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Constraining imprecision via structural alternatives*

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Abstract Most recent theories of homogeneity and non-maximality in plural predication take the two phenomena to be closely related. Conjunctions challenge this view because they show homogeneity while seemingly lacking non-maximal construals. This paper argues that conjunctions can nonetheless be given an underlying semantics compatible with non-maximality, if their non-maximal construals are blocked by a global constraint which requires weak construals of an imprecise expression to preserve certain inferences of the maximally strong construal. I tentatively suggest that the relevant class of inferences can be characterized in structural terms, as inferences towards alternatives derivable by deletion.

Keywords: structural alternatives, imprecision, non-maximality, homogeneity, conjunction, team credit, obligatory inferences

1 Background: Homogeneity and imprecision

This paper revisits the relation between **homogeneity**, a gap phenomenon in which an expression seems to contribute a stronger meaning in upward-entailing (UE) environments than in downward-entailing (DE) ones, and **imprecision**, a form of context-dependency driven by implicit questions.[1] The paradigmatic example of a structure with both of these properties are definite plurals, whose function is usually described as picking out a maximal plurality (e.g. Sharvy 1980). That their behavior

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1 See e.g. Krifka 1996, Križ 2015, Križ 2016, Križ & Spector 2021, Bar-Lev 2021, Feinmann 2020, Paillé 2025, Guerrini & Wehbe 2025 for work connecting the two phenomena, Brisson 1998, Lasersohn 1999, Malamud 2012, Burnett 2017 for important work on imprecision in the plural domain that does not relate it to homogeneity, and Fodor 1970, Schwarzschild 1994, Löbner 2000, Sbardolini 2023 for important work on homogeneity that does not relate it to imprecision.

is in fact more intricate is shown in (1)-(4), which we will come back to throughout this paper. (1) illustrates that out of the blue, a definite plural in a UE environment tends to pick out the maximal plurality in the NP domain: (1a) expresses roughly the proposition $p_{\max}$ in (1b), which entails that the speaker saw all the salient linguists.[2] (To abstract away from issues with intensionality that seem unrelated to the point of this paper, I will assume throughout that the maximal plurality picked out by *the linguists* and other similar plural DPs does not vary across worlds. I indicate this by relativizing restrictor predicates like *linguists* to a fixed world w_0.)

(1) a. Bert: *I saw **the linguists***.

b. default construal: $p_{\max} = \lambda w.{}^{**}\mathbf{see}_w(\bigoplus(\mathbf{linguist}_{w_0}))(b)$

In contrast, when (1a) is negated, the preferred construal corresponds to the negation of an existential statement ranging over subpluralities, as paraphrased in (2b), which expresses that Bert did not see *any* of the salient linguists. This non-complementarity between (1a) and its negation (2a) is an instance of homogeneity.

(2) a. Bert: *I didn't see **the linguists***.

b. default construal: $\neg p_{\exists}$ where $p_{\exists} = \lambda w.\exists y[y \sqsubseteq \bigoplus(\mathbf{linguist}_{w_0}) \wedge {}^{**}\mathbf{see}_w(y)(b)]$

Even in UE environments, however, weaker construals become available given certain choices of the implicit **question under discussion (QUD)**.[3] This phenomenon, which I refer to as **imprecision**, is illustrated in (3). In the STRICT CONTEXT (3a), where $p_{\max}$ in (1b) is directly relevant to the salient QUD Q_{strict} = 'Who exactly did you see at the meeting?', the sentence appears to convey $p_{\max}$—Bert's statement seems untrue if he saw only half of the linguists. In the LAX CONTEXT (3b), where $p_{\max}$ is overinformative for the pertinent QUD Q_{lax} = 'From which departments did

2 Throughout this paper, I will make use of the basic concepts of plural semantics: I assume that the individual domain D_e is obtained by closing a set A of **atomic individuals** under a **sum operation** $\bigoplus$, which maps an arbitrary nonempty subset of D_e to its sum, an element of D_e. I further assume a one-to-one correspondence between the elements of D_e and nonempty sets of atoms, so that the structure $(D_e, \bigoplus)$ must be isomorphic to $(\mathscr{P}(A)\backslash\{\emptyset\}, \bigcup)$. The sum $a \oplus b$ of individuals $a, b \in D_e$ can then be defined as $\bigoplus(\{a,b\})$ and the part-whole relation $\sqsubseteq$ can be defined as follows: $a \sqsubseteq b$ iff $a \oplus b = b$. Finally, I make use of the * and ** operators defined in (i) and (ii) (see e.g. Link 2002 [1983]; Krifka 1989; Sternefeld 1998) in the metalanguage to express closure of a predicate extension under sum, or under 'component-wise sum' in the relational case.

(i) For $P \in D_{\langle e,t\rangle}$: ${}^*P = \lambda x.\exists Q_{\langle e,t\rangle}[\forall x'[Q(x') \rightarrow P(x')] \wedge x = \bigoplus(Q)]$

(ii) For $R \in D_{\langle e,\langle e,t\rangle\rangle}$: ${}^{**}R = \lambda y.\lambda x.\exists S_{\langle e,\langle e,t\rangle\rangle}[\forall y', x'[S(y')(x') \rightarrow R(y')(x')] \wedge y = \bigoplus(\{y' : \exists x'[S(y')(x')]\}) \wedge x = \bigoplus(\{x' : \exists y'[S(y')(x')]\})]$

3 See e.g. Romoli, Sudo, Augurzky, Bonnet, Breheny, Cremers, Ebert, Steinbach & Mayr 2024.

you encounter two or more faculty members?', we perceive the sentence to convey something weaker—that Bert saw at least two of the linguists, as formalized in (4).

(3) SCENARIO: It is common ground that there are four faculty members in linguistics: Claire, Dora, Ernie and Fritz. Administrators Abe and Bert organized a meeting for faculty members in the humanities. Bert recalls he saw two of the linguists at the meeting, but does not remember which two.

a. STRICT CONTEXT: The meeting was obligatory for all faculty members. Abe wants to know who exactly was at the meeting.

b. LAX CONTEXT: Every department was supposed to send at least two faculty members to the meeting. Abe wants to know which departments complied with this requirement.

