbracket \wedge \neg \llbracket \text{Jo ate all of the cookies} \rrbracket$

Interestingly, with *exh*, SIs may be drawn recursively, locally, and may directly depend on other syntactic features of the sentence. This view proved successful in many subdomains of pragmatic theory (Chierchia et al., 2009, Magri, 2011, Meyer, 2013, Bar-Lev and Fox, 2017, Fox, 2018, Bassi et al., 2021, i.a.). Yet, the existence of *exh* raises a first, obvious question: does *exh* differ from *only*, and if so in what sense? There seems to be many empirical advantages to assume that *exh* and *only* convey the same overall information, but cut the pie differently between presupposition and assertion. Specifically, under Bassi et al. (2021)’s view, *exh* asserts its prejacent and presupposes the negation of non-weaker alternatives. *Exh* was hence dubbed *presuppositional*, and abbreviated *pex* (see (4)). The rest of this paper adopts this view. *Only* on the other hand, can be taken to presuppose its prejacent, and to assert the negation of non-weaker alternatives (see (5)).¹

- (4) $\llbracket pex \rrbracket = \lambda p : \forall q \in \mathcal{A}_p : p \not\leq q. \neg q. p$ (5) $\llbracket only \rrbracket = \lambda p : \underline{p}. \forall q \in \mathcal{A}_p : p \not\leq q. \neg q$

Independently of the specific differences between *pex* and *only*, a second question arises: why is *only* robustly overt cross-linguistically, while *pex* is not?² More specifically, why do overt exhaustifiers robustly presuppose their prejacent, while covert ones – if they are real – do not? This puzzle in fact extends to Neo-Gricean approaches: why does (covert, optional) pragmatic reasoning never result in the presupposition of the prejacent, while appealing to *only* does? In this paper, we argue that this robust (c)overtness asymmetry can be most easily explained assuming Bassi et al. (2021)’s view on *exh* and *only*, and that, granted this view, it is all a matter of minimizing ambiguity. Ambiguity will be understood in relation to (implicit) QuDs (Roberts, 2012, Büring, 2003, Riester, 2019, Zhang, 2022, i.a.).

2 Exhaustifiers and the (implicit) QuD

We define the Context Set (henceforth **CS**) as the set of worlds compatible with the premises of the conversation (Stalnaker 1978 i.a.). QuDs are defined as partitions of the CS (Groenendijk and Stokhof, 1984), i.e. sets of non-empty, disjoint subsets of the CS (*cells*) together covering it. We assume that an assertion is relevant to a QuD if rules out at least one of its cells (Roberts, 2012). Additionally, we assume that accommodating a presupposition *p* on a CS amounts to intersecting it with *p* (Stalnaker, 1970, Karttunen, 1974, Heim, 1983); and that accommodation should not trivialize the QuD (Heim, 2015, Aravind et al., 2022, Doron and Wehbe, 2024); in

¹Though see Atlas (1993), Horn (2002), Roberts (2011) (i.a.) for more elaborate views on *only*.

²One could argue that *pex* may come with overt features, such as pitch accent, and that clefts may in certain respects instantiate *overt* versions of *pex*. We will see that this is not ruled out by our approach.

particular, accommodation should not produce a CS on which the QuD is only one cell. The explicit question-answer pairs in (6) and (7) show that this principle applies to sentences involving *pex* and *only*, which, as we discussed, carry distinct presuppositions.

- (6) Did Jo eat **all** of the cookies or not? (7) Did Jo eat **some** of the cookies or not?
 QuD: $\boxed{\forall} \boxed{\neg\forall}$ QuD: $\boxed{\exists} \boxed{\neg\exists}$
 Jo ate { all[✓], some[✗], only some[✓] } Jo ate { all[?], some[✓], only some[✗] }

