What number marking on indefinites means: conceivability presuppositions and sensitivity to probabilities[1]

Émile Enguehard — *ILLC, University of Amsterdam*

Abstract. The inferences due to number marking on indefinites have been argued be pragmatic in nature, and to disappear in downward-monotonic environments. This paper shows that indefinites are associated to a conceivability presupposition even when embedded under negation. Furthermore, it presents the results of an experiment that shows, on the basis of a production task, that the preferred number for negated indefinites is sensitive to probabilistic information in a gradient way: the more common it is in general for the objects of interest to come in groups, the more plural is used, etc. The sketch of an account of these facts is provided, in a model of pragmatics where statements compete on the basis of their potential continuations.

Keywords: number marking, indefinites, experimental pragmatics.

1. Background: the pragmatic view of number marking on indefinites

English and many other languages distinguish two numbers, singular and plural. For expressions with well-identified (countable) referents, the choice of number depends on the atomicity of the referent: singular is used when the referent is an atomic individual, and plural when it is a collection of individuals. Indefinite DPs, whose referents can be unspecified, also bear number marking. In simple positive uses such as the examples in (1), use of a particular number contributes an inference that the unspecified witness of the indefinite has the atomicity corresponding to the number: if singular was used, the indefinite has exactly one potential atomic witness, while if plural was used, it has at least two.

(1) a. There is a blue circle on the card. $\rightsquigarrow |C| = 1$
 b. There are blue circlers on the card. $\rightsquigarrow |C| \geq 2$
 where C is the set of blue circles on the card.

In various non-veridical contexts however, number marking does not appear to affect truth conditions on indefinites. In particular, when indefinites are used under negation as in (2), or when negated indefinites are used as in (3), the observed truth conditions is that the potential witness set is empty, regardless of number. This pattern also extends to use of indefinites in questions.

(2) a. There isn't any blue circle on the card. $\rightsquigarrow |C| = 0$
 b. There aren't any blue circle on the card. $\rightsquigarrow |C| = 0$

(3) a. There is no blue circle on the card. $\rightsquigarrow |C| = 0$
 b. There are no blue circles on the card. $\rightsquigarrow |C| = 0$

The data in (2) and (3) has generally been taken to support an analysis where the denotation of plural NPs includes both atomic and non-atomic elements while the denotation of singular NPs only includes atomic individuals (cf. e.g. Schwarzschild 1996: p. 5, fn. 1 and references therein). This makes plurals in principle strictly weaker than singulars; however, when the

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predicate the indefinite combines with is distributive, the truth conditions end up being the same for both numbers. In particular, the truth conditions of the negative examples of (2) and (3) are straightforwardly predicted.

Under this view, the predicted meaning of positive examples with either number is that the witness set is non-empty; in other words, both sentences in (1) should mean that $|C| \geq 1$. The stronger meaning that is actually observed has then been analyzed a pragmatic inference, for instance by Spector (2007), Zweig (2009), and Ivlieva (2013). The shared idea of these accounts is as follows: the atomicity inference from singular marking is due to competition of the singular form with another form whose semantics would entail the existence of at least two witnesses, for instance the competition of (1a) with (4). The multiplicity inference from plural marking is due to competition of (1a) with (1b).[2] These enrichments are some form of scalar implicature, and they do not obtain under negation for the same reason that scalar implicatures in general do not, which is a general constraint that implicatures should not weaken the global meaning of the sentence.

(4) There are two blue circles on the card.

2. The conceivability presupposition

The pragmatic account we just sketched takes it as its aim to predict perfect equivalence between singular and plural indefinites in simple negative sentences. Both forms are however not fully interchangeable. Indeed, both forms appear to exhibit what we are going to call an "conceivability presupposition": they are subject to the condition that the number inference appropriate to each number *could in principle* obtain — that there could in principle exactly one or several witnesses. This is illustrated in (5) and (6). If we are talking about something that could exist at most in one instance, like the table of contents of a book in (5), use of plural as in (5b) is infelicitous. Meanwhile, talking about an object that can never be unique, such as the chapters of a book in (6), use of singular as in (6a) is infelicitous. This is summarized through the generalization in (7).[3]

(5) a. This book has no table of contents.
b. #This book has no tables of contents.