Bert: *I saw **the linguists** at the meeting.* ✕ in context (3a), ✓ in context (3b)

(4) $p_2 = \lambda w.\exists y[y \sqsubseteq \bigoplus(\textbf{linguist}_{w_0}) \wedge |y| \geq 2 \wedge {}^{**}\textbf{see}_w(y)(b)]$

When a sentence shows this kind of variability, I will use the term **maximal construal** for the strongest proposition it can convey (regardless of whether this proposition is about a maximal plurality) and refer to contextually licensed weaker interpretations as **non-maximal**. As (3b) illustrates, non-maximal construals can be stronger than $p_\exists$ in (2b), if the QUD is sensitive to absolute cardinality, proportions or even particular exceptions (Malamud 2012; Križ 2015; Križ & Spector 2021).

Research on homogeneity in non-monotonic embedding environments has shown that homogeneity gaps cannot be the result of a structural ambiguity between a stronger and a weaker LF (Križ 2015; Križ & Chemla 2015). This suggests that the stronger and weaker meanings involved in homogeneity gaps must both be derivable from a single semantic value, such as an alternative set (see Križ & Spector 2021 and also Bar-Lev 2021; Chatain 2021) or a trivalent proposition (Križ 2015, 2016; Feinmann 2020; Guerrini & Wehbe 2025; Paillé 2025). It seems natural then to derive non-maximal construals from these richer semantic values as well, e.g. via a mechanism that filters out overinformative alternatives, or a QUD-dependent mapping from trivalent to bivalent propositions. Most current proposals therefore take homogeneity and imprecision to have a common source.

In support of this unified approach, note that modifiers that remove homogeneity tend to reduce imprecision and vice versa. For instance, the variant of (5a) with *all* is no longer QUD-dependent—it is false in both the STRICT and the LAX context in (3)—and also lacks homogeneity, since embedding it under negation cannot produce the negated existential reading shown in (2b). We find the same pattern with summative predication as in (5b) (Löbner 2000; Križ 2015; Paillé 2024 a.o.), conditionals as in (5c) (von Fintel 1997; Schlenker 2004; Gajewski 2005; Križ 2015 a.o.), and generics as in (5d) (Löbner 2000; Križ 2015 a.o.).

(5) a. *I saw (**all**) the linguists.*
b. *The shirt is (**completely**) red.*
c. *We (**always**) play soccer if the sun shines.*
d. *(**All**) swans are white.*

In sum, we seem to observe a non-arbitrary correlation between homogeneity and imprecision (Križ 2015). However, this correlation is not exceptionless. This paper focuses on one class of exceptions—*and*-conjunctions, which exhibit homogeneity gaps, but seem to lack imprecision[4]—and suggests a way of making sense of them within a theory that takes homogeneity and imprecision to have a common source.

Section 2 introduces the core contrast between definites and conjunctions and suggests a characterization in terms of a constraint that is sensitive to **deletion alternatives** in the sense of Katzir (2007). Section 3 provides a sketch of how this constraint can be formalized within Križ & Spector's (2021) candidate-meaning view of imprecision. Section 4 discusses some additional predictions of the proposal, and in Section 5 I conclude by outlining two of the many open issues it raises.

2 Maximality and alternative structure: Conjunctions vs. definites

2.1 Obligatory maximality in conjunctions

The semantics of English *and*-conjunctions mostly parallels that of definite plurals. They combine with almost the same range of non-distributive predicates and largely interact in the same way with overt and covert distributivity operators.[5] Further, both *and*-conjunctions and definites show homogeneity effects (see e.g. Schwarzschild 1994; Szabolcsi & Haddican 2004; Schmitt 2013, 2019; Ren 2024): Given the QUD from (3a), Bert can utter (6a) to convey that he saw all four linguists and (6b) (with unstressed *and*) to convey that he saw *none* of them.[6] If Bert saw only two out of four linguists, neither sentence seems straightforwardly true in this context.[7]

(6) a. *I saw **Claire, Dora, Ernie and Fritz** at the meeting.* $\approx p_{\max}$

4 Another type of mismatch involves semantic phenomena that appear to involve imprecision but not homogeneity, such as 'round' numerals (Krifka 2007; Sauerland & Stateva 2007; Solt 2014 a.m.o.), certain degree predicates (Feinmann 2020; Haslinger & Paillé 2023), and attitude complements as analyzed in Mayr & Schmitt 2024. Here I will have nothing new to say about these cases.

5 See e.g. Link 2002 [1983]; Krifka 1990; Schwarzschild 1996; Schmitt 2013, 2019 a.m.o.

6 This is not the only possible reading of (6b)—a non-homogeneous 'not all' reading is also available, and seems to become obligatory with narrow focus on *and* (see e.g. Szabolcsi & Haddican 2004).

7 This has been demonstrated experimentally by Ren (2024), who used a trivalent judgment task with the options 'completely true', 'completely false' and 'neither'. In scenarios where half of the individuals mentioned in the conjunction satisfied the predicate, a significant proportion of the participants chose the 'neither' option (the other responses were 'completely false').

b. *I didn't see* ***Claire, Dora, Ernie and Fritz*** *at the meeting.*
can mean: 'I didn't see any of Claire, Dora, Ernie and Fritz.' $\approx \neg p_{\exists}$

Despite these similarities, there is one striking difference: Unlike its definite-plural counterpart (3), (6a) lacks non-maximal construals. Thus, while the LAX context from (3b) allows Bert to use a definite plural to convey the 'at least two' proposition p_2 from (4), he cannot use (6a) to do so. (7) makes the same point with the predicate *wet*, which is particularly prone to non-maximality (although a maximal construal can be forced by manipulating the QUD; see Haslinger & Paillé 2023). Again, the use of a conjunction blocks a non-maximal construal no matter how salient it is.

