Local Competition, Number and Definitness

by

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ABSTRACT
In this dissertation, I explore the consequences of local competition inside the DP. I argue that various phenomena, including multiplicity inferences, homogeneity and definiteness, are best explained as locally-triggered scalar implicatures (SIs), when coupled with a view of SIs as presupposed (Bassi et al., 2021). I begin with the puzzle of the multiplicity inferences that arise from the use of plural indefinites, and show that deriving them as presupposed SIs naturally explains their felicity conditions and projection from embedded environments. I then argue that this competition-based system can account for the typology of number marking, and in fact providing us with a parsimonious theory of the crosslinguistic variation. A key result of this argument is that any language which allows for number marking on nouns has both the singular and the plural feature in its inventory. Finally, I suggest that local competition can also derive the inferences stemming from definite descriptions, including uniqueness, maximality and homogeneity.

Thesis Supervisor: Danny Fox
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Acknowledgments

This dissertation is dedicated to the memory of Edit Doron, who made me fall in love with semantics. One day in 2019 I went on a plane from Boston to Tel Aviv, thinking from time to time about all the things I would tell her when we talk. When I landed, she was dead. This is not a worthy return for all that she has given me, but it's all I've got.

Elitzur Bar-Asher Siegal was the first real-life linguist I've met. I approached him one time after class and asked him to tell me how to become a linguist. He told me, and now I guess I'm a linguist, so in a sense this is all his fault.

Luka Crnič taught me that taking semantics seriously can be very fun. Sitting in Luka's classes, watching him walking back and forth, waving his hands, summoning the gods of semantics, getting so lost in thought that he walks into the blackboard, asking us unanswerable questions, taunting us, was truly a transformative experience. He taught me so much, and whenever we meet I learn how much I still have to learn from him.

My dissertation committee members – Danny Fox, Kai von Fintel, Viola Schmitt, and Martin Hackl – who, I'm shamelessly proud to say, don't need any introductions, were truly the best mentors I could have asked for throughout the long and painful process of writing this dissertation. Talking to someone about research, walking them through your ideas and be guided by them through theirs, gives you some weird and intimate understanding of how their mind works. Getting a glimpse of how the mind of each of these people works has been one of the great privileges of my life. As I'm writing these lines, their figures loom so large in my mind that I can hardly imagine how you normal people who never met them live your lives. The fact that they found me worthy of investing so much time and energy is something I always remind myself when I feel worthless. To say that this dissertation wouldn't have existed without them is a gross understatement.

Martin, who was my first semantics teacher at MIT and the first instructor I TA'd for, treats semantics like gold panning. He takes time to examine every grain of sand, sifting through them slowly and methodically. Working with him, you get the sense that you're taking part in some ancient tradition, that you're interacting with some mystic force that is eventually beyond the reach of even our most careful methodologies. And when you get a small win, when you discover something that seems to resemble the smell of truth, you feel like you've been blessed by the gods. The way he would consider every idea I brought him from all sides, weighing all the possibilities it presents, and eventually point at an angle so simple and profound that it would sometimes take me weeks to understand, was always astonishing.

Viola is the most generous person I know. She's generous with her kindness and support as much as she is with her ideas. I once told her, to a mixed reaction I'm sad to report, that her writing is carnivalesque. Let me double down on this take – I think Viola is a carnivalesque person. Her semantics is overflowing with theories, hypotheses and generalizations. She always has some brilliant idea to suggest and she always knows to point at why it can't be the whole story. When you talk to her, you feel the urge to start a thousand new research projects. She's a meticulous scholar, and she's also a very cool person who makes everyone around her feel cool themselves. Every part of this dissertation owes to her, but the insane parts owe her the most.

If this dissertation makes any sense, it is due to Kai. Someone once said to me that Emmanuel Kant treated the sublime like a doctor treats an illness. I think you can say the same thing about Kai and semantics. He has an unnatural ability to diagnose the weaknesses of a theory, break it down to its most basic components until you think it's beyond saving, and then, with one swift wave of his scalpel, bring it back to life, feeling better than ever. He seems to know everything, read everything, and treat everything with the same ironic skepticism. He has a chillingly clear vision of how different theoretical constructs interact, but it is in the rare moments that he loses his clarity and has to rely on his intuition that you can really start to get a sesnse of the kind of engine that drives this vision. It is, dear reader, a sight to behold.

Since my first year in grad school, it was clear for me that I wanted Danny to be my thesis supervisor. He seems to theorize like normal people breath. In my countless meetings with him, I don't remember ever being able to come up with a question that he had not already had a ready theoretical framework of how to go about it, and how to go about going about it, and so on. He is the least puzzle-solving kind of linguist I know, but he has theorized his way into solving the toughest puzzles. He's more aware, and has a deeper understanding, than anybody I know of the weird gap between theory and reality, and whenever I allowed myself to ignore it, he was there to convince me of its importance. And it's weird how, despite my natural contrarianism, I was eventually convinced every time. Before I knew it, it completely changed how I think about everything. But he also helped me in much less intellectual ways. Two months ago, I completely lost track of how and why I'm writing this dissertation. I couldn't convince myself that I'm able to write a dissertation, and as a result I couldn't bring myself to write even one word of it. I'm no stranger to the art of procrastination, but that time I really felt the icy breath of mastering out upon my neck. He was there, as he was multiple times before, to convince me that this is not my faith. And as always, I couldn't help but being convinced.

This dissertation would also not have been possible without hours and hours of conversations with Ido Benbaji-Elhadad and Jad Wehbe, my close friends and frequent collaborators. My thoughts are never as clear as when I'm talking to them, and I intend to force them to continue working with me, because without them being one step ahead of me, pushing me to go on, I'm not sure who I am as a linguist.

But more importantly, Ido and Jad are part of the bigger group of friends that has been my family here, which includes, in addition to them, Keely New, Margaret Wang, and Adèle Hénot-Mortier. You don't know what a stupid conversation looks like until you've listened to us talking over coffee at the 8th floor lounge. No other group of people in the world, I'm convinced, has ever developed our delicate sensitivity to the subtleties of stupidity, and it is only fitting that these are some of the most intelligent people I've ever met. I would happily continue living the sitcom that is our life together for decades longer, and refuse to accept that on a mere technicality, i.e. graduating, I will no longer be within a few steps of these people.

I would also like to thank the following people for their friendship, conversation, ping pong, lunch breaks, fights, inappropriate language, walks on the esplanade, weird gym sessions, smokes on the 4th floor, Taco Tuesday, New Haven adventures, Porchfest, and more: Lorenzo Pinton, Janek Guerrini, Alex Hamme, Christopher Gaston Romero Legerme, Mina Hirzel, Nina Haslinger, Anastasia Tsilia, Yash Sinha, Eunsun

Jou, Enrico Flor.

The staff of MIT linguistics are some of the kindest, ablest, most helpful bunch of people I was lucky enough to meet. They were a constant benevolent presence in my life in the past six years, and so it felt only natural to make some of them the protagonists of the examples here. Jen Purdy, Matt Sikorski, Beatriz Garcia Osorio, Chrissy Graham, Chris Naylor, Val Gaviria, Doug Purdy, Mary Grenham, Aggie Fernandez. Each of them has made the department's headquarters the efficient, quirky, fun and friendly place that it is, and I'm sure that in addition to the reasons I know, I owe them for a thousand other reasons.

I would be a fool to let this opportunity to engrave my words on the slate of eternity go away without mentioning a couple of the places that carry Boston's food scene on their back. Serving great food consistently is a form of magic; doing it in Boston is a straight up miracle. Dear reader, the dissertation you're about to read might very well be misguided in all kinds of ways. As compensation for all its shortcomings, here is some real useful, science-backed information:

- Highland Buthcer Shop (201A Highland Ave, Somerville, MA 02143) is the best place to buy meat in the greater Boston area, and I do not believe there could be any other legitimate opinion on the matter. One day I hope to be good in linguistics as much as Shannon Largey is good in meat.
- Jana Grill (2 Watertown St, Watertown, MA 02472) makes the best Chicken Tawook that has ever blessed my mouth, and they somehow keep getting better.
- Alive and Kicking (269 Putnam Ave, Cambridge, MA 02139) is the quintessential lobster roll spot. My best work in semantics was born over a bowl of bisque at their parking lot/outdoor dining hall.
- Clear Flour Bread (178 Thorndike St, Brookline, MA 02446) is the only place I know that makes both a pound cake that tastes like a hug from my grandma and an orange cardamon tart so subtle and sophisticated that any other physical entity feels vulgar and inappropriate.

Where was I? None of this, and by *this* I mean all of the things described above, but also more basic things like my existence in this world, my development as a somewhat healthy and arguably sane human begin, etc., would have been possible without my parents, Tami and Gadi. I'm sure that they are extremely baffled by the things I've been doing in the past six years, of which the pages you'll find below are a representative example, but they do an admirable job pretending that it's all very important. Being on the other side of the Atlantic has been hard, and it's only getting harder, but I feel their support every day, and it is more important to me than I'm usually willing to admit.

Finally, my wife Galya, whose fingerprints are all over this dissertation, all over my work, all over my life, who a hundred times made me believe in myself when I lost hope, who supports me in ways that make the word *support* feel ridiculously insufficient, deserves much more than an acknowledgment. But words elude me when it comes to her. Writing this dissertation was not easy, but describing what she means to me is a project of a whole different scale. I will have to leave it, as the say, for future research.

Contents

Introduction

This dissertation is about the internal structure of DPs. It is in a sense a collection of thoughts on number marking and definiteness, but the one big theme that runs throughout its three chapters is that many of the inferences that arise from DPs in argument position are the result of local competition. Its contribution is not in proposing the idea that such local competition takes place within the DP – this has been proposed and discussed since the first days of the formal semantic research on number marking. Sauerland (2003), arguably the first systematic attempt to account for the semantics of singular and plural features, implements this using a local version of I. Heim's (1991) *Maximize Presupposition* principle. Zweig (2009) adopts the idea of local competition as well for the case of indefinites, but cashes it out in terms of scalar implicatures, adopting (Chierchia, 2006)'s (2006) view that they stem directly from properties of the compositional system. Ivlieva (2013) further develops Zweig's system, implementing it within the grammatical view of SIs Chierchia et al. (2012). Mayr (2015), looking at definites, argues that local SIs play a role in bringing about some of the inferences they give rise to.

In fact, the idea that local competition can explain the basic properties of definites and indefinites has been pursued from so many angles that it seems to have gone out of fashion. New kind of accounts, perhaps the most prominent of which due to Križ (2015; 2016; 2017; 2021), has swept the field, shifting the focus from the internal makeup of the nouns in argument position to that of predicates. Why did this shift take place? I would argue that a key reason for the general departure from the idea of local competition lies in the fact that the account arguing for it were proven to provide limited empirical coverage. The problem runs through a number of domains. Competition-based accounts have a hard time accounting for the projection of multiplicity and anti-multiplicity inferences from certain embedded environments, as shown by e.g. Spector (2007). They also seem ill-equipped to explain the patterns of number-related inferences in languages which allow for nouns without number marking, as discussed by e.g. Dalrymple

& Mofu (2012) and Dawson & Gibson (To appear). Finally, local competition does not straightforwardly explain the triggering of *homogeneity*, a phenomenon which have been the focus of much debate in recent years – proposals like Križ (2015) and Križ & Spector (2021) do away with competition all together, and even proposals like Bar-Lev (2021), which rely on competition, argue that the locus of it is outside the NP itself.

My purpose in this dissertation is to show that the old idea of local competition within the DP as the explanation of these phenomena still has some life in it. The main difference in the way I implement this idea relative to previous accounts lies in the nature of this competition. I adopt an idea proposed by Bassi et al. (2021), who argue that scalar implicatures – the inferences that result from this competition – are presuppositional in nature. My hope is to convince the reader that the combination of this idea with an account of the internal structure of DPs as containing a position in which this competition takes place, significantly expands the empirical coverage of this kind of accounts. On this view, many of the problems that previous competition-based accounts faced were rooted in a misunderstanding regarding the nature of this competition, and in turn of the projection of the SIs to which it gives rise.

In chapter 1, I lay the foundations for this novel system, by examining number marking on indefinites as a case study. I develop an account of the multiplicity and anti-multiplicity inferences that arise from plural and singular indefinites. I maintain the claim of Sauerland (2003) and Zweig (2009) that these inferences are the result of a local competition within the NP, but implement this competition using the notion of presuppositional exhaustification PEX, as proposed by Bassi et al. (2021). By positing that a local instance of PEX operates within the indefinite NP, multiplicity inferences are derived as a presupposition that arises from the plural form competing with its singular alternative. I further show that the puzzling logical properties of (anti-)multiplicity are simply the result of their projection from the environment in which they are triggered, as predicted by the Strong Kleene theory of projection (Peters, 1979; **?**; George, 2008; Fox, 2013).

This presuppositional approach to multiplicity allows for a unified explanation of several persistent puzzles. The apparent neutralization of multiplicity inferences in downward-entailing environments, as well as their complex projection from non-monotonic contexts, is shown to follow from the projection properties of the presuppositions generated by PEX. Furthermore, this account explains the infelicity of indefinites in downward entailing environments in contexts where the simplex sentence in which they are contained expresses impossible truth conditions, a phenomenon first noted by Spector (2007), by analyzing it as a violation of the Post-Accommodation Informativity generalization argued for in **?**. The chapter also extends this analysis to anti-multiplicity inferences, treating them as a second-order, global scalar implicature that is dependent on the local implicature responsible for multiplicity.

Chapter 2 extends this framework to account for cross-linguistic variation in number marking, focusing on languages that feature unmarked or "general number" nouns. I address the challenge posed by languages like Bayso, which have distinct singular, plural, and general number forms, by arguing that the general number form is structurally simpler, lacking the number projection present in singular and plural forms. This structural difference prevents it from competing with the singular form, thus explaining the absence of multiplicity inferences. This analysis provides insight into the nature of structural alternatives (Katzir, 2007; Fox & Katzir, 2011) and supports a view of lexical cumulativity for nouns (Krifka, 1992a; Kratzer, 2008).

The chapter then tackles the more difficult puzzle of languages like Indonesian, which appear to have only a general and a plural form, yet still exhibit multiplicity inferences with the latter. I argue that these languages are not truly missing a singular form but instead exhibit a systematic syncretism where the singular and general number forms are homophonous. Evidence for this hidden singular form is provided through diagnostics like Hurford's Constraint, which reveals its presence in disjunctive constructions. This analysis allows for a more parsimonious typology of number systems, where variation is reduced to the obligatoriness of number marking and the specific spell-out rules for each form, and it also offers an explanation for the typological gap of languages lacking a plural but having a singular. I further show that it can help to solve a puzzle involving plural marking on wh-words in languages like Spanish (Maldonado, 2020; Elliott et al., 2022; Alonso-Ovalle & Rouillard, 2023), by situating it in the broader crosslinguistic pattern.

Chapter 3 uses the same ideas, but it is logically independent from the first two chapters. It is also the most speculative one I argue that this same mechanism of presuppositional exhaustification can provide a novel, quantificational account of definiteness, in a radical divergence from traditional analysis. I propose that definite and indefinite descriptions share the same underlying existential semantics and structure, with the crucial difference being the placement of focus. On this view, the definite article is simply the spell-out of a noun phrase in which the internal trace is focused. This focus on the trace expands the set of alternatives for the local PEX operator, which in turn generates a scalar presupposition that enforces maximality for plurals and uniqueness for singulars.

This structural account of definiteness offers principled explanations for several well-known and challenging phenomena. The homogeneity effect observed with plural definites, where they receive an "all-or-nothing" interpretation, follows directly from the derived semantics, without the need for additional mechanisms. The analysis also correctly predicts the projection of definiteness from non-monotonic quantifiers, and resolves a puzzle concerning Maximize Presupposition noted by Percus (2006). Finally, it explains cases of "definites without definiteness" – instances where definite descriptions containing focus-sensitive operators like *only* lose their uniqueness or maximality entailments – by showing how these operators can occupy the structural position of PEX, thereby bleeding the mechanism that generates the definiteness effect.

Taken together, these three chapters aim to demonstrate the explanatory power of a unified, competition-based account of nominal interpretation. My hope is that this approach will be used to further deepen our understanding of the correspondence between abstract structure and pragmatic inferences, mediated by mechanisms like alternative generation, competition and presupposition projection. In this sense, the main contribution of this dissertation is in expanding our ability to test morpho-syntactic hypotheses by observing the pragmatic behavior of certain expressions, and vice-versa – learning about the nature of our pragmatics from morpho-syntactic facts. While number marking, and the internal structure of NPs in general, is a useful case study of this theoretical strategy, extending the ideas developed here to other domains seems natural. Much work is left to be done.

Chapter 1

Presupposing multiplicity

1.1 Introduction: puzzles of multiplicity

1.1.1 The basic problem

Plural indefinites in argument position give rise to so-called **multiplicity inferences**,[1] demonstrated in (1). More generally, a sentence containing a plural indefinite N as an argument of a predicate P gives rise to the inference that there is more than one individual in $[\![N]\!] \cap [\![P]\!]$. This inference presumably stems in some way from the semantics of plural marking; as we will see, singular-marked nouns do not give rise to multiplicity inference. An immediate question that arises from examples like (1) is – what kind of meaning for plural marking could explain them?

(1) Jen owns cats. $\rightsquigarrow$ Jen owns more than one cat.

Before setting about answering this question, let us explicate some of my basic assumptions about the semantics of plural marking. I adopt the assumption first presented by Link (2002) and widely adopted in the semantic literature since, that the ontology of the domain of individuals allows us to refer directly to *sums* of individuals. Link introduces the sum-formation operator $\bigoplus$ – a metalanguage function that takes two individuals, say a and b, as input and return a third individual $a \bigoplus b$, which can be thought of as the combination of the two individuals given as input. Importantly, sums of individuals are "flat" – they do not have an internal structure. In other words, knowing the set of individuals that a sum includes tells

[1] I focus here on sentences with distributive predicates. I think that everything I say can be extended to other types of predicates as well, but I will not go into the details here.

us all we need to know about that sum. Link then posits that the entire domain of individuals D_e is closed under sum-formation: if $a \in D_e$ and $b \in D_e$, then necessarily $a \bigoplus b \in D_e$. The algebraic properties of this operation and of the structure it gives rise to have been the focus of much research both in linguistics and in mathematics. I will have little to add to this body of research here, and I will mainly treat the structures involved as convenient tools for describing the semantics of certain linguistic expressions.

Using Link's basic notion of sum-formation, we can define some useful notation. The *parthood relation* $\sqsubset$, defined in (2), is a relation between individuals which is true if one of the individuals can be transformed into the other by summing it with a third individual. We can further define the notion of an *atomic individual* (3) – an individual which does not have any parts. Individuals which are not atomic are sometimes termed *plural individuals*, but to avoid confusion with the morphological notion of plurality, I will refer to them as *non-atomic* individuals, or simply *sums*. Finally, we can define a notation for the process of closure under sum-formation, standardly expressed as the asterisk symbol * (*Link's Star*). Link's Star is used in the literature both as metalanguage notation and as a hypothesized object-language operator at LF. The question of whether the latter use of it is justified relates to the fundamental question of how closure under sum-formation comes about. Different authors have argued that it is an inherent lexical property of predicates (Krifka, 1992a; Kratzer, 2008), that it is encoded in the compositional system (Schmitt, 2019), and that it is due to an instance of Link's Start at LF (Ionin & Matushansky, 2003; Wehbe, 2023). This debate is tangential to the main argument in this chapter, and so I will not weigh in on it (it will become more relevant in the next chapter). Here, I will use Link's Start sloppily both as metalanguage and as an object language operator, mostly for reasons of clarity, and without any intention to make a substantial theoretical claim.

(2) $a \sqsubset b \iff \exists c\ [a \bigoplus c = b]$

(3) $\text{ATOM}(a) \iff \neg\exists b\ [b \sqsubset a]$

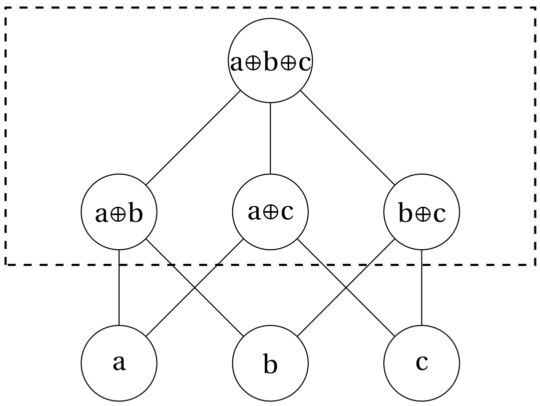
(4) $^{*}P(a) \iff \exists A\ [A \subseteq P \wedge a = \bigoplus A]$

We now go back to the main question of this chapter – what is the meaning of plural nouns? One natural way to go about this is to posit that the semantics of plural marking is *exclusive*, namely the extension of plural-marked nouns contains only plural individuals. This is given in (5), and demonstrated by the semi-lattice below. Assuming, for simplicity, that our domain of individuals contains three atomic cats

- *a*, *b*, *c*, in addition to all their possible combinations via sum-formation, (5) states that plural NPs like *cats* denote only non-atomic sums of cats.[2]

(5) **Semantics of plural-marking (first pass):**

$[\![\text{cat.PL}]\!] = \lambda x.\ x \in [\![\text{*cat}]\!] \wedge \neg\text{ATOM}(x)$



To see how this semantics for plural marking can account for the multiplicity inference in (1), we first need to flesh out some assumptions about the composition of sentences with plural indefinites. I assume the LF in (6) for the sentence in (1). The bare plural *cats* is existentially-closed via an implicit operator, and QR's to an interpretable position. The derived predicate in its scope is closed under sum-formation by Link's star operator (4). Plugging in the semantics in (5), the sentence ends up conveying that there exists a non-atomic sum of cats such that Jen owns all of its atoms (7). This, of course, entails that Jen owns more than one cat.

(6) $[[\exists\ \text{cat.PL}] * \lambda x\ [\text{Jen owns}\ x]]$

(7) **Prediction of exclusive plural semantics:**

$[\![\text{Jen owns cats}]\!]^{w} = \lambda w.\ \exists x\ [x \in [\![\text{*cat}]\!] \wedge \neg\text{ATOM}(x) \wedge \text{Jen owns}\ x\ \text{in}\ w]$

≈ Jen owns more than one cat.

But it turns out that the exclusive semantics in (5), as it is, yields wrong predictions once we examine

[2]Notice that the definition in (5) is syncategormatic – it does not specify the meaning of the plural feature itself, but only the meaning of its composition with the noun it attaches to. This corresponds to a weaker theoretical claim, since it is underspecified regarding the division of labor between the noun and the number feature. In particular, it allows me to remain uncommitted, at this point, as to whether the closure under sum-formation comes from the noun (and then the plural feature only filters out the atoms), or from the plural feature (which would mean that the noun contains only atoms in its denotation). This relates to the debated mentioned above on the source of closure under sum-formation. I will get back to it in the next chapter, but for now, it is beside the point.

more complex sentences, as is known at least since Van Benthem et al. (1986), and famously pointed out by Schwarzschild (1993). Most notably, the multiplicity inferences seem to be neutralized in negated sentences, and in downward entailing (DE) environments in general, as demonstrated in (8). If multiplicity were entailed by the core semantics of sentences like (1), we would expect the sentence in (8-a) to be judged true in a scenario in which Jen has exactly one cat. This is because applying negation to the truth conditions in (7) yields a proposition which is true if Jen has either exactly one cat, or zero cats. To see that, it might be useful to compare the indefinite examples in (8) with ones containing the modifier *multiple*, as given in (9).

(8) a. Jen doesn't own cats. ⇝ Jen owns zero cats.

b. If Jen owns cats, she has to pay a special tax. ⇝
If Jen owns at least one cat, she has to pay a special tax.

c. Every friend of mine who owns cats has black hair. ⇝
Every friend of mine who owns at least one cat has black hair.

(9) a. Jen doesn't own multiple cats. ⇝ Jen owns zero cats or exactly one cat.

b. If Jen owns multiple cats, she has to pay a special tax. ⇝
If Jen owns at least two cats, she has to pay a special tax.

c. Every friend of mine who owns cats has black hair. ⇝
Every friend of mine who owns at least two cats has black hair.

I will focus for now on the negated example in (8-a) for simplicity, but we will come back to the more complex cases of multiplicity in DE environments in the next sections. Another way to describe the facts we have seen above is that the sentences in (1) and (8-a) display truth value judgments that are stronger than we might expect. We expect a negated sentence to be true whenever its non-negated counterpart is false, and vice versa, but in our case, neither sentence is judged true if Jen has exactly one cat. A basic challenge for any theory of multiplicity is therefore to account for this discrepancy.

(10) **Prediction of exclusive plural semantics:**

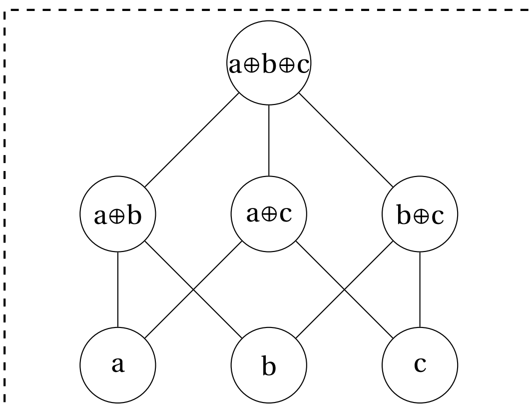
$[\![\text{Jen doesn't own cats}]\!]^w = \lambda w.\ \neg\exists x\ [x \in [\![{*}\text{cat}]\!] \wedge \neg\textsc{atom}(x) \wedge \text{Jen owns } x \text{ in } w]$

≈ Jen either owns zero cats or one cat.

The behavior of plural indefinites in DE environments is often taken to indicate that the semantics of plural nouns is actually *inclusive* – they contain both atomic and non-atomic individuals in their extension, as stated in (11) and demonstrated in the semi-lattice below. If this analysis is on the right track, the semantic contribution of the plural feature is vacuous – NPs like *cat.PL* denote the entire domain of cat individuals. For that reason, it naturally delivers the right prediction for the negated case, namely it predicts that sentences like (8-a) are false whenever Jen has one cat or more. Of course, assuming inclusive plural semantics (or any semantics for that matter) cannot explain the gap described above. Without additional mechanism, the inclusive semantics in (11) yields the wrong prediction for the meaning of the matrix sentence in (1), as shown in (12). The sentence is now predicted to have a meaning that is weaker than the one we observe – it is predicted to be true in a scenario where Jen has exactly one cat. We are therefore left with the initial question of how multiplicity inferences come about.

(11) **Semantics of plural-marking (second pass):**

$[\![\text{cat.PL}]\!] = \lambda x.\ x \in [\![\text{*cat}]\!]$



(12) **Predictions of inclusive plural semantics:**

a. $[\![\text{Jen doesn't own cats}]\!]^{w} = \lambda w.\ \neg\exists x\ [x \in [\![\text{*cat}]\!] \wedge \text{Jen owns } x \text{ in } w]$

≈ Jen owns zero cats.

b. $[\![\text{Jen owns cats}]\!]^{w} = \lambda w.\ \exists x\ [x \in [\![\text{*cat}]\!] \wedge \text{Jen owns } x \text{ in } w]$

≈ Jen owns at least one cat

A common intuition is that it has something to do with a competition between the plural form and the singular form (Sauerland, 2003; Sauerland et al., 2005a; Spector, 2007; Zweig, 2009; Ivlieva, 2013; Mayr, 2015). Compare (1) (repeated below) with its singular counterpart, which gives rise to so-called *anti-multiplicity inferences* (15).[3] A naive competition story might go as follows (abstracting away, for now, from the specific theory of scalar implicatures). We assume that the plural sentence in (14) is underlyingly inclusive, and that the anti-multiplicity inferences given rise to by the singular sentence in (15) stem from its core semantics.[4] The singular sentence in (15) is therefore logically stronger, in its core semantics, than the plural sentence in (14). Plugging in your favorite theory of SI generation (at this point we can abstract away from the specifics), the meaning of the plural sentence is strengthened by the negation of its singular alternative. We end up with an exclusive semantics for the plural sentence.