Answering the QuD in (6) with *all* is fine, because *all* assertorically rules out the $\neg\forall$ -cell of the QuD. Answering with *some* however, is infelicitous. Here is why. If *some* is understood literally as $\exists$ (*pexless* parse), it is compatible with both cells of the QuD, and so fails to be relevant. If *some* is understood as *pex*($\exists$), it identifies the $\neg\forall$ -cell presuppositionally, leaving no space for the assertion ($\exists$) to be relevant.³ So either way, *some* does not constitute a relevant answer. Lastly, answering with *only some* is fine, because even after this answer’s presupposition ($\exists$) gets accommodated, it rules out the $(\exists \wedge) \neg\forall$ cell of the QuD. The same reasoning applies to the QuD in (7). Answering with *all* is slightly degraded, due to overinformativeness. Answering with *some* is fine, because it rules out the $\neg\exists$ -cell, whether or not a $\neg\forall$ presupposition (contributed by *pex*) gets accommodated. Lastly, *only some* is degraded, because it identifies the $\exists$ -cell presuppositionally.

In the absence of an overt QuD, we assume that an assertion may *evoke* the implicit QuD(s) it could felicitously address. The patterns in (6-7) then suggest that utterances conveying *all* and *only some* may evoke a QuD of the form $\{\forall, \neg\forall\}$, while an utterance conveying *some*, may evoke a QuD of the form $\{\exists, \neg\exists\}$. There are of course many other possibilities, depending on e.g. focus.⁴ For simplicity and conciseness, we will only consider 2-cell “polar” QuDs here. We additionally assume that evoked QuD interact with presuppositions: QuDs evoked by utterances are defined on the CS *updated with whatever presupposition the utterance carries*. So, an assertion *A* presupposing *p*, will evoke a QuD inferred from *A*, but defined on the CS intersected with *p*. This predicts *all*, literal *some*, *pex some*, and *only some* to evoke distinct QuDs – see Table 1.

Parse	Assertion	Presupposition	QuD
$\forall$	$\forall$	-	$\boxed{\forall} \boxed{\neg\forall}$
$\exists$	$\exists$	-	$\boxed{\exists} \boxed{\neg\exists}$
<i>pex</i> ($\exists$)	$\exists$	$\neg\forall$	$\boxed{\exists \wedge \neg\forall} \boxed{\neg\exists}$
<i>only</i> ($\exists$)	$\neg\forall$	$\exists$	$\boxed{\forall} \boxed{\neg\forall \wedge \exists}$

Table 1: QuDs inferred from utterances involving *some* and *all*, with or without *pex/only*.

³If *exh* had been assumed instead, *some* could be understood as asserting $\exists \wedge \neg\forall$, which would be expected to be slightly degraded due to overinformativeness: $\exists \wedge \neg\forall$ strictly entails the $\neg\forall$ -cell. We would thus predict that answering *some* to a *whether all* QuD should be roughly as felicitous as answering *all* to a *whether some* QuD. But the former move is more degraded and “feels” different. This favors a *pex* analysis. A reviewer however pointed out that the picture changes if the CS entails $\exists$; in that case, answering a *whether all* QuD with *some* is fine. This makes more sense under and *exh* parse, which identifies the relevant $(\exists \wedge) \neg\forall$ cell assertorically.

⁴For instance, focus on *cookies* in (1) may induce a partition of the CS according to what Jo ate. It can be shown however that considering these alternative QuDs does not fundamentally affect our subsequent predictions.

Specifically, $\exists$ and $pex(\exists)$ evoke the same QuD “structure”, but $pex(\exists)$ defines it on a smaller CS entailing its presupposition $\neg\forall$. Likewise, $\forall$ and $only(\exists)$ evoke the same QuD structure, but $only(\exists)$ defines it on a smaller CS entailing its presupposition $\exists$. It thus appears that $\exists$ and $pex(\exists)$ share the same evoked QuD structure, while $\exists$ and $only(\exists)$ do not. With this difference in mind, the next Section argues that pex creates less QuD ambiguity than a covert counterpart of $only$ would.