(6) a. #This book has no chapter.
b. This book has no chapters.

(7) **Conceivability presupposition:** a singular- (resp. plural-)marked indefinite presupposes that it is conceivable that it could have exactly one (resp. more than one) witness.

Note that we diagnose the inference described by (7) as a presupposition because it generally projects regardless of the semantic environment: we can observe it not just when indefinites are negated, but also when they occur in questions or in conditional antecedents, or when negated indefinites occur in those environments. In positive cases such as in (1), the presupposition

[2] The main thing that has to be explained in such an account is how (1b) can be enriched through competition with (1a), even though they are truth-conditionally equivalent. For Spector (2007), the implicature obtains by comparing (1b) to *the enriched interpretation* of (1a). For Zweig (2009) and Ivlieva (2013), the enrichment happens at a subsentential level where the two forms are not equivalent.

[3] This effect is noted by Spector (2007), but only for the case of plural. Farkas and de Swart (2010) discuss the full paradigm.

is entailed by the enriched truth conditions of the sentence, and therefore indetectible. Furthermore, this inference only makes sense as a pre-condition for asserting the sentence, rather than something that proceeds from the sentence's assertion: once (5a) for instance is accepted, the common ground does not contain any worlds where the book has any number of tables of contents, so that we cannot formulate a constraint about their uniqueness or lack thereof.

3. The gradient pattern of number marking in production: an experiment

3.1. Motivation

Our generalization so far only describes what governs the choice of number in cases where potential witnesses are known to be unique or non-unique. When both conceivability presuppositions are satisfied, we allow for both numbers to be used. This is in general correct: as we have seen, it is in general possible to use both numbers under negation in such cases, and they yield truth-conditionally equivalent sentences. Nevertheless, it is natural to ask what determines speakers' actual choice of number in these cases. This section describes a production experiment that tries to address this question.

One (perhaps unlikely) hypothesis, which we will call H_0, is that variation between singular and plural under negation is governed purely by non-semantic factors, such as stylistic effects and speakers' personal preferences, or even pure randomness. Alternatively, there is an intuition that what matters in cases where the appropriate number for potential witnesses is not clear is the atomicity of *prototypical* witnesses, or some related notion. In particular, Farkas and de Swart (2010) essentially propose the generalization in (8), on the basis of examples like (9).

(8) **Farkas and de Swart's generalization:** a singular indefinite presupposes that in a prototypical situation, there would be a unique atomic witness.

(9) a. (i) Do you have children?
(ii) ?Do you have a child?
b. (i) Do you have a child on our baseball team?
(ii) ?Do you have children on our baseball team?

(adapted from Farkas and de Swart, 2010)

As we will discuss in Section 4.1, this generalization can be derived from existing proposals on number semantics with conservative amendments, and we can derive some form of the conceivability presupposition of plural from it as a *Maximize Presupposition* effect; the conceivability presupposition of singular follows from the generalization. Under this view, the apparent free variation in cases where both numbers are conceivable is an illusion due to the possibility of restricting our attention to prototypical cases. Thus, in situations where both unique and non-unique witnesses are salient, we expect plural productions to dominate. We will call this hypothesis H_1.

The third hypothesis we will consider, H_2, also involves some notion of typicality or prototypicality: it could be that speakers choose the number they use on the basis of whether they perceive witnesses as being *more typically* unique or non-unique. Unlike in H_1, there is no asymmetry between singular and plural under this view: we expect singular to be used more when potential situations with a unique witness are more salient, and plural to be used more; when both possibilities are salient, we expect both productions to be equally natural. We will call this hypothesis H_2.

Our goal is to tell apart these three hypotheses; since the question is how speakers decide what number to use, we can do it through a production study. The study presented here is premised on the assumption that at least when discussing abstract situations that do not relate to real-life experiences or cultural knowledge, prototypicality comes down to frequency: what is most prototypical is what occurs most often.[4] Then, if we expose participants to situations where sometimes a certain set has a unique member and sometimes it has several members, and we vary the frequency of each situation, we can control what participants perceive as prototypical; if we then prompt them to produce a sentence containing a negated indefinite over S, our various hypotheses make predictions as to what number they should use, which we can verify. To recapitulate, the predictions are as follows:

(10) a. H_0: productions will not depend on the distribution of situations.
b. H_1: we will observe singular productions when situations of uniqueness dominate, and plural productions otherwise. When both kinds of situations are equally common, we will observe plural productions.
c. H_2: the more situations of non-uniqueness, the more plural productions. When both kinds of situations are equally common, we will observe both kinds of productions.