(14) Jen owns cats ⇝ Jen owns more than one cat

(15) Jen owns a cat ⇝ Jen owns exactly one cat

One main point of appeal to this kind of story is that it provides us a way to reduce the neutralization of multiplicity in DE environments to a broader observation regarding SIs. It is a well known fact about SIs, at least since Grice (1975), that they tend to not arise under negation, and in DE environments in general. A representative example is given in (16) below. In one of the canonical cases of SI, the use of *or* in sentences like (16-a) gives rise to the inference that the corresponding *and*-alternative is false, namely that only one of the disjuncts is true. Assuming that this inference is assertive in nature (i.e. not presupposed), it seems to be neutralized under negation, as shown in (16-b). If the SI were generated under negation, we would expect a reading of (16-b) which is true if Matt either ate both desserts or none of them. While this reading might exist in some marginal cases (especially when the word *or* is phonetically stressed), it is definitely not as prominent as the exclusive inference in (16-a). We will get deeper into the reasons behind this pattern in the next section, but for now just note that the truth-judgment gap in (16) is of the same shape as the gap given rise to by multiplicity. Adopting a view of

[3]Anti-multiplicity inferences generally seem to be more easily cancelable than multiplicity inferences. While this intuition is somewhat vague without a more detailed context, examples like (13-a) below, where a sentence with plural indefinite is followed by a sentence which contradicts multiplicity, are generally judged as infelicitous. Compare that to examples containing a sentence with a singular indefinite followed by one which contradicts anti-multiplicity, which seem to be more felicitous. I will ignore this contrast for now, and return to it in section 5.

(13) a. Jen owns cats. ??In fact, she owns exactly one cat.
b. Jen owns a cat. In fact, she owns multiple cats.

[4]By *core semantics* I mean to refer to the meaning of a sentence sans SIs, or in other words – the meaning that constitutes the input for the SI-generation mechanism, whatever it may be.

multiplicity inferences as SIs allows us to import any explanation of the gappy behavior of SIs to our case as well.

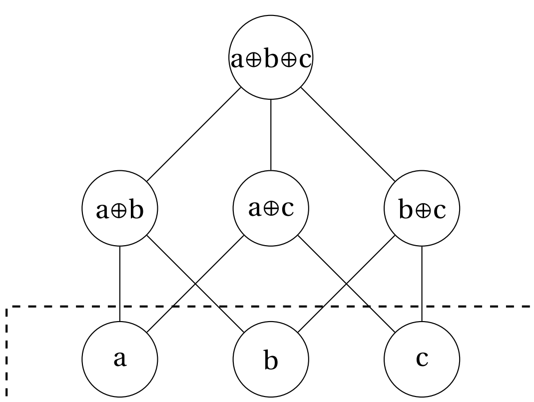
(16) a. Matt ate ice cream or cake for dessert. ⇝ Matt ate exactly one of ice cream and cake.

b. Matt did not eat ice cream or cake for dessert. ⇝ Matt ate neither ice cream nor cake for dessert.

This story crucially relies on anti-multiplicity being a part of the core meaning of sentences with singular indefinites. But this does not seem to be a reasonable assumption. First, it is unclear how anti-multiplicity can be accounted for compositionally. It is obviously the result of the singular marking on the indefinite, but baking it into the semantics of singular in a straightforward way is doomed to fail, due to the so-called *Van Benthem's paradox* (van Benthem, 1986) – the observation that existential quantification renders upper bounds in its scope superfluous. To understand its relevance to our case, let us assume that the singular feature restricts the NP to which it attaches to atomic individuals, as given in (17).[5] There are independent reasons to make this assumption, for example the incompatibility of singular nouns with collective predicts, and indeed, I will adopt this assumption throughout this paper. However, it is important to see that this meaning cannot explain anti-multiplicity.

(17) **Semantics of singular-marking:**

$[\![\text{cat.SG}]\!] = \lambda x.\ x \in [\![{*}\text{cat}]\!] \wedge \textsc{atom}(x)$



[5] As mentioned above, I present the semantics of number marking in a syncategormatic way in order to avoid making unnecessary assumptions regarding the meaning of nouns before they compose with the number head. In the case of (17), this choice might be confusing, since the formula on the right side of the equal sign is necessarily redundant – if we assume that nouns are born atomic, the second conjunct is superfluous, and if we assume that they are born closed under sum-formation, applying Link's Star to *cat* is superfluous. I trust the reader to understand that this redundancy does not reflect any substantial claim, and is simply a tool to avoid unclarity in my notation.

To see why the denotation in (17) does not predict anti-multiplicity, notice that applying it to the structure in (18) yields the meaning in (19). The crucial point is that the existence of a non atomic sum of cats in the extension of the predicate [$*\lambda x$. Jen owns x] logically entails the existence of an atomic cat individual in the extension of that predicate. This follows directly from the property termed *distributivity*, defined in (20). The sentence in (15), like any sentence with a distributive predicate, suffers from a severe case of van Benthem's paradox – it is not only compatible with states of affairs where non-atomic sums of cats are in the extension of the predicate, these states of affairs necessarily verify it. The singular sentence in (15) ends up having the same meaning that we predicted for the plural sentence in (1) given inclusive plurality. It is therefore unclear how anti-multiplicity comes about compositionally.

(18) [[∃ cat.SG] $*\lambda x$ [Jen owns x]]

(19) $[\![\text{Jen owns a cat}]\!]^{w} = \lambda w.\ \exists x\ [x \in [\![\text{*cat}]\!] \wedge \text{ATOM}(x) \wedge \text{Jen owns } x \text{ in } w]$

≈ Jen owns at least one cat

(20) **Distributivity:**

A predicate P_{et} is distributive if for every $x \in P$ and for every $y \sqsubseteq x$ it holds that $y \in P$

Moreover, anti-multiplicity behaves like multiplicity in that it is neutralized in DE environments, and specifically under negation, as shown in (21). Again, our truth judgments of the affirmative and the negated examples are not complementary – neither (15) nor (21-a) is judged true if Jen owns multiple cats.[6] Any explanation which relies on anti-multiplicity being a part of the core semantics of sentences like (15), therefore, has to account for the neutralization of it in (21). Since this seems like an a very tough task, I will neglect this line of argumentation.

One possible alternative strategy would be to assume that multiplicity is somehow entailed by the semantics of sentences with plural indefinites, and then derive anti-multiplicity from a competition of sentences like (15) with their plural alternative (1). This is essentially the mirror image of the competition account entertained and rejected above, but it might have a better chance, since we at least know what the semantics of plural nouns would have to be to make it work. We will return to this idea, but for now let us conclude that whatever is the correct account of anti-multiplicity, it is hard to see how it could

[6]It might be worth emphasizing again that anti-multiplicity inferences are significantly less robust than multiplicity inferences. It is manifested in this case by the fact that many speakers report an intuition that the sentence in (19) is true even if Jen has multiple cats. I will return to this in section 5.

serve as a basis for a theory of multiplicity.

(21) a. Jen doesn't own a cat. ⇝ Jen owns zero cats.

b. If Jen owns a cat, she has to pay a special tax. ⇝
If Jen owns at least one cat, she has to pay a special tax.

c. Every friend of mine who owns a cat has black hair. ⇝
Every friend of mine who owns at least one cat has black hair.

Recall that the puzzle at the core of this paper is to explain multiplicity. In a sense, we have not made much progress in solving it – hard-coding it into the semantics of plurality fails when we look at the projection of multiplicity from DE environments, and attributing it to a global competition with the corresponding singular sentence forces us to commit to unrealistic assumptions about the semantics of singular indefinites. What we learned so far is that our puzzle is more difficult than it might initially seem. Indeed, it has triggered various involved accounts, some of which we will review in the next section. My proposal in this paper, however, will not demand many more tools in addition to those I have already introduced. I will argue that the semantics of the number features are as given in (11) and (17), and that multiplicity is indeed the result of a competition between the forms; most of the heavy lifting will be done by being more specific about the nature of this competition.

The rest of the paper is structured as follows. In section 2, I present some prominent theories of multiplicity, including what I take to be the most conceptually-appealing account, proposed by Zweig (2009) and further developed by Ivlieva (2013). I then review two of the most pressing challenges a theory of multiplicity faces, both presented by Spector (2007). In section 3, I propose to think of multiplicity as a case of presupposition, based on a proposal by Križ (2017). I show how this account can solve both of Spector's puzzles. In section 4, I show how those hypothesized presuppositions can be derived from an independently-motivated proposal as to the nature of scalar implicatures (Bassi et al. 2021). I turn to the case of anti-multiplicity in section 5, showing that the system developed in the previous sections can be used to explain both the similarities between multiplicity and anti-multiplicity, and a notable property which sets them apart. I conclude in section 6.

1.2 Local competition to the rescue?

1.2.1 Zweig's solution

A global competition account of multiplicity like the one sketched out in the previous section leads to what seems like a vicious cycle – to derive multiplicity, we need to assume that anti-multiplicity is already a part of the semantics of sentences with singular indefinites, but the only way to derive anti-multiplicity is to assume that multiplicity is already a part of the semantics of sentences with plural indefinites. Zweig (2009) points at a way out. He argues that multiplicity is indeed the result of a competition between the noun forms, but not at the sentential level. Instead, Zweig argues that a competition between the forms takes place below the existential closure. Zweig's insight is that while the existential quantification obscures the atomic semantics of singular nouns, they are still logically stronger than their plural counterparts before they get quantified over, and thus give us a way to derive exclusive semantics for plural nouns. To see how this works, we first need to be more concrete about what it means for a competition to take place at an embedded level.

Zweig assumes Chierchia's (2004) theory of SIs, which posits that they are triggered by an inherent feature of the compositional feature. In my rendition of Zweig, I will follow Ivlieva (2013) in assuming that SIs are generated by an operator at LF.[7] In fact, I will keep this assumption throughout this chapter. As a starting point, I will use the operator dubbed EXH, proposed in Chierchia et al. (2012). A somewhat simplified definition is given in (22). While I am not committed to every detail of this definition (and indeed, I will revise some of these assumptions in the next sections), there are a number of important features that are worth emphasizing. What EXH essentially does is apply to a propositional constituent (namely a node of type t), and adds to its assertive meaning the negation of all the innocently-excludable alternatives. The notion of innocent exclusion given in (22-b) is adopted from Fox (2007). Note that for the purposes of this discussion, we can simply assume that any alternative whose meaning is not logically-weaker than that of EXH's prejacent is innocently excludable. A more involved issue, which will feature prominently in the next chapters, is how to define what is an alternative.

[7] It might be worth stressing that this framework is not completely equivalent to the one used by Zweig, and while I am not aware of any difference between them when it comes to the phenomena discussed here, I cannot rule out the possibility that Chierchia's system allows Zweig ways to approach the puzzles I will discuss here that are not available in the EXH approach. I choose to represent Zweig's idea in this way mainly because in the years since Zweig's paper, the EXH approach has become the most prominent approach within the grammatical view of SIs. I therefore hope that putting his idea in terms of EXH would make it more easily accessible to the readers.

(22) a. $[\![\text{EXH}(\phi)]\!] = [\![\phi]\!] \bigwedge\{\neg[\![\psi]\!] : \psi \in IE(\phi, \text{ALT}(\phi))\}$

b. $IE(\phi, C) = \bigcap\{C' \subseteq C | \, C'$ is a maximal subset of C s.t. $\{\neg[\![\psi]\!] | \, \psi \in C'\} \cup \{[\![\phi]\!]\}$ is consistent$\}$

(Adapted from Fox 2007)

I will adopt the notion of alternative proposed by Fox & Katzir (2011). It is in a sense a combination of two previous proposals: Rooth's idea that the alternative set of a given expression is a subset of its focus value, and Katzir's (2007) idea that an expression must be at least as structurally complex as its alternatives. The algorithm for generating alternatives is given in (23)–(24) below. We begin by defining the notion of structural complexity as a partial ordering on syntactic representations – if we can get from one representation to the other by a series of deletions of constituents and of replacing constituents with lexical items, than the second representation is at most as complex as the first (23). We then use this notion to define the alternative set of a given expression as the set of all expressions created by replacing focused constituents in the original expression with constituents that are at most as complex (24).

(23) $\psi \precsim \phi$ (ψ is at most as complex as ϕ) if ψ can be derived from ϕ by successive deletion or replacement of subconstituents of ψ with elements from the lexicon.

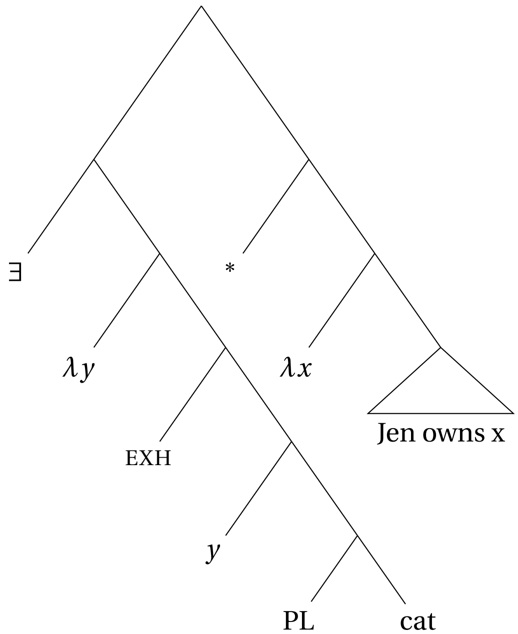
(Adapted from Katzir 2007)

(24) $\text{ALT}(\phi) = \{\psi | \psi$ is derived from ϕ by replacing focused constituents $x_1, ..., x_n$ with $y_1, ..., y_n$, where $x_1 \precsim y_1, ..., x_n \precsim y_n\}$

(Adapted from Fox & Katzir 2011)

The core of Zweig's idea is that an instance of EXH is merged below the existential closure in sentences like (1). Given our assumption that EXH applies only to propositional arguments, we need to posit the existence of a <(s)t>-type constituent somewhere between the NP and the existential closure (another possible route would be to adopt Mayr's (2015) assumption that EXH is type-flexible). To do that, I will simply assume the LF in (25): the existential closure operator starts out as the sister of the NP *cats*, and raises to a higher position; EXH is then tucked in to take scope over the propositional constituent that emerges from this movement. Moreover, I will assume that the noun itself (*cats* in our case), including its number head, is always focused for the purposes of alternative generation.

(25) Jen owns cats



Armed with these assumptions, we are now able to present Zweig's account in concrete terms. As a first step, let us calculate the semantic contribution of the embedded EXH. Given our assumption that the meaning of the plural feature is inclusive, EXH's prejacent [y cat.PL] simply means that y is a sum of cats (atomic or non-atomic). What are the alternatives of this constituent? I assume that deleting either the noun or the number head would result in an ungrammatical expression, and so these structures are ruled out as alternatives. We are left with alternatives that are the result of substituting one or both with other lexical items. For simplicity, I will ignore the alternatives that come about by substituting the noun *cat*, and focus on alternatives that stem from substitution of the number head. In fact, there is one such alternative – the one in which the plural head is substituted with a singular head: [y cat.SG] This singular alternative, by our assumption, is true only if y is an atomic cat. For that reason, the singular alternative is logically stronger than EXH's prejacent, and is therefore innocently excludable. That means that EXH strengthens the meaning of its prejacent by adding to it the negation of its singular alternative, namely the proposition that y is *not* atomic. This is shown in (26).

(26) $[\![\text{EXH [y cat.PL]}]\!] =$

$= [\![\text{cat.PL}]\!](y) \wedge \neg [\![\text{cat.SG}]\!](y) =$

$= y \in [\![\text{*cat}]\!] \wedge \neg\text{ATOM}(y)$

We end up with the same exclusive meaning that we have initially ascribed to the plural feature in the previous section in order to explain the basic case of multiplicity. Recall that this meaning explains multiplicity in a straightforward way: plugging it into the argument position of the predicate [* λx. Jen owns x] yields the meaning that there exists a non-atomic sum of cats such that all of its atomic parts are owned by Jen. This is therefore a good result. But further recall the reason we gave up on the exclusive plurality hypothesis – it does not work for cases of plural indefinites under negation. More specifically, it wrongly predicts the negated sentence in (8) to be judged true if Jen has exactly one cat. Can Zweig's system fare better on these cases?

A key advantage that Zweig's system has over the naive exclusivity hypothesis is that the former is modular – it consists of a component which encodes an inclusive meaning (the plural feature itself), and an additional component which strengthens it into an exclusive meaning (EXH). This allows us to account for the observed truth value gap by constraining the triggering of the exclusive inference. In other words, it allows us to reduce the apparent neutralization of multiplicity in DE environments to the general patterns of scalar implicatures (SIs) in these environments. As is known at least since Grice (1975), SIs indeed tend to be neutralized in DE environments, as demonstrated in (27).

(27) a. John ate cake or ice cream. ⇝ John had one of cake and ice cream but not both.

b. John didn't eat cake or ice cream. ⇝ John had neither cake nor ice cream.

The reasons for this phenomenon are still debated (see e.g. Magri (2009) and Bar-Lev (2024) for discussion on the topic). I will end up adopting a view of SIs which makes this question obsolete, and so I will not dedicate much ink sketching the different accounts proposed in the literature. It is worth noting, however, that the two prominent lines of explanation are: (i) positing that the distribution of EXH is limited to non-DE environments (modifying Magri's obligatory EXH assumption); (ii) positing that the set of alternatives which EXH operates on is restricted in a way that is sensitive to the monotonicity of the environment in which it is embedded. Each of these options could be implemented to allow Zweig's account to predict the difference between UE and DE environments when it comes to multiplicity.

Let us take stock. Zweig's account of multiplicity relies on two assumptions: (i) that multiplicity inferences are a case of and SI, and are therefore neutralized in DE environments; (ii) that multiplicity is triggered below the existential closure, in a position where the plural NP is strictly weaker than its singular alternative. Both of these assumptions is independently motivated, and do not require especially costly stipulations. For this reason, I take Zweig's account as the baseline theory of multiplicity, putting the burden of proof on any competing theory. But while it seems to be conceptually sensible, it turns out that it suffers from some severe empirical issues. Below, I point at two such issues that seems to me the most pressing ones, both observed by Spector (2007). The challenge will therefore be to propose a theory which maintains the conceptual advantages of Zweig's, but offers us a way forward in solving Spector's challenges.

1.2.2 Spector's challenges

In his 2007 paper, Spector proposes a theory of multiplicity that relies on certain modifications he proposes for the notion of competition. I will not go into the details here, but will note that Spector's account captures more empirical data than Zweig's, but does so at the cost of a major divergence from the standard notion of *alternative*.[8] Ideally, we would be able to explain multiplicity without this kind of ad-hoc assumptions.

More relevant to our current discussion is the fact that Spector points at a number puzzles for any theory of multiplicity. Two of them, which I take to be the most significant ones, are listed below:

1. The projection of multiplicity from non-monotonic environments.

2. The infelicity of plural indefinites under negation in certain contexts.

As we will see next, Zweig's account of multiplicity is not able to solve, as it is, either of these puzzles. My main goal in the rest of this chapter will be to propose a modification to Zweig that is able to do so. But first, let us introduce Spector's challenges.

The projection puzzle

The first puzzle observed by Spector is demonstrated in (28) below. Embedding the basic example of mutliplicity in the scope of a non-monotonic quantifier – in this case *exactly one* – gives rise to what can be described as a twofold inference: that one of my friends owns multiple cats, and the rest own no cats at all. Notably, the sentence is not judged true in a situation in which any of my friends has exactly one cat.

(28) Exactly one of my friends owns cats.

[8] Specifically, Spector posits that the alternative relation is not transitive.

a. **Inference 1:** Exactly one of my friends owns more than one cat.

b. **Inference 2:** The rest of my friends own zero cats.

Zweig's account cannot straightforwardly predict this inference. Its exact prediction for this case depends on our assumption about the generation of scalar implicatures in the scope of *exactly one*, but in either case, the prediction is too weak. Assuming that no scalar implicature is generated, the proposition in the scope of the quantifier is predicted to have an inclusive meaning ("at least one cat"), and therefore the entire sentence should be true if one of my friends has exactly one cat, and the rest have zero. Alternatively, assuming that a scalar implicature is generated, the proposition in the scope of the quantifier is predicted to have an exclusive meaning ("more than one cat"), and therefore the entire sentence should be true if one of my friends has more than one cat, and the rest have exactly one. We conclude that as it is, Zweig's account cannot deliver a satisfactory solution to the projection challenge.

The infelicity puzzle

The semantic differences between singular and plural indefinites seem to be neutralized in DE environments, as demonstrated in (8) and (21), repeated below. this is in line with Zweig's account – as we have seen, in the lack of multiplicity inferences, the two forms are predicted to give rise to equivalent truth conditions in distributive sentences. In fact, this was one of the intended results of Zweig's proposal.

(29) Jen doesn't own cats. $\rightsquigarrow$ Jen owns zero cats.

(30) Jen doesn't own a cat. $\rightsquigarrow$ Jen owns zero cats.

But weirdly, the two alternatives do differ from each other in their felicity conditions, as first observed by Spector (2007), and later discussed in de Swart & Farkas (2010), Sudo (2023), Enguehard (2024). This is demonstrated in (32) below. Both sentences contain an indefinite under negation, but while the sentence containing a singular indefinite is completely felicitous, the one containing a plural indefinite is very weird. The general intuition is that the infelicity of (31-b) has something to do with the fact that it is impossible to be wearing more than one suit at the same time, but what exactly is the generalization is not completely clear. [9]

[9] This pattern is somewhat reminiscent of the claim by L. Horn (1989) that negated sentences always signal that the corresponding affirmative is salient in the context. L. Horn does not discuss sentences with plural indefinites, but one may wonder whether it is possible to cash out Spector's observation as a special case of this effect. I will not get into the details of L. Horn's

(32) a. Matt likes to dress fancy, but today he's not wearing a suit.

b. #Matt likes to dress fancy, but today he's not wearing suits.

(Amir Anvari, P.C.)

Spector characterizes the generalization as follows:

> "The use of plural indefinites (even under negation) presupposes that the minimal proposition containing that indefinite **could** be true for multiple individuals."
>
> (Spector, 2007)

In the next section, I will argue for a slightly different generalization, or at least for a different formulations of this generalization (depending on what exactly we think is the modal base of *could* in Spector's formulation). But for now, this is good enough to give us an intuitive understanding of the phenomenon. It of course raises the question of where this modal presupposition comes from, a question to which Spector does not provide an answer. Cashing out this observation in explanatory terms is therefore an important challenge to any theory of multiplicity. It is fairly clear why Zweig's theory cannot account for this contrast in acceptability as it is – it does not provide us with any semantic property by which we could distinguish the two sentences But to the best of my knowledge, no theory on the market can account for this pattern.

It is worth mentioning that this effect is not limited to cases in which it is common ground that the sentence in the scope of negation cannot be true for multiple individuals. As pointed out by de Swart & Farkas (2010) and Sudo (2023), and later tested experimentally by Enguehard (2024), this mysterious effect is also manifested in more gradient cases. Consider (33) for example, taken from Sudo (2023). As in the Spector examples above, both of these sentences seem to assert that the postdoc will submit zero abstracts to CUNY. Assuming that both submitting a single abstract and submitting multiple ones are in theory possible, both of these sentences are acceptable, and are definitely judged more felicitous than (32-b) above. However, as Sudo observes, their relative felicity seems to depend on the prior probability

account here, but I would like to argue that any explanation which attributes Spector's observation to some property of negation is inadequate. That is because the same infelicity arises in other environments, as demonstrated in (31).

(31) a. #If Matt is wearing suits today, it'll be easy to spot him in the crowd.

b. #Every professor who's wearing suits today will make a great impression on the students.

c. #Unless you're wearing suits, you're not allowed to enter the restaurant.

of the number of abstracts submitted by the postdoc. If it is assumed to be unlikely for the postdoc to submit only one abstract (for example, she is very ambitious and tends to submit as many abstracts as she can to every conference), the singular sentence in (33-a) becomes degraded; conversely, if the assumption is that she is unlikely to submit multiple abstracts (for example, she only has one project that matches this year's topic), the plural sentence in (33-b) becomes degraded. It is easy to see how Spector's generalization can be thought of as representing an edge case of this gradient pattern.

(33) a. The postdoc will not submit an abstract to CUNY.

b. The postdoc will not submit abstracts to CUNY.

(Sudo, 2023)

1.2.3 A look ahead

The two puzzles presented above not only elude Zweig's (2009) account, but seem to demand a wholly different set of tools to explain. In the next section, I will argue that adopting a view of multiplicity inferences as presuppositions, along the lines of Križ allows us to solve both of these puzzles. The question that arises is, of course, whether we can explain this presupposition in a reasonable way. As it will turn out, Zweig's account already contains almost all the ingredients we need to do so.

1.3 The case for presuppositional multiplicity

1.3.1 Križ's insight

Motivated (among other things) by the puzzling projection of multiplicity, Križ (2017) proposes to diverge from a competition-based approach to it. Instead, he argues that sentences with plural indefinites have a trivalent meaning, which deems them undefined in certain cases. He derives this property as a result of certain assumptions about plural predication, which are irrelevant for our current discussion.

(34) $$[\![\text{Jen owns cats}]\!]^w = \begin{cases} 1 & \text{if Jen owns more than one cat in w} \\ 0 & \text{if Jen owns zero cats in w} \\ \# & \text{if Jen owns exactly one cat in w} \end{cases}$$

It is important to emphasize that in Križ's system, the value # does not correspond to presupposition failure. In Križ (2015), he explicitly clarifies that the truth conditions he ascribes to plural predicates have nothing to do with presuppositions. Instead, he fleshes out the pragmatic status of # in his system by defining a set of principles that govern the way this kind of trivalent sentences are admitted to the common ground. Understanding Križ's pragmatic assumptions is crucial for understanding the conceptual and empirical differences between his account of multiplicity and the account presented here. Let us therefore briefly present Križ's recipe for updating the context with a trivalent proposition like (34) above.

One unique feature of Križ's update process is that it is relativized to a pragmatic parameter which he calls *issue* – a partition of the context set into equivalence classes. These equivalence classes, also known as *cells*, intuitively represent the distinctions between worlds that discourse participants are interested in making. Worlds within the same cell (*cell-mates*) are, as far as discourse participants are concerned, identical. The idea that such a partition is present in the background of any discourse is originally due to Lewis (1988), who terms it *subject matter*. Another widely used term for this partition, which I will adopt here, is *question under discussion (QUD)* (Roberts, 2012). Note that these three terms – *subject matter*, *QUD* and *issue* – are completely equivalent as far as our discussion here goes.

Lewis (1988) uses this assumption of a partition of the context set as a background parameter to define the notion he calls *aboutness*, or, as it is more conventionally known, *relevance*. A rendition of Lewis's definition of relevance is given in (35) below. It states that a (bivalent) proposition is relevant to a given QUD if it supervenes on that QUD, namely does not distinguish between cell-mates. We can think of this notion of relevance as the basis of a general pragmatic constraint: any declarative sentence must denote a proposition that is relevant to the current QUD.[10]

(35) **Relevance:** Given a context set c and a partition of that context set I, a proposition p is relevant ($p \in \mathscr{R}$) iff it is contextually equivalent to a union of cells in I, namely $\exists I' \subseteq I\ [p \cap c = I']$ (Adapted from Lewis)

The notion of QUD features in Križ's (2015) pragmatics in two ways. First, Križ adopts the idea that every declarative utterance must denote a relevant proposition, and extends it to trivalent propositions. Ac-

[10] This is not the only formulation of relevance on the market. See Grice (1975), Groenendijk & Stokhof (1984), B"uring (2003), among others, for different proposals. I have argued in Benbaji-Elhadad and Doron (forthcoming) that the Lewisian notion of relevance is the right one, but for the purposes of this discussion, we do not need to commit to it completely. As we will see, any notion of relevance that can derive the property that equivalent propositions have the same relevance status would suffice.

cording to Križ's generalized relevance constraint, given in (36) below, worlds for which the proposition in question returns # are essentially ignored for the purposes of evaluating relevance – all it demands is that 0-worlds and 1-worlds not share the same cell. Second, Križ defines an update rule for trivalent propositions, stated in (37) below. It is based on the idea that a #-world is considered "true enough" if it is a cell-mate of 1-worlds. Updating the context set with a given proposition therefore means filtering out all the cells that contain 0-worlds, and leaving intact the ones that contain 1-worlds (Križ's relevance constraint ensures that no cell could contain both kinds of worlds).[11]

(36) **Križ's generalized relevance:**

A (possibly trivalent) proposition p is relevant given a QUD Q if:

$\forall q \in Q\ [\forall w, w' \in q\ [\neg(p(w) = 1 \wedge p(w') = 0]]$

(37) **Križ's (2015) update rule for trivalent propositions:**

Given a (possibly trivalent) proposition p, a context set c and a QUD Q, the result of updating c with p is:

$c \setminus \bigcup\{q \in Q \mid \forall w \in q[p(w) \neq 1]\}$

We can now see that Križ's conception of trivalence, and specifically the pragmatic role of the third value #, is significantly different from the conventional use of # as representing a presupposition failure. We can compare Križ update procedure to the update procedure of a presuppositional proposition in the Stalnakerian view of pragmatics (Stalnaker, 1975), which I will adopt here. According to this view, declarative sentences in discourse are subject to the constraint termed *Stalnaker's Bridge* by Von Fintel (2004). That means that context update is done in two parts: first, we make sure that all worlds in the context set satisfy the presupposition of the proposition we wish to update (this may require *accommodation*, a process I will discuss in sections 3.2 and 3,3); second, we filter out the worlds in which p is false from the context set. Crucially, no #-worlds can remain in the context set after the update process is done. For (Križ, 2015), however, the question of whether a given #-worlds remains in the context set depends on the identity of its cell-mates; his system is designed such that in some cases, #-worlds are not filtered out.