3 Parsing ambiguities trigger QuD ambiguities

SIs are optional, which, in the grammatical framework, can be cashed out by assuming that exh/pex is optionally merged.⁵ Therefore, a $pexable$ sentence is in principle ambiguous between two parses: a parse with pex , and a parse without. An ambiguity thus arises as to which implicit QuD should be inferred from $pexable$ sentences. An utterance of *some* for instance, may evoke a QuD addressed by $\exists$ or $pex(\exists)$. This would lead to an ambiguity between a $\{\exists, \neg\exists\}$, and a $\{\neg\exists, \exists \wedge \neg\forall\}$ QuD; see Table 2. Crucially, such ambiguities do not arise with overt operators like *only*.

What would happen if pex were overt, and *only*, covert? We define *opex* as the putative overt realization of pex , and *conly* as the putative covert realization of *only*. We assume that languages are endowed with at most one covert exhaustifier, pex or *conly*.⁶ In an *opex-conly* language, an utterance of *some* may be parsed as $\exists$ or *conly*($\exists$), inducing an ambiguity between a $\{\exists, \neg\exists\}$, and a $\{\forall, \neg\forall \wedge \exists\}$ QuD; see Table 3. In that kind of language, an utterance of *opex some* would not lead to a parsing-induced QuD ambiguity, since *opex* is posited overt.

Utterance	Parse	QuD
<i>all</i>	$\forall$	$\forall \quad \neg\forall$
<i>some</i>	$\exists$	$\exists \quad \neg\exists$
	$pex(\exists)$	$\exists \wedge \neg\forall \quad \neg\exists$
<i>only some</i>	<i>only</i> ($\exists$)	$\forall \quad \neg\forall \wedge \exists$

Table 2: Attested case: QuDs evoked by utterances containing *all*, *some* (ambiguous between $\exists$ and $pex(\exists)$), and *only some*.

Utterance	Parse	QuD
<i>all</i>	$\forall$	$\forall \quad \neg\forall$
<i>some</i>	$\exists$	$\exists \quad \neg\exists$
	<i>conly</i> ($\exists$)	$\forall \quad \neg\forall \wedge \exists$
<i>opex some</i>	<i>opex</i> ($\exists$)	$\exists \wedge \neg\forall \quad \neg\exists$

Table 3: Unattested case: QuDs evoked by utterances containing *all*, *some* (ambiguous between $\exists$ and *conly*($\exists$)), and *opex some*.

A language with the two overt operators *opex* and *only* would be characterized by minimal parsing-induced QuD ambiguity, but at the cost of prolixity.⁷ The next Section defines a relative measure of QuD ambiguity, and shows that the attested state of affairs described in Table 2 leads to comparatively less QuD ambiguity than the unattested state of affairs described in Table 3.

⁵Alternatively, one can assume this operator is always merged, but that the alternatives it operates on may be impoverished by *pruning* (Fox and Katzir, 2011, Ivlieva, 2012, Katzir, 2014, Denić, 2023, i.a.).

⁶Otherwise, it would be impossible to unequivocally determine which operator was used in the many sentences that license *pex* and *only* at the same site.

⁷A language with only *opex* or *only* would also be optimal in principle but would not express the same range of asserted vs. presupposed meanings as a language lexicalizing both operators.

4 QuD ambiguity, and competition for covertness

When an utterance may contain a covert operator, e.g. *pex* or *conly*, an ambiguity arises regarding the implicit QuD inferred from the utterance. In the attested case (Table 2), we observe that the two possible QuDs produced by the parsing ambiguity share a cell (the $\neg\exists$ -cell), while in the unattested case (Table 3), they do not. In that sense, the attested configuration induces less ambiguity than the unattested configuration: at least, we know that the QuD involves a $\neg\exists$ -cell.

We now generalize this observation: if U and U' are two utterances, then U is less QuD-ambiguous than U' , if the questions evoked by (the different parses of) U are “closer” to each other, than those evoked by U' . Closeness is understood in terms of sets of matching cells: “close” questions have a lot of cells in common. A set of questions $\mathcal{Q}$ is then less ambiguous than another set of questions $\mathcal{Q}'$, if the set of cells that all members of $\mathcal{Q}$ have in common strictly contains the set of cells that all members of $\mathcal{Q}'$ have in common. (8) implements this in the form of a partial order between sets of questions. Note that the set of cells that questions have in common corresponds to their grand intersection; see (9).