3.2. Description of the experiment

The experiment was conducted online, with 100 participants recruited through the platform Prolific, who reported English to be their first language. Participants were told that their task was to learn a rule from examples. They were shown a series of 20 cards with abstract symbols on them, and asked for every card to guess whether the card was "valid" according to some unspecified rule. After every guess, they were given immediate feedback on whether the card was in fact valid or not. They could see at all times all the feedback they had so far, that is, the list of valid and invalid cards they had seen; an example of a trial is shown in Figure 1. After the 20 trials, they were asked to describe what they thought the rule was in one sentence, by completing the prompt *"the card is valid when..."*. The median duration of the experiment was 3:32 minutes, and participants were paid £0.90 each.

The general idea is that participants were exposed to a probability distribution over symbols, which varied with each condition, and that the experiment was set-up so as to make them likely to produce negated or negative indefinites in the final question, so that we can see how their productions vary with the probability distribution. Concretely, cards shown to participants contained symbols of one of four categories: blue circles, red squares, green diamonds or black crosses (cf. Figure 1). Each card contained several different kinds of symbols, chosen randomly; symbols of a given kind were clustered together and could number between 1 and 5. The rule that participants had to guess was always the same: cards were valid if they did not have any blue circles.

Participants were randomly assigned to one of five conditions, which determined the conditional probability that there were multiple symbols of a given kind on the card, when there were any. In other words, if a card included say black crosses, the condition determined the chance that the card had several black crosses, rather than just one. In every condition, all

[4] See section 4.2 for more discussion on this topic.

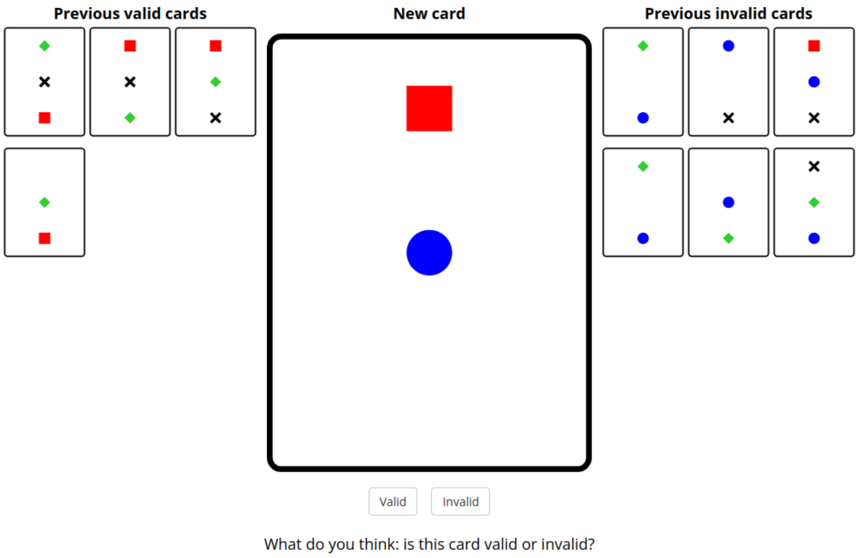

Figure 1: Example of a trial in the Sg condition.

categories of symbols followed the same distribution. The conditions are described below:[5]

(11) a. **Sg:** 0% chance that there are multiple symbols on the card, if there are any.
b. **SgPl:** 10% chance that there are multiple symbols on the card, if there are any.
c. **Mix:** 50% chance that there are multiple symbols on the card, if there are any.
d. **PlSg:** 90% chance that there are multiple symbols on the card, if there are any.
e. **Pl:** 100% chance that there are multiple symbols on the card, if there are any.