(7) CONTEXT: A plate, a mug, a glass and a bowl were left on the counter to dry. B can see that the mug and the plate have dried, while the glass and the bowl are still wet. A: *Can I already put everything away?*

a. B: *No.* ***The dishes*** *are still wet.* ✓

b. B: *No.* ***The mug, the bowl, the plate and the glass*** *are still wet.* ×

One might attempt to reduce these effects to a Manner preference for structurally simpler utterances (Grice's (1975) submaxim 'Be brief!'; cf. Katzir & Singh 2015; Solt 2018 for recent applications). This would work in contexts like (7), where speaker B could simplify their utterance by saying *The glass and the bowl are wet*. But contexts like the LAX CONTEXT in (3b) pose a problem for this approach. Since Bert does not remember which two of the linguists were at the meeting, he cannot convey the proposition p_2 with a simpler conjunction. He could use a non-conjunctive DP, but this is not guaranteed to result in a simpler structure. For instance, if we extended the scenario with a requirement for every department to send two *students* to the meeting, Bert can only convey that he saw two linguistics *professors* by using an indefinite as in (8a) or by relying on a non-maximal construal of (8b). Due to the internally complex NP, the sentences in (8) will not come out as simpler than the conjunction in (6a) on a structural notion of simplicity such as that of Katzir (2007). So a simple Manner constraint banning needless complexity fails to explain why, in this scenario, non-maximality is still blocked for (6a).

(8) a. *I saw two (of the) linguistics professors at the meeting*.

b. *I saw the linguistics professors at the meeting.*

In sum, the contrast between conjunctions and definites poses a challenge for unified theories of homogeneity and imprecision. While the data point itself is well known (see e.g. Brisson 1998; Schmitt 2013; Križ 2015; Bar-Lev 2021 a.o.), this theoretical challenge has received relatively little attention. A notable exception is Sbardolini (2023), who proposes a theory of homogeneity in which imprecision does not figure

at all, and takes the behavior of conjunction to support this property of his proposal. On this approach, (6) is no longer puzzling. However, the correlation exemplified in (5), which is arguably a quite general fact about expressions showing homogeneity effects (Križ 2015; Haslinger 2025), must then be viewed as accidental.

2.2 Preserving inferences involving deletion alternatives

Here I want to suggest a different response to this contrast, namely that it teaches us that the possible non-maximal construals of a sentence are constrained by its alternative structure. We will continue to assume a common source for homogeneity and imprecision in compositional semantics. But we will posit a post-compositional constraint that requires non-maximal construals of a sentence to preserve certain inferential properties of the maximal construal. This constraint will force conjunctive sentences like (6a), (7b) and their negations to be interpreted relative to a QUD that gives rise to a maximal construal. Since the maximal construal of a sentence with a homogeneity gap is not complementary to the maximal construal of its negation, such a constraint will preserve homogeneity, but remove imprecision.

How can this constraint distinguish between conjunctive and definite arguments if their contributions to semantic composition are essentially the same? One salient property that distinguishes conjunctive sentences like (6a) from their definite-plural counterparts is that their maximal construals entail alternatives that can be obtained by deleting parts of the structure. For instance, (9a) entails the alternatives in (9b).

(9) a. *I saw Claire, Dora, Ernie and Fritz at the meeting.*

b. *I saw Claire at the meeting*, *I saw Dora at the meeting*, *I saw Claire and Dora at the meeting*, ..., *I saw Dora, Ernie and Fritz at the meeting*

This property can be made precise using structure-based theories of alternatives such as that of Katzir (2007). A simplified version of Katzir's notion of structural alternatives is defined in (10a) and (10b); this allows us to define the subclass of **deletion alternatives** as in (10c).

(10) Given two syntactic trees ϕ, ψ: (adapted from Katzir 2007)

a. A **simplifying derivation** leading from ϕ to ψ is a finite sequence of trees $\phi_1, \ldots, \phi_n$, where $\phi = \phi_1$, $\phi_n = \psi$ and for $1 < i \leq n$, ϕ_i is derived from ϕ_{i-1} either (i) by replacing a constituent α with a proper subconstituent of α or (ii) by replacing a constituent with a syntactic terminal.

b. ψ is a **structural alternative** of ϕ iff there is a simplifying derivation leading from ϕ to ψ.

c. ψ is a **deletion alternative** of ϕ iff there is a simplifying derivation leading from ϕ to ψ in which all steps are of the form (i) in (10a).

Suppose now that whenever the maximal construal of an imprecise sentence ϕ entails a deletion alternative ψ of ϕ, there is a requirement for non-maximal construals of ϕ to preserve this entailment, so that non-maximal construals that no longer entail ψ are blocked. I will call this the **inference preservation (IP)** constraint. The IP constraint blocks non-maximality for (9a) across the board, because on any possible non-maximal construal of (9a), at least one of the deletion alternatives in (9b) is no longer entailed. However, it does not remove the homogeneity gap of (9a): Assuming a semantics that generates homogeneity gaps for conjunctions and definites alike, the maximal construal of (11a) corresponds to $\neg p_{\exists}$. This construal entails all the alternatives obtained by deleting some of the conjuncts, given in (11b). As in the positive case, the IP constraint enforces a maximal interpretation because on any non-maximal construal, at least one of these entailments would not be preserved.