- (8) **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 $\mathcal{M}(\mathcal{Q}) \supset \mathcal{M}(\mathcal{Q}')$
- (9) **MATCHING CELLS.** Let $\mathcal{Q}$ be a set of questions. $\mathcal{M}(\mathcal{Q}) = \{c \mid \forall Q \in \mathcal{Q}. c \in Q\} = \bigcap_{Q \in \mathcal{Q}} Q$

We can then define a relative measure of QuD ambiguity induced by covert operators like *pex* or *conly*. (10) defines the set of questions induced by the absence or presence of a specific covert operator. Building on (8) and (10), (11) then defines a relative measure of QuD ambiguity between covert operators, allowing us to compare them in terms of their potential for QuD ambiguity. These definitions apply to a fixed insertion site in a fixed utterance.

- (10) **QUESTIONS INDUCED BY A COVERT OPERATOR.** Let U be an utterance, Φ a covert operator and S a site in U where Φ could be inserted. Let U' be the result of the insertion of Φ at site S in U . The questions induced by the covertness of Φ at site S in U , noted $\mathcal{Q}(U, S, \Phi)$ corresponds to the set of questions evoked by either U or U' .
- (11) **COMPARING COVERT OPERATORS RE:QUD AMBIGUITY.** Let U be an utterance, Φ and Ψ covert operators and S a site in U where Φ or Ψ could be inserted. Φ induces less QuD ambiguity than Ψ at site S in U iff $\mathcal{Q}(U, S, \Phi) \prec \mathcal{Q}(U, S, \Psi)$.

In a *pex-only* language, applying (10) to a bare *some* utterance yields the set of questions evoked by $\exists$ and *pex*($\exists$), i.e. the set $\{\{\exists, \neg\exists\}, \{\exists \wedge \neg\forall, \neg\exists\}\}$. The two questions in this set share the $\neg\exists$ -cell, i.e., $\mathcal{M}(\mathcal{Q}(\text{some}, \text{root}, \text{pex})) = \{\exists\}$. In an *opex-conly* language, applying (10) to the same utterance yields the set of questions evoked by $\exists$ and *conly*($\exists$), i.e. $\{\{\exists, \neg\exists\}, \{\forall, \neg\forall \wedge \exists\}\}$. The questions in this set do not have any cell in common, i.e., $\mathcal{M}(\mathcal{Q}(\text{some}, \text{root}, \text{conly})) = \emptyset \subset \{\exists\}$. Thus, $\mathcal{Q}(\text{some}, \text{root}, \text{pex}) \prec \mathcal{Q}(\text{some}, \text{root}, \text{conly})$ as per (8). *pex* is therefore more optimal when it comes to QuD ambiguity when compared to *conly* against a bare *some* utterance.

In order to measure a covert operator’s *general* potential for QuD ambiguity, and to eventually determine if that operator deserves to be part of the grammar, one should extend the above reasoning to other utterances and insertion sites. (12) thus proposes that a covert operator leading to comparatively less QuD ambiguity (as measured by $\prec$) than another semantically close operator

across all possible utterances should be preferred by the grammar. The optimal operator may not be strictly better across the board, $\prec$ being a partial order. Rather, it should *sometimes* be better (12i), and *never* be worse (12ii), than its competitor.

(12) **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). Φ sometimes induces less QuD ambiguity than Ψ , meaning, **there is** an utterance U and a site S in U in which Φ or Ψ can be inserted, s.t. $\mathcal{Q}(U, S, \Phi) \prec \mathcal{Q}(U, S, \Psi)$.
- (ii). Φ never induces less QuD ambiguity than Ψ , meaning, **for no** utterance U and insertion site S in U in which Φ or Ψ can be inserted, $\mathcal{Q}(U, S, \Psi) \prec \mathcal{Q}(U, S, \Phi)$.