3.3. Results

Participants' final productions were categorized by the author as containing a negated or negative singular indefinite (*SG*), containing a negated or negative plural indefinite (*PL*), or describing the rule without using a negated or negative count indefinite (*Other*), without looking at the participant's condition. Unclear cases were categorized as *Other* as a conservative default.[6] Furthermore, 14 participants who did not appear to be describing the rule were excluded from the analysis. In spite of these difficulties, most productions clearly fell into the *SG* and *PL* categories.[7]

[5]Since stimuli were generated randomly for each participant, the actual distribution of what a given participant saw was not exactly what is given here. More information on the exact shape and distribution of the stimuli as well as access to the code and data is available on request.

[6]In particular, a number of productions include some variant of "there is no blue". I assumed these participants were mostly using "blue" as a mass noun, to refer to the colour, and categorized the production as *Other* accordingly. It is likely that a few of them actually intended "blue" to be a count noun, which would make their productions *SG*; while this is somewhat non-standard English, there are some clear cases of "blue" as a count noun in *PL* productions, e.g. "there are no blues".

[7]Two participants who reversed the rule (that is, described its negation) were included in the analysis reported in the abstract and slides, and excluded on second thought for the analysis reported here; this does not affect results meaningfully. In general, participants were not excluded for adding extra conditions or unnecessary precisions to the rule. Many participants did not produce a full clause (e.g. they wrote "no blue circles"); they were not excluded for this either. The complete list of participants' productions together with their categorization is available on

The proportion of participants in each category as a function of the condition is shown in Figure 2. We can see that the share of *SG* productions varies with the share of unique-symbol stimuli in a gradient way: the more unique-symbol stimuli, the more *SG* productions. Conversely, the more multiple-symbol stimuli, the more *PL* productions.[8] This is consistent with H_2, but not with H_0 and H_1. In conclusion, this experiment has uncovered that number marking on negated indefinites, in production, depends on the distribution of prototypical situations (or perhaps situations in general) in a gradient way.

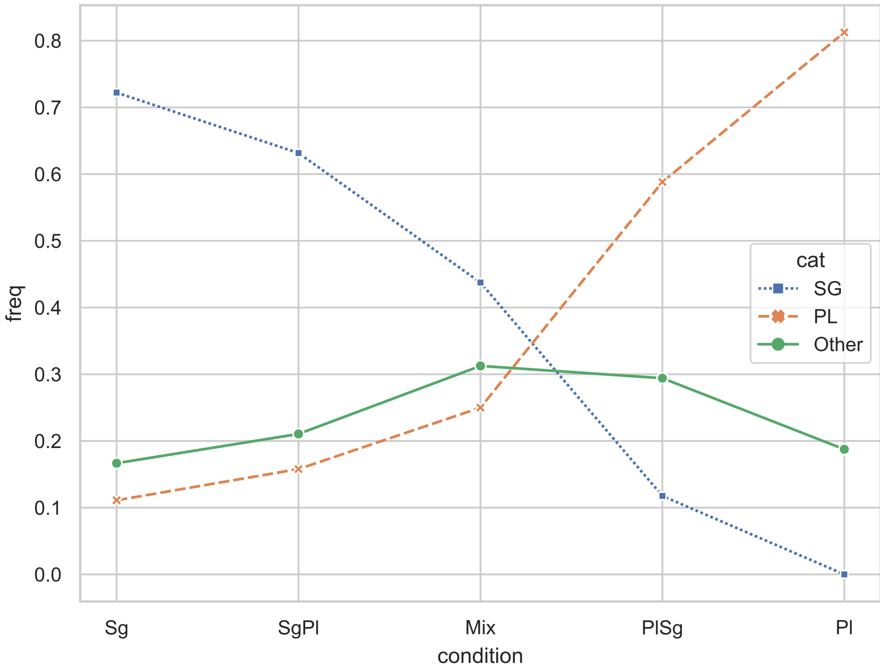

Figure 2: Share of participants using a negated singular indefinite (SG), a negated plural indefinite (PL), or another strategy (Other), as a function of condition. Conditions are ordered by increasing frequency of stimuli containing multiple symbols of the same kind.

4. Discussion

4.1. Consequences for the analysis of number marking

As we already mentioned, the conceivability presupposition specifies what number should be used in extreme cases where only one number could be countenanced in positive use, but allows for both numbers in any intermediate situation. In our experiment, both singular and plural forms were used, in varying proportions, in all situations where both unique and non-unique instances had been shown. This situation of free variation presents a challenge for pragmatic,

request.