(11) a. *I didn't see Claire, Dora, Ernie and Fritz at the meeting.*

b. *I didn't see Claire at the meeting*, *I didn't see Dora at the meeting*, *I didn't see Claire and Dora at the meeting*, . . . , *I didn't see Dora, Ernie and Fritz at the meeting*

Turning now to definite plurals, while *I saw the linguists at the meeting* will also contextually entail the alternatives in (9b) given the context in (3), these alternatives are not obtained by deletion and are therefore not subject to the constraint. The overall idea, then, is that the contrast between conjunctions and definites reflects distinct alternative structures, rather than distinct contributions to semantic composition.[8]

3 Implementing the proposal formally

In this section, I show how to implement the IP constraint within a particular theory of imprecision—a variant of the candidate-meaning view of Križ & Spector (2021). In this framework, the hallmark of imprecise sentences is that the compositional system does not map them to a single proposition, but to a set of several propositions, their so-called **candidate meanings (CMs)**. Non-maximal construals are the result of a truth definition that only considers those candidate meanings that directly address the QUD, and homogeneity gaps arise when there are multiple such CMs. Within this framework, there are at least two natural notions of contextual entailment

8 The experimental literature on implicatures triggered by different subtypes of alternatives has observed that some scalar alternatives presumably derived by replacement pattern with deletion alternatives. In particular, this seems to hold for alternatives derived from numeral scales (see Spector 2013 for a survey). I leave potential connections between the semantics of numerals and conjunctions to future work (but see chapter 6-7 of Haslinger 2025 for an attempt to draw a connection that involves a stronger, but also more complex and stipulative variant of the IP constraint).

for imprecise sentences, and the IP constraint can be viewed as a ban on certain mismatches between these two forms of entailment (cf. related ideas in Anvari 2018).

For readers working with an exhaustification approach to homogeneity (Bar-Lev 2021; Chatain 2021; Guerrini & Wehbe 2025 a.o.), I note briefly that the IP constraint can be translated into that framework as a condition on alternative pruning. The idea would be that pruning can only produce alternative sets resulting in strengthened meanings that still entail the deletion alternatives entailed by the strongest possible strengthened meaning. I leave the formal details of this variant to future work.

3.1 Characterizing candidate meanings

Consider again the three propositions $p_{\exists}$, $p_{\max}$ and p_2, repeated in (12). The idea in Križ & Spector (2021) is that these are among the many **candidate meanings** of *I saw the linguists*—a set of propositions obtained by varying certain parameters of the semantic evaluation function. I will assume that besides the context c, the evaluation function is also relativized to a **parameter valuation** v, a function mapping a set of additional parameters not encoded in c to their values. Parameter valuations are drawn from a set $\mathscr{V}$ that encodes certain constraints on the individual parameter values. Thus, I write $[\![\phi]\!]^{c,w,v}$ for the truth value of a sentence ϕ relative to context c, world w and parameter valuation $v \in \mathscr{V}$, and $[\![\phi]\!]^{c,v}$ for the proposition ϕ expresses in c relative to v. A sentence ϕ is imprecise iff $[\![\phi]\!]^{c,v} \neq [\![\phi]\!]^{c,v'}$ for some $v, v' \in \mathscr{V}$.

(12) a. $p_{\max} = \lambda w.{}^{**}\mathbf{see}_w(\bigoplus({}^{*}\mathbf{linguist}_{w_0}))(b)$
b. $p_{\exists} = \lambda w.\exists y[y \sqsubseteq \bigoplus({}^{*}\mathbf{linguist}_{w_0}) \wedge {}^{**}\mathbf{see}_w(y)(b)]$
c. $p_2 = \lambda w.\exists y[y \sqsubseteq \bigoplus({}^{*}\mathbf{linguist}_{w_0}) \wedge |y| \geq 2 \wedge {}^{**}\mathbf{see}_w(y)(b)]$

How are candidate meanings computed in general? Križ & Spector (2021) assume that each CM is obtained by existential quantification over a set of parts of the maximal plurality picked out by the DP. As shown in (13), the three candidate meanings in (12) can be obtained from different choices of this set.

(13) a. Quantificational domain for $p_{\max}$: $\{\bigoplus({}^{*}\mathbf{linguist}_{w_0})\}$
b. Quantificational domain for $p_{\exists}$: $\{x : x \sqsubseteq \bigoplus({}^{*}\mathbf{linguist}_{w_0})\}$
c. Quantificational domain for p_2: $\{x : x \sqsubseteq \bigoplus({}^{*}\mathbf{linguist}_{w_0}) \wedge |x| \geq 2\}$

Following Križ & Spector (2021), I assume that every valuation $v \in \mathscr{V}$ provides a function f_v that maps any $x \in D_e$ to a nonempty, upward-closed set of parts of x (a set of parts of x is **upward-closed** if, for any $y \sqsubseteq x$ in the set, any z such that $y \sqsubseteq z \sqsubseteq x$ is also in the set).[9] Deviating from their implementation, I analyze definite

9 Additionally, Križ & Spector (2021) use indices to allow different occurrences of the same expression to be interpreted with different degrees of non-maximality. I suppress the indices for simplicity.

plurals as directly denoting such a set (14), and assume that predicates compose with plural arguments via a predicate-level existential operator $\exists_{\text{pl}}$, as in (15).

(14) $[\![\text{DEF NP}_{\text{pl}}]\!]^{c,w,v} = f_v(\max_{\sqsubseteq}([\![\text{NP}_{\text{pl}}]\!]^{c,w,v}))$

(15) Given a predicate P of type $\langle e,t\rangle$: $[\![\exists_{\text{pl}}\ P]\!]^{c,w,v} = \lambda X_{\langle e,t\rangle}.\exists x.X(x) \wedge [\![P]\!]^{c,w,v}(x)$

Applying this to our example, we obtain the schema in (16a), which generates $p_{\exists}$, p_2 and $p_{\max}$ as well as a wide range of other CMs. Assuming further that the semantics of the DP conjunction in (16b) also involves access to f_v, a similar range of CMs is generated for the conjunctive sentence. In fact, given our simplifying assumption that the extension of *linguist* is fixed, the two sets of propositions in (16a) and (16b) will be equivalent if Claire, Dora, Ernie and Fritz are the relevant linguists.

(16) a. $[\![[\text{DEF } \textit{linguists}]\ [\exists_{\text{pl}}\ [1\ [\textit{I saw } t_1]]]]\!]^{c,v} = \lambda w.\exists x[x \in f_v(\bigoplus({}^*\textbf{linguist}_{w_0})) \wedge {}^{**}\textbf{see}_w(x)(b)]$

b. $[\![[\textit{Claire, Dora, Ernie and Fritz}]\ [\exists_{\text{pl}}\ [1\ [\textit{I saw } t_1]]]]\!]^{c,v} = \lambda w.\exists x[x \in f_v(c \oplus d \oplus e \oplus f) \wedge {}^{**}\textbf{see}_w(x)(b)]$

Having spelled out one way of associating imprecise sentences with a set of alternatives, we can now specify how the QUD drives the choice between these alternatives.