(12) predicts $\Phi = \textit{pex}$ to be preferred over $\Psi = \textit{only}$ – which implies that if a language has a covert exhaustifier, it has to be of the *pex* type. Here is why. First, we have already shown that (12i) is verified by a bare *some* utterance.⁸ Second, rigorously verifying (ii) – a universal statement over an infinite set of utterances – would require a compositional model of QuDs evoked by complex sentences, and of their interaction with presupposition projection.⁹ Without diving into the details, it seems reasonable to assume that QuDs evoked by complex sentences are derived from those evoked by their subcomponents (*compositionality*), subdividing cells in the process rather than merging them (*specificity increasing with complexity*). Then, given that QuDs evoked by a weaker scalemate p and by $\textit{pex}(p)$ share a cell, while those evoked by p and $\textit{only}(p)$ do not, more complex utterances involving p will either lead to incomparable sets of questions ($\mathcal{Q}(U, S, \textit{pex}) \not\prec \mathcal{Q}(U, S, \textit{only})$), or to sets favoring *pex* over *only*.

This line of reasoning can be extended in two ways.¹⁰ First, it can incorporate QuD optionality, e.g. cases in which *some* may evoke either a $\{\exists, \neg\exists\}$, or a $\{\forall, \exists \wedge \neg\forall, \neg\exists\}$ QuD. This move does not affect the QuDs evoked by *pex* and *only*, and we still have $\mathcal{M}(\mathcal{Q}(\textit{some}, \textit{root}, \textit{pex})) = \{\neg\exists\} \supset \emptyset = \mathcal{M}(\mathcal{Q}(\textit{some}, \textit{root}, \textit{only}))$. Our result is thus maintained under these assumptions. Second, more than two scalemates may be considered; e.g. $\exists$, M (*most*), and $\forall$. For any non-maximal alternative p on such a scale (e.g. $\exists$, M), $\textit{pex}(p)$ and $(\textit{c})\textit{only}(p)$ can be shown to evoke QuDs which merely overlap on the cell corresponding to the exhaustified meaning of p (according to that scale), leading to incomparable sets of questions. This is not a threat to our result.

5 Discussion and outlook

We developed and formalized the idea that semantically similar objects, like *pex* and *only* “compete” for covertness: none, or only one of these operators can be covert in a given language. We moreover argued that the covert operator, if any, is chosen by the grammar to minimize the QuD ambiguity induced by its covertness. QuD ambiguity was defined as a relative and partial measure, based on sets of matching cells between candidate implicit questions. The covertness

⁸This in fact extends to any pair of scalemates $\langle p, p^+ \rangle$ with $p^+ \models p$, in particular $\langle \textit{not all}, \textit{none} \rangle$. See Hénot-Mortier (forthcoming) for proof.

⁹Such a model is sketched for a fragment of the language in Hénot-Mortier (2025). But one can actually wonder whether grammars evolved by optimizing QuD ambiguity on *all* utterances equally (including the rarest and most complex ones), or whether simple matrix utterances constitute their core benchmark.

¹⁰See Hénot-Mortier (forthcoming) for extended demonstrations.

asymmetry between *pex* and *only* was then cashed out by comparing 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 can be traced back to how *pex* and *only* divide up the work between presupposition and assertion; but relating this difference to implicit QuDs, made way for a more explanatory account of the observed pattern. Our account’s typological prediction is that, if *pex/opex* is real and present in every single language, no language should display a covert variant of *only* (*conly*). 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. This raises two questions: why do so many languages display *pex* instead of *opex* (along with *only*)?¹¹ Is this dominant pattern solely due to cost-related considerations? Secondly, what treatment should be assigned to more complex (and hence costly!) constructions sharing similarities with *pex*, e.g. clefts? In any case, 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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¹¹ A reviewer pointed out that an *opex-only* language would be optimal w.r.t. QuD ambiguity. A solution to disfavor such languages, suggested by the reviewer, is to disallow trivial sets of matching cells to be compared.

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