(38) **Stalnaker's Bridge:**

A (possibly trivalent) proposition p can only be updated to a context set c if $\forall w \in c\ [p(w) \neq \#]$.

[11] My understanding of Križ's pragmatics laid out above is informed by Fox (2018) and Feinmann (To appear).

(adapted from Von Fintel 2004)

Of course, the fact that Križ uses the same notation that is used in other places to represent presupposition failure does not mean that his account is incompatible with the conventional view of presuppositions. Indeed, Križ seems to assume that presuppositions do generally behave according to the Stalnakerian view. Setting aside the notation he chooses to use, his argument is that the kind of undefinedness that arises from sentences containing plural indefinites is not the same one that arises from presupposition failure. He motivates this claim by a number of apparent differences in the pragmatic behavior of the two kinds of undefinedness, one of which – their interaction with diagnostics like the *Hey, wait a minute* test (Von Fintel, 2004; Shanon, 1976) – I will discuss in section 3.2. I will argue, however, that positing these two notions of indefinedness is misguided – sentences like our basic example in (34) do genuinely presuppose that Jen either has multiple cats or zero cats. This, I will try to show, allows us both to have a more reasonable conception of the semantics of plural indefinite, and to solve Spector's infelicity puzzle, which remains unexplained in Križ's system. It is therefore important to note that while the notation I will use is similar to that of Križ, the semantic-pragmatic picture it represents is completely different.

1.3.2 The presuppositional nature of multiplicity

I argue that multiplicity indeed the result of trivalent semantics, but not in the sense defined by Križ. Instead, it simply corresponds to a presupposition, as given in (39) below.[12] In its most general statement, my argument can be summarized as follows: a matrix sentence containing a predicate P applied to a plural indefinite N presupposes that either $[\![N]\!] \cap [\![P]\!] = \emptyset$, or $|[\![N]\!] \cap [\![P]\!]| > 1$. Alternatively, if $|[\![N]\!] \cap [\![P]\!]| > 0$ then $|[\![N]\!] \cap [\![P]\!]| > 1$. Th reader may wonder where exactly this presupposition comes from, and whether we can derive it in an explanatory way. I will try to do just that in section 4, but for now, let us take the semantics in (39) as a given, and see how it helps us solve the puzzles discussed above.

(39) $[\![\text{Jen owns cats}]\!]^w =$

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

[12]For clarity, I present the truth conditions both in a "two dimensional" way (the a examples) and a trivalent way (the b examples). While I find it easier to present the argument using a two dimensional notation, I am not committed to it in terms of expressive power, and can make do with a trivalent system.

b. $= \begin{cases} 1 & \text{if Jen owns more than one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

More generally, ascribing this kind of a presupposition to sentences containing plural indefinites is completely ad-hoc at this point. In the next section, we will see how it can be derived in a principled way. For now, let us focus on the predictions we can derive from assuming this presupposition. An immediate consequence is that the negated correlate of the sentence carries the same presupposition, as stated in (40). This is based on the generally-accepted assumption that presuppositions project from under negation.

(40) $[\![\text{Jen doesn't own cats}]\!]^w =$

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns zero cats in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns zero cats in } w \\ 0 & \text{if Jen owns more than one cat in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

We thus explain the apparent neutralization of multiplicity in DE environments as a result of two possible ways to satisfy our hypothesized presupposition: to have multiple witnesses, or none at all. Importantly, I follow Križ in positing that multiplicity is triggered regardless of the environment in which the minimal sentence containing the indefinite is embedded – it is just a part of the semantics of the sentence. This is in contrast to theories like Zweig's, which posit a strengthening operation which takes place in certain environments but not in others. Notice, however, that while the two lines of explanation agree on the conditions under which the sentences in (39)-(40) are true, they do not agree on their falsity conditions. Taking (39) as an example, Zweig's account analyzes this sentence as false whenever Jen does not have multiple cats; the presuppositional account, on the other hand, predicts this sentence to be false only when Jen has no cats at all.

One might wonder at this point how sensible it really is to analyze multiplicity as a presupposition. By their nature, presuppositions have to be a part of the conversational common ground prior to the utterance of the sentence (*Stalnaker's Bridge*; Stalnaker, 1975). This is obviously not the case in the multiplicity examples we have seen so far. Taking our basic data point (14) as an example, nothing in the given context of utterance implies that discourse participants take as given that Jen cannot have a single cat. In fact, it seems safe to assume that most naturally-occurring cases of plural indefinites are not uttered in such a context. Does this mean that multiplicity cannot be presupposed?

One confounding factor is the availability of so-called *presupposition accommodation* (Kartunen, 1974; Stalnaker, 1974). This is the process by which cooperative discourse participants reevaluate their assumptions about the common ground so that Stalnaker's Bridge could be satisfied. In other words, upon hearing a sentence bearing a presupposition which is not common ground, the addressee can choose to pretend as if the presupposition was common ground, rescuing the speaker's utterance from a Stalnaker's Bridge violation. I argue that this is exactly what we do when evaluating sentences like (14) – we accommodate a common ground which entails that Jen either has zero cats or multiple cats, which we then update with the truth conditions of the sentence.

This claim has empirical consequences. Presupposition accommodation tends to leave fingerprints, and a number of tests were developed over the years to detect those fingerprints. Perhaps the most well known among them is the *Hey, wait a minute!* test, first proposed by Shanon (1976) and further developed by von Fintel (2004). It is demonstrated in (41) below . The sentence in (41-a) presupposes that there exists a (unique) mathematician who proved Goldbach's Conjecture. It is natural to respond to it by using the phrase *Hey, wait a minute!* to indicate refusal to accommodate this presupposition, as in (41-b). It is much less natural to refuse to update asserted content in the same way, as shown by (41-c). This test is therefore standardly taken to detect presupposition accommodation, and distinguish it from assertive update.

(41) a. A: The mathematician who proved Goldbach's Conjecture is a woman.
b. Hey, wait a minute. I had no idea that someone proved Goldbach's Conjecture.
c. #Hey, wait a minute. I had no idea that that was a woman.

We therefore predict, in the lack of additional assumptions, that the presupposition of a sentence like (14) could be detected by the HWAM test. As shown by (42), this prediction is not borne out – any way of phrasing the presupposition in the HWAM response yields an infelicitous discourse. The fact that these phrasings are awkward might contribute to the infelicity, but it cannot be the full picture. As we will see, this failure in the HWAM test is a part of a broader pattern of presuppositions. Certain presuppositions, it seems, are so easy to accommodate that their accommodation becomes completely transparent. In Benbaji-Elhadad & Doron (2024) we attempt to explain the existence of these presuppositions by appealing to consideration of *Relevance*. I will not expand on that here. Instead, I will simply assume that multiplicity is a part of a class of presupposition that cannot be detected by the HWAM test.

(42) a. A: Jen owns cats.
b. B: #Hey, wait a minute! I didn't know that she either owns zero cats or multiple cats.
c. B: #Hey, wait a minute! I didn't know that she doesn't own only one cat.

But the fact that multiplicity is invisible to the HWAM test does not mean that it is impossible to detect all together. Next, I will present a diagnostic first proposed in different versions by Irene Heim and Orin Percus in lecture notes, and further developed in Doron and Wehbe (2022). Instead of relying on refusal to accommodate a presupposition, it relies on bleeding relation between accommodation and certain constraints on context update, capitalizing on the Stanakerian idea of accommodation as taking place separately, and *before*, context update. If I am right in assuming that certain presuppositions are impossible to refuse to accommodate, this kind of test could overcome the limitation of HWAM.

1.3.3 Post-Accommodation Informativity

My aim here is to provide evidence that sentences containing plural indefinites have a presupposition of the kind stated in (39) above. To do so, I will use a diagnostic first proposed by Irene Heim and Orin Percus (class notes), developed more systematically by Doron and Wehebe (2022), and applied to the case of definite plurals by Wehbe (2022). It is based on a principle dubbed *Post-Accommodation Informativity* by Doron and Wehbe (2022). PAI is not a novel claim on its own, and it follows directly from the prominent Stanakerian view of pragmatics, as noted already by Aravind et al., (2023). More specifically, it is the result of a treating presupposition accommodation as reconsidering what was taken to be the common ground by adding the assumption that the common ground satisfies the presupposition of the uttered sentence. Any constraint on assertability which makes reference to the common ground, in this case anti-triviality,[13] must therefore be evaluated relative to the accommodated common ground. The importance of formulating PAI explicitly is that it provides us with a tool to systematically test for

[13] But notice that the same is true for Relevance, as discussed in Benbaji-Elhadad & Doron (in press).

presuppositions.

(43) **Post-Accommodation Informativity:** A sentence S presupposing p can be uttered felicitously only if it is not trivial with respect to the common ground after presupposition accommodation.

(Doron & Wehbe, 2022)

(44) **Anti-triviality:** A declarative utterance ϕ is felicitous given a context set c only if $[\![\phi]\!] \cap c \neq c$.

(Stalnaker, 1978)

PAI provides us with a test for presuppositions in the following way: Given a sentence ϕ suspected to presuppose p, it is predicted to be infelicitous in a context in which the common ground entails $p \rightarrow [\![\phi]\!] \neq 0$. Consider the example in (45) below. We know the conditions under which the sentence in (45-a) is true, but we are not sure which part of them (if any) is due to a presupposition. However, we suspect that the presupposition is have two kids, as stated in (45-c). To test whether our suspicion is correct, we construct below a context such that it is common ground that if the suspected presupposition is true, then the entire sentence has to be true. If our suspicion is indeed correct, that means that the common ground relative to which we evaluate Anti-triviality is necessarily one which entails that John and Jen have two kids. Together with the context given in (46), the common ground is therefore expected to entail that John and Jen have two kids and they adopted them, rendering the sentence itself trivial. The fact that the sentence is infelicitous in this context is evidence that our suspicion is correct.

(45) a. John and Jen adopted both of their kids.
b. **Inference:** John and Jen have two kids and they adopted them.
c. **Suspected presupposition:** John and Jen have two kids.

(46) **Context:** We know John and Jen can't have biological kids, and so if they have any, they must be adopted. We're not sure how many kids they have, if any.
a. #Here is something interesting I learned about John and Jen – they adopted both of their kids!
b. Here is something interesting I learned about John and Jen – they have two kids!

(Adapted from Doron & Wehbe 2022)

We can now apply this test to our multiplicity example. Our target sentence here is the basic multiplicity example, *Jen owns cats*, which we intuitively judge as true if and only if Jen has multiple cats; our suspected presupposition is that Jen either owns zero cats or multiple cats. We therefore need to construct a context in which it is common ground that if Jen either owns zero cats or multiple cats, then she owns multiple cats. This is logically equivalent to demanding that the common ground entail that Jen owns at least one cat. This kind of context would not allow the sentence to be false if the presuppositional account presented above is correct, namely if our suspicion regarding the presupposition is on the right track.

An attempt to construct such an example is given in (47) below. Importantly, the context is constructed such that it is necessarily common ground between John and Jen that Jen has at least one cat. If Jen's utterance in (47-a) indeed presupposes that she either has zero or multiple cats, accommodating this presupposition would give rise to a common ground which entails that Jen has multiple cats. Her utterance would therefore suffer an anti-triviality violation, and is predicted to be infelicitous. I take the fact that it is indeed judged as infelicitous as evidence for that presupposition. To sharpen this judgment, we can compare it to the sentence in (46-b), which presumably asserts that Jen has more than one cat without presupposing anything. The fact that it is felicitous in the given context is further indication that the infelicity of (47-a) stems from its presupposition.

(47) **Context:** John and Jen met on *Match&Scratch* – a dating app for cat lovers, where you can only sign up if you own at least one cat. On their first date, John asks Jen to tell him something he didn't know about her. Jen:

a. #I own cats.

b. I own multiple cats.

1.3.4 Solving the infelicity puzzle

We have seen above that PAI provides us with independent evidence for the presuppositional approach to multiplicity. Let us now see how that approach can solve Spector's challenges. We start with the infelicity puzzle, since it is almost an immediate consequence of the PAI considerations sketched above. Recall that the problematic cases are ones like (32), repeated below in (48). The underlying generalization to which these cases correspond is not completely clear, however. Spector characterizes it in modal terms - he posits that the badness of (48-b) stems from the fact that the minimal clause containing the plural indefinite, namely ”Matt is wearing suits“, cannot not be true. He postulates that the use of plural indefinites generally gives rise to the presupposition that the minimal proposition containing them could be true, and so this presupposition projects from under negation.

[discussion on the projection of this hypothesized presupposition from other environments?]

(48) a. Matt likes to dress fancy, but today he's not wearing a suit.

b. #Matt likes to dress fancy, but today he's not wearing suits.

I argue for a slightly different characterization of the infelicity of (48-b). It is given in (49) below. This characterization differ's from that of Spector's in two main aspects: (i) it makes clear that the relevant "modal base" in Spector's characterization is simply the common ground; (ii) it it shies away from treating the felicity condition as a result of a presupposition, and instead just describes the constraint this kind of sentences impose on the common ground. This recasting of Spector's observation will allow us to see more clearly how it follows from PAI.

(49) **The felicity conditions generalization:**

The use of plural indefinites under negation is infelicitous if it is common ground that the minimal proposition containing that indefinite is not true for more than one individual.

Let us now see how the felicity conditions generalization above follows from PAI considerations. Let there be a minimal sentence containing a plural indefinite, namely a sentence of the form $\exists N\ P$, and let there be a common ground which entails that $|[\![N]\!] \cap [\![P]\!]| \leq 1$. I have argued above that sentences of this form presuppose $|[\![N]\!] \cap [\![P]\!]| = 0 \vee |[\![N]\!] \cap [\![P]\!]| > 1$. Given that presuppositions project from under negation, embedding our sentence under negation would yield a sentence carrying the same presupposition, and is true if and only if $|[\![N]\!] \cap [\![P]\!]| = 0$. accommodating this presupposition in a common ground which already entails $|[\![N]\!] \cap [\![P]\!]| \leq 1$ yields a common ground which entails $|[\![N]\!] \cap [\![P]\!]| = 0$, rendering the sentence trivial, and therefore infelicitous.

In the case of (48) above, I assume that the common ground generally entails, based on world knowledge, that one cannot wear more than one suit at the same time. Accommodating the presupposition of (48-b) that Matt is either wearing zero suits or multiple suits results in a common ground which entails that Matt is wearing zero suits. This renders the sentence in (48-b) trivial relative to this new common ground. We therefore explain its infelicity as a result of accommodating the multiplicity presupposition.[14]

Notice that Križ (2017) cannot account for the infelicity puzzle in the same way. To see why, recall that the way I cash out above the infelicity of sentences like (48) crucially relies on context update as a two-step procedure: first accommodate the presupposition, then filter out all the 0-worlds from the context. The assumption that only the second step is subject to a non-triviality constraint has allowed me to argue that the type of accommodation required in (48) inevitably results in a violation of that constraint. Križ posits that plural indefinites bring about undefinedness as well, but as discussed above in section 3.1, this is a different kind of undefinedness, which crucially interacts differently with pragmatic constraints like triviality. Križ's procedure for updating a context set with a trivalent proposition is repeated in (50) below. Let us see how it handles infelicitous examples like (48) above.

(50) **Križ's (2015) update rule for trivalent propositions:**

Given a trivalent proposition p, a context set c and a QUD Q, the result of updating c with p is: $c \setminus \bigcup\{q \in Q \mid \forall w \in q[p(w) \neq 1]\}$

For concreteness, imagine that the sentence is uttered relative to a "normal" common ground, namely one that entails that it is impossible to wear multiple suits at the same time, and leaves open whether Matt is wearing a suit or not. Imagine also that the QUD is the polar question *is Matt wearing a suit?*, which partitions the context set to two cells: one in which Matt is wearing a suit, and another in which he is not. Notice that the first cell consists purely of #-worlds, and the second purely of 1-worlds. The update is therefore very straightforward – we remove the worlds in the first cell and are left with a common ground which entails that Matt is not wearing a suit. Nothing here, as far as I can see, is expected to lead to the infelicity we in fact witness. I take this as evidence that my proposed implementation of Križ's trivalent semantics as stemming from a presupposition has an empirical advantage over his original implementation.

[14]The gradient pattern observed by de Swart & Farkas (2010), Sudo (2023) and Enguehard (2024) follows, under the view laid out here, from general properties of accommodation. As noted by e.g. Szabó (2006), surprising or controversial presuppositional tend to be harder to accommodate. Given a choice between accommodating a multiplicity or an anti-multiplicity presupposition, it is therefore predicted that accommodating the less likely one be more marked. I leave a more detailed discussion of this case for future work.

1.3.5 Solving the projection puzzle

Recall now the puzzle of the projection of multiplicity from the scope of quantifiers like *exactly one*. The example is repeated below in (51). Further recall that the problem that examples like this one pose for Zweig's (2009) account (and in general, any account which treats plural indefinites as somehow ambiguous between an exclusive and an inclusive reading) is that the inference we intuitively get is too strong – both the exclusive and the inclusive meaning yield weaker truth conditions when plugged in the scope of *exactly one*. The inference we draw from (51) may seem, under that approach, as the result of a strange conspiracy by which the "positive component" of the quantifiers uses the exclusive meaning, and its "negative component" uses the inclusive meaning.

(51) Exactly one of my friends owns cats.

a. **Inference 1:** Exactly one of my friends own more than one cat.

b. **Inference 2:** The rest of my friends own zero cats.

Things are different when we move to a view of multiplicity as presupposed. The relevant question now is not which of the meanings of the indefinite to choose (there is only one meaning to begin with), but how the multiplicity presupposition projects from this environment. Križ's (2017) insight is that the behavior of multiplicity in examples like (51) indeed seems to resemble the projection of non-at-issue content, and the account I argue for here is purposefully designed to maintain this insight. So while I diverge from Križ when it comes to the type of non-at-issue content multiplicity is – and as we have seen above, this is an important difference – the way I propose to account for the projection puzzle is very much along the lines of Križ's proposal.

Let us come back to the question of how the presupposition of the proposition in the scope of the quantifier projects. In other words, given that *x owns cats* presupposes that *x* either owns more than one cat or zero cats, what is the predicted presupposition of the sentence in (51) above? A principled answer for this question naturally needs to be couched within a general theory of presupposition projection. I will adopt throughout this paper the theory conventionally termed *Strong Kleene* (SK; Peters 1979; **?**; George 2008; Fox 2013, for reasons that will be discussed in the next section. For our current purposes, I will just note that SK, as most predictive theories of projection (e.g. Schlenker's (2007) Transparency) essentially predicts *universal projection*, stated in (52).[15] This gives rise to the truth conditions in (53) below.

(52) **Projection from the scope of *exactly one of my friends*:**

A sentence of the form [exactly one of my friends λx [$\phi_\pi(x)$]] (where $[\![\phi]\!](x)$ presupposes $p(x)$) has the following presupposition: $\forall x$ [x is a friend of mine $\rightarrow p(x)$]

(53) $[\![$Exactly one of my friends owns cats$]\!]^w$ =

a. $= \begin{cases} \textbf{prs:} & \text{Each friend of mine owns either more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Exactly one friend of mine owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if exactly one friend of mine owns more than one cat, and the rest own zero cats in } w \\ 0 & \text{if each of my friends owns zero cats in } w\text{, or more than one of my friends own more than one cat, and the rest own zero cats in } w \\ \# & \text{if at least one of my friends owns exactly one cat in } w \end{cases}$

This seems to be on par with the judgments stated in (51) above – notice that the conditions under which the sentence is true in (53) are the result of collapsing the two inferences in (51). However, it is somewhat misleading to think about the meaning of the sentence above as consisting of two separate inferences given this way of capturing the facts. In fact, this "split" inference is just the result of the two different ways to satisfy the presupposition triggered in the scope of the quantifier – having zero cats and having multiple cats. This disjunction is presupposed to hold for each of my friends, but it can hold in each case in virtue of a different disjunct. As it turns out, this allows us to capture the truth conditions of the sentence in a way that was not possible with other approaches.

[15] The prediction is actually a bit more involved – the sentence is predicted to presuppose the following:

- $\forall x$ [x is a friend of mine $\rightarrow p(x)$] $\vee \exists_2 x$ [x is a friend of mine $\wedge\, p(x) \wedge \neg[\![\phi]\!](x)$]

Since for our purposes here we only care about the conditions under which the sentence is true, this presupposition can be thought of as equivalent to the simple universal one given in (52).

1.4 Deriving multiplicity

One immediate question about the proposal presented above is how the hypothesized presuppositions comes about. The simplest hypothesis, at least from a morphological perspective, is that this presupposition is simply the result of the lexical meaning of the plural feature. There are reasons to doubt this hypothesis, which will be discussed in the next section. But it is useful at this point to abstract away from this issue and ask – what kind of meaning would the plural indefinite need to have in order to derive the global presupposition argued for above? I will argue that the semantics which would yield the right prediction is what is given in (55). A plural indefinite like *cats*, according to this semantics, presupposes that it does not contain any atomic cats in its extension – it is true for a given individual if that individual is a non-atomic sum of cats, false if it is not a cat or a sum of cats at all, and undefined if that individual is an atomic cat.

(54) $[\![\text{Jen owns cats}]\!]^{w}$ =

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns more than one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

(55) **Hypothesized semantics for cat.PL:**

$[\![\text{cat.PL}]\!]$ =

a. $= \lambda x. \begin{cases} \textbf{prs:} & \neg\textsc{atom}(x) \\ \textbf{asr:} & x \in [\![\text{*cat}]\!] \end{cases}$

b. $= \lambda x. \begin{cases} 1 & \text{if } x \in [\![\text{*cat}]\!] \wedge \neg\textsc{atom}(x)] \\ 0 & \text{if } \neg[x \in [\![\text{*cat}]\!]] \\ \# & \text{otherwise} \end{cases}$

1.4.1 Strong Kleene theory of projection

The Strong Kleene framework for presupposition projection (Peters 1979, Beaver and Krahmer 2001, George 2008, Fox 2013) aims to derive projection of presuppositions of embedded sentences from the logical properties of the environment in which they are triggered rather than stipulating them via ad-hoc rules. The basic insight that guides this theory is that presupposition failure of a certain propositional expression can be thought of as uncertainty regarding the truth value of that expression. We thus assume that as far as the pragmatic system is concerned, there are only two truth values – 0 and 1; a proposition with the value # is treated as if it was ambiguous between these two values. Under this view, presupposition satisfaction is driven by a demand that the value that a sentence assigns to each world in the common ground should be deterministically deduceable. In the case of simplex sentences, this just means that the presupposition should be entailed by the common ground. But when the propositional constituent in which the presupposition is triggered is embedded in a complex sentence, things become more involved.

Consider, for example, a coordination sentence $p_\pi \wedge q$, where p presupposes π. We assume that the lexical semantics of coordination is specified only for bivalent propositions – it returns 1 if both propositions return 1, and 0 if one of the propositions returns 0 – and aim to derive the presupposition of the entire sentence based on this, in addition to the meaning of each conjunct. One obvious type of world that would allow us to determine the truth value of our sentence is one that satisfies π. But notice that this is not the only type – a world in which q is false would allow us to determine that the sentence is false even without knowing the truth value of p_π. For that reason, any context set in which every world is either a π-world or a $\neg q$-world (or both) would satisfy our demand. We conclude that sentences of the form $p_\pi \wedge q$ presuppose $\pi \vee \neg q$, or in other words $q \rightarrow \pi$.

Our case is still more complicated – it involves a presupposition triggered in the restrictor of an existential quantifier. The source of the additional complexity of this case, and of presuppositions in quantificational sentences in general, is that the proposition in which the presupposition is triggered contains a free variable, which is bound by the quantifier. The algorithm for computing the semantic value of a quantificational sentences generalizes the principle described above of treating undefinedness as uncertainty. It does so by appealing to the notion of *bivalent corrections*, defined in (56). Intuitively, a bivalent correction of a trivalent function of type <e,st> assigns an arbitrary value to any individual-world pair for which the original function assigns #, and keeps all other mappings as they are. The guiding principle is eliminating uncertainty regarding the truth value of the entire sentence, which in this case means demanding that all bivalent corrections of the trivalent proposition would yield the same result when we replace the trivalent propositions with them.

(56) **Bivalent correction:**

A function $g : X \to \{0,1\}$ is a bivalent correction of a function $f : X \to \{0,1,\#\}$ if the following holds: $\forall x[f(x) \neq \# \to g(x) = f(x)]$.

(Adapted from Fox 2013)

Let us see how this works in sentences in which a presupposition is triggered in the same environment as our examples in (54), namely in the restrictor of an existential quantifier.[16] Abstracting away from the specifics of our example, we want to calculate the presupposition of a sentence of the form $\exists x[p_\pi(x) \wedge q(x)]$. We therefore ask again – what kind of worlds would satisfy the demand that all bivalent corrections of p_π yield the same truth value for the entire sentence? One such type is worlds in which there exists at least one individual x such that $p_\pi(x) = 1$ and $q(x) = 1$. The entire sentence is true for worlds of this type regardless of the choice of bivalent correction, since the existence of such individual is enough to satisfy its truth conditions regardless of the status of other individuals. Another type of worlds that are bivalent correction-invariant are ones in which for every individual x such that $q(x) = 1$, it holds that $p_\pi(x) = 0$. This ensures that the entire sentence would be false, since no individual returns true for both p_π and q. Since these are the only types of worlds which satisfy the SK requirement for certainty, we conclude that the presupposition is as given in (57).

(57) **SK projection from the restrictor of an existential quantifier:**

A sentence of the form $\exists x\ [p_\pi(x) \wedge q(x)]$ presupposes:

$\exists x\ [p_\pi(x) = 1 \wedge q(x) = 1] \vee \forall x\ [q(x) = 1 \to p_\pi(x) = 0]$

Notice that plugging the hypothesized semantics in (55) in this template indeed yields the presupposition argued for above (54). To see that, recall that the hypothesis in (55), repeated below in (59), states that plural nouns like *cat.PL* presuppose that the individuals in their extension are not atomic. This

[16] Since the two arguments of an existential quantifier are commutative, the projection from the restrictor and the nuclear scope is identical.

means that for ⟦cat.PL⟧$(x) = 1$ if x is an atomic cat, and ⟦cat.PL⟧$(x) = 0$ if x is neither an atomic cat nor a sum of cats. Now, given the sentence *Jen owns cats*, p_π in the template in would correspond to ⟦cat.PL⟧, and q would correspond to $[\lambda x.$ Jen owns $x]$. The entire presupposition predicted for this sentence can therefore be paraphrased as *either there exists a non-atomic sum of cats such that Jen owns each atom in it, or everything that Jen owns is not a cat.* Simplifying it a little, we get exactly the desired presupposition in (54), repeated below in (58). We can conclude that our hypothesized semantics for plural nouns indeed delivers the correct result when it comes to simplex sentences with plural indefinites.