3.2 From candidate meanings to two different kinds of truth conditions

To assign truth conditions to an imprecise sentence ϕ in a context c, the set $\{[\![\phi]\!]^{c,v} : v \in \mathscr{V}\}$ of its CMs in c must be mapped to a single proposition. Križ & Spector (2021) propose that this mapping has two core properties. First, only those CMs that are relevant to the salient QUD Q_c contribute to the truth conditions. Following Groenendijk & Stokhof's (1984) partition semantics for questions, we can view Q_c as a partition of the context set C_c and define the pertinent notion of relevance as in (17) (adapted from Križ & Spector (2021), who do not relativize it to the context set): A strongly relevant proposition (i) eliminates at least one partition cell and (ii) does not express extra information orthogonal to Q_c by 'cutting through' a cell.

(17) A proposition p is **strongly relevant** to an issue Q_c iff $p \cap \bigcup Q_c$ is a union of a proper subset of the partition cells of Q_c.

In our original example (3), the proposition p_2 is strongly relevant relative to the question Q_{lax} = 'From which departments did you encounter two or more people at the meeting?', since (i) it eliminates the partition cells in which the linguistics department did not meet this condition and (ii) it does not express any additional information orthogonal to Q_{lax}. Weaker candidate meanings such as $p_{\exists}$ do not eliminate any cells, and stronger ones like $p_{\max}$ will cut through a cell. Therefore,

the perceived truth conditions given Q_{lax} will be based on p_2 only. In contrast, given Q_{strict} ='Who exactly did you see at the meeting?', any CM in (16) is strongly relevant by virtue of ruling out at least one cell while not conveying any irrelevant information.

What happens if multiple CMs of an imprecise sentence ϕ are strongly relevant? Križ & Spector (2021) propose that in such cases, the perceived truth conditions of ϕ correspond to the conjunction of all the strongly relevant candidate meanings. In the STRICT CONTEXT, this coincides with the strongest candidate meaning, $p_{\max}$.

The resulting QUD-dependent notion of truth (for which Križ (2015) uses the term 'true enough') is formalized in (18). Note that condition (18a) requires ϕ to have at least one strongly relevant CM, a requirement I will refer to as **∃-relevance**. While failures of condition (18b) result in the judgment that the sentence is not true relative to the given QUD, failures of ∃-relevance result in the accommodation of a more fine-grained QUD. Therefore, the two requirements do not have the same pragmatic status. I include them both in the truth definition anyway, in order to be able to discuss the consequences of ∃-relevance for entailment.

(18) A sentence ϕ is **imprecisely true** in context c and world w iff both
   a. $\exists v \in \mathscr{V}[[\![\phi]\!]^{c,v}$ strongly relevant to $Q_c]$
   b. and $\forall v \in \mathscr{V}[[\![\phi]\!]^{c,v}$ strongly relevant to $Q_c \rightarrow [\![\phi]\!]^{c,v,w} = 1]$

To see how homogeneity gaps are derived on this approach, let us contrast the imprecise truth conditions of ϕ = *I saw the linguists* in our STRICT CONTEXT, which amount to $p_{\max}$, with those of *not* ϕ = *I didn't see the linguists*. Each CM of *not* ϕ is obtained from a CM of ϕ using a standard, bivalent meaning of negation. Since negation preserves strong relevance, all these negated propositions will be strongly relevant. Therefore, for *not* ϕ to be imprecisely true in this context, all the negations of candidate meanings of ϕ must be true. Its truth conditions then amount to the negation of the *weakest* candidate meaning of ϕ, i.e. $\neg p_{\exists}$. More generally, an imprecise sentence ϕ and its negation [*not* ϕ] can receive non-complementary imprecise truth conditions if several candidate meanings of ϕ are strongly relevant.

3.3 Two different kinds of contextual entailment

Besides this context-dependent truth definition, there is a second natural way to think about truth conditions in the presence of imprecision: One could take the maximal construal of an imprecise sentence to reflect its underlying truth conditions and see non-maximality as a 'slack' phenomenon in which a sentence can be felicitously uttered without being strictly true (see e.g. Lasersohn 1999; Križ 2015; Feinmann 2020). The notion of **precise truth** assumed by this second view can be reconstructed in the present system by conjoining all the candidate meanings.

(19) Given a sentence ϕ, context c and world w:
ϕ is **precisely true** wrt. c in w iff $\forall v \in \mathscr{V}[[\![\phi]\!]^{c,v,w} = 1]$

If we characterize contextual entailment as preservation of truth given the common ground, these two notions of truth give rise to two notions of contextual entailment.

(20) Given sentences ϕ and ψ and a context c:

a. ϕ **imprecisely entails** ψ in c iff $\{w \in C_c : \phi \text{ is imprecisely true wrt. } c \text{ in } w\} \subseteq \{w \in C_c : \psi \text{ is imprecisely true wrt. } c \text{ in } w\}$

b. ϕ **precisely entails** ψ in c iff $\{w \in C_c : \phi \text{ is precisely true wrt. } c \text{ in } w\} \subseteq \{w \in C_c : \psi \text{ is precisely true wrt. } c \text{ in } w\}$

To illustrate the difference between these definitions, consider the question of whether (21a) contextually entails its deletion alternative (21b). Using precise entailment, the answer is clearly yes: The strongest candidate meaning of (21a) entails the single candidate meaning of (21b). For the same reason, (21a) imprecisely entails (21b) in the STRICT CONTEXT from (3). What about the LAX CONTEXT though? In this context, the only strongly relevant candidate meaning of (21a) is the 'at least two' proposition p_2. The imprecise entailment from (21a) to (21b) is then blocked for two different reasons: First, p_2 is true in some worlds in which (21b) is false, and second, since (21b) does not address the question of which departments sent two or more people to the meeting, it does not satisfy $\exists$-relevance relative to the QUD Q_{lax}. (21a) therefore does not imprecisely entail (21b) in the LAX CONTEXT.