[8]For the reader wondering about statistical significance, here are the p-values obtained from the likelihood-ratio test for a logistic regression between the condition (seen as an ordinal variable) and the category *PL* (seen as a binary variable), for various subsets of the data:

Restriction	All productions	*PL* or *SG* productions
All conditions	$< 10^{-6}$	$< 10^{-8}$
3 intermediate conditions	$< 10^{-2}$	$< 10^{-3}$

competition-based approaches to number inferences, such as the theories we have mentioned in Section 1, or any theory based on the *Maximize Presupposition* principle (along the lines of Sauerland 2003). Indeed, these theories derive the truth conditions or presuppositions of utterances by enriching some basic meaning with the negation of the truth conditions or presuppositions of competitors. This leads to the prediction that the use conditions of different competitors should not overlap, unlike what we observe here, where both singular and plural can be used in most situations, and they only come apart in extreme cases.

To make this point more concrete, suppose we wanted to derive the conceivability presupposition of plural. It would be tempting to think that the *Maximize Presupposition* (MP) principle, according to which one should not use a sentence if an equivalent competitor has a stronger presupposition, will help us. What we then derive is that one should only use plural when the presupposition of singular is not satisfied; for this to correspond to the conceivability presupposition of plural, the presupposition of singular has to be that it is *certain* that any witness would be unique. If we allow for the possibility of (perhaps defeasible) contextual restriction to prototypical situations, we end up with what we have called hypothesis H_1 above: singular presupposes that prototypical witnesses are always unique. This is still much stronger than the conceivability presupposition of singular, and too strong in light of our experimental results: we observe singular productions even in the Mix and PlSg conditions, where participants see as many instances of grouped symbols as lone symbols. The problem here is that we want to derive use conditions that overlap, but theories based on MP or scalar implicature mechanisms more naturally predict that competitors will be in complementary distribution. Of course, one could also maintain that the distributions of singular and plural are in fact complementary, but with a dividing line that is a "soft" judgement, e.g. "a parent most typically has one child on a given baseball team". The theoretical challenge is then to generate such an inference, as we discuss in the next section. In conclusion, the existing approaches to deriving number inferences in positive uses do not extend to negative cases, whether one is trying to capture the sensitivity to probabilities or merely to derive the limiting presuppositions.

The fact that we observe a few plural productions in the Sg condition, but no singular production in the Pl condition, can be taken as further support for the well-established idea that plural is semantically weaker than singular. However, I am not aware of a precise theory that would explain it. Furthermore, this observation is based on only a handful participants and would merit further investigation.

4.2. On probabilistic biases in semantics and pragmatics

The possibility of sensitivity to probabilistic biases in semantics and pragmatics has been the subject of some discussion.[9] The kind of formal-logical models most often used in the literature do not allow for sensitivity to "soft" information; nor do they allow for gradient predictions. There exists a different family of modelling approaches involving probabilistic calculations, such as the *Rational Speech Act* model (RSA, a.o. Bergen et al., 2016) or the *Iterated Best Response* model (IBR, Franke and Jäger, 2014) among others, where productions follow from a numerical optimization procedure and can depend in a gradient way on inputs, and in particular

[9]Here I use "(prior) bias" to refer to probabilistic information agents may have about the world, e.g. "it is 50% likely to rain tomorrow". This is often referred to as a "prior belief" in the context of Bayesian modelling, but in the context of linguistics and philosophy, the word "belief" is mostly used for non-probabilistic information about which worlds are possible at all or not.

on speakers' prior biases about the world.

Fox and Katzir (2020) argue that the way in which these models allow for sensitivity to biases is problematic: they show that the models predict that various pragmatic effects should disappear or be modified in some way in conditions of extreme prior biases on speakers' part, even though in truth the effects in question persist in those situations. Nevertheless, Enguehard and Spector (2021: sec. 2.2) present a specific case where the alternation between two forms whose enriched truth conditions are equivalent appears to be sensitive to prior biases. The experiment presented here is to the author's knowledge the first case of sensitivity to biases for which the gradience of the effect is demonstrated, which makes the conclusion that biases are the determining factor much more certain. Thus, our results speak for the integration of probablistic devices at some level of pragmatic modelling, whether taking inspiration from the aforementioned family of models or in some other way.