(58) ⟦Jen owns cats⟧^{w} =

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns more than one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

(59) **Hypothesized semantics for cat.PL:**

⟦cat.PL⟧ =

a. $= \lambda x. \begin{cases} \textbf{prs:} & \neg\text{ATOM}(x) \\ \textbf{asr:} & x \in [\![{*}\text{cat}]\!] \end{cases}$

b. $= \lambda x. \begin{cases} 1 & \text{if } x \in [\![{*}\text{cat}]\!] \wedge \neg\text{ATOM}(x)] \\ 0 & \text{if } \neg[x \in [\![{*}\text{cat}]\!]] \\ \# & \text{otherwise} \end{cases}$

1.4.2 Multiplicity and scalar implicatures

So far we have seen that cashing out the semantics in (55) for plural indefinites is the key for solving Spector's puzzles for theories of multiplicity – it derives the desired presupposition for the entire sentence (54), which in turn explains the felicity conditions of thid kind of sentences, and the projection pattern of their multiplicity inferences. One way to go about it is to stipulate this meaning as the lexical meaning of the plural feature. While nothing in the arguments laid out above prevents us from doing so, I argue that this kind of stipulation would miss an important generalization, which motivated many of the attempts to derive multiplicity from competition. In essence – multiplicity inferences pattern like scalar implicatures. They do so both in their felicity conditions and in their projection patterns from embedded environments. This has been pointed out by Spector (2007), as a side note to his discussion of the two puzzles presented above. It might be useful to instantiate Spector's observation and demonstrate how these two puzzles can be recreated for "standard" SIs.

Consider first the basic case in (60). It is generally agreed, at least since Grice (1975), that the *not-both* inference triggered by the use of *or* is due to the competition with the alternative in which *or* is replaced with *and*. I will take it to be a representative case of an SI. Spector observes that this SI projects in the same manner as multiplicity, giving rise to the same problem – assuming that SIs are a part of the assertive meaning of the basic sentence, the inference in (61) is too strong. Regardless of our assumptions about the generation of SIs in the scope of *exactly one of my friends* (or at the global level), it is impossible to capture the seemingly split projection of the *not-all* SI. The same is true for the the felicity puzzle, as demonstrated in (62). Given a context in which it is common ground that one cannot meet only one of Peter and Jack without the other, embedding the disjunctive sentence under negation is infelicitous. Notice that this case is logically parallel to the infelicity example involving multiplicity (48) – the combination of the common ground and the *not-both* SI entails that Jen met neither of the twins, rendering the assertion uninformative. It is therefore very natural to see this case as a part of the larger PAI generalization presented above (see Wehbe & Doron (2025) for further discussion on this issue).

(60) Beatriz had ice cream or cake for dessert. ⇝ Beatriz had only one of ice cream and cake for dessert.

(61) Exactly one of my friends had ice cream or cake for dessert.
⇝ One of my friends had only one of ice cream and cake for dessert, and the rest had neither.
(adapted from Spector (2007))

(62) **Context:** Peter and Jack are conjoined twins – it is impossible to meet one without the other.
a. Jen didn't meet Peter and Jack.
b. #Jen didn't meet Peter or Jack.
(adapted from Spector (2007))

We can conclude that multiplicity shares with SIs the properties which led us to argue that it is in fact the result of a presupposition. This conclusion has two main consequences. First, multiplicity should be viewed and accounted for as a case of scalar implicature. In a sense, this is stating the obvious, as this intuition was implicit in many of the accounts of multiplicity proposed in the literature over the years. But the prominence of accounts like Križ's, which treats multiplicity (along with its definite counterpart *homogeneity*) as uniquely related to plural predication, shows that its apparent similarity to other SIs is not enough in the lack of a coherent way to theorize it. This brings us to the second consequence – if multiplicity is to be cashed out as a presupposition, so should all SIs. Next, I will present Bassi et al.'s (2021) theory of SIs, which does just that, and by doing so, I will argue, constitutes the missing link between Zweig (2009) and Križ (2017).

1.4.3 Presuppositional exhaustification

Based on similar considerations, Bassi et al. (2021) argued that SIs are indeed presuppositional in nature. To capture that, they introduce a modification of EXH, which they term PEX (*presuppositional exhaustification*). Its definition is given below. PEX essentially does what EXH does – it uses the same Innocent Exclusion process to negate as many alternatives as possible without creating contradictions and making arbitrary choices. The one important difference is that PEX, as opposed to EXH, presupposes the negation of the IE alternatives.

(63) $[\![\text{PEX}\ \phi]\!]^w =$

a. $= \begin{cases} \textbf{prs:} & \bigwedge\{\neg[\![\psi]\!]^w | \psi \in IE(\phi, \text{ALT}(\phi))\} \\ \textbf{asr:} & [\![\phi]\!]^w \end{cases}$

b. $= \begin{cases} 1 & \text{if } [\![\phi]\!]^w = 1 \bigwedge\{[\![\psi]\!]^w = 0 | \psi \in IE(\phi, \text{ALT}(\phi))\} \\ 0 & \text{if } [\![\phi]\!]^w = 0 \\ \# & \text{otherwise} \end{cases}$

(64) $IE(\phi, C) = \bigcap\{C' \subseteq C |\ C' \text{ is a maximal subset of } C \text{ s.t. } \{\neg[\![\psi]\!] |\ \psi \in C'\} \cup \{[\![\phi]\!]\} \text{ is consistent}\}$

(Adapted from Fox 2007)

Bassi et al. provide various arguments for PEX, which I will not repeat here, but are of a similar nature to the ones brought above. One important advantage of this approach that is relevant for our discussion here relates to the distribution of PEX. The fact that SIs seem to be neutralized in DE environments motivated researchers [citation] to hypothesize constraints limiting the distribution of EXH. But as we have seen, this is problematic for a number of reasons: (i) it does not account for the felicity conditions of scalar items like *or*, demonstrated in (62) above; (ii) it does not account for the behavior of scalar items in non-monotonic environments, as demonstrated in (61). PEX allows us to make do with a much leaner distribution rule – PEX is mandatorily inserted at every scope site, as stated in (65). It is an idea originally due to Magri (2009), but the framework of PEX allows us to avoid stipulations that are necessary under the EXH approach. The apparent neutralization of SIs in DE environments and the apparent split behavior in non-monotonic ones can be cashed out as stemming from the projection of the presuppositions generated by PEX.

(65) **Magri's obligatoriness assumption:** Every t-type node at LF must either have EXH as its sister, or as one of its daughters.

As it turns out, it also allows us to account for our hypothesized presuppositional semantics of plural nouns in an explanatory way. The semantic ingredients needed have already been introduced: an inclusive meaning for plural indefinites, and an atomic meaning for singular ones, both repeated in (66)-(67) below. The role that these meanings play in delivering our desideratum is simple – the semantics we hypothesized in (55) is simply the plural semantics in (66) with a presupposition that the singular semantics in (67) is false.

(66) **Semantics of plural-marking:**

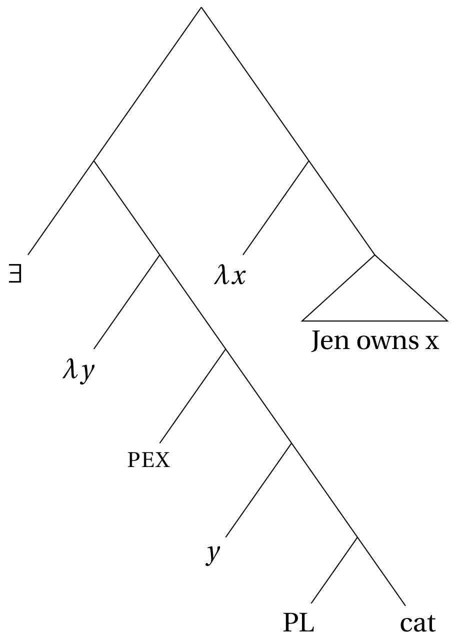
$[\![\text{cat.PL}]\!] = \lambda x.\ x \in [\![{*}\text{cat}]\!]$

(67) **Semantics of singular-marking:**

$[\![\text{cat.SG}]\!] = \lambda x.\ x \in [\![{*}\text{cat}]\!] \wedge \text{ATOM}(x)$

Let us see how this comes about in more detail. Recall that the structure I assume for the basic multiplicity example is as given in (68), with PEX instead of EXH. The relevant part of this LF whose meaning we want to derive is the constituent [λy [PEX [y cat.PL]]]. What is the result of the composition of PEX and its prejacent? The alternative of [y cat.PL] is [y cat.SG] (for the purposes of the discussion I assume that there is no other relevant alternative), and so what PEX does is adding the negation of the singular alternative's meaning as a presupposition. This is spelled out in (69) below.

(68) Jen owns cats



(69) ⟦PEX [y cat.PL]⟧ =

a. $= \begin{cases} \textbf{prs:} & \neg[y \in [\![\text{*cat}]\!] \wedge \text{ATOM}(y)] \\ \textbf{asr:} & y \in [\![\text{*cat}]\!] \end{cases}$

b. $= \begin{cases} 1 & \text{if } y \in [\![\text{*cat}]\!] \wedge \neg\text{ATOM}(y)] \\ 0 & \text{if } [y \in [\![\text{*cat}]\!] \wedge \text{ATOM}(y)] \\ \# & \text{otherwise} \end{cases}$

1.5 Explaining anti-multiplicity

1.5.1 Anti-multiplicity as a presupposition

Let us now go back the phenomenon dubbed *anti-multiplicity*, which seems in many ways like the mirror image of multiplicity. A sentence containing a singular indefinite $\exists N$ as an argument of a predicate P gives rise to the inference that exactly one individual in $[\![N]\!] \cap [\![P]\!]$. It is demonstrated in (15), repeated below in (70). It is sometimes reported that anti-multiplicity inferences have some qualitative difference from multiplicity inferences – they seem less robust and more easily cancelable. We will return to this difference at the end of this section. But before that, it is important to emphasize the various points of similarity between the two phenomena.

(70) Jen owns a cat. $\rightsquigarrow$ Jen owns exactly one cat.

Anti-multiplicity has the same signature as multiplicity when it comes to its projection patterns and to its pragmatic properties. First, recall that like multiplicity, anti-multiplicity is seemingly neutralized in DE environments. This is demonstrated in (21) and repeated below in (71). Second, anti-multiplicity also demonstrates the split projection pattern under non-monotonic quantifiers, as demonstrated in (72). Third, anti-multiplicity displays the same PAI-effects we have seen for multiplicity. The sentence in (73) exemplifies the singular correlate of Spector's infelicity puzzle – given that it is common ground that a situation in which a person has a single blood cell is impossible, the singular sentence in (73-b) is infelicitous, even when embedded under negation. The sentence in (74) recreates for singular indefinites the more direct PAI effect demonstrated above for plural indefinite – whenever it is common ground that there is at least one witness to the existential proposition denoted by the singular sentence (in this case, that Jen has at least one cat), it is impossible to use that kind of sentences to convey that there are no more witnesses than one.

(71) a. Jen doesn't own a cat. $\rightsquigarrow$ Jen owns zero cats.
b. If Jen owns a cat, she has to pay a special tax. $\rightsquigarrow$
If Jen owns at least one cat, she has to pay a special tax.
c. Every friend of mine who owns a cat has black hair. $\rightsquigarrow$
Every friend of mine who owns at least one cat has black hair.

(72) Exactly one of my friends owns a cat.
a. One of my friends owns exactly one cat.
b. The rest of my friends own zero cats.

(73) Ann has a rare disease, ...
a. ... she doesn't have white blood cells.
b. ... #she doesn't have a red blood cell.

(74) **Context:** John and Jen met on *Match&Scratch* – a dating app for cat lovers, where you can only sign up if you own at least one cat. On their first date, John asks Jen to tell him something he didn't know about her. Jen:

a. #I own a cat.

b. I own (only) one cat.

The same considerations that led us to conclude that multiplicity is a presupposition should therefore lead to the same conclusion in the case of anti-multiplicity. The semantics required to account for this range of phenomena is given in (75) below. It is similar to the multiplicity presupposition I have ascribed to the plural indefinite case, but the presupposition in this case requires that the common ground entail that Jen owns either zero cats or a single cat. The question is whether we can derive this presupposition as well.

(75) $[\![\text{Jen owns a cat}]\!]^{w}$ =

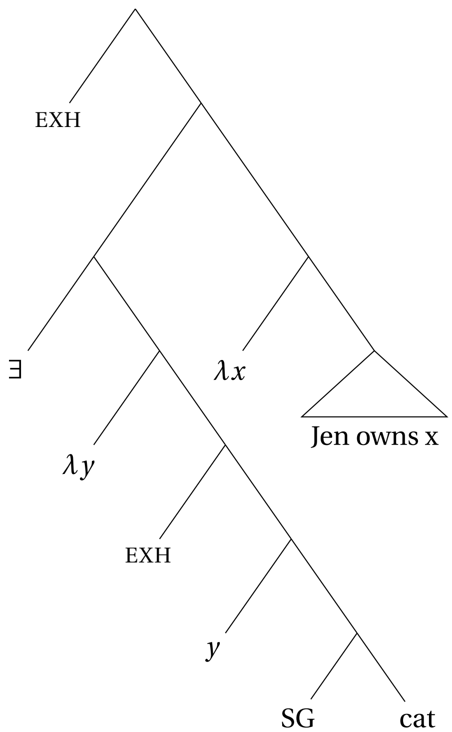
a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns exactly one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns exactly one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns more than one cat in } w \end{cases}$

1.5.2 Deriving anti-multiplicity

Ivlieva (2013) proposes that anti-multiplicity is the result of a second-order SI, namely global competition of sentences containing singular indefinites like (75) with their strengthened plural alternative. She assumes an account similar to Zweig's (2009), in which multiplicity inferences arise from embedded insertion of EXH – essentially the account I have been argued for, only normal exhaustification instead of presuppositional exhaustification (naturally, since Ivlieva preceded the introduction of PEX). She argues that another instance of EXH, at the matrix level, is responsible for the triggering of anti-multiplicity. A simplified version of the LF Ivlieva posits for examples like (75) is given in (76) below.

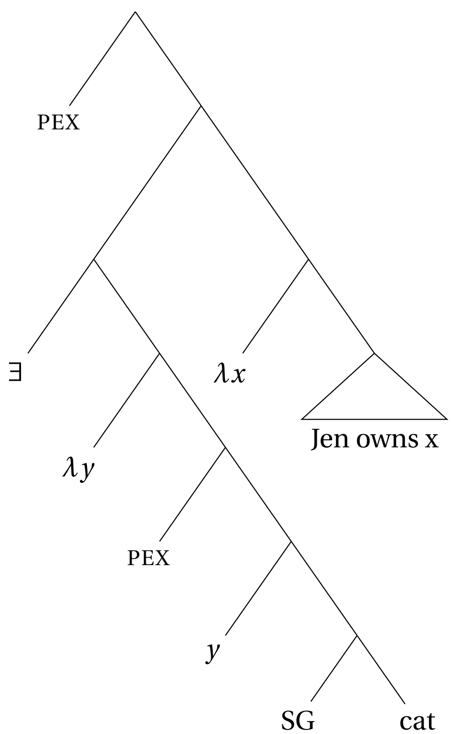
(76) Jen owns a cat



Recall that the prejacent of EXH in the LF above denotes that proposition that Jen owns at least one cat (the embedded EXH is idle). Further recall that the prejacent's alternative with the singular indefinite replaced with a plural one denotes the proposition that Jen owns multiple cats, since the embedded EXH strengthens the meaning of the plural indefinite from inclusive to exclusive. Importantly, the plural alternative is logically stronger than the singular prejacent, and is thus innocently excludable. The matrix EXH therefore strengthens the entire sentence to mean that Jen owns at least one cat, and does not own multiple cats; in other words, Jen owns exactly one cat. This is the anti-multiplicity inference we were after.

But this does not straightforwardly work with PEX. Assuming an LF which is identical to Ivlieva's, with PEX instead of EXH, as given in (77) below, we run into the problem of how the multiplicity presupposition generated by the embedded instance of PEX interacts with its matrix instance. More concretely, the prejacent of the matrix PEX here is again not affected by the embedded PEX and can be paraphrased with the proposition that Jen owns at least one cat. The problem is that its plural alternative now has the meaning in (54), repeated below in (78). Notice that it is Strawson-equivalent to the singular prejacent – specifically, if (78) is false, the prejacent must also be false. For that reason, adding to the prejacent the presupposition that the plural alternative is false would result in a contradiction, and it is therefore not innocently excludable. We end up predicting that no anti-multiplicity inference should arise for sentences like (77)– an obviously wrong prediction.

(77) Jen owns a cat



(78) $[\![\text{Jen owns cats}]\!]^{w} =$

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

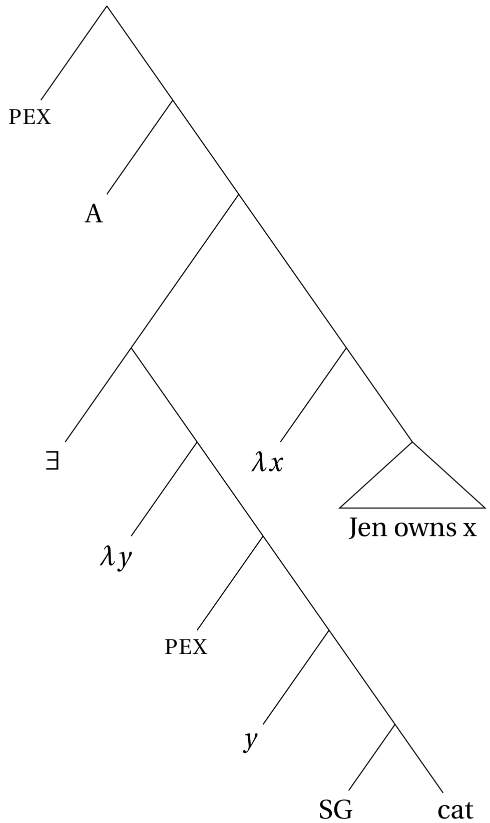
b. $= \begin{cases} 1 & \text{if Jen owns more than one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

One way to fix this would be to change the meaning we ascribe to PEX, so that it would be able to "negate" the presuppositions of alternatives instead of projecting them. This would amount to changing the demand that IE alternatives are false to a demand that they are not true. But that would require us to give up a significant portion of the initial motivation of proposing PEX, including the solution it provides for the so-called *some under some* problem and the problem of scalar items in the scope of factives (Bassi et al., 2021). Another, perhaps more promising way would be to posit that in addition to the LF in (77), there is an available LF where the presupposition in the prejacent of PEX is locally accommodated. I assume that local accommodation is done by an insertion of the *A-operator* (**?**), whose definition is given in (79) below. It collapses the presupposition and assertion of the proposition in its scope, yielding a bivalent proposition which is true whenever the original proposition is true, and false otherwise. The LF in (80) would therefore allow PEX to negate the plural alternative without giving rise to contradictory truth conditions. The fact that an insertion of the A operator is needed for this process to go through may explain why at least for certain speakers, anti-multiplicity is less robust than other SIs.[17]

(79) $$[\![A[\phi]]\!] = \begin{cases} 1 & \text{if } [\![\phi]\!] = 1 \\ 0 & \text{if } [\![\phi]\!] \neq 1 \end{cases}$$

(80) Jen owns a cat

[17] One may wonder whether the A operator is licensed here, given that it is usually thought of as a last resort mechanism (**?**). One way to go about this issue is to view it as a trade-off between an economy constraint which penalizes any insertion of A, and a Quantity-type constraint, which demands the speaker to eliminate as many cells from the QUD as possible. Assuming that the worlds in which Jen owns exactly one cat and the worlds in which she owns multiple cats are in separate cells (otherwise the plural alternative would have been pruned anyway), the insertion of A here allows us to eliminate at least one more cell. The variation with respect to the triggering of anti-multiplicity between cases and speakers can be therefore explained stemming from the interaction between these two constraints.



Let us see how this would work. The insertion of A does not affect the prejacent itself, since there is no presupposition there that could be locally accommodated. However, it does affect its plural alternative. Instead of having the trivalent semantics in (78) above, the plural alternative now denotes the bivalent proposition that Jen owns multiple cats. Adding the negation of this proposition is, as shown above, logically compatible with the prejacent. We end up with a sentence that is true if Jen owns exactly one cat, false if she owns none, and undefined otherwise – exactly the meaning hypothesized in (75), repeated below in (81).

(81) $[\![\text{Jen owns a cat}]\!]^w =$

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns exactly one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns exactly one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns more than one cat in } w \end{cases}$

1.5.3 Differences in cancellability

The account of multiplicity and anti-multiplicity laid out here treat the two phenomena as stemming from a similar source – both are SIs, given rise to by the presence of PEX in different positions at LF. This treatment is motivated by the fact that the two phenomena show the same patterns in many respects – as we have seen above, they both display PAI effects in matrix sentences and under negation, and they both project in the same manner from under non-monotonic quantifiers. But one property that sets the apart relates to the circumstances under which they could be canceled. Consider for example the sentences in (82) below. As shown in (82-a), a sentence containing a singular indefinite, which generally conveys anti-mutltiplicity, can be felicitously followed up by a sentence which contradicts that inference. It may be somewhat marked, but it seems qualitatively better than more overt contradictions. Intuitively, the second sentence forces the listener to reinterpret the first sentence without anti-multiplicity inferences. Compare that to the case of plural indefinites given in (82-b). The same paradigm of a sentence which normally conveys multiplicity preceding a sentence which contradicts that inference sounds significantly degraded relative to its singular counterpart. The same process of reinterpretation seems to be blocked in the case of multiplicity.

(82) a. Jen owns a cat. In fact, she owns multiple cats.

b. #Jen owns cats. In fact, she owns exactly one cat.

To be able to explain this difference, we first need to understand the mechanism behind this cancellation. One prominent approach, which I will adopt here, is that it is a case of so-called relevance-driven *pruning*. This notion is based on a simple idea, dating back at least to L. R. Horn (1972): only relevant alternatives are considered for the purposes of SI generation. I will follow Katzir (2007) in assuming that the notion of relevance involved here is the one formulated by Lewis (1988), and discussed above in section 3.1. It is repeated below in (83).

(83) **Relevance:** Given a context set c and a partition of that context set I, a proposition p is relevant ($p \in \mathscr{R}$) iff it is contextually equivalent to a union of cells in I, namely $\exists I' \subseteq I\ [p \cap c = I']$ (Lewis, 1988)

A simple way to cash out the idea that alternatives have to be relevant is to modify the definition of

PEX such that the set of formal alternative to the prejacent is restricted not only by innocent exclusion, but also by relevance.[18] This is given in (84). This allows us to explain the apparent neutralization of the anti-multiplicity implicature in (82-a) above while keeping our assumption that PEX is obligatory at every scope site. This is done by assuming that the QUD relative to which the first sentence in (82-a) is uttered renders the proposition that Jen owns multiple cats irrelevant. An example for such a QUD is the partition that carves the context set into two cells: one containing all the worlds in which Jen owns no cats, and the other containing all the worlds in which she owns at least one cat. Notice that this proposition is the meaning of the plural alternative whose exclusion by the matrix PEX, I have argued, gives rise to anti-multiplicity inferences. Since it is not relevant in this case, no anti-multiplicity inference arises, and the sentence simply asserts that Jen owns at least one cat. This is what allows for the second sentence in (82-a) to be uttered without giving rise to contradiction.

(84) $[\![\text{PEX } \phi]\!]^w =$

a. $= \begin{cases} \textbf{prs:} & \bigwedge\{\neg[\![\psi]\!]^w | \psi \in IE(\phi, \text{ALT}(\phi) \wedge p \in \mathscr{R}\} \\ \textbf{asr:} & [\![\phi]\!]^w \end{cases}$

b. $= \begin{cases} 1 & \text{if } [\![\phi]\!]^w = 1 \bigwedge\{[\![\psi]\!]^w = 0 | \psi \in IE(\phi, \text{ALT}(\phi) \wedge p \in \mathscr{R}\} \\ 0 & \text{if } [\![\phi]\!]^w = 0 \\ \# & \text{otherwise} \end{cases}$

Why can the same process not rescue the sequence in (82-b)? One difference between multiplicity and anti-multiplicity is that the former is triggered in an embedded position while the latter is the result of a matrix instance of PEX. An immediate question that arises is how is relevance evaluated in such an embedded position, and specifically in quantified sentences. To my knowledge, this question is rarely discussed explicitly in the literature.[19] I will take what seems to me a reasonable route, and assume that an alternative of an embedded constituent is relevant for the purposes of PEX if the entire sentence is relevant when that constituent is replaced by its alternative. This is given in (85).

(85) **Generalized relevance:**

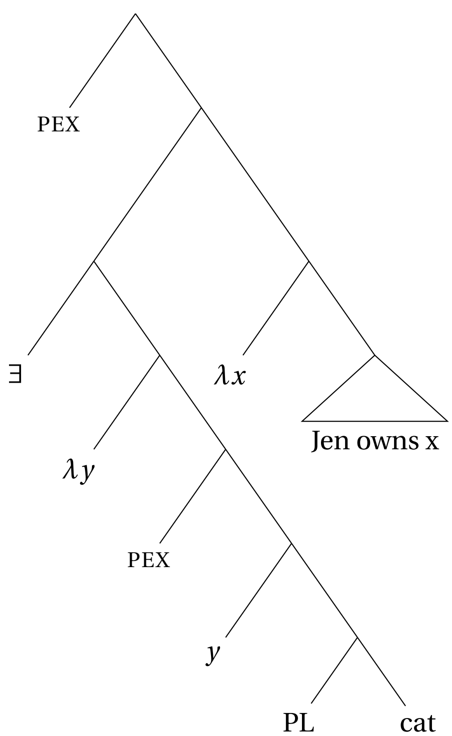
[18] See Crnič (2023), Bar-Lev, (2024) for different proposals regarding the role of relevance in SI generation.

[19] The one discussion familiar to me on the topic is in Hénot-Mortier (2025b,a), who develops a theory of embedded QUDs and uses it to define relevance in embedded positions. Since her theory is designed to account for clauses in the scope of sentential connectives, it does not straightforwardly apply to our case, where the relevant constituent is in the scope of a quantifier.

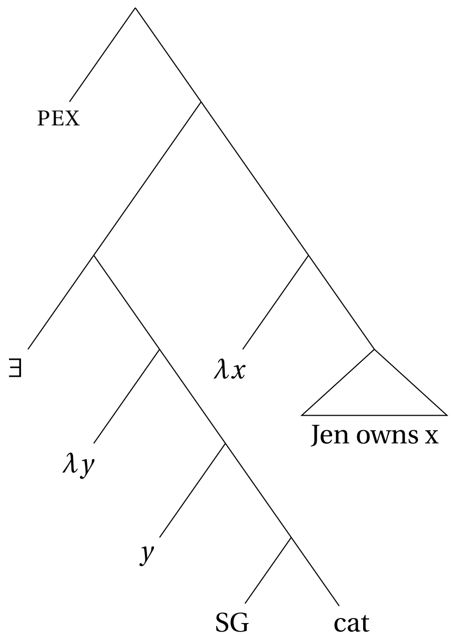
Given a sentence ϕ dominating a propositional constituent [PEX ψ] and given $\psi' \in$ALT(ψ)), ψ' is defined as relevant if $\phi[\psi']$ is relevant.

Let us see how this generalization applies to the case of multiplicity. The LF for our basic example is repeated in (86). Looking at the constituent in the scope of the embedded PEX, namely [y cat.PL], we ask whether its alternative [y cat.SG] is relevant. According to (85), this amounts to asking whether the proposition corresponding to the LF in (87) is relevant. What is the meaning of the LF in (87)? Recall that since the existential quantification obscures the atomic semantics of the singular indefinite, the LF simply means that Jen owns at least one cat. As we have seen, this is exactly the same meaning we would get from replacing the singular indefinite in (87) with a plural one. We are therefore in a situation where, for the purposes of evaluating relevance, the prejacent of PEX and its alternative are logically equivalent. Under the Lewisian definition of relevance assumed here, and in fact under any formulation of relevance based purely on meaning, this ensures that the prejacent is relevant if and only if the singular alternative is relevant. Assuming that the uttered sentence itself is relevant, we conclude that the alternative has to be relevant as well.

(86) Jen owns cats



(87)



If this was a case of matrix SI, the fact that the alternative is logically equivalent to the prejacent for relevance purposes would mean that it is not innocently excludable. This is what we have seen above when analyzing the generation of anti-multiplicity inferences, which was the reason that we needed to appeal to local accommodation. But since multiplicity inferences are the result of an embedded SI, the inputs for the evaluation of relevance and innocent exclusion come apart – the former is evaluated globally by our assumption in (85), while the latter is evaluated locally. This discrepancy, I argue, is the reason that the singular alternative falls through the cracks of the pruning mechanisms in (86). Since it is locally stronger than the prejacent of the local PEX, it is innocently excludable, and since it is globally equivalent to it, it is necessarily relevant. Abstracting away from the specifics of our case here, we can formulate the prediction in (88). I leave for future research the task of finding additional cases to test this generalization.