(21) a. *I saw Claire, Dora, Ernie and Fritz.*

b. *I saw Claire.*

In sum, imprecise entailment amounts to preserving $\exists$-relevance and truth under all relevant CMs, while precise entailment amounts to preserving truth under all CMs.

3.4 Inference preservation

We can now express the IP constraint formally as a ban on mismatches between precise and imprecise entailment as far as deletion alternatives are concerned:

(22) Given an imprecise sentence ϕ and a context c:

a. ϕ is **inference-preserving** in c iff every deletion alternative of ϕ that is precisely entailed by ϕ in c is imprecisely entailed by ϕ in c.

b. ϕ is usable in c only if ϕ is inference-preserving in c.

Consider the consequences for our conjunctive example (23). Since (23) precisely entails all its deletion alternatives, it must imprecisely entail all of them in order to be inference-preserving. This can be the case only if all the deletion alternatives satisfy ∃-relevance. An alternative like ψ = *I saw Claire at the meeting* must therefore be strongly relevant to Q_c, which means any worlds w, w' such that ψ is true in w and false in w' must be in distinct partition cells wrt. Q_c. The same requirement holds for the other single-conjunct deletion alternatives. As a consequence, any two worlds w, w' that differ wrt. the set of linguists seen at the meeting must be in distinct partition cells of Q_c. This choice of Q_c results in a maximal construal of (23).

(23) *I saw Claire, Dora, Ernie and Fritz at the meeting.*

Next, let us turn to the definite plural example (24). Even though (24) can precisely entail sentences like ψ = *I saw Claire at the meeting* given a suitable context set, these sentences are crucially not deletion alternatives of (24) and therefore not subject to the IP requirement. The only plausible candidate for a deletion alternative of (24) is the bare-plural sentence in (25), if it is analyzed without a null determiner.

(24) *I saw the linguists at the meeting.*

(25) *I saw linguists at the meeting.*

But even if (25) counts as a deletion alternative, the existential meaning it conveys is entailed by all the candidate meanings of (24). Therefore, (24) still comes out as inference-preserving regardless of whether it is interpreted non-maximally.[10]

3.5 Interim summary and related ideas

We have seen that definite plurals and conjunctions can both be treated as underlyingly imprecise if the intuitive meaning difference between them is attributed to

10 The predictions are less clear for definite plurals embedded in DE environments. The question is whether the maximal construal of (i)—the 'none' construal obtained by negating $p_{\exists}$—entails (ii). If so, the IP constraint requires preservation of this entailment, blocking non-maximal construals of (i).

(i) *I didn't see the linguists at the meeting.*

(ii) *I didn't see linguists at the meeting.*

At first glance, this seems like a nice prediction given the experimental finding that definite-plural sentences are much less QUD-dependent when the plural occurs under a negative quantifier (Romoli et al. 2024). However, in the same study it is shown that *not every* patterns differently from negative quantifiers, which might suggest that blocking non-maximality under negation altogether is not the right approach. One way to avoid this prediction might be to appeal to the idea that compared to bare plurals, definite plurals come with an additional domain restriction to 'salient' individuals. If so, (i) would not entail (ii) because it does not say anything about non-salient linguists.

a structure-sensitive constraint on the QUDs an imprecise sentence can address. This in itself is not a new idea—authors such as Brisson (1998: 50), Križ (2015: 83) and Bar-Lev (2021: fn. 52) have suggested that the reason why conjunctions lack non-maximality is that, when each conjunct is explicitly mentioned, hearers tend to assume that each conjunct is in some sense relevant. The present proposal does not directly force deletion alternatives to be relevant, but does so indirectly via an inferential condition—it requires deletion alternatives that are precisely entailed to be imprecisely entailed, which requires relevance. There is an obvious parallel here with the "Logical Integrity" constraint proposed by Anvari (2018, 2019), which blocks the use of sentences that entail one of their structural alternatives contextually without also entailing it logically. This raises the question of whether any other constraints on semantic/pragmatic variability could be reframed in terms of a ban on mismatches between inference relations.

4 Further applications of the proposal

4.1 Definite plurals with embedded conjunctions

So far, we have been contrasting conjunctive arguments with definite DPs that have a simple lexical restrictor predicate, but we have not considered cases where the restrictor of a definite DP contains a conjunction. Consider the contrast in (26), taken from Schwarzschild (1996: 91f., (215), (217)). Schwarzschild observes that even if the definites in (26a) and (26b) are construed as picking out the same maximal plurality, the sentences do not have the same range of non-maximal construals. Given a suitable QUD, such as 'Did the president take any questions from the media?', (26a) can be judged true even if, say, no NBC reporter got to ask a question, whereas (26b) seems infelicitous in this kind of situation.

(26) a. [*The reporters*] *asked the president questions.*

b. [*The reporters from NBC, CBS and ABC*] *asked the president questions.*

On the present proposal, this contrast is expected: (26b) precisely entails the deletion alternative in (27), and must therefore imprecisely entail it to be inference-preserving in a context c. This can only be the case if at least one candidate meaning p of (27) is strongly relevant to Q_c. Since this p involves existential quantification over a nonempty set of subpluralities of the reporters mentioned in (26b), it must be a candidate meaning of (26b) as well. Therefore, (26b) must have a relevant candidate meaning that entails that at least one NBC reporter got to ask a question. Since the same applies to the other deletion alternatives, the upshot is that (26b) can only be used in contexts where its imprecise truth conditions entail that at least one question per network was asked. However, non-maximality within the subgroups of reporters

from the same network is still permitted. For instance, the QUD Q_c = 'Which of the networks got to ask at least one question?' licenses a construal of (26b) that has all the imprecise entailments required by the IP constraint, but is still non-maximal.

(27) *The reporters from NBC asked the president questions.*

In sum, because the IP constraint makes use of structural alternatives, definite plurals with conjunctions embedded in them are correctly predicted to pattern with conjunctions rather than simple definite plurals.