It should be noted that the precise nature of the "soft" information responsible for the effect we uncovered is unclear, and I do not think it should be identified to epistemic biases in general. Our various hypotheses for production patterns were formulated in terms of prototypicality rather than probability or frequency, and we made the working hypothesis that these come down to the same thing in our experimental setting. While the notion of protypicality is too vague to make precise predictions, in some realistic examples, it is clear that probability is not the right predictor. For instance, both (12a) and (12b) are acceptable and (12a) is if anything more natural, even though in a realistic situation, the speaker is more likely to find many chairs than to find exactly one; what seems to matter here is that the speaker only needs one chair.[10]

(12) I arrived late at the seminar and all the seats were taken, so I went to have a look in the surrounding rooms, ...
  a. ...but there was no chair anywhere.
  b. ...but there were no chairs anywhere.

5. Towards an account

In this section, we will provide the ingredients of an account of number marking on indefinites; the proposal is programmatic in nature and we will not provide a detailed formal set-up. At the heart of the proposal is a pragmatic principle whereby speakers try to set-up useful referents for future discourse. The main advantage of this way of looking at pragmatic competition is that it immediately generalizes to all environments. The possibility for free variation and sensitivity to biases will come from the fact that the principle is impossible not to violate in some cases, which forces speakers to go with their best guess.

One question any account of number inferences needs to address is how to make different predictions for singular and plural indefinites, given that they are assumed to be truth-conditionally equivalent. As we have discussed, Zweig (2009) and Ivlieva (2013) do it by considering subclausal constituents, while Spector (2007) allows for enriched meaning to enter competition. What we are going to rely on here is the dynamic potential of indefinites.[11]

[10]In a related vein, Denić (2023) describes a case where a pragmatic effect is sensitive to numerical properties of the situation that formal-logical models are generally not sensitive to, while probabilistic models are. In spite of this adequation with probabilistic models, the effect is not sensitive to epistemic biases, and behaves as if the speakers' biases were replaced by some generic defaults for the purpose of pragmatic processes.

[11]A recent proposal by Sudo (2023) also relies on dynamic potential in order to account for number inferences in

5.1. The dynamic potential of negated indefinites

It is well-known that indefinites can bind pronouns outside their scope, even in the absence of a well-identified referent, a fact which has prompted the development of dynamic semantics. In early dynamic theories such as DPL (Groenendijk and Stokhof, 1991) negation was made to block dynamic binding on the basis of examples like (13).

(13) #There is no bathroom here. It's upstairs.

However, there are in fact many cases where an anaphor refers back to a negated or negative indefinite. This include so-called *bathroom*-pronouns, named after the example in (14), which occur in the second member of a disjunction and refer back to a negative indefinite in the first member. A negated indefinite can also be referred back to if it is itself under negation, as in (15).

(14) There is no bathroom here, or it is upstairs.

(15) It is false that there is no bathroom here. It is upstairs.

Other cases where one may refer back to a negated indefinites include modal contexts, as in (16), and after a retraction or denial, as in (17).

(16) There is no bathroom here. It would be downstairs.

(17) — There is no bathroom here.
— Yes there is! It is upstairs.

These examples can be analyzed in a dynamic theory as long as the notion of truth is divorced from dynamic effects, so that referents can be set up even when the proposition is false. This can be done within a bilateral system (e.g. Krahmer and Muskens, 1995; Elliott, 2020) where propositions have a positive and a negative denotation, or in a system where referents and context updates are represented separately (e.g. Hofmann, 2019); we will not provide a detailed theory here.

5.2. Number marking on negated indefinites and their bindees

Pronouns bound by an indefinite have to match the indefinite in number. This is shown in (18) and (19).

(18) It's not true that the card doesn't have a circle.
a. It's just hard to see.
b. *They're just hard to see.

(19) It's not true that the card doesn't have any circles.
a. *It's just hard to see.
b. They're just hard to see.