(88) **Predicted generalization:**

Given a sentence ϕ dominating a propositional constituent [PEX ψ] and given $\psi' \in IE(\psi)$, if $\phi[\psi]$ is equivalent to $\phi[\psi']$ then the local SI of $\neg[\![\psi']\!]$ is obligatorily generated.

1.6 Conclusion

In this chapter, I have proposed a novel account of the inferences that arise from plural and singular indefinites in argument position, also known as multiplicity and anti-multiplicity inferences respectively. This account combines two prominent ideas in the literature on the topic. The first, due to Sauerland (Sauerland, 2003) and Zweig (2009), is that multiplicity inferences are the result of an embedded competition between the plural and the singular form; while this idea is theoretically parsimonious, it fails to predict some basic facts about the projection of these inferences and the felicity conditions they impose on the context. The second, due to Križ (2017), is that multiplicity inferences are the result of trivalent truth conditions; while this idea captures the projection facts, it fails to predicts the felicity conditions given rise to by multiplicity inferences, and misses the apparent connection between multiplicity and standard cases of scalar implicature.

I have argued that recent proposal by Bassi et al. (2021) regarding the pragmatic nature of SIs is the missing link that could connect those two ideas – it allows us to cash out Križ's trivalent semantics as the result of a presupposition given rise to by Zweig's competition mechanics. The resulting picture of multiplicity as presuppositional in nature maintains Križ's good predictions regarding the projection of multiplicity, while also explaining the felicity conditions it imposes. I show, following Ivlieva (2013), that it can further be used to account for anti-multiplicity inferences as global SIs fed by the local SI that is responsible for multiplicity. Interestingly, it allows us to explain a property which sets multiplicity inferences apart from other SIs – their resistence to cancellation. I have explained the persistence of multiplicity as stemming from relevance considerations, which prevent the singular alternative of the indefinite from being ignored in the process of SI computation.

The importance of the account presented here is not only in providing a novel solution to a long-standing puzzle. It bears on fundamental questions regarding both SIs and number marking. With respect to the former, it can be viewed as further evidence for the presuppositional approach to SIs put forward by Bassi et al. (2021), while at the same time providing us with a useful case study of an embedded implicature; as we have seen, it can shed new light on issues like the process of relevance-driven pruning in embedded positions. When it comes to number marking, my account supports the analysis of plural nouns as inherently inclusive, and in addition allows us to probe into the morphology of NPs, relying on the notions of structural alternatives (Katzir, 2007) as the bridging principle. It teaches us that despite their surface asymmetry, plural and singular nouns are equally complex at the level of representation visible for the mechanism of alternative generation.

In the next chapters, I further explore the consequences of this approach to the pragmatics of number marking. In chapter 2, I broaden the crosslinguistic picture, and turn to examine the case of languages like Indonesian, which seemingly do not have a singular form, and instead have what is conventionally analyzed as an unmarked form. Those languages pose a challenge for many theories of multiplicity, the current one included, since it is not clear how it can arise in the lack of a singular alternative. I show that the current system is in fact very suitable for accounting for the Indonesian-type pattern given some independently-motivated assumptions about the nature of the unmarked form. This also allows me to pin down the difference between those languages and languages which pattern like English, and thus get a better understanding of the typology of number marking across languages. In chapter 3, I turn to the case of plural definites, arguing that the system devised here can be used as the basis of a radical approach to definiteness. I show that the phenomena associated with definiteness – mainly *maximality* and *homogeneity* – can be cashed out without appealing to lexical stipulations regarding the semantics of the definite article. Instead, I suggest that definites are simply the spell out of indefinites with a specific focus placement. This allows us to explain the apparent similarity between definites and indefinites, while also solving some long-standing puzzles involving the semantics and distribution of the definite article.

Chapter 2

Unmarked nouns and the typology of multiplicity

2.1 Introduction

In chapter 1, I have proposed an account of the inferences given rise to by plural and singular indefinites in English. I relied on an approach developed mainly by Sauerland (2003) and Zweig (2009), which derives the *multiplicity inferences* that arise from plural indefinites as the result of local competition with their singular alternatives, and the *anti-multiplicity inferences* that arise from singular indefinites as the result of a global competition with their strengthened plural alternatives. My novel contribution was implementing within this approach the idea that scalar implicatures (SIs) are presuppositions, as argued by Bassi et al. (2021). I have shown that putting these ideas together results in a system that can explain many of the open puzzles involving multiplicity and anti-multiplicity.

In this chapter, I aim to broaden the empirical picture and turn to look at the crosslinguistic variation of (anti-)multiplicity; as it turns out, certain nominal systems across languages pose a serious challenge to the kind of system I argue for in chapter 1. The main question I will ask is – what can we learn about the morphology of nouns in different languages by using the analysis in chapter 1 to explain their multiplicity patterns? Answering this question will lead us to two main conclusions. The first is that the system I argue for in the case of English is, contrary to what might seem at first glance, suitable to account for the crosslinguistic facts, and indeed allows us to have a parsimonious theory of the differences between languages when it comes to number marking. In this sense, this chapter can be viewed as further evidence for the arguments made in chapter 1. A second conclusion will be that the morphology of nouns in certain kinds of languages (and in certain domains within certain languages) is different from what have been assumed so far, and in a sense much simpler.

But before laying out the analysis, let us review the typology of number marking as it is conventionally understood. In doing so, I will rely heavily on Corbett (2000). The nominal system of English generally forces every noun to have either plural or singular number marking. The fact that English nouns can have a plural feature is quite apparent - this form is usually marked on the surface with an *-s* suffix, and it gives rise to multiplicity inferences, at least in matrix sentences (and as we have seen in chapter 1, we can detect the fingerprints of multiplicity even in embedded environments where the inference itself seems to disappear). The singular feature in English is less visible, since it does not have an overt morphological exponent on the noun, and its semantic contribution is less stable. However, it can be detected in less direct ways. Syntactically, it gives rise to distinctive agreement patterns; semantically, it is apparent in the incompatibility of seemingly-unmarked nouns with collective predicates, and in the (occasional) triggering of anti-multiplicity inferences.

At this point, it might be helpful to comment briefly on the different senses of *number marking* that are involved in this discussion. One sense is what might be called *surface marking* – the patterns of overt affixation that nouns undergo in different environments. In this sense, plural marking on English nouns corresponds to the presence of an *-s* suffix, and in some cases some less regular alternation of the noun; singular marking, on the other hand, does not exist in English in this perspective – nouns that are not marked on the surface by plural inflection do not seem to have any other affixation in its place. But there is another notion of marking, which corresponds to the syntax of an expressions, and not to its spell out. This notion corresponds to the presence of a number head in the internal structure of the NP. I assume that this sense of marking stands at the basis of the broader syntactic effects of number marking, e.g. agreement, and of its semantic import. It is commonly assumed that while English does not have any specialized singular exponent, it does have an abstract singular feature in its inventory, along with a plural one.

In this work, it is mostly the morpho-syntactic notion of number marking that is of interest to me. I will therefore refer to it when using terms like *morphology*, *feature* or *markedness*, unless mentioned otherwise. But as opposed to surface marking (which of course has its own complications), syntactic marking is not always transparent. Especially in the context of a crosslinguistic investigation, the categorization of nominal forms in different languages into uniform classes requires some caution. We need to agree on a consistent set of diagnostics to decide whether a given nominal form in a given language belongs to the same category as English singulars or English plurals, or perhaps a different category that does not exist in English. For that purpose, I will use the semantic properties of each form as an indication of its deep morphology. Let us define a *plural*-marked noun as a noun which, in its indefinite form, gives rise to multiplicity inferences; inversely, let us define a *singular*-marked noun as a noun which gives rise (at least in some contexts) to anti-multiplicity inferences in its indefinite form, in addition to being incompatible with collective predication.

English can thus be described as a languages in which every noun is either plural or singular.[1] This is the situation in most documented languages. Let us term this class of languages *SG-PL* languages. If singular and plural were the only number forms available across languages, it would have been hard to imagine a different pattern. But many languages allow for a third number form, one which seems to be less specified than both the plural and the singular. This form, which I will call *general number* following Andrzejewski (1960), does not give rise to any multiplicity or anti-multiplicity inferences, and is compatible with both collective and distributive predicates. This form is sometimes thought of as the spell out of nouns without any number feature, a claim I will adopt in my analysis as well, but for now I will try to remain neutral regarding the deep morphological makeup of each form. The typology of number marking that I will describe here essentially classifies languages according to the forms that they allow of these three – singular, plural, and general.[2]

One class of languages, which we can refer to as *GN-SG-PL* languages, is composed of languages that have all three forms in their inventory. Bayso (Cushitic, East Africa) is an example of such a language (Corbett & Hayward, 1987). As demonstrated in (1) below, nouns like *lion* in Bayso have three number forms: one without any surface affixation, which does not give rise to any number-related inference and is compatible with all kinds of predication, and hence can be categorized as a general number form (1-a); another one, bearing the suffix *-titi*, which gives rise to anti-multiplicity inferences and is incompatible

[1] I focus here on count nouns in argument position, and ignore incorporation, reference to kinds, generics, and mass nouns. While these pose some serious challenges to the kind of account I lay out here, addressing them properly is beyond the scope of this dissertation.

[2] For the purposes of this discussion, I will ignore more specialized number forms like dual, trial, paucal, etc. While I do not know of any specific problem that these forms pose to the account I will present here, extending the account to include them is obviously a non-trivial task, and I leave it for future research.

with collective predication, hence a singular form (1-b); and a third one, bearing the suffix *-jool*, which gives rise to multiplicity inferences, hence a plural form (1-c). Other languages which display this pattern include the Fouta Djallon dialect of Fula (Senegambian, West Africa; Evans, 1994), and Syrian Arabic (Cowell, 1964).[3] It is worth noting that the GN form in those languages is consistently less complex in its surface morphology than the SG and PL forms. In fact, as far as I know, no documented language has the reverse pattern, of a GN form with a more complex surface morphology than SG or PL.[4]

(1) a. lúban foofe
lion.GN watched.1SG
"I watched some number of lions"

b. lubán-titi foofe
lion-SG watch.1SG
"I watched a lion"

c. luban-jool foofe
lion-PL watched.1SG
"I watched (multiple) lions"

(Corbett (2000), attributed to Dick Hayword p.c.)

Another slot in our typology contains languages which only have the general number form, which I will refer to as *GN* languages. These include Nias (Austronesian) (Brown, 2001), Zapotec (Oto-Manguean) (Black, 2000) and Hmong Njua (Hmongian) (Harriehausen, 1990), among others. Nouns in these languages can be thought of as "numberless" - there is no way to trigger number-related inferences via nominal morphology in those languages. They will mostly not feature in our discussion.

Finally, a class of languages which will be of particular interest to us contains languages which (seemingly) only have the general form and the plural form in their inventory. Unsurprisingly, I will call them *GN-PL* languages. These include Moghol (Mongolic) (Weiers, 2003), Amharic (Ethio-Semitic) (Leslau, 1966) and Indonesian (Austronesian) (Sneddon, 1996), among others. The pattern is illustrated in (2) below, taken from my own fieldwork. In (2-a), where the bare form of the noun *latihan* (exercise) is used, the sentence implies that the homework contains one or more difficult exercises; it does not give rise to any inference about their number. In comparison, the sentence in (2-b) contains the reduplicated form

[3] Both of these languages have the full three-form paradigm for only a restricted set of nouns. As we will see, such a split in the nominal system is not unusual.

[4] There are, however, many cases of a GN form which is equally complex to the SG form in its surface morphology, as we will see below.

of *latihan*, which I assume is the spell out of plural marking in Indonesian. This form, like the English plural form, gives rise to the familiar multiplicity inferences, namely the inference that the homework contains more than one difficult exercise.[5]

(2) a. PR-nya ada latihan yang susah
Homework.POSS exist exercise that difficult
"There is some number of difficult exercises in the HW"

b. PR-nya ada latihan-latihan yang susah
Homework.POSS exist exercise.PL that difficult
"There are (multiple) difficult exercises in the HW"

We have therefore described a typology consisting of four classes: SG-PL, GN-SG-PL, GN, and GN-PL. As far as I know, the rest of the possible subsets of our three number values are not systematically demonstrated in any documented languages. The absence of some possibilities seems to be expected. SG-languages, namely languages in which all nouns must be singular, would be, if existed, strangely limited in their expressive power. For example, these languages would not be able to express collective predication. Their absence is therefore explained by assuming some basic communicational constraints on the development of languages. PL-languages, namely languages in which all nouns must be plural, would be, according to the account laid out in chapter 1, indistinguishable from GN-languages. That is because we assume that plural nouns are born inclusive, and trigger multiplicity inference via competition with the singular form. Since those hypothetical languages do not have any singular form in their inventory, we expect the plural form to remain inclusive, meaning semantically equivalent to the general number form. And even if multiplicity inferences were triggered somehow in those languages, the expressiveness problem of the SG-languages would be recreated here as well. The one lacuna left in this typology is the apparent absence of GN-SG-languages. Indeed, this is a surprising gap – there does not seem to be any straightforward way to explain it, as opposed to the other ones. We will return to it in section 4.

We can think of this typology as divided into two cases: languages which do not allow a general number form, and ones which do. The former is beside the point for our purposes – it consists only of SG-PL languages, i.e. languages that are virtually identical to English as far as number marking is concerned. We dealt with those languages in chapter 1. My aim in this chapter is to discuss the latter

[5]It is often reported that plural marking in Indonesian, and in general in GN-PL languages, gives rise to a stronger inference – that there is a "significant number" of difficult questions in our case. I will discuss this inference in the next sections, but for now let us ignore it.

case – languages that do have a GN form in their inventory. As we will see, they pose some issues to the analysis laid out in chapter 1. Their typology is summarized in the table below (3).

(3) Typology of languages that have a general number form:

	-SG	+SG
-PL	Nias	?
+PL	Indonesian	Bayso

An account that derives multiplicity inferences in SG-PL languages from competition between the plural and the singular form faces two challenges arising from the above typology. The first relates to GN-SG-PL languages, and specifically the interpretation of the general number in these languages. Assuming a naive analysis of GN as a number feature of the same type as SG and PL, its semantics must be that of *inclusive* plurality, namely denoting both atomic and non-atomic individuals. But this is exactly the semantics we hypothesized for the plural feature in chapter 1, which gets enriched by a multiplicity presupposition due to local competition. This raises the question of why the same multiplicity inferences are not triggered in the case of the general number; in other words, what is the difference between GN and PL? My answer will be simple – GN is not a number feature but the lack thereof. The reason it does not trigger multiplicity is that it does not compete with the singular feature like the plural feature does. While this analysis is often assumed in the literature and is thus unoriginal, I will argue that it allows a glance into the nature of the alternative relation.

The second challenge relates to GN-PL languages. Given that multiplicity inferences arise from a competition between the plural form and the singular form, and given that these languages do not have the singular feature in their inventory, it seems mysterious that multiplicity still arises in them. My solution to this problem will be more radical – I will argue that these languages are underlyingly just a special case of GN-SG-PL languages; what makes them appear as GN-PL languages is systematic homophony between the spell out of the general and the singular forms. I will show that while the singular feature is hard to detect in these languages, its existence becomes clear when tested using the right diagnostics. This, in turn, will allow me to propose a more parsimonious way to describe the typology, one in which languages vary across two dimensions – the obligatoriness of number marking on nouns, and the spell out of each number form.

The rest of this chapter is structured as follows. In section 2, I will discuss GN-SG-PL languages, describe the solution to the problem they pose, and discuss its implications for our theory of pragmatics. In section 3, I will move on to discuss the case of GN-PL languages, propose a way to account for them using the same tools that I used to account for the English pattern, and present novel evidence for it. In section 4, I will show how the solutions to these two puzzles allow us to reinterpret the typological picture in a way which gives rise to an interesting generalization. In section 5, I will turn to the case of split systems - languages with a nominal system that display different number patterns in different domains. I will show that this pattern is more common than has been assumed so far, and that a puzzle that has gained attention in the semantic literature in recent years – plural marking on wh-words in languages like Spanish – can be productively analyzed as a special case of such a split system. I conclude in section 6.

2.2 The general form – a number feature or the lack thereof?

In this section, I discuss the case of GN-SG-PL languages and the way the system presented in chapter 1 can account for them. These are languages in which nouns come in three number forms: general number (GN), which does not give rise to any number-related inferences and is compatible with both distributive and collective predication; singular (SG), which often gives rise to anti-multiplicity inferences and is not compatible with collective predication; and plural (PL), which generally gives rise to multiplicity inferences. The question that I will try to answer in this section is – why do general number nouns not trigger multiplicity inferences? To understand why this is a relevant question, we first need to have some more explicit assumptions about the morphology of the three number forms.

Let us assume that each of these forms corresponds to a distinct number feature, or in more structural terms – a distinct value of the Num head. The three number forms of a given noun are therefore similar in structure, and importantly are of the same complexity. By *complexity* I mean the notion of structural complexity as it is formulated by Katzir (2007). It is given in (5). Since the three forms can each be transformed into the other by substitution of the Num head, they are each at most as structurally complex as the other. In other words, they are equally complex.

(4) **Hypothesized structure of nouns in GN-SG-PL languages (first pass):**

a. General number: $[_{NumP}$ GN $[_{NP}$ lion]]

b. Singular: $[_{NumP}$ SG $[_{NP}$ lion]]

c. Plural: $[_{NumP}$ PL $[_{NP}$ lion]]

(5) $\psi \preceq \phi$ (ψ is at most as complex as ϕ) if ψ can be derived from ϕ by successive deletion or replacement of subconstituents of ψ with elements from the lexicon.

(Adapted from Katzir 2007)

Now, what is the meaning of each of the forms? Since nouns in the general number are compatible with both atomic and non-atomic witnesses, it must be the case that they contain both atomic and non-atomic individuals in their extension. To see that, let us come back to the example of general number in Bayso (1-a), repeated below in (6). This sentence is reported to be judged true both if the speaker watched a single lion and if they watched multiple lions. I assume that bare nouns in Bayso behave like English indefinites in the sense that they are existentially closed by a silent operator, as stated in the simplified LF in (6-b). This means that the truth conditions of the sentence in (6-a) are that there exists an individual or a sum of individuals in the extension of *lion.GN* such that the speaker watched each of its atoms. Had the noun *lion.GN* not contained atomic lions in its extension, the sentence would have been judged false in a scenario where the speaker watched exactly one lion.

(6) lúban foofe
lion.GN watched.1SG
"I watched some number of lions" (Corbett 2000, attributed to Dick Hayward, p.c.)

(7) [[∃ lion.GN] $*\lambda x$ [I watched x]]

The general number form also contains non-atomic individuals in its extension, namely it is closed under sum-formation. This is evident from the fact that nouns in the general number form are felicitous as arguments of collective predicates like *numerous*, as demonstrated in (8) below.[6] I take compatibility with collective predication to be a reliable diagnostic for the existence of non-atomic individuals in the extension of an argument. Collective predicates are generally assumed to not contain atomic individual in their extension (in a sense, this is their defining property), which is evident by the infelicity of English

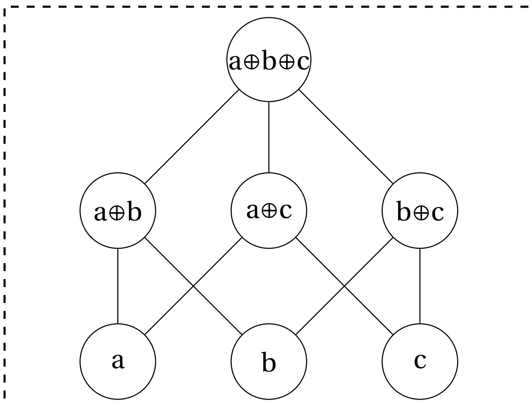
[6] I assume that the translation of *yaydool* ("calf") as a definite does not indicate any hidden difference in structure between the noun in (8) and the one in (6), which is translated as an indefinite. Specifically, I assume that both are existentially quantified. Bayso does not have any surface distinction between indefinites and definites, and the translations to English therefore tend to fluctuate between the two options.

sentences like *the calf is numerous*. We can therefore conclude that the denotation of general number nouns like *lion.GN* is simply the closure under sum-formation of the set of lions, as stated in (9) below.

(8) yaydool ka-njiiya
calf.GN numerous.M
"the calves are numerous" (Hayward, 1979)

(9) **Semantics of the general form:**

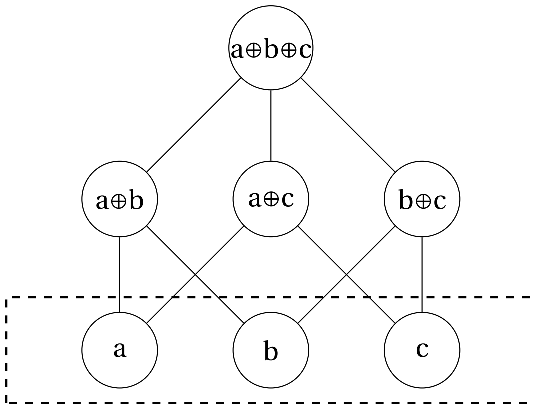
⟦lion.GN⟧ = $x.\ x \in {}^{*}\textsc{lion}$



What about the plural and the singular? In chapter 1, I have discussed the meaning of these forms in English. Based on their incompatibility with collective predication, I have reached the conclusion (following many others, including Sauerland 2003, Spector 2007, Zweig 2009) that English singular nouns denote only atomic individuals, as stated in (10). Given that the singular form in GN-SG-PL languages behaves the same as the English form in this respect, I will assume that it has the same semantics in those languages as well.

(10) **Semantics of singular-marking:**

⟦lion.SG⟧ = $\lambda x.\ x \in {}^{*}\textsc{cat} \wedge \textsc{atom}(x)$



The meaning of the plural form is harder to pin down. Based on the patterns of multiplicity inferences triggered by the plural form, I have reached the conclusion that English plural nouns denote both atomic and non-atomic individuals, as stated in (11). I argued that the multiplicity inferences they give rise to are not a direct result of the semantics of plural marking, but stem from local competition with the singular form. I will not repeat the analysis here, but it is important to emphasize that it is based on two assumptions: (i) that scalar implicatures are obligatorily triggered at every scope site; (ii) that the singular form of a noun is an alternative of its plural form for the purposes of scalar implicature computation. The second assumption is rooted in the complexity relations discussed above, with the bridging principle being the notion of *structural alternatives*, given in (12) below, combined with the assumption that the number head is always focused. Since the singular form is equally complex to the plural form, the former as an alternative of the latter – multiplicity inferences are an SI triggered by this competition.

(11) $[\![\text{lion.PL}]\!] = x.\ x \in {}^{*}\text{lion}$

(12) $\text{ALT}(\phi) = \{\psi | \psi$ is derived from ϕ by replacing focused constituents $x_1, \ldots, x_n$ with $y_1, \ldots, y_n$, where $x_1 \preccurlyeq y_1, \ldots, x_n \preccurlyeq y_n\}$

(Adapted from Fox & Katzir (2011))

It should become clearer now why the lack of multiplicity inferences of the general form is puzzling, given the assumption that it is similar in structure to the other number form. Its semantics is identical to that of the plural form, as is its structure. Specifically, it is equally complex as the singular form, and therefore should compete with it for the purposes of SIs. Given the identical semantics, the result of this competition should be the same as in the case of the plural form. As a consequence, we predict sentences with the general form to be completely equivalent to their plural counterparts. The fact that a multiplicity SI is triggered in the latter case but not in the former is therefore indication that we need to change some of our assumptions.

I argue that the problematic assumption is the one regarding the internal structure of the general form – the general form is not the spell out of a number head, but the lack thereof. In other words, we were wrong in positing that the general number form corresponds to an NP construction with a number head value which is neither singular nor plural. What it really is is the spell out of an NP structure which does not have any number projection in it. This is not a novel proposal by any means. Corbett (2000) states it explicitly, echoing what seems to be a general assumption in the grammars of languages like Bayso. The main motivation for making this assumption is the fact, mentioned above, that the general number form is spelled out across languages as the bare noun form, without any detectable number-related affixation.

But while providing significant support for the assumption of general number as the lack of number, this fact alone seems to me like a shaky ground to base it on. It is a well known fact that in many languages (including English), the singular feature has no systematic surface realization. Greenberg et al.'s (1963) universal 35, given in (13) below, highlights the asymmetry on this front between the singular form and the plural form – the former often has no overt marking, while the latter almost always does. This is a curious crosslinguistic tendency, but one would be hasty to view it as conclusive evidence against the existence of a singular number head. In the same way, the lack of surface marking on the general form cannot be enough to convince us that it does not correspond to a covert number head. A more convincing piece of evidence comes from the inference pattern given rise to by each form in GN-SG-PL languages like Bayso, and specifically from the fact that the plural form, but not the general form, gives rise to multiplicity inferences.

(13) **Greenberg's universal 35:**

There is no language in which the plural does not have some nonzero allomorphs, whereas there are languages in which the singular is expressed only by zero. The dual and the trial are almost never expressed only by zero. (Greenberg et al., 1963)

Let us see how the puzzle of multiplicity inferences is solved by analyzing the general form as lacking a number projection. Our revised structures for the different number forms is given in (14) below. It is important to stress that our assumptions about the semantics of these forms remain the same, and specifically we assume that the general form and the plural form have the same core semantics. This is not an innocuous assumption, but as we will see, it is a necessary one. I will discuss below the commitments it forces us to make, but for now let us focus on the comparison between the plural form and the general form. What sets them apart in this revised analysis is their complexity relations – the plural and the singular form are still equally complex, but both are strictly more complex than the general form. This affects the alternative relations between them, which in turn changes the predicted SIs triggered by each form. The crucial point is the competition with the singular form. The singular is still an alternative to the plural form, and so multiplicity inferences are predicted to arise from the use of the plural form. However, the singular form is not an alternative to the general form now, because of their complexity asymmetry. We therefore correctly predict that the general form should not give rise to multiplicity inferences.

(14) **Hypothesized structure of nouns in GN-SG-PL languages (second pass):**

a. General number: $[_{NP}$ lion$]$

b. Singular: $[_{NumP}$ SG $[_{NP}$ lion$]$ $]$

c. Plural: $[_{NumP}$ PL $[_{NP}$ lion$]$ $]$

Let us go back to the assumption that the general form and the plural form have the same core meaning. Given our conclusion that the general form is the spell out of a noun without number features, we can now see that this assumption commits us to a certain view of the general semantics of nouns before they compose with their number feature. As discussed in chapter 1, so far I was able to remain agnostic about the division of labor between the noun and the number feature in bringing about the semantics of the entire NP. One potential view was that nouns are born atomic. Under this view, the singular feature is semantically idle, while the plural feature can be thought of as denoting Link's Star, namely closing under sum-formation the extension of its sister noun. It is a tempting view, especially given Greenberg's universal 35, which states that the spell out of singular marking is simpler than that of plural marking, since it allows us to tie the exponence rules to the semantics by positing that semantically stronger elements correspond, as a rule, to more complex surface forms. While this hypothesis does not explain the connection between meaning and form, it connects Greenberg's universal to a broader pattern.

Unfortunately, the view that nouns are born atomic is not compatible, as it is, with our assumption that the extension of nouns in the general form is closed under sum-formation, given that they directly express the lexical semantics of nouns. To cash out this assumption, it would therefore be natural to adopt the hypothesis dubbed *lexical cumulativity* (Krifka, 1992b; Kratzer, 2008), which posits that the lexical meaning of nouns is closed under sum-formation. While the lexical cumulativity hypothesis was formed based on independent arguments, the account of general-number nouns given here can be viewed as further evidence for it. However, as noted by Sauerland et al. (2005b), this stands in tension with the meaning-form correspondence sketched above, which would have given us a first foothold in the task of accounting for Greenberg's universal. This is all the more unfortunate, since this universal will play an important role in the next sections of this chapter. We are therefore forced to leave this tension unresolved, taking Greenberg's universal as an mysterious-yet-significant fact of the world.