4.2 Team credit as an instance of imprecision

Given the sensitivity of the IP constraint to (contextual) entailment, we might expect conjunctions with predicates lacking distributive inferences to be exempt from the constraint. This expectation is arguably borne out by a class of examples discussed by Lasersohn (1990) and Brisson (1998: 51) a.m.o., which involve collective predicates of the *lift the piano* class as in (28a), or cumulative predicates as in (29a). These sentences have a surprisingly weak reading paraphrased in (28b) and (29b) (the metalanguage predicate **carry** is construed as exhaustive, i.e. $\mathbf{carry}(y)(x)$ is true only if there was an event of carrying y in which only the individuals in x participated).

(28) a. LAX CONTEXT: Abe, Bert and Carl work in IT support. Their boss asked them to remove a huge old computer. They decided together with the boss that two of them would go and carry the computer to the basement. Their boss doesn't know who exactly ended up doing the carrying.
Later, the boss is asked whether the computer is gone. She reports:
Abe, Bert and Carl carried the computer to the basement. %✓

b. $\lambda w.\exists x[x \sqsubseteq a \oplus b \oplus c \wedge {}^{**}\mathbf{carry}_w(\iota y.\mathbf{computer}_w(y))(x)]$

(29) a. LAX CONTEXT: Like (28a), but several computers need moving and Abe, Bert and Carl told the boss that two of them would each carry half of them.
Abe, Bert and Carl carried all the computers to the basement. %✓

b. $\lambda w.\exists x[x \sqsubseteq a \oplus b \oplus c \wedge {}^{**}\mathbf{carry}_w(\bigoplus({}^{*}\mathbf{computer}_w))(x)]$

In both English and German, some speakers who accept standard cases of non-maximality with definites still reject these weak construals (hence the % marks). I suspect that this is due to optional scalar inferences triggered by the deletion alternatives. For instance, we might expect the weak reading of (29a) to come with an inference that no proper subplurality of Abe, Bert and Carl did all the carrying. However, a closer investigation of this variation will have to wait for future work. The crucial point for now is that the weak interpretations in (28) and (29) have the hallmarks of an imprecision phenomenon. First, they seem to show the same QUD

effect as non-maximality with distributive predicates: In (28) and (29) the salient QUD is completely resolved by the existential statements in (28b) and (29b). In fact, a maximal construal, as paraphrased in (31) for (29a), would be overinformative. However, in a context like (30), where it matters who exactly participated in the carrying, (29a) must be interpreted maximally as in (31). Another parallel concerns homogeneity: In context (30), if the boss believes that Abe and Bert did all the carrying by themselves, (29a) does not seem true, but neither does its negation (32).

(30) STRICT CONTEXT: Abe, Bert and Carl work in IT support. Their boss thinks someone on their team is being unproductive, and wants to know what exactly each of them did today. She is going through a list of tasks, which includes removing the old computers, and checking who participated in each task.

(31) maximal construal of (29a): $\lambda w.^{**}\mathbf{carry}_w(\bigoplus(^*\mathbf{computer}_w))(a \oplus b \oplus c)$

(32) *Abe, Bert and Carl didn't carry all the computers to the basement.*

The weak construals in (28a) and (29a) therefore seem to be instances of imprecision in conjunctions. The IP constraint correctly permits imprecision in such examples despite blocking it in distributive sentences: (29a) does not precisely entail its deletion alternatives, such as (33), intuitively because (33) is true only if no individuals other than Abe and Bert participated in the carrying. The IP constraint therefore does not require (28a) and (29a) to imprecisely entail these alternatives.

(33) *Abe and Bert carried all the computers to the basement.*
$\lambda w.\exists x[x \sqsubseteq a \oplus b \wedge {}^{**}\mathbf{carry}_w(\bigoplus(^*\mathbf{computer}_w))(x)]$

At this point, it is worth noting that the phenomenon illustrated by (28a) and (29a) is often taken to be distinct from non-maximality, and discussed under headings like **team credit** (Lasersohn 1990) or **partial cumulativity** (Landman 1996, 2000). While Brisson (1998: 51) and Križ (2015: 83f.) have suggested a unified treatment of team credit and non-maximality, there is no consensus on this issue. One reason for this appears to be that apparent cases of non-maximality with conjunctions consistently involve non-distributive predication, whereas definite plurals permit non-maximality regardless of whether the predicate is distributive. The present proposal derives this asymmetry, thus removing one of the obstacles for a unified treatment. That being said, some obstacles remain. For instance, unlike non-maximality with distributive predicates, team-credit construals are available with indefinite arguments, as in (34), which can be true in a scenario like (29a) (cf. Landman 2000 a.o. for similar cases). This is surprising because numeral indefinites categorically lack homogeneity gaps when they occur as arguments of a distributive predicate, and suggests that the source of imprecision in (34) is the predicate, not the DP.

(34) *It's impressive:* ***Three IT people*** *carried all the computers to the basement.*

Here I will leave the question of the correct analysis of cases like (34) open and merely point out that, even if collective and cumulative predication involve an additional source of imprecision introduced at the predicate level, we need to understand why this kind of imprecision is not blocked when the argument DP is a conjunction. Unlike the intuition that conjunctions generally force their conjunct alternatives to be relevant, the IP constraint allows us to make sense of this observation.

4.3 Numeral indefinites

I conclude this section by pointing out a potential application of the IP constraint outside the domain of conjunction. As discussed by Križ (2015) a.o., numeral modification removes non-maximality. For instance, (35) is not true on any QUD if the speaker saw only two linguists. Numeral-modified definite plurals, however, still have homogeneity gaps, at least in English and German. Therefore, like conjunctions, they present a challenge to unified accounts of homogeneity and imprecision.

(35) *I saw* ***the four linguists*** *at the meeting.*

I want to note that the IP requirement derives the obligatory maximality effect in (35) given two independently plausible premises: (i) the indefinite numeral sentence in (36) is a deletion alternative of (35), and (ii) (36) has a fully precise semantics.