It is clear that (18a) can be used felicitously to describe a situation where there is a unique circle on the card. However, if there are several circles all the card, it is not natural for a speaker who has the card in front of them to assert (18a). Similarly, (19b) is degraded in a situation where the speaker can see that the card has exactly one circle. Thus, the use of the pronoun triggers

positive sentences; I lack space and time to discuss it here in detail.

an inference to the effect that the pronoun's number is appropriate to its maximal referent.[12] Note that this inference is not present in the first sentence, since one may explicitly introduce a referent of the appropriate number with a new indefinite, as in (20a) and (20b).

(20) a. It's not true that the card doesn't have a circle. It has several but they're hard to see.
b. It's not true that the card doesn't have any circles. It has one but it's hard to see.

While again we will not develop a full system here, this pattern can be modelled in a dynamic theory under the following assumptions: (a) the referents introduced by indefinites bear formal number features, which anaphors have to match (as is assumed by Sudo (2012)), (b) the number features on pronouns are nevertheless interpreted and have to be appropriate to actual referents, and (c) pronouns receive maximal interpretations.

5.3. Explaining number inferences: a pragmatic principle of forward-looking cooperation

The previous sections have established that the choice of number marking on negated or negative indefinites affect the possible ways in which the conversation may continue. Indeed, after a first speaker has uttered (21) (repeated from (3a)), a second speaker who knows that there is in fact one barely visible circle on the card may contradict the first speaker by using (22a). If, however, the second speaker knows there are several such circles, they cannot use (22a), where the pronoun's number does not match the referent (or where the referent is not maximal, depending on one's point of view); nor can they use (22b), where the pronoun's number does not match that of the indefinite that licenses it. One can see this as a situation of ineffability, where a speaker would like to express a statement about something for which there is a referent in the discourse context, but has no licit way of doing so. In such a situation, the second speaker is forced to introduce their own referents, for instance through saying (22c). A similar problem can arise in the case where the first speaker used plural in their negative assertion, while the second speaker is aware of a unique witness.

(21) There is no blue circle on the card.

(22) Context: *there are several, hard to see blue circles on the card.*
a. #Yes there is! It's just hard to see.
b. *Yes there is! They're just are to see.
c. Yes there is! There are several, they're just hard to see.

In light of the pattern outlined above, the first speaker's choice of number is not entirely innocuous: it will determine in which situations a potential contradictor can re-use the first-speaker's referent, or needs to introduce a new one. What I would like to propose here is that this is at the source of the conceivability presupposition and the gradient sensitivity of production to biases. The key assumption is that speakers are trying to *set up useful referents*, in application of a conversational principle of facilitating potential continuations of the conversation —

[12] Note that this is a judgement on naturalness of production. In an informal survey, I have not found consistent judgements on whether these examples are interpretable and what their truth conditions are when the pronoun's number is not appropriate. In particular, if there are several circles on the card, of which some but not all are hard to see, it is unclear whether (18a) is true. The truth conditions and precise use conditions of generic variants of these episodic examples are unclear in a similar way; this connects to debates in the litterature on the interpretation of *donkey*-pronouns. It would of course be very interesting to investigate these issues experimentally and bring together production and comprehension data; this is beyond the scope of this paper.

a forward-looking maxim of Manner. The principle can be for instance stated as in (23).

(23) ***Provide useful referents*:** between utterances of equivalent acceptability as per other principles, prefer the one that sets up referents that can be used in well-formed continuations.

The conceivability presupposition of number marking on indefinites follows immediately from this principle, together with the theory of binding and number marking sketched in the previous section: the referents set up by the indefinite — which exist even for negated indefinites — are useless if their number is known not to be appropriate. When the conceivability presuppositions of both numbers are met, it is in fact impossible for speakers to obey (23): whatever number they use, there is a chance that it could lead to the situation of ineffability we described above. In those cases, a natural strategy for speakers is to resort to a best guess as to what continuations might be needed later, so as to minimize the chance of ineffability. This explains that speakers will be sensitive to distributional information about the witnesses in their choice of number.