Beside teaching us about the internal structure of the number forms and providing evidence for lexical cumulativity, the absence of multiplicity inferences stemming from the use of the general number can also serve as a tool to explore the correspondence between structure and alternative relations. While the general Katzir/Fox view of alternatives as derived from structural complexity has a significant body of independent evidence, it is still unclear what kind of structural complexity counts towards alternative computation. One possible view on this question is that the relevant complexity is purely syntactic – word-internal structure does not play a role when it comes to alternatives; another view could be that only morphemes with surface realization play this game. The analysis presented above seems to rule out both of these views. Since asymmetries in morphological complexity affect the triggering of multiplicity, word-internal structure must be relevant for alternative computation as much as sentential structure is; and since singular nouns in English compete with their plural correlates (as indicated by anti-multiplicity inferences), surface realization is not a necessary condition.

2.3 The puzzle of the missing singular

We move on now to the class of languages I have termed GN-PL languages. These are languages which, at least *prima facie*, have only two number forms in their inventory – the general number and the plural. These include Indonesian, Korean and Amharic, among many others. The pattern they display is demonstrated in (2), repeated below in (15). The use of the general form of the noun *latihan* ("exercise") in (15-a) does not give rise to any number-related inference – the sentence could be true both in a scenario where there is a single difficult exercise in the homework, and in one where there are multiple difficult exercises. As opposed to this, the use of the plural form (spelled out as reduplication) gives rise to multiplicity inferences – the sentence in (15-b) is only judged true if there are multiple difficult exercises in the homework. To make sure that what I call here the general form is not actually singular, we can see in (16-a) that the bare form of nouns is indeed compatible with collective predication (as is the plural form, brought in (16-b) as a sanity check).[7]

(15) a. PR-nya ada latihan yang susah
Homework.POSS exist exercise that difficult
"There is some number of difficult exercises in the HW"

b. PR-nya ada latihan-latihan yang susah
Homework.POSS exist exercise.PL that difficult
"There are (multiple) difficult exercises in the HW"

(16) a. murid kumpul di lapangan
student gather in yard
"(The) students gathered in the yard"

b. murid-murid kumpul di lapangan
student gather in yard
"(The) students gathered in the yard"

The basic problem that this pattern poses relates to the triggering of multiplicity inferences by the use of the plural form. Assuming that these inferences arise from the competition of the plural form with the singular form, and given that Indonesian does not have a singular form, we wrongly predict that no multiplicity inferences should arise. Another way to describe this problem is by pointing out that, according to our analysis, the two number forms in Indonesian are semantically equivalent – the only difference between them is their structural complexity. In GN-SG-PL languages like Bayso, this difference in complexity eventually gives rise to a semantic difference, because it allows the plural, but not the general form, to compete with the singular. If there is no singular form to compete with, no semantic difference between the forms is predicted.

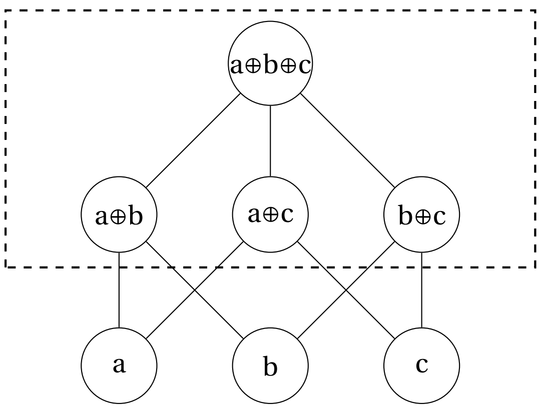
One way to go about this puzzle is to posit that Indonesian plural, unlike the English plural, is inherently exclusive, as stated in (17) below. This is the path taken, for example, by Carson (2000) in her analysis of Malay, and by Rullmann & You (2006) in their analysis of Mandarin Chinese. Recall that we have

[7] Given that collective predicates like *kumpul* ("gather") presuppose that their argument is non-atomic, one might wonder why (16-b) does not incur a redundancy violation. I will leave this question for future research.

considered this option for English as well at the beginning of chapter 1. But this hypothesis has a detrimental flaw – it does not predict the neutralization of multiplicity in downward entailing environments. This is demonstrated for Indonesian in (18). If the Indonesian plural form were inherently exclusive, the sentence in (18) should have conveyed that there is either one difficult exercise in the homework, or no difficult exercises at all. Instead, it says something stronger – that there are no difficult exercises at all. Importantly, it is not judged true in a scenario where there is exactly one difficult exercise.

(17) **Semantics of plural-marking in Indonesian (first pass):**

$[\![\text{exercise.PL}]\!] = \lambda x.\ x \in {}^{*}\text{exercise} \wedge \neg\textsc{atom}(x)$



(18) PR-nya nggak ada latihan-latihan yang susah
HW-nya NEG exists exercise.REDUP that difficult
"There are no difficult exercises in the HW"

Dalrymple & Mofu (2012) observe the puzzle posed by languages like Indonesian, and the flaw in the attempts to derive multiplicity by encoding it in the meaning of the plural form. They suggest instead to adopt an analysis of plurality first proposed by de Swart & Farkas (2010). At the core of this analysis stands the argument that plural nouns across languages are ambiguous between an inclusive meaning and an exclusive one. This is supplemented by the *Strongest Meaning Hypothesis* (SMH), a pragmatic principle that, given an ambiguous expression, favors its strongest interpretation. Applying SMH to the ambiguous plural form can allow us to explain the presence of multiplicity inferences in upward entailing environments and their neutralization in downward entailing environments. I will not present de Swart & Farkas's analysis in more detail here, but it should be fairly clear how SMH would favor the exclusive meaning in UE environments and the inclusive one in DE environments, giving rise to the observed neutralization. Importantly, de Swart & Farkas's system does not derive multiplicity from competition, which makes it suitable for accounting for the GN-PL pattern.

However, de Swart & Farkas's account suffers from some empirical problems. Mainly, it does not seem to able to account for the behavior of plural indefinites in non-monotonic environments. An example of this behavior, first pointed out by Spector (2007), is given in (19) below. The use of plural indefinites in the scope of a non-monotonic quantifier like *exactly one of my friends* gives rise to what can be described as a split inference: the proposition in the scope is true for one of my friends in its exclusive meaning, and false for the rest in its inclusive meaning. Even if we assume, like de Swart & Farkas, that plural nouns are ambiguous between an exclusive meaning and an inclusive one, it is still unclear how to account for this inference. If we plug in the exclusive meaning, we predict the sentence to mean that exactly one of my friends owns multiple cats, and the rest own one cat or no cats at all. Plugging in the inclusive meaning, we predict the sentence to mean that exactly one of my friends owns at least one cat, and the rest own no cats. Notice that both are weaker than the inference we actually get from this sentence. It is therefore hard to see how this approach could get us out of the weeds. The example in (20) shows that the same problematic pattern arises in Indonesian.

(19) Exactly one of my friends owns cats.

a. **Inference 1:** Exactly one of my friends owns more than one cat.

b. **Inference 2:** The rest of my friends own zero cats.

(20) tepat satu dari teman aku punya anak-anak
exactly one of friend 1SG have kid.PL
"Exactly one of my friends have kids."

I argue that there is in fact no need to diverge from the analysis I laid out in chapter 1. The price we need to pay for it might seem high at first glance, but as I will try to show, it pays off both in explaining some surprising empirical observation and in allowing us to significantly simplify our typology. In essence, I argue that Indonesian, and any other GN-PL language, in fact does have a singular form. The reason this form is hard to detect is that it is homophonous with the general form – GN-PL languages have a systematic syncretism between the two forms. The term GN-PL languages is therefore misleading – as far as morpho-semantics is concerned, Indonesian is just like Bayso. The only difference is that Bayso has a designated spell out for the singular form, while in Indonesian it has a zero-realization.

Let us first see how this new assumption helps explain the multiplicity puzzle. Given a sentence like

(15-b), repeated below in (21), we ask what are the alternatives of the plural indefinite *latihan-latihan* ("exercises"). We assume its internal structure is $[_{NumP}$ PL $[_{NP}$ exercise]], and so it has at least these two structural alternatives: (i) $[_{NumP}$ SG $[_{NP}$ lion]], namely the singular form, and (ii) $[_{NP}$ lion], namely the general form. As we have seen, the general form is semantically equivalent to the plural form, and therefore cannot be negated without contradiction (see discussion on Innocent Exclusion in chapter 1). However, the singular form has only atomic individuals in its extension, and it is therefore logically stronger than the plural form at the scope position where the competition takes place (i.e. below the existential quantifier, see chapter 1 for details). The fact that the singular and the general form are spelled out in the same way does not play any role in this competition mechanism – as far as this mechanism is concerned, Indonesian is identical to Bayso or English.

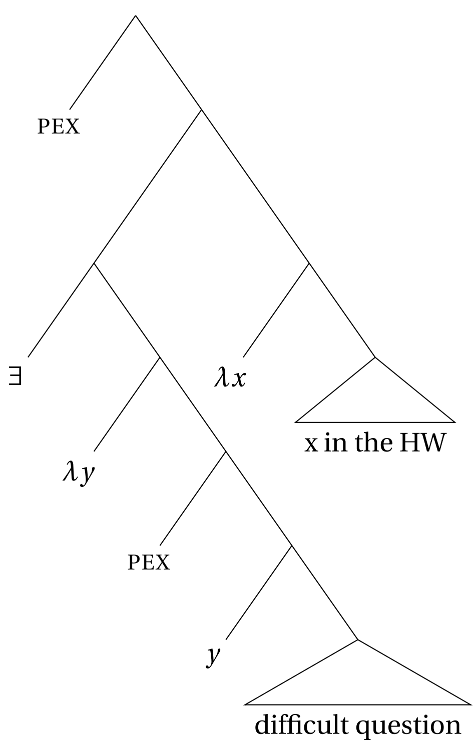
(21) PR-nya ada latihan-latihan yang susah
Homework.POSS exist exercise.PL that difficult
"There are (multiple) difficult exercises in the HW"

One immediate question that this approach gives rise to relates to the elusiveness of the singular form in Indonesian. If that form exists in the Indonesian inventory, as indicated by the triggering of multiplicity inferences by the plural form, why is it so easy to miss it? One way to detect a singular reading of bare nouns in Indonesian would be if they gave rise to different agreement patterns. Unfortunately, Indonesian does not have any overt number agreement. But the problem runs deeper than the specific case of Indonesian. Imagine a version of Indonesian which does have number agreement (Amharic, for example, is such a language); since the general form has no number features to agree with, it would have to get what is usually dubbed *default agreement*. But to make things complicated, default agreement across languages is almost always identical to singular agreement, with the only two potential counterexamples being Godié (Kru, Western Africa) and Kiowa (Tanoan, North America) (Fraser & Corbett 1997, Corbett 2000). It is therefore the case that agreement cannot straightforwardly help us detect the existence of the singular form in GN-PL languages.

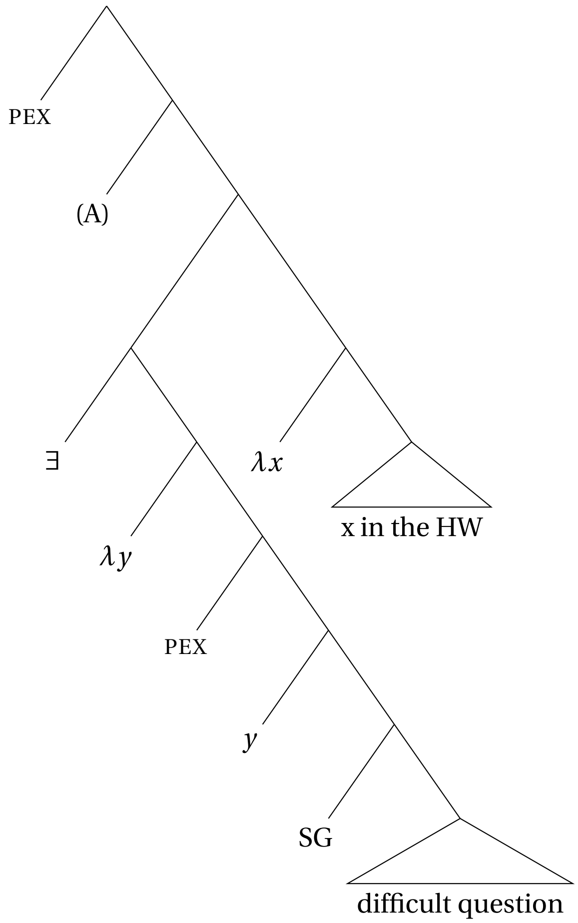
The only other method known to me is to use the semantic differences between the general form and the singular form to detect the latter. That would require us to construct an example in which the general form is expected to be infelicitous, while the singular form is expected to be felicitous. Such an example, if it turns out to be felicitous, would show that the indefinite in sentences like (15-a), repeated below in (22), must have a singular reading. I will indeed use this method, but note that it is not trivial to find such an example, since the semantics of the forms is such that whenever the hypothesized singular reading of the sentence in (22) is felicitous, the general number reading is also felicitous. To see that, consider the the two possible LF's corresponding to the sentence in (22). Recall that I have analyzed the anti-multiplicity inferences that sometimes arise from English singular indefinites as dependent on the insertion of the A operator below the higher instance of PEX. As we will see, with anti-multiplicity or without it, the singular form is hard to pin down.

(22) PR-nya ada latihan yang susah
Homework.POSS exist exercise that difficult
"There is some number of difficult exercises in the HW"

(23) There is difficult exercise.GN in the homework



(24) There is difficult exercise.SG in the homework



The meaning of the LF in (23) is given in (25) below. It simply asserts that there is a difficult question or a sum of difficult questions that are in the homework. What about the meaning of the singular LF in (24)? We have two cases to consider here – the LF with the insertion of the A operator, and the one without it. The former gives rise to anti-multiplicity, while in the latter no SI is generated. Now, notice that without anti-multiplicity, and given a distributive predicate like *in the HW*, the LF in (24) yields a meaning which is logically equivalent to (25) (see discussion on van Benthem's Paradox in chapter 1). It is therefore clear that this LF cannot distinguish the singular form from the homophonous general form. If we allow the insertion of A, and consequently the generation of anti-multiplicity inferences, we get the meaning in (26). This meaning is Strawson-equivalent to the meaning in (25), but not strictly logically equivalent – it has more restrictive felicity conditions due to the added presupposition. But that cannot help us either, since it follows that no context is such that it admits the singular reading but not the general one. To pin down the singular reading, we will have to construct a more complicated example.

(25) $[\![(23)]\!]^w$ = there is at least one difficult exercise in the HW in w.

(26) $[\![(24)\ (\text{with A})]\!]^{w} =$

a. $= \begin{cases} \textbf{prs:} & \text{There is either exactly one difficult exercise or zero difficult exercises in the HW in } w \\ \textbf{asr:} & \text{there is at least one difficult exercise in the HW in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if there is exactly one difficult exercise in the HW in } w \\ 0 & \text{if there are zero difficult exercises in the HW in } w \\ \# & \text{if there is more than one difficult exercise in the HW in } w \end{cases}$

Let us repeat the argument so far. I hypothesized that zero-marked indefinites like in (22) above are ambiguous between a general number reading and a singular reading. This is contra to standard view, which takes them to be unambiguously general number. To test this hypothesis, we need to find an example in which an indefinite is acceptable only if it has a singular reading. We have seen that a simple matrix sentence like (22) cannot have this property. There is, however, one construction that can help us smoke out, so to speak, the singular reading. It relies on a phenomenon dubbed *Hurford disjunctions* (Hurford, 1974),[8] and is demonstrated in (27). The sentence in the example is infelicitous, and the general assumption in the literature is that the source of this infelicity is the fact that the proposition that Jen lives in Paris entails the proposition that Jen lives in France. A standard formulation of this generalization is given in (28).

(27) #Jen lives in Paris or in France.

(28) **Hurford's Constraint (HC):**

A disjunction of the form ϕ *or* ψ is infelicitous if $[\![\phi]\!]$ entails $[\![\psi]\!]$, or $[\![\psi]\!]$ entails $[\![\phi]\!]$.

(adapted from Fox & Spector, 2018)

Fox & Spector (2018) observe that SIs bleed HC violation – given two propositions such that one's core semantics (i.e. its meaning without SIs) entails the other's, their disjunction can still be felicitous if an SI is generated which breaks this entailment relation. This is demonstrated in (29). The assumption is that in its core semantics, the sentence *John bought some of the furniture* is true whenever John bought some or all of the furniture; it is strengthened to mean *some but not all* via an SI. What (29) shows is that the meaning which counts for the purposes of HC is the one that includes SIs.[9] Importantly for our purposes

[8] I thank Nina Haslinger for suggesting this idea to me.

[9] Fox & Spector assumed that the mechanism responsible for SIs is the operator EXH, which adds the SI to the assertion of its

here, this also holds for the disjunction of a sentences containing a singular indefinite, and ones that contains a plural indefinite. It is demonstrated in (30) below. Although the two disjuncts are equivalent in their core semantics – an obvious violation of HC – the triggering of multiplicity and anti-multiplicity inferences sets them apart, crucially making them logically independent.

(29) John bought some of the furniture or all of it. (adapted from Fox & Spector 2018)

(30) Jen has a cat or she has cats.

Notice that the generation of anti-multiplicity inferences in the singular sentence plays a crucial role in the felicity of (30). If the singular disjunct was interpreted without anti-multiplicity, namely as conveying that Jen has at least one cat (but not necessarily exactly one), it would have been weaker than the second disjunct, violating HC. This is shown in (31), where the first disjunct unambiguously has the meaning of the singular disjunct in (30) if no anti-multiplicity inferences are generated. As predicted, the sentence is infelicitous.

(31) #Jen has at least one cat, or she has cats.

Now, what do we predict for a disjunction of an Indonesian sentence containing a bare noun with one containing a pluralized noun? It depends on our assumptions about the meaning of the bare noun. If we take the standard approach and assume that bare nouns in Indonesian are unambiguously the spell out of the general number form, we predict such a disjunction to pattern like (31), namely be infelicitous. That is because the sentence with the general form is weaker than the sentence with the plural form, which makes the whole disjunction violate HC. On the other hand, if the bare noun is ambiguous between a general number reading and a singular reading, as I have tried to argue, we predict the disjunction to pattern like (30) and be felicitous. That is because, as we have seen, sentences with singular indefinites have a reading which gives rise to anti-multiplicity inferences, breaking the entailment relation between the disjuncts. The results of this experiment are given in (32)-(33) below – the sentences are judged felicitous, supporting my syncretism analysis. This result is demonstrated both for a matrix disjunction (32), and a disjunction embedded in the antecedent of a conditional (33).

prejacent. Given our assumption here that SIs are presuppositional, one might wonder whether an SI actually matters to HC in its current formulation. I will not try to answer this question in detail in the current work, but I will note that one general way to solve it is to posit the availability of local accommodation for the *some*-disjunct.

(32) aku melihat perempuan atau perempuan-perempuan keluar dari ruangan-nya
1SG see woman or woman.PL come-out of room
"I saw a woman or women walk out of the room"

(33) Kalo kamu punya kucing atau kucing-kucing kamu harus bayar pajak khusus
if 2SG have cat or cat.PL, 2SG must pay tax special
"If you own a cat or cats, you must pay a special tax"

I conclude that the approach to GN-PL languages I have argued for, which views them as a special case of GN-SG-PL languages where the singular form has a zero-realization, has significant empirical evidence. First, it accounts for the triggering of multiplicity inferences in those languages, also explaining cases like their projection from under non-monotonic quantifiers, which approaches like de Swart & Farkas's (2010) seem to fail at explaining. Second, it correctly predicts the felicity of Hurford disjunctions in Indonesian which coordinate an expression containing a bare noun with one containing a pluralized noun. It is worth pointing out that there is a way to rule out other potential explanations to the felicity of the Hurford examples above, by examining GN-SG-PL languages like Bayso. In those languages, where everyone agrees that bare nouns are unambiguously general number, the disjunction of a sentence containing a bare noun with one containing a plural noun (or a singular noun, for that matter), is predicted by my account as well to be infelicitous. At the time of writing this dissertation, I have yet to gain access to a native speaker of such a language, and I will therefore leave this for future research. In the next section, I will lay out another positive result of the analysis presented here – it allows us an economic way to describe the typology, as well as explaining the GN-SG gap.

2.4 Revising our typology

We can now return to the crosslinguistic picture presented in the introduction, and reassess the way we analyze it. Our initial observation was that languages differ in their inventory of number forms – some have only singular and plural (like English), some have only the general form (like Nias), some have the general form along with the singular and the plural (like Bayso), and some have only the general and the plural form. This is summarized in (34) below, which shows the typology of languages that have the general form (languages which do not have the general form all pattern like English as far as our discussion here is concerned). One basic puzzle that arises from this typology relates to the absence of GN-SG languages – no documented language has only the general and the singular form in its inventory.

Assuming that the forms available in each language are a set by a designated parameter, it is unclear why the value of this parameter cannot be set to allow only those two forms.

(34) Typology of languages that have a general number form:

	-SG	+SG
-PL	Nias	?
+PL	Indonesian	Bayso

The arguments that I have presented in this chapter equip us with a new set of tools for approaching the typology. First, I have argued (following Corbett 2000 a.o.) that the general form does not correspond to a number feature, but to an NP structure without any number projection. Second, I have argued that GN-PL languages like Indonesian are underlyingly GN-SG-PL, namely they have both the singular and the plural feature in their inventory, a fact that is obscured by a systematic syncretism between the general and the singular. We can now form a generalization regarding the typology of number marking given in (35), which states that any given language either has both the singular and the plural, or has neither of them. A slightly more theoretically-involved way to express this generalization is that if a given language allows NPs to bear any number feature, then it must allow both the singular and the plural.

(35) **The number homogeneity generalization:**

No language has one of the singular and the plural feature in its inventory without also having the other.

Given this generalization, it becomes clear that the parameter which controls the typology does not directly determine the available number features in each language. It simply determines the status of number features on NPs: obligatory, optional, or banned. Languages which I have termed SG-PL are ones in which number marking is obligatory, and therefore no NPs without number feature, namely in the general number, are possible. GN langauges like Nias are, accordingly, languages in which number marking is banned, and they therefore have only NPs in the general form, which do not bear any number feature. The interesting slot in this typology is the one populated with languages that have optional number marking. These languages can express both singular and plural nouns in addition to unmarked ones, but they differ in their exponence of each form – Bayso-type languages (which I termed GN-SG-

PL) assign each form a designated spell out, while Indonesian-type languages collapse the spell out of general and the singular to one ambiguous spell out.

(36)

obligatory	optional	banned
English	Indonesian, Bayso	Nias

In fact, we can be more explicit about the difference between Bayso-type and Indonesian-type languages. Given that the general form is always expressed as ∅, namely identical to the stem, the relevant question is whether a given language has some designated spell out for the singular form, or whether it is spelled out as if it had no number feature. In the former case, the two forms would be spelled out differently and we will get a language like Bayso; in the latter case, both forms would be spelled out identically, without any surface morphology. This is given in the table below. Notice that in obligatory number languages, it is much more difficult to tell whether the singular has any designated spell out or not. That is because we do not have direct access to the surface form of an NP without number features. One naive way to go about it is to check whether the singular form has any piece of surface morphology that the plural form does not have; according to this simple test, English is a ∅-singular language, while Romance languages like Italian are not. This diagnostic is of course highly tentative, but since obligatory-marking languages are not the focus of this chapter, I will leave this issue at that.

(37)

	obligatory	optional	banned
Singular expressed as ∅	English	Indonesian	Nias
Singular not expressed as ∅	Italian	Bayso	

Importantly, we can now reduce the puzzle of the missing GN-SG languages to some familiar facts regarding the exponence of the number forms. Given the generalization in (35), such a language would have to be one that has optional number marking, and additionally the plural form is expressed as ∅. But this directly contradicts Greenberg et al.'s (1963) universal 35, repeated below in (38), which states that no language systematically spells out the plural form with the same surface realization as the stem. While this universal poses in itself some explanatory challenges to our view of the morphology-semantics interface, the fact that it explains away the GN-SG gap in our typology allows us to have a minimal analysis of the typology of abstract number morphology. I take this as further evidence for the ambiguity approach to GN-PL languages argued for in the previous section.

(38) **Greenberg's universal 35:**

There is no language in which the plural does not have some nonzero allomorphs, whereas there are languages in which the singular is expressed only by zero. The dual and the trial are almost never expressed only by zero. (Greenberg et al., 1963)

2.5 The case of pluralized wh-words

So far, I have discussed the crosslinguistic variation regarding number marking as if it concerned entire languages. In fact, it is a well known fact that in many languages, the nominal system is split between two or more domains, each behaving differently with respect to the parameters discussed above. In particular, various languages have a domain within their nominal system in which number marking is obligatory, and another domain in which it is optional. Tiwa (Tibeto-Burman; India), for example, displays a split between humans and non-humans – nouns denoting humans are obligatory singular or plural, while nouns denoting non-humans are allowed to have no number feature, namely be in the general form (Dawson & Gibson, To appear).[10] Marind (Marind; Southern Irian Jaya) has a similar split, only between animates and inanimates – the former have an obligatory number marking, while in the latter it is merely optional (Foley, 1986). Other languages have nominal systems split along the lines of kin vs. non-kin (e.g. Maori; Bauer 2003), and the list goes on.

The lines along which nominal systems are split across languages are not completely arbitrary. Smith-Stark et al. (1974) observes that the splits tend to correspond to different points on the so-called *animacy hierarchy*, given in (39). Marind is split at the rightmost point, Tiwa at the second rightmost, Maori on the third rightmost, and so on. A vast literature is dedicated to analyzing this hierarchy and the split systems corresponding to it, and I will have little to add to it. I will just note that the typology presented above should be now understood not as concerning languages, but nominal domains within languages. While certain languages may display monolithic nominal systems, those are only special cases of the more general picture.

(39) **The animacy hierarchy:**

[10] This description reflects my analysis, imposed on Dawson & Gibson's data. Their analysis of their own data is different, and is more similar to the approach of Dalrymple & Mofu (2012). Specifically, since Tiwa non-humans pattern like Indonesian, they posit that they cannot bear a singular feature. I will not present their analysis in detail here, since it is tangential to the main point of this section.

speaker > addressee > 3rd person > kin > human > animate > inanimate

What I wish to focus on in this section is a case of a split system that, to my knowledge, has not been discussed in these terms. It is not mentioned in the literature on split nominal systems, and accordingly, the literature concerning this phenomenon does not approach it as a case of a split system. My humble goal here is to propose to view this phenomenon in the broader context of split systems presented above, and to provide some evidence that this is indeed a productive theoretical move. The phenomenon I am referring to is the optional plural marking on wh-words in languages like Spanish, Greek and Hungarian (Maldonado 2020, Elliott et al. 2022, Alonso-Ovalle & Rouillard 2023).

As first discussed by Maldonado (2020), the word *quién* ("who") in Spanish can get a plural suffix *-es* in certain contexts. When a pluralized *quiénes* appears in a question, it seems to add a presupposition that multiple individuals have the property denoted by its sister: *quiénes P* presupposes that P is true for more than one individual in the domain of *who*. This is demonstrated in (40) below. Interestingly, the question containing bare *quién* does not give rise to any anti-multiplicity inferences, and is compatible with both a single caller and multiple ones. This paradigm is reported to also exist in Greek, Hungarian, and Farsi. To my knowledge, a thorough crosslinguistic mapping of this paradigm has not been done, and so it seems plausible that it appears in many more languages.

(40) a. Quién llamó?
who.SG called.SG?
"who called?" (inference: one or more people called)

b. Quiénes llamaron?
who.PL called?
"Who called?" (inference: multiple people called)

Maldonado 2020

This pattern should already be familiar to the reader – it is exactly the GN-PL pattern we have seen in section 3. The bare form of the wh-word *quién* is semantically unspecified for number, while the pluralized form triggers multiplicity inferences. To show conclusively that *quién* is indeed number neutral, Maldonado shows that it is compatible with collective predicates, as given in (41) below. It might be helpful to compare the inferences speakers draw from sentences like (40) to the ones given rise to by which-questions, which crucially have an overt NP restrictor. This is demonstrated in (42) below. The use of the singular noun *cliente* ("client") in the restrictor position of *cuál* ("which") gives rise to the inference that exactly one client called. If *quién* had a singular noun somewhere in its structure, we would expect it to pattern similarly.

(41) quién se juntó ayer a la noche
who.sg reflx gathered yesterday at the night
"Who gathered last night?" (Maldonado, 2020)

(42) a. cuál cliente llamó?
which.SG client.SG called?
"Which client called?" (inference: exactly one client called)

b. cuáles clientes llamaron?
which.PL client.PL called?
"Which clients called?" (inference: more than one client called) (Maldonado, 2020)

Let us be more explicit about the internal structure of wh-words. Following Karttunen (1977) (and many others), I will assume that *quién* underlyingly has the morphological structure of an existential quantifier, as given in (43). I further assume that it has a silent NP restrictor, similarly to the overt restrictor in *which*-phrases, which restricts its scope to humans. Importantly, this NP restrictor does not have any number projection, namely it is in the general number form. Applying standard Kartunen-semantics, we get that the question in (40-a) denotes the set of propositions of the form *x called*, such that x is a human or a sum of humans. This is given in (44).

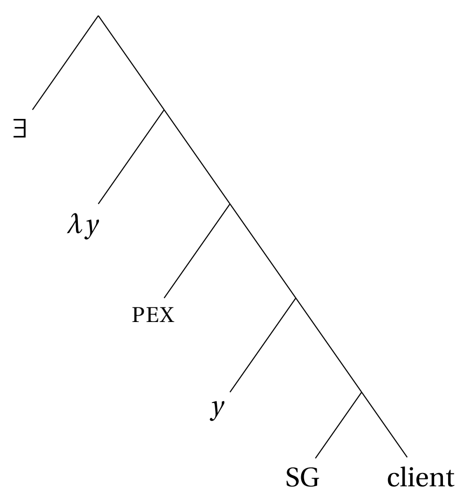
(43) quién: $[_{DP}\ \exists\ [_{NP}\ ^{*}\textsc{human}]]$

(44) $[\![\text{Quién llamó?}]\!] = \lambda p.\ \exists x \in {}^{*}\textsc{human}\ [p = \lambda w.\ x \text{ called in } w]$

I further assume, following Dayal (2012), that interrogative clauses presuppose that the set they denote contains a *maximally-informative true answer* (MITA), meaning a true proposition which entails all other true propositions in the set. Given the semantics in (44), this presupposition is satisfied as long as at least one person called. To see that, assume that there are three humans in the domain: a, b, c. Given that the restrictor *HUMAN is closed under sum formation, it contains a, b, and c, and every possible sum of them, totaling in seven elements. The question in (44) therefore denotes a set containing seven propositions – each of these elements plugged in to the predicate $\lambda x.\ x$ *called*. Now, assume that exactly one of these individuals, say a, called. In this case, only one of the propositions in the question's denotation is true – the one asserting that a called – and the MITA constraint is obviously satisfied. Otherwise, assume that multiple individuals called, say a and b. In this case, three of the answers denoted by the question are true – that a called, that b called, and that a⊕b called. It is easy to see that the last proposition entails the other two, satisfying the MITA constraint as well. In the general case, since the predicate restricting the quantifier is closed under sum formation, it is guaranteed to contain an individual which is the sum of all individuals that called; that sum, when plugged into the predicate in the scope of the quantifier, will give us the maximally-informative true answer.

Compare that to the situation with singular *which*-questions like (42-a). I assume the structure in (45) for the *which*-phrase – like the case of *who*, it is headed by an existential quantifier, but now the NP in its scope has a number projection, singular in this case. Recall that singular NPs contain only atomic individuals in their extension, the set denoted by the question in (42-a) include only propositions that assert that an atomic individual called. Assuming again that our domain includes a, b and c, this set includes propositions like *a called*, but importantly not propositions like *a⊕b called*. For that reason, if more than one person called, the MITA constraint would not be satisfied – none of the true propositions in the denotation of the question would entail all the others. This explains the inference we draw from a question like (42-a) that only one person called.

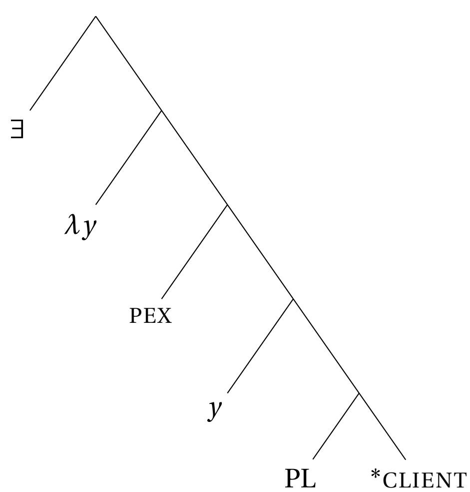
(45) (46) cuál cliente:



(47) $[\![$cuál cliente llamó?$]\!] = \lambda p.\ \exists x \in \text{client} \wedge \textsc{atom}(x)\ [p = \lambda w.\ x \text{ called in } w]$

We can now be clearer about the puzzle posed by the plural marking in *quiénes*. Recall that questions in Spanish headed by what seems like plural marking on top of the wh-word *quién* give rise to the inference that multiple individuals in the domain constitute true answers to the question, as shown by (40-b). Where does this inference come from? Again, comparison to the parallel *which*-question is instructive. The sentence in (42-b) gives rise to the same multiplicity inference as (40-b), but in this case the reasons are more obvious. We can assume that the structure of the *which*-phrase *cuáles clientes* is identical to the structure of its singular correlate, aside from the number head, as given in (48). This time, PEX does generate a local implicature that y is not atomic, by competition with the singular form (see chapter 1 for discussion). Given that implicatures are presuppositions, this raises the question of its projection from this environment. I will not try to answer it, since it is tangential to my argument in this section, and since presupposition projection from questions is an ill-understood topic as it is. Instead, let us conveniently assume that the presupposition is locally accommodated within the restrictor of the existential quantifier, essentially filtering out atomic individuals from the domain of quantification. This gives rise to the meaning in (49). Since the MITA constraint ensures that there is at least one true answer in the denotation of the question, we end up presupposing that more than one client called.

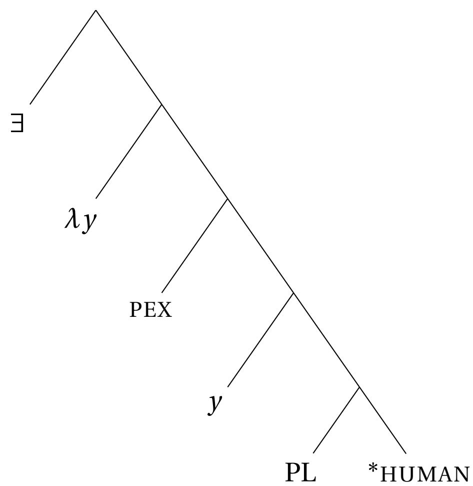
(48) cuáles clientes:



(49) $[\![\text{cuáles clientees llamaron?}]\!] = \lambda p.\, \exists x\, [x \in {}^*\text{client} \wedge \neg\text{ATOM}(x) \wedge p = \lambda w.\, x \text{ called in } w]$

It seems natural to hypothesize that the structure of *quiénes* is essentially identical to that of *cuáles*. Specifically, the plural affixation is the realization of plural marking on the silent NP in the restrictor position. This is given in (50). Since questions headed by *quiénes* give rise to the same multiplicity inferences triggered by questions headed by *cuáles*, one would expect a similar process of generating an exclusive implicature. The problem is that no singular form seems to exist in this case; as we have seen, the bare *quién* has the semantics of the general number form.

(50) quiénes:



(51) $[\![$quiénes llamaron?$]\!] = \lambda p.\ \exists x\ [x \in {}^{*}\text{HUMAN} \wedge \neg\text{ATOM}(x) \wedge p = \lambda w.\ x \text{ called in } w]$

The observations discussed so far were first made by Maldonado (2020), with her basic analysis of the puzzle slightly modified to incorporate my account of multiplicity inferences presented in chapter 1. This puzzle should be familiar to the reader – it is exactly the pattern of GN-PL languages like Indonesian, discussed in section 3. Indeed, I will suggest that the solution to Maldonado's puzzle is the same one I have argued for in the case of GN-PL languages. But before that, let us briefly present the current proposals in the literature. Maldonado proposes to that the meaning of the plural marking on *quiénes* is different than plural marking on overt nouns like in *cuáles clientes*. While the latter is inclusive, namely contains both atomic individuals and their sums, the former is exclusive – it does not contain atomic individuals. This derives the multiplicity presupposition in the same fashion as in the previous case, but instead of deriving it compositionally, we rely on a lexical stipulation.

(52) Maldonado's semantics for plural marking in interrogatives:

$[\![\text{PL}\ {}^{*}\text{HUMAN}]\!] = \lambda x.\ x \in {}^{*}\text{HUMAN} \wedge \neg\text{Atom}(x)$

Elliott et al. (2022) point out the stipulative nature of Maldonado's account, and propose a different analysis instead. They posit that *who* in languages like Spanish behaves like a regular indefinite, in that it has obligatory number marking. According to them, *quién* is singular, similarly to *cuál cliente*, and *quiénes* is plural, like *cuáles clientes*. Both number values have their regular semantics: the singular is restricted to atomic individuals, while the plural ranges over both atoms and their sums. This immediately solves the multiplicity problem, since the plural simply competes with the singular, triggering an exclusive inference. However, another problem arises – why is the singular *quién* compatible with plural answers?

To solve this problem, Elliott et al. argue that simplex wh-words like *who* are type-flexible – they can have a meaning of type <et,t>, similarly to what we have assumed so far, by they can also take higher types. Importantly, they can range over generalized quantifiers, taking the type «<et,t>,t>,t>. This is given in (53) and (54).[11] The interaction between number marking and the kind of higher-type quantification they posit is complicated, and I will not flesh it out in detail, but instead state its consequences: while the higher type retains the multiplicity inferences stemming from the plural marking in (54-b), it obscures the atomic semantics of the singular marking in (53-b). The singular form *quién* ends up being ambiguous between an meaning similar to *which person*, and one which is essentially number-neutral (but see Alonso-Ovalle & Rouillard 2023 for arguments that it still undergenerates).

(53) **Elliott et al.'s semantics for *quién* (modified for uniformity):**

a. $[\![\text{quién}_{<et,t>}]\!] = \lambda P_{<et>}.\ \exists x\ [\text{P(x)} \wedge {}^{*}\textsc{human}(x) \wedge \text{Atom}(x)]$

b. $[\![\text{quién}_{<<<et,t>,t>,t>}]\!] = \lambda \mathscr{P}_{<<et,t>,t>}.\ \exists Q_{<et,t>}\ [Q \in \mathscr{P} \wedge \forall P \in Q\ [\forall x \in P\ [{}^{*}\textsc{human}(x) \wedge \text{Atom}(x)]]]$

(54) **Elliott et al.'s semantics for *quiénes* (modified for uniformity):**

a. $[\![\text{quién}_{<et,t>}]\!] = \lambda P_{<et>}.\ \exists x\ [\text{P(x)} \wedge {}^{*}\textsc{human}(x)]$

b. $[\![\text{quién}_{<<<et,t>,t>,t>}]\!] = \lambda \mathscr{P}_{<<et,t>,t>}.\ \exists Q_{<et,t>}\ [Q \in \mathscr{P} \wedge \forall P \in Q\ [\forall x \in P\ [{}^{*}\textsc{human}(x)]]]$

I propose to adopt Elliott et al.'s idea that the bare form *quién* is ambiguous between an atomic and a number neutral reading. However, I reject the claim that this ambiguity stems from type flexibility. Instead, I would like to point at the similarity between the case of wh-words in languages like Spanish and the cases of split nominal systems discussed above. Wh-words in Spanish behave like non-human

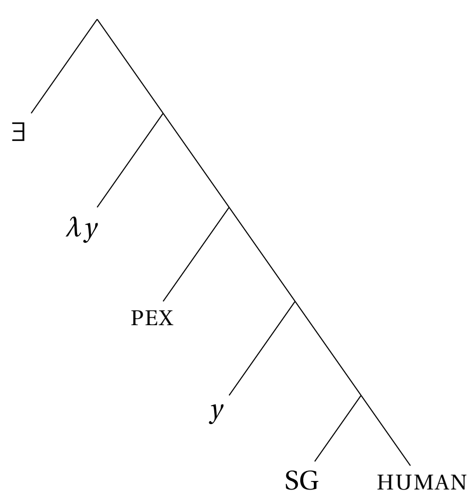
[11] Elliott et al. assume that number marking attaches to e-type expressions instead of <et>-type, as I am assuming here. The way the atomicity requirement of the singular is imposed in their system is therefore different, and in particular not encoded in the structure of the wh-word, but in the trace it leaves at its base position. This difference between the accounts is, as far as I can tell, tangential to the main question here. The denotations given here represent the core insight of Elliott et al., but are adapted to match my assumptions about the attachment position of number marking.

nouns in Tiwa – the bare form is number neutral, and the pluralized form triggers multiplicity inferences; the rest of the Spanish nominal system behaves like human nouns in Tiwa – the bare form is atomic, and the pluralized form triggers multiplicity inferences as well. In my analysis, the difference between the nominal domains within each language is in the obligatoriness status of number marking. In one domain (human nouns in Tiwa, non-interrogative nouns in Spanish) number marking is obligatory, while in the other (non-human nouns in Tiwa, interrogative nouns in Spanish) it is merely optional. This, in combination with a systematic homophony between unmarked nouns and singular nouns, explains the triggering of multiplicity without there appearing to be any singular alternative. It is worth noting that languages like English, in which simplex wh-words cannot bear any number marking, are also split – in this case between banned number marking and obligatory number marking.

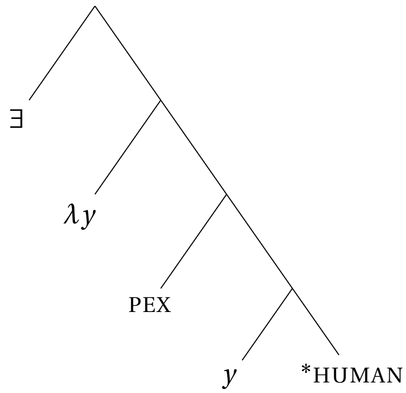
Let us see how this works for the case of *quién* and *quiénes*. *quién* is ambiguous between a structure without any number projection (55-a), and a singular form (55-b). The singular form imposes an atomicity requirement on the arguments in the corresponding answers, which in combination with Dayal's (2012) MITA requirement gives rise to the inference that the answer is only true for one person. However, upon hearing a question headed by *quién*, if the context does not admit this presupposition, we can always interpret the question using the unmarked reading in (55-a), which only presupposes that the answer is true for at least one person. Since the presupposition of the singular form is stronger than that of the unmarked form, the existence of the former reading is not easily noticeable.

(55) quién:

a.

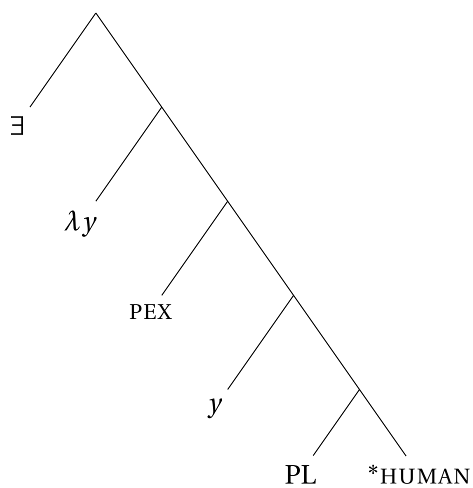


b.



quiénes, on the other hand, is unambiguous. It is the spell out of the structure in (56). As any plural indefinite, its core meaning is inclusive, but becomes exclusive due to an application of PEX in the restrictor of the existential quantifier. More specifically, PEX adds the negation of the singular alternative as a presupposition, which projects in a way that filter from the denotation of a question all answers that include an atomic individual as an argument. This, of course, relies on the existence of a singular alternative. Can we probe for it using the same method that we used to probe for the singular form in Indonesian?

(56) quiénes:



I argue that the same test, relying on Hurford's Constraint (HC), can indeed work in this case. Recall that HC, whose full statement is given in (57), rules out disjunctive sentences like (58), in which one disjunct entails the other. As demonstrated in (59), a disjunction of a singular indefinite and a plural one does not raise a violation of HC, presumably because the triggering of multiplicity inferences (in the case of plurals) and anti-multiplicity inferences (in the case of singulars) makes them logically independent. I therefore take the singular feature in the indefinite *a cat* to be necessary in allowing (59) to avoid infelicity; a disjunction of an indefinite in the general form with a plural one is predicted to be infelicitous.

(57) **Hurford's Constraint (HC):**

A disjunction of the form ϕ *or* ψ is infelicitous if $[\![\phi]\!]$ entails $[\![\psi]\!]$, or $[\![\psi]\!]$ entails $[\![\phi]\!]$.

(adapted from Fox & Spector, 2018)

(58) #Jen lives in Paris or in France.

(59) Jen has a cat, or she has cats.

To test whether Spanish *quién* has a singular reading, we therefore need to construct an example in which a question contains a disjunction of *quién* with its plural correlate *quiénes*. If such a question is judged felicitous, it is evidence that *quién* can be interpreted as singular to avoid HC violation; if it is judged infelicitous, it is evidence that only a general number reading is available. This relies on the assumption that HC applies to disjunctions of wh-words in the same way it does for other kinds of disjunctions. To support this assumption, consider (60) below. English is a language which does not allow for number marking on simplex wh-words, and therefore *who* is unambiguously in the general number.[12] Disjoining it with *which people*, as demonstrated in (60-a), gives rise to a HC violation, since the second disjunct entails the first. On the other hand, a disjunction of the singular *which person* with *which people*, demonstrated in (60-b), seems to avoid HC violation. Which one of these cases does the Spanish case behaves like? The answer seems to be the latter – questions in Spanish headed by the expression *quién o quiénes* are judged acceptable. This is exemplified in (61) below.

(60) a. #Who or which people called?

b. Which person or people called?

(61) a. quién o quiénes llamaron?
who.SG or who.PL call.pl?

[12] I note that in certain examples involving identity sentences (namely sentences in which the predicate is a definite description or a proper noun), wh-words in English seem, *prima-facie*, to take plural agreement. This is demonstrated in 12 below. Since this agreement pattern does not occur with any other kind of predicates, I assume that it does not reflect the internal structure of wh-words in English. However, more needs to be said on these cases, which I leave for future research.

(i) a. Who are the the grad students in this department?
b. #Who are grad students in this department?

"which person or people called?"

b. quién o quiénes escribieron la biblia?
who.SG or who.PL write.PL the bible?
"which person or people wrote the bible?"

I conclude that the puzzle of number marking on wh-words is best explained in the context of the broader pattern of nominal domains within languages which seem to have only a general form and a plural form. The solution to all these cases is that a singular form does exist in those domain as well, it is just homophonous with the general form. The judgments of the HC examples seem to confirm this claim. If that is so, a split nominal system is much more common than previously thought. This raises questions about the possibility of integrating the Spanish-type pattern into the animacy hierarchy generalization, and the factor that control this split. I leave them for future research.

2.6 Conclusion

In this chapter, I have broadened the empirical picture established in chapter 1, extending the analysis of multiplicity inferences to a wider range of typological data. The investigation into languages with unmarked nouns has led to two priJen conclusions that reinforce and refine the overall account.

First, I have argued that the theoretical model developed in chapter 1 for English, which derives multiplicity from local competition between plural and singular alternatives, is robust enough to account for more complex typologies. The seemingly problematic case of GN-SG-PL languages like Bayso was resolved by analyzing the general number (GN) form not as a feature, but as the absence of a number projection. This structural difference explains why the general form, unlike the plural, does not compete with the singular and thus does not trigger multiplicity inferences.

Second, I addressed the puzzle of GN-PL languages like Indonesian, where multiplicity inferences arise despite the apparent lack of a singular form. I proposed that these languages are underlyingly GN-SG-PL systems in which a systematic zero surface marking renders the singular form homophonous with the unmarked general form. Evidence from Hurford's Constraint confirmed that a singular reading must be available for bare nouns, thereby saving disjunctions of bare and pluralized nouns from infelicity. This approach not only explains the data but also allows for a more parsimonious typology, where crosslinguistic variation reduces to whether number marking is obligatory and how the singular form is spelled out.

Finally, I argued that this ambiguity analysis provides is applicable to split nominal systems, including the optional plural marking on wh-words in languages like Spanish. By viewing the word *who* in languages like Spanish as ambiguous between a singular and a general number reading, we can elegantly account for its inference patterns without resorting to lexical stipulations or otherwise unmotivated type-flexibility. This move reveals that splits in number-marking behavior are more widespread than previously assumed and strengthens the core claim that a competition-based approach offers a principled and far-reaching account of (anti-)multiplicity inferences across languages.

Chapter 3

A structural account of definiteness

3.1 Introduction

3.1.1 Definite descriptions - quantificational or referential?

So far, my discussion on plural marking was mainly focused on the case of indefinites. This is a natural starting point – indefinites seem like the simplest form that a noun in argument position can take, both semantically and morphologically. I have assumed that they denote <et>-type predicates, which get existentially closed at LF, and derived the effects of the different forms of number marking from interaction between the meaning of the noun and the existential quantification. The bottom line is given in (1) below. A sentence of the form $\exists N_{PL}\ P$, where N_{PL} is a plural marked noun and P a predicate, presupposes that either multiple individuals in $[\![N]\!]$ are also in $[\![P]\!]$, or no individual is in both. This semantics, I have argued, allows us to solve some of the most resistant puzzles involving number marking, and can be naturally derived from independently-motivated mechanisms.

(1) $[\![\text{Jen owns cats}]\!]^{w} =$

a. $= \begin{cases} \textbf{prs:} & \text{Jen either owns more than one cat or zero cats in } w \\ \textbf{asr:} & \text{Jen owns at least one cat in } w \end{cases}$

b. $= \begin{cases} 1 & \text{if Jen owns more than one cat in } w \\ 0 & \text{if Jen owns zero cats in } w \\ \# & \text{if Jen owns exactly one cat in } w \end{cases}$

But in another sense, indefinites are not the obvious starting point for this discussion. That is because there is a more popular, better studied and more glamorous type of DPs – the definites. Definites have featured in some of the first studies on the semantics of natural language, and are still the center of much debate in the linguistic and philosophical literature. A basic example of a singular definite in argument position is given in (2) below.[1] The inferences that we draw from it can be thought of as divided into three parts: (i) an existence inference, which conveys that the extension of the noun in the scope of the definite article is not empty; (ii) a uniqueness inference, which conveys that it does not have multiple individuals; and (iii) a predicational inference, conveying that the individual in the extension of the noun is also in the extension of the predicate.

(2) Jen read the book.

a. **Existence inference:** the extension of *book* is not empty.

b. **Uniqueness inference:** the extension of *book* contains at most one individual.

c. **Predicational inference:** That individual is such that Jen read it.

Notice that the predicational inference could be formulated in a different way. It could be described as conveying that some individual in the extension of *book* is such that Jen read it; or as conveying that every individual in the extension of *book* is such that Jen read it. Given that the other two inferences are true, all three of these ways are equivalent. But there is a deeper question there – what is the meaning of definite descriptions like *the book*? Do they denote an individual, like the characterization in (2) hints? Or do they denote a quantifier, namely a property of predicates, like the alternative characterizations above do? In other words, are they type e or type <et,t>?

This has been the topic of what might be considered the first debate in formal semantics. In his seminal paper "On denoting", Russell (1905) argues that definites are essentially quantifiers, which assert all three inferences as their meaning. Abstracting away from notational variance, Russell argues for the semantics in (3) below for definite descriptions like *the book*. Every component of this argument has been contested over the years, but the one relevant to this discussion is the idea that definite descriptions do not directly refer to individuals, but denote a property of predicates.

[1] I begin with singular definites and not with plural ones for historical reasons – the debate on definites in the first days of analytic philosophy was focused almost exclusively on singulars. To this day, singular definites are often treated in semantic textbooks as the simpler case, and plurals as posing extra complications. It is an interesting property of the account I will argue for that it actually has an easier time accounting for plurals than for singulars. However, to avoid confusing the reader, I will stick, at least in the introduction, to the historical order.

(3) $[\![\text{the}]\!] = \lambda P.\ \lambda Q.\ |P| = 1 \wedge \exists x\ [x \in P \wedge x \in Q]$

On the other side of this debate, Strawson (1950), building on ideas by Frege (1952), argued that definite descriptions are more similar to proper names than to quantifiers. In his analysis, expressions like *the book* directly refer to an individual in the world. The quantificational claims expressed by the existence inference and the uniqueness inference are, according to Strawson, not a part of the asserted meaning of the expression, but preconditions that make sure that it can successfully refer to an individual. In modern terms, we can think of Strawson's semantics as partial – the domain of the definite article *the* is limited to predicates which contain only one individual in their extension (ignoring plural definites for now). In other words, Strawson argues that existence and uniqueness are presupposed, making sure that there is a single individual for the definite description to refer to; the predicational inference is simply the result of applying the predicate to the individual denoted by the definite. This is given in (4) below. This account as well raised various kinds of objections and counter arguments since it was proposed, but what is important for our purposes here is that it treats definites not as expressing some abstract function, but as directly denoting an individual.

(4) $[\![\text{the}]\!] = \lambda P : |P| = 1.\ \iota x\ [x \in P]$

While this debate still ranges on in various arenas, the prominent approach in the linguistic literature in recent decades has essentially been the Strawsonian one – definites are largely thought of as type-e expressions, directly denoting individuals, and imposing conditions on the context of utterance to make sure that this reference can go through. Heim & Kratzer, in their foundational 1998 textbook, cheerfully dismiss the quantificational analysis of definites with the following statement:

> The basic intuition about phrases of the form "the NP" is that they denote individuals, just like proper names. Had it not been for Bertrand Russell's famous claim to the contrary, few people would think otherwise. Frege, for one, thought it obvious...

This seems to me to represent the general attitude towards this debate in the linguistic literature ever since. And there is a good reason for this attitude – the referential view of definites has proven to be a very productive one, elegantly capturing various semantic and syntactic phenomena. However, in this chapter I would like to take issue with it, and argue for a novel variant of the Russellian, quantificational approach. In doing so, I will by no means be able to provide even a survey of the huge number of arguments for and against the referential approach, let alone attempt to solve the challenges they pose to my analysis. Instead, I will present a handful of cases that this analysis can explain, in hope to at least prompt the reader to view this debate in a new light.

3.1.2 The case of plural definites

Definite plurals, which will play a key role in my argumentation, were largely set aside in the first days of the quantificational vs. referential debate. The patterns they present have proven challenging for both approaches. Consider the basic example in (5). While the existence inference persists, the uniqueness inference no longer arises. We instead get an *anti-uniqueness inference*, demanding that the noun to which the definite article attaches contain more than one individual. Moreover, notice that the formulation of the predicational inference as expressing universal quantification is not an arbitrary notational choice, but a substantial empirical observation – the sentence in (5) is only true if Jen read each of the books in the domain.[2] An immediate question is whether we can give a unified description of the semantics of singular and plural definites.

(5) Jen read the books.

  a. **Existence inference:** the extension of *books* is not empty.
  b. **Anti-uniqueness inference:** the extension of *books* contains more than one individual.
  c. **Predicational inference:** Every element in the extension of *books* is such that Jen read it.

Sharvy (1980) has proposed a solution that has become the standard analysis of definites. The fact that his solution is couched within the referential approach to definites marks a major advantage of that approach over the quantificational one. Sharvy's insight relies on the notion of a *maximal element*, an element in a set which every other element in the set is a part of. The formal definition is brought in

[2] I ignore here the phenomenon termed *non-maximality* by Brisson (2000) (who builds on previous observations by Fiengo & Lasnik 1973, Kroch 1975, Williams 1991, a.o.). It is demonstrated in 2, which is argued to be judged true even in a scenario where some of the townspeople are awake. I will not discuss this effect in detail here. I note, however, that it can be cashed out in my account as an instance of relevance-driven pruning, in the same way as in accounts such as Bar-Lev (2021); Guerrini & Wehbe (2024).

(i) The townspeople are asleep. (Kroch, 1975)

(6) below.[3] Definite descriptions, according to Sharvy, are referential expressions, denoting the maximal element in the noun they govern. In the case of plural nouns, given that they are closed under sum formation, the maxmial element is the sum of all the individuals in their extension. The only scenario in which such maximal element does not exist is if the extension of the noun is empty. By presupposing that there exist a maximal element of a certain plural nouns, we thus presuppose that the extension of that noun is not empty; hence the existence inference. In simple sentences like (5), if this presupposition is satisfied, the maximal element is simply fed to the predicate. Since *read* is a distributive predicate, this leads to the assertion that every element in *books* is such that Jen read it, effectively introducing universal quantification via the process, whichever it may be, that is responsible for distributivity. This is the cause for the predicational inference. Sharvy does not attempt to analyze the non-uniqueness inference, but his successors have generally appealed to competition with the singular form (e.g. Sauerland 2003).

(6) $x = max(P) \Longleftrightarrow x \in P \wedge \forall y\ [y \in P \rightarrow y \sqsubseteq x]$

(7) $[\![\text{the}]\!] = \lambda P : \exists x\ [x = max(P)].\ max(P)$

In the case of definite singulars, the demand for a maximal element becomes more restrictive. Since singular nouns contain only atomic individuals in their extension, none of their elements is a part of the other. The presupposition that there exists a maximal element can therefore only be satisfied if there exists one and only one individual in the extension of the noun. That is the source of the existence and uniqueness inferences. The predicational inference stems from plugging this maximal (and only) individual into the predicate. In the case of (2), this adds up to asserting that the one book in the domain is such that Jen read it. Sharvy's semantics of the definite article (9) is therefore equivalent to the Strawsonian semantics in (4) in the case of singulars, but generalizes it to account for the plural case as well.

However, there is a fly in this ointment. It manifests itself in the clearest way when we turn to look at the behavior of plural definites under negation. Consider the example in (26) below, which is the result of embedding the sentence in (5) under negation. First, notice that the existence inference and the anti-uniqueness inference project from this environment; this is expected in Sharvy's account, since both are presupposed. The problem begins with the predicational inference, which constitutes the asserted

[3] Throughout this discussion of Sharvy's analysis, I represent his formal notions using slightly different notation from that which Sharvy uses. This is just a notational variant, which does not affect the content of his claims.

meaning of the sentence. Since the affirmative sentence in (5) asserts that Jen read every book, we expect the negated sentence in (26) to assert the complementary proposition, namely that some books are such that Jen did not read them. More explicitly, if the definite description *the books* refers to the maximal sum of books, then the entire sentence in (26) should be false if that individual is in the extension of the predicate $^*[\lambda x.\text{ Jen read } x]$ and true if it is not. In a scenario where Jen read some but not all of the books, the maximal book individual is clearly not in the extension of the predicate, and the negated sentence is predicted to be true. This does not seem to be the case. As first pointed out by Fodor (1970), the truth conditions we intuitively get are stronger – the sentence is true only if Jen read none of the books in the domain.

(8) Jen didn't read the books.

  a. **Existence inference:** the extension of *books* is not empty.

  b. **Anti-uniqueness inference:** the extension of *books* contains more than one individual.

  c. **Predicational inference:** No element in the extension of *books* is such that Jen read it.

This phenomenon, termed *homogeneity*, has been the topic of much debate in recent years (see Schwarzschild 1993; L"obner 2000 for early discussions and Križ 2019 for a more recent survey). While there is no consensus as to the correct analysis of this pattern (see Križ 2015; Križ & Spector 2021; Bar-Lev 2021 for prominent analyses), recent accounts tend to agree on one point – the source of homogeneity is not the definite plural itself, but its interaction with the predicate. This is a natural move to make given a referential theory like Sharvy's. Given that a definite description like *the books* simply refer to an individual (while imposing a presupposition which makes sure that the reference goes through), it is hard to imagine what kind of modification to this semantics could explain the homogeneity effect. I will take issue with this claim as well. Specifically, I will argue that once we move to a quantificational view of definites, cashing out homogeneity as stemming directly from the semantics of definite descriptions becomes much more natural.

3.1.3 Definites and indefinites

Another observation that can be viewed as exposing some wrinkles in the Sharvy theory of definites relates to their relation to indefinites, which were the focus of the previous two chapters. An examination of the corsslinguistic picture reveals that languages like English, which distninguish between definites and indefinites, are not representative of the general pattern. Many languages, including Bayso, Indonesian and Korean, which have featured prominently in the second chapter, seem to express both meanings by the same surface form – a bare noun. This kind of languages, sometimes dubbed *article-less languages*, is in fact more widespread across languages than English-type languages, which do distinguish between the forms (Lyons, 1999). Moreover, there seems to be robust evidence that bare nouns in article-less languages convey in certain cases the same meaning that definites do in languages like English, while in other cases they convey and indefinite meaning (Lyons, 1999; Cheng & Sybesma, 1999; Von Heusinger & Kornfilt, 2017). If that is true, we are forced to conclude that bare nouns in article-less languages are either systematically ambiguous between a definite and an indefinite meaning, or they somehow have a meaning which is compatible with both.

This pattern stands in tension with theories that ascribe definites and indefinites completely different meanings. Given, for example, a treatment of indefinites along the lines of what I have assumed in the previous chapters, namely as existential quantifiers, and given a referential analysis of definites along the lines of Sharvy, the widespread ambiguity/underspecification between the two forms is quite surprising. While not hopelessly incompatible with this kind of accounts, the crosslinguistic picture raises questions regarding the source of this pattern, and the ability of speakers to acquire the meaning of bare nouns in article-less languages.

It is not surprising, then, that a number of recent proposals have tried to argue that definites and indefinites have, in some sense, the same meaning. Szab'o (2000) argues that the semantic import of both definite and indefinite descriptions is simple existential quantification; The crucial difference between them is pragmatic. Drawing on Heim's (1982) file-change semantics, Szab'o proposes that interlocutors maintain "mental files" on discourse referents. Indefinite descriptions are conventionally used to open a new file card, while the definites are conventionally used to update a familiar, pre-existing file card. The uniqueness implication is derived from the hearer's reasoning about the speaker's choice. By using a definite, the speaker signals that the referent should be familiar. In many contexts, the only way for the hearer to unambiguously identify a familiar file is if there is only one such file that fits the description, leading to a pragmatic inference of uniqueness.

Ludlow & Segal (2004) also propose a single existential semantic meaning for both articles, tracing the differences between them to a similar source. Their explanation for the difference relies on a distinction within Gricean pragmatics. They argue that definites and indefinites have the same truth-conditional meaning but differ in their *conventional implicatures*. Definites carry a conventional implicature that the individual they introduce is "given" in the context, while indefinites conventionally-implicate that it is "new". The uniqueness inference associated with definites is then derived as a conversational implicature. A hearer, recognizing the speaker's use of an expression signaling "givenness", reasons that the speaker must believe there is a unique, identifiable referent that the hearer can pick out, otherwise the choice of 'the' would violate conversational maxims of clarity and relevance.

I will adopt the idea that definites and indefinites assert the same meaning. However, I would like to argue that there is no need to turn to ad-hoc mechanisms to explain the different inferences given rise to by each form – this difference can be cashed out as a result of the structure of indefinites I have argued for in chapter 1, and specifically from the presence of PEX inside the NP.

3.1.4 A look ahead

My main argument in this chapter is that definite descriptions have essentially the same internal structure as indefinite descriptions. They differ from each other only in the scalar implicatures they give rise to. This difference, in turn, follows from different focus placement corresponding to each form. In essence – definite descriptions are the spell out of NPs in which the internal trace is focused. I will show that this analysis immediately accounts for the homogeneity effects in definite plurals, while also allowing us to explain a puzzle involving singular definites, pointed out by Percus (2006). Furthermore, it helps explaining a family of cases in which definite descriptions seem to have the semantics of indefinites, identified by Coppock & Beaver (2012) and Sharvit (2015).

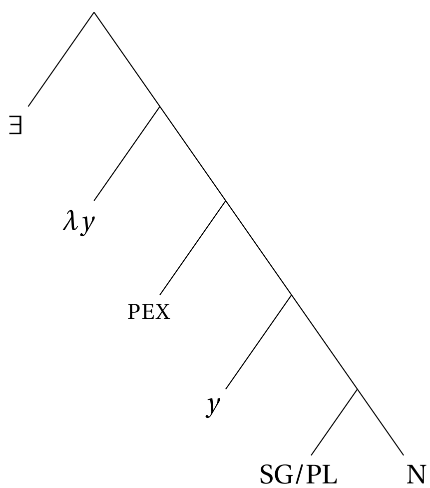
The rest of this chapter is structure as follows. In section 2, I lay out my proposed analysis of definites and discuss some of its implications for their semantics. In section 3, I present some of its predictions, arguing that it provides us with the tools to tackle some persistent problems in the study of definiteness. I conclude in section 4.

3.2 Proposal: definiteness as a scalar implicature

3.2.1 Recap: anatomy of a plural indefinite

In chapter 1, I have argued for an analysis of indefinites like *a book* and *books* as bare NPs which get existentially closed at LF. To explain the multiplicity inferences given rise to by plural indefinites, I have followed Zweig (2009) in arguing that a local SI is triggered inside the NP. As opposed to Zweig, however, I have posited that indefinites contain a local instance of the operator PEX, which generates SIs as presuppositions (Bassi et al., 2021). This is given in (9) below. Importantly, the internal structure of indefinites contains a trace, presumably created by movement of the existential operator, which then gets abstracted over. This in turn creates a t-type node within the NP, to which PEX can apply. The meaning of PEX is given in (10)-(11).

(9) Structure of an indefinite N:



(10) $[\![\text{PEX}\ \phi]\!] =$

a. $= \begin{cases} \textbf{prs:} & [\![\phi]\!] \rightarrow \bigwedge\{\neg[\![\psi]\!] \mid \psi \in IE(\phi, \text{ALT}(\phi))\} \\ \textbf{asr:} & [\![\phi]\!] \end{cases}$

b. $= \begin{cases} 1 & \text{if } [\![\phi]\!] = 1 \bigwedge\{[\![\psi]\!] = 0 \mid \psi \in IE(\phi, \text{ALT}(\phi))\} \\ 0 & \text{if } [\![\phi]\!] = 0 \\ \# & \text{otherwise} \end{cases}$

(Bassi et al., 2021)

(11) $IE(\phi, C) = \bigcap\{C' \subseteq C |\ C'$ is a maximal subset of C s.t. $\{\neg[\![\psi]\!] |\ \psi \in C'\} \cup \{[\![\phi]\!]\}$ is consistent$\}$

(Fox, 2007)

PEX essentially takes the set of alternatives of its prejacent and presupposes the negation of all the alternatives that can be negated consistently and without arbitrary choices. But how is the set of alternatives determined? This issue that will play an important role in my account. I have adopted the notion of *structural alternatives* (Katzir, 2007; Fox & Katzir, 2011) – a theory by which the set of alternatives of a given constituent is generated by replacement and deletion of focused nodes in its structure. The formal definitions, adapted from Fox & Katzir (2011) and slightly simplified for clarity, are given in (12)-(13) below. Notice that the placement of focus plays a crucial role in determining the set of alternatives to a given constituent, which in turn affects the SIs generated by PEX.

(12) $\psi \preccurlyeq \phi$ if ψ can be derived from ϕ by successive replacement of subconstituents of ψ with elements from the lexicon.

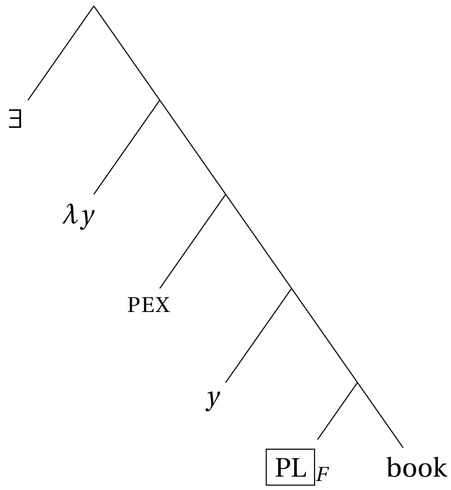
(13) $\text{ALT}(\phi) = \{\psi|\psi$ is derived from ϕ by replacing focused constituents $x_1, ..., x_n$ with $y_1, ..., y_n$, where $x_1 \preccurlyeq y_1, ..., x_n \preccurlyeq y_n\}$

(Fox & Katzir, 2011)

Let us see how this works for the case of sentences containing indefinites. The kind of LF I have assumed for plural indefinites is demonstrated in (14) below. Importantly, I have assumed that the plural number head is focused. Given that in English, every NP in argument position must be either singular- or plural-marked, the only alternative of the local PEX's prejacent is the same structure, with the plural substituted by a singular head, as shown in (15).[4] This, in turn, gives rise to the strengthened semantics in (16) for the constituent c-commanded by PEX, which presupposes that its singular alternative is false.

(14) books

[4]As discussed in chapter 1, the question of whether the noun *book* is focused as well is beside the point for our current discussion, which is the triggering of multiplicity. An exclusive inference with respect to alternatives in which *book* is replaced with other nouns seems to be available but not obligatory. The part of this analysis I would like to emphasize is that the trace y is crucially not focused.



(15) $\text{ALT}([y\ [\text{PL}_F\ \text{book}]) = \{[y\ [\text{SG book}]\}$

(16) $[\![\text{PEX}\ [y\ [\text{PL}_F\ \text{book}]]\!] =$

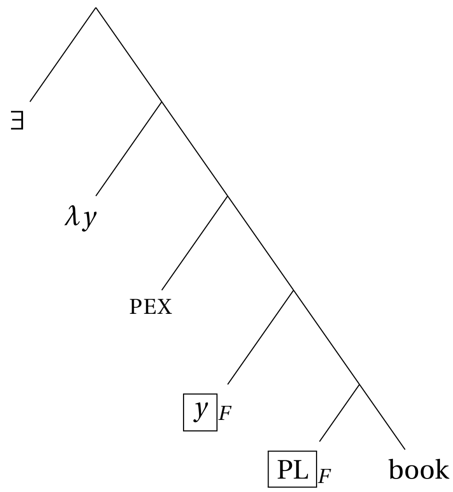
a. $= \begin{cases} \textbf{prs:} & \neg[[\![y]\!] \in [\![\text{*book}]\!] \wedge \text{ATOM}([\![y]\!])] \\ \textbf{asr:} & [\![y]\!] \in [\![\text{*book}]\!] \end{cases}$

b. $= \begin{cases} 1 & \text{if } [\![y]\!] \in [\![\text{*book}]\!] \wedge \neg\text{ATOM}([\![y]\!]) \\ 0 & \text{if } [\![y]\!] \notin [\![\text{*book}]\!] \\ \# & \text{otherwise} \end{cases}$

3.2.2 Explaining plural definites

I propose that a definite description like *the books* has exactly the same structure as the indefinite *books*. The difference between them is that in *the books*, the trace y is focused in addition to the number head, as demonstrated in (17) below. This, in my analysis, is the defining property of definites – they are the spell out of existential DPs in which the internal trace is focused. This is sketched out in (18) below. It follows immediately that the core semantics (namely the meaning we would get if we removed all instantiations of PEX) of definites and indefinites is equivalent. The only difference between them relates to the effect of PEX, namely to the SIs they give rise to. What is the influence of focusing the trace on the triggered SIs?

(17) the books



(18) **Spell out rule for existential DPs:**

a. If the trace inside the NP is focused, the DP is spelled out as definite

b. Otherwise, it is spelled out as indefinite.

The first question we need to answer to determine the prediction of the analysis above for the semantics of definites is – what are the alternatives of PEX's prejacent in the LF in (17)? While in the indefinite case we only had one focused constituent – the number head – we now have additionally a focused trace. That means that our alternatives are now generated by substituting both the number head and the trace with any lexeme that would yield a grammatical structure. In the case of the plural number head, this is still only its singular correlate; in the case of the trace, however, we can substitute it with any type e expression whose structure is at most as complex as the trace's. Understanding which expressions have this property and how they interact with PEX demands some further assumptions. I will make the following: (i) pronouns are at most as complex as traces; (ii) the meaning of pronouns in the structure of an alternative is computed relative to the same assignment function as the original expression; (iii) assignment functions are always surjective – given an assignment g and an individual a, there exists a pronoun x such that $g(x) = a$.[5] The combination of these assumption gives rise to the alternative set given in (19) below. It contains, in addition to the singular alternative we have seen in the case of the indefinite, all LFs in which the trace is replaced by an expression denoting an individual in our domain, and all LFs in which both the trace and the number head are substituted.

[5] Danny Fox (p.c.), cites Kai von Fintel (p.c.) as pointing out the following problem. The assumption that pronouns can serve as alternative might be problematic given the existence of propositional pronouns – if we allowed propositional pronouns to be counted as alternatives to the entire prejacent of PEX, the structural notion of alternatives would be voided, as any possible proposition would have to be considered for the purposes of SI generation. I leave this issue for future research.

(19) $\text{ALT}([y_F\ [\text{PL}_F\ \text{book}]) = \{[y\ [\text{SG book}]\} \cup \{[x\ [\text{PL book}]|\ x \in *D_e\} \cup \{[x\ [\text{SG book}]|\ x \in *D_e\}$

The next question we ask is – which of these alternatives are innocently excludable, in the sense defined in (11) above (adopted from Fox 2007). Let us begin by focusing on alternatives of the form $[x$ [PL book]], where $[\![x]\!] \in *D_e$. Recall that an alternative is innocently excludable if its negation is in every maximal subset of alternatives which is consistent with the meaning of the prejacent, in our case $[\![y]\!] \in [\![\text{PL book}]\!]$. If $[\![x]\!] = [\![y]\!]$, the negation of $[\![x\ [\text{PL book}]]\!]$ is obviously not consistent with the prejacent, as it is simply its negation. The same is true for any x whose reference overlaps with y's, meaning $[\![x]\!] \sqcap [\![y]\!] \neq \emptyset$. That is because given that *book.PL* is closed under sum-formation, the proposition that $[\![x]\!]$ is in not the extension of *book.PL* entails that none of the atoms in $[\![x]\!]$ are in the extension of *book.PL*; given that it is a distributive predicate, the proposition that y is in the extension of *book.PL* entails that all of its atoms are. If there exists an individual a s.t. $[\![x]\!] \sqcap [\![x]\!] = a$, the combination of these two propositions are inevitably inconsistent – it demands that a both be and not be in the extension of *book.PL*.[6] We are therefore left with alternatives of the form $[x$ [PL book]], where $[\![x]\!] \sqcap [\![y]\!] = \emptyset$. As we will see, these are all innocently excludable.

Notice that the same is true for the singular alternatives. Given an alternative of the form $[x$ [SG book]] where $[\![x]\!] \sqcap [\![y]\!] \neq \emptyset$, the negation of $[\![x\ [\text{SG book}]]\!]$ is inconsistent with $[\![y\ [\text{PL book}]]\!]$. We can therefore filter out all alternatives of this sort as well. Now, I argue that the resulting subset of alternatives is the only maximal subset which is consistent with $[\![y\ [\text{PL book}]]\!]$; this would mean that it is exactly the set of innocently excludable alternatives. This claim is stated in (20) below. To show that, we need to prove two claims: (i) that this subset is consistent with $[\![y\ [\text{PL book}]]\!]$, and (ii) that no other maximal subset is consistent with $[\![y\ [\text{PL book}]]\!]$. The claim in (ii) is trivial – we have just seen that the negation of each of the alternatives not included in the subset in (20) is by itself inconsistent with $[\![y\ [\text{PL book}]]\!]$; since inconsistency is an upward monotone property, it follows that any subset of alternatives which contains elements that are not in the subset in (20) is inconsistent with $[\![y\ [\text{PL book}]]\!]$.

(20) $IE([y_F\ [\text{PL}_F\ \text{book}]], \text{ALT}([y_F\ [\text{PL}_F\ \text{book}]) =$

$= \{[y\ [\text{SG book}]\} \cup \{[x\ [\text{PL book}]|\ [\![x]\!] \in *D_e \wedge [\![x]\!] \sqcap [\![y]\!] = \emptyset\} \cup \{[x\ [\text{SG book}]|\ [\![x]\!] \in *D_e \wedge [\![x]\!] \sqcap [\![y]\!] =$

[6] This raises the question of whether the algorithm for determining the set of innocently excludable alternatives takes into consideration properties like closure under sum-formation and distributivity. Magri (2009) has argued for a theory of innocent exclusion according to which only logical properties of alternatives are considered for the purposes of SI generation, while this mechanism is blind to context-dependent properties. If Magri is right, that would mean I have to commit to a view of these properties as part of the logical structure of nouns like *book.PL*.

$\varnothing\}$

To prove the claim in (i), it is enough to show that there exists a world in which $[\![y \text{ [PL book]}]\!]$ is true, and in which each alternative in (20) is false. Consider a world w in which there are multiple books, and y is the sum of all books. For concreteness, imagine that the domain contains three books – a, b, c, with $[\![y]\!] = a \oplus b \oplus c$. First, notice that since singular nouns contain only atomic individuals in their extension, it holds that $[\![y]\!] \notin [\![\text{book.SG}]\!]$; in other words, the alternative $[y$ [SG book] is indeed false in w. Second, let there be an alternative of the form $[x$ [PL book]], where $[\![x]\!] \sqcap [\![y]\!] = \varnothing$. Since y contains all books in the domain, the assumption that it has no overlap with x means that x cannot refer to a book or a sum of books, namely $x \notin [\![\text{book.PL}]\!]$; this means that our alternative is also false in w. Finally, let there be an alternative of the form $[x$ [SG book]], where $[\![x]\!] \sqcap [\![y]\!] = \varnothing$. By the same reasoning as the previous case, x cannot refer to a book (since our alternative is singular, we can consider only atomic books), and the alternative is therefore necessarily false in w. We conclude that w satisfies both $[\![y \text{ [PL book]}]\!]$ and the negation of all alternatives in our subset. The statement in (20) is therefore true.

We can now finally derive the meaning of the entire constituent headed by PEX. It is the result of adding the negation of all innocently excludable alternatives as a presupposition to the meaning of the prejacent (or more accurately – presupposing that if the prejacent is true, then all innocently excludable alternatives are false). It is given in (21) below.

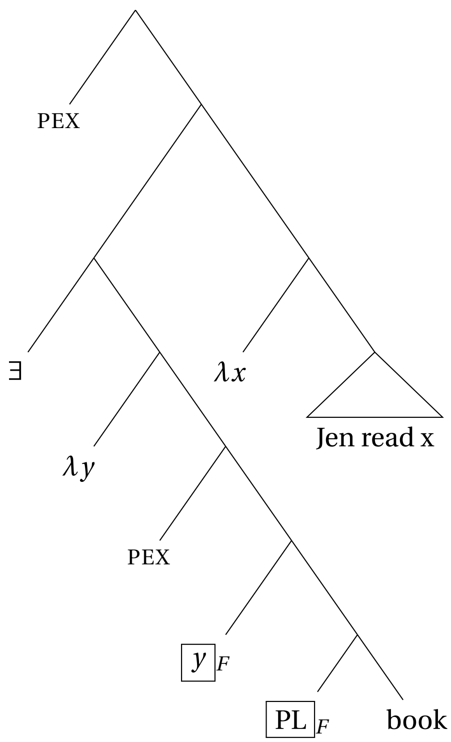
(21) $[\![\text{pex } [\text{y}_F \text{ [book PL}_F]]]\!] =$

a. $= \begin{cases} \textbf{prs:} \quad [\![y]\!] \in [\![\text{*book}]\!] \rightarrow [\neg\textsc{atom}([\![y]\!]) \wedge \forall a \in *D_e\ [a \sqcap [\![y]\!] = \varnothing \rightarrow a \not\in [\![\text{*book}]\!]]] \\ \textbf{asr:} \quad [\![y]\!] \in [\![\text{*book}]\!] \end{cases}$

b. $= \begin{cases} 1 \quad \text{if } [\![y]\!] \in \text{*book} \wedge \neg\textsc{atom}([\![y]\!]) \wedge \forall a \in *D_e\ [a \sqcap [\![y]\!] = \varnothing \rightarrow a \not\in [\![\text{*book}]\!]] \\ 0 \quad \text{if } [\![y]\!] \notin [\![\text{*book}]\!] \\ \# \quad \text{otherwise} \end{cases}$

This, in turn, allows us to derive the meaning of an entire sentence containing a plural definites. Consider, for example, the sentence *Jen read the books.* Its LF is given in (22) below. Given that the presupposition described above is triggered locally in the restrictor of an existential quantifier, the meaning of the entire sentence depends on our assumptions regarding the projection of presuppositions from that environment. In chapter 1, I have assumed the theory of projection conventionally dubbed *Strong Kleene* (George, 2008; Fox, 2013), arguing that it allows us to explain some notable patterns involving indefinites. It would therefore be desirable if we could derive the right meaning for definites using the same theory. To do that, let us repeat the projection pattern predicted by Strong Kleene for sentences of this form. This is given in (23) below.

(22) Jen read the books



(23) **SK projection from the restrictor of an existential quantifier:**

A sentence of the form $\exists x[p_\pi(x) \wedge q(x)]$ presupposes:

$\exists x[p_\pi(x) = 1 \wedge q(x) = 1] \vee \forall x[q(x) = 1 \rightarrow p_\pi(x) = 0]$

Applying the projection pattern in (23) above to the meaning derived in (24), we get the meaning in (24) for the entire sentence. It is true if there exists a non-atomic sum of books that Jen read s.t. any other sum of books (atomic or non-atomic) overlaps with it, false if Jen read no books at all, and undefined otherwise. Notice that given a sum of books a, any other sum of books overlaps with it if and only if a is the maximal element in ⟦*book⟧. To see why, let us assume by contradiction that a is not the maximal element in ⟦*book⟧, namely there exists $b \in$ ⟦*book⟧ s.t. $b \not\sqsubseteq a$. That means that there exists $c \in$ ⟦*book⟧

s.t. $c \sqsubseteq b$ and $c \sqcap a = \emptyset$. This directly contradicts our assumption that any other sum of books overlaps with a. We can therefore rephrase the truth conditions given below as demanding that there be multiple books in the domain and that Jen read the maximal book-sum for the sentence to be true.

(24) $[\![(22)]\!] =$

a. $$= \begin{cases} \textbf{prs:} \quad \exists a\,[a \in [\![\text{*book}]\!] \wedge \neg\textsc{atom}(a) \wedge \forall b \in *D_e\,[b \sqcap a = \emptyset \rightarrow b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ \qquad\quad \vee\, \forall c \in *D_e\;[\text{Jen read } c \rightarrow c \notin [\![\text{*book}]\!]] \\ \textbf{asr:} \quad \exists a\,[a \in [\![\text{*book}]\!] \wedge \text{Jen read } a] \end{cases}$$

b. $$= \begin{cases} 1 \quad \text{if } \exists a\,[a \in [\![\text{*book}]\!] \wedge \neg\textsc{atom}(a) \wedge \forall b \in *D_e\,[b \sqcap a = \emptyset \rightarrow b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ 0 \quad \text{if } \forall c \in *D_e\,[\text{Jen read } c \rightarrow c \notin [\![\text{*book}]\!]] \\ \# \quad \text{otherwise} \end{cases}$$

It is now easy to see how these truth conditions explain the inferences we draw from simple sentences containing plural definites, repeated below in (25). The existence inference follows from the claim that there exists $a \in [\![\text{*book}]\!]$; the anti-uniqueness inference stems from the claim that a is not atomic; and finally, the predicational inference is the result of the claim that Jen read a, combined with the fact that *read* is a distributive predicate. The analysis laid out above therefore fairs as well as Sharvy's standard analysis in the simple cases. Recall that the negated case, and specifically the *homogeneity effect* it gives rise to, has proven to be a challenge for Sharvy's analysis.

(25) Jen read the books.

a. **Existence inference:** the extension of *books* is not empty.

b. **Anti-uniqueness inference:** the extension of *books* contains more than one individual.

c. **Predicational inference:** Every element in the extension of *books* is such that Jen read it.

Interestingly, the predicational inference of the negated sentence, which was the problematic part for the standard analysis, follows immediately in my analysis from the truth conditions in (24). Assuming that the presupposition of the affirmative sentence simply projects from under negation, we get the truth conditions in (27). Crucially, we predict the negated sentence to be true if and only if Jen read no books, which is exactly the reported predicational inference. Explaining the existence and anti-uniqueness inferences, however, is more involved, as they do not follow directly from the conditions under which the sentence is true. I will argue in section 2.4 that they are the result of considerations involved in the accommodation of the sentence's presupposition. But first, let us turn to the case of singular definites.

(26) Jen didn't read the books.

a. **Existence inference:** the extension of *books* is not empty.

b. **Anti-uniqueness inference:** the extension of *books* contains more than one individual.

c. **Predicational inference:** No element in the extension of *books* is such that Jen read it.

(27) $[\![(26)]\!] =$