(36) *I saw* ***four linguists*** *at the meeting.*

As for (ii), note first that even given the weak QUD Q_{lax}, (36) is categorically false if Bert saw only two of the linguists. More importantly, numeral indefinites as in (36) also lack homogeneity gaps: (37) seems true even if each linguist saw three of her colleagues (the bound pronoun controls for scope; cf. Bar-Lev 2021).

(37) [*No linguist*]$_1$ *saw four of her*$_1$ *colleagues at the meeting.*

This suggests that distributive sentences with numeral-modified indefinite arguments are fully precise expressions with only one candidate meaning. Turning now to (i), (36) is often taken to involve a null indefinite determiner, which would mean it is not a deletion alternative of (35). However, the cross-linguistic tendency for numeral-modified indefinites to be formally less marked than numeral-modified definites[11] provides us with a reason to take the surface asymmetry in English at

11 For instance, among the 16 languages discussed in Keenan & Paperno's (2012) 'Handbook of Quantifiers in Natural Language', the 7 languages that obligatorily formally distinguish definites and indefinites in the plural (Basque, German, Greek, Hebrew, Hungarian, Italian, Wolof) all mark definiteness overtly in the presence of numerals, but allow numeral indefinites to be bare (i.e. without overt indefiniteness marking). Interestingly, in the articles on Basque and Wolof determiners are said

face value and analyze numeral-modified indefinites as lacking a counterpart of DEF, as in (38). Since we are already assuming that plural arguments are of type $\langle e,t\rangle$, no compositionality problem would arise from this. (The approach does face one serious problem, however: As Chatain (2021) notes, the behavior of definites suggests $\exists_{\text{pl}}$ takes obligatory narrow scope, unlike the existential quantification introduced by numeral indefinites. I leave a closer investigation of this issue to future work.)

(38) [(DEF) [*four linguists*]] [$\exists_{\text{pl}}$ [1 [*I saw* t_1 *at the meeting*]]]

Let us assume, then, that (36) is indeed a deletion alternative of (35). Since the maximal construal of (35) precisely entails (36), the IP constraint requires any non-maximal construal of (35) to entail (36). Any amount of non-maximality would compromise this entailment, so the effect of numerals on non-maximality is derived.

5 Outlook

This paper attempted to draw a connection between the recent imprecision/homogeneity literature and theories of formal alternatives, by claiming that the distribution of obligatory maximality effects can be characterized in terms of a syntactically grounded distinction between 'replacement' and 'deletion' alternatives. If correct, this provides a new reason to believe that semantics is sensitive to this distinction. I conclude by outlining two directions in which the present work should be extended.

5.1 Connections to the exhaustification literature

Prior arguments for distinctions between subclasses of formal alternatives come largely from the literature on exhaustification (for a general discussion, see Chemla & Singh 2014). For instance, free choice inferences of modalized disjunctions, which can be derived via exhaustification with deletion alternatives (Fox 2007), are more 'robust' and processed and acquired more easily than scalar inferences, which involve alternatives derived by replacement (Chemla & Bott 2014; Tieu, Romoli, Zhou & Crain 2016; but cf. Marty, Romoli, Sudo & Breheny 2024).

A widespread idea in this literature is that the contrasts derive from deletion alternatives being 'easier to access' than other types of formal alternatives. I take this to mean that the source of the contrast is the structure of the cognitive systems that implement the grammar of strengthening, rather than the grammar itself (i.e. the algorithmic level in the sense of Marr (1982), not the computational level). In contrast, my proposal involves a hard grammatical constraint. This shift is motivated

to be obligatory in the plural, but still examples of numeral indefinites without overt determiners are given. This suggests that there is something specific to numerals that permits the determiner to be absent.

by the observation that obligatory maximality effects persist when an explicit context is provided that would make the deletion alternatives irrelevant.

The question arises whether some of the strengthening-related contrasts that have been attributed to 'algorithmic-level' differences between alternative subtypes should also receive a grammatical account. For instance, free choice inferences involve deletion alternatives which are entailed by the strengthened reading, and could therefore be subsumed under the present proposal if the notion of 'imprecision' is extended to cover optional strengthening (as proposed in Haslinger 2025; cf. Bar-Lev 2021). Applying the IP constraint here would go against the intuition that free choice inferences are cancellable, but it has been proposed independently that they are in fact obligatory once the scope of disjunction relative to the modal is controlled for (see e.g. Fusco 2019; Crnič 2025). At the same time, there are also some 'robustness' effects due to deletion alternatives that the IP constraint would not cover. For instance, Cremers, Roelofsen & Uegaki (2019) show that ignorance inferences of *believe* and *wonder* statements are very robust if the alternatives are derivable by deletion, and less so if their derivation requires replacement of an indefinite. These cases differ from free choice in that the proposed strengthened meanings do not entail the deletion alternatives themselves, but their negations, and are therefore outside the scope of my proposal. If these effects are as categorical as obligatory maximality effects, the proposal might therefore not be general enough.

5.2 Embedding and non-homogeneous construals

Another major open question is how to capture the embedding behavior of obligatory maximality effects. As shown experimentally by Ren (2024), conjunctions under negation permit construals with and without homogeneity gaps (see also Mayr & Sudo 2023 for a related point about numeral-modified definites). Thus, (39) has both a 'none' and a 'not all' interpretation. The IP constraint in its present form does not capture this variation, and only licenses the homogeneous 'none' interpretation.

(39) *I didn't see Claire, Dora, Ernie and Fritz at the meeting.*

I suspect that the source of this undergeneration problem is the assumption that the operation that 'flattens' a set of candidate meanings to a single proposition is encoded in the truth definition and must therefore apply at the root-clause level. If we permitted this operation to optionally apply in embedded environments, e.g. under negation, we could assume that the IP requirement is evaluated locally wherever it applies. A 'not all' construal of (39) would then no longer be blocked, since on that construal the prejacent of negation in (39) would be locally inference-preserving even if the full sentence (39) itself is not. For reasons of space, I leave the technical implementation of this idea and its empirical consequences to future work.

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Constraining imprecision via structural alternatives

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