Corrections or denials are often assumed to fall outside the ideal conversational setting formal pragmatics models, and it might seem strange to propose that the pragmatic system is optimized to facilitate them. It should be noted, however, that the above reasoning is not limited to negated indefinites and retractions thereof. What the reasoning relies on is that indefinites create referents, and that these referents are accessible later. As evoked in Section 5.1, dynamic theories where negative indefinites can set up referents more generally allow for indefinites' referents to be preserved at some level of the semantic representation, regardless of the syntactic environment of the indefinite. Furthermore, while we have focussed on denials as a simple example, there are also ways of using referents created in arbitrary environments while keeping to monotonic conversational updates, in particular through appropriate use of modals as in (16). The proposal therefore extends to use of indefinites in any environment. In particular, the same patterns of valid and invalid continuations extend to use of indefinites in questions, another case where singular and plural have been described as equivalent; this is seen in (24). The principle in (23) is very natural in this case, as the first speaker is interested in the information the second speaker will provide. Through its application, we predict the choice of number for indefinites in questions to follow the same rules to as for negative statements; at least for the conceivability presupposition, we have seen that this is correct.[13] Here we see that our proposal is not dependent on the notion of truth conditions, and applies even to non-truth-conditional sentences.

(24) Situation: *there are several blue circles on the card.*
Q: Is there a blue circle on the card?
a. A: Yes, *(there are several,) but they're hard to see.
b. #A: Yes, but it's hard to see.

The account presented here is not fully formalized; some of the difficulties that formalizing it entails include specifying how the set of competitors is determined, as well as how the prag-

[13]In order to properly extend the account to questions, we need a dynamic theory of questions where dynamic ouput and truth are separated. As it happens, the dynamic theories with this property that we discussed in Section 5.1 do not cover the case of questions, while existing dynamic theories of questions (e.g. Haida, 2008; Roelofsen and Dotlačil, 2022) do not have this property. Enguehard (2021) proposes a bilateral theory of questions with the appropriate formal properties.

matic principle we stated interacts with other conversational principles; this latter question becomes non-trivial once we accept that pragmatic principles are violable, as we did. When it comes to the specific issue of number marking, it would be desirable to extend it into an account of all number inferences, including in positive uses.[14] Given that number inferences in positive cases have been argued to show similarities to scalar implicature computation and *Maximize Presupposition* effects, it would also be desirable to try to relate our approach of forward-looking competition to existing competition-based interface mechanisms.

6. Conclusion

The goal of this paper was to ascertain the difference in meaning between singular and plural indefinites in syntactic contexts where the number inferences usually associated to them, and analyzed by various authors as scalar implicatures, do not obtain, and in particular under negation. We have seen that negated or negative indefinties trigger a conceivability presupposition to the effect that the witness set of the indefinite *could in principle* have the cardinality associated to the indefinite's number features. Through an experiment, we have shown that this presupposition is a limiting case of a more general pattern whereby the number of the indefinites is determined by whicher cardinality is more common or more prototypical for its witness set. These facts are difficult to explain in many existing theoretical approaches, both because it is difficult to generate inferences that are not mutually exclusive through competition mechanisms, and because soft distributional information, as opposed to propositional information, is not taken into account. We have offered a tentative solution in the form of a model of pragmatics where the potential continuations of the utterance are a driver of competition.

Beyond the specific issue of number marking, I hope that some of the ideas presented here can be of wide interest to semantics and pragmatics researchers. In particular, I believe the experimental approach consisting in teaching people a distribution — or any other kind of information — through an non-trivial task before actually making them perform the task of interest can reduce the risk that effects might be driven by the uncontrolled ways participants provide missing bits of context or import world knowledge. I also hope that the idea of reasoning about potential continuations of an utterance can be applied to other phenomena; compared to competition mechanisms based on logical comparisons, this approach presents the advantage that it applies equally well to non-truth-conditional statements such as questions.[15] Finally, our data provides a novel example of gradient sensitivity to distributional information in pragmatics, which speaks to the necessity for pragmatic theories of integrating this sort of information.

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[14] When it comes to positive uses, our account does not derive the strong inferences associated to number: what we derive is the same thing as for negative uses, specifically the conceivability presupposition and perhaps a soft inference of the form: "blue circles are more likely to come in groups". The strong inference — e.g. "there are several blue circles" — can perhaps be derived if we assume that direct monotonic continuations are privileged: speakers care more about avoiding ineffability for future updates building up on their assertion than for denials, counterfactual claims etc. It remains to be seen if this idea can be formalized.

[15] Some related ideas are found in the literature on linguistic processing (Levy, 2008), as well as in Krifka's (2015) proposal of Commitment Space Semantics.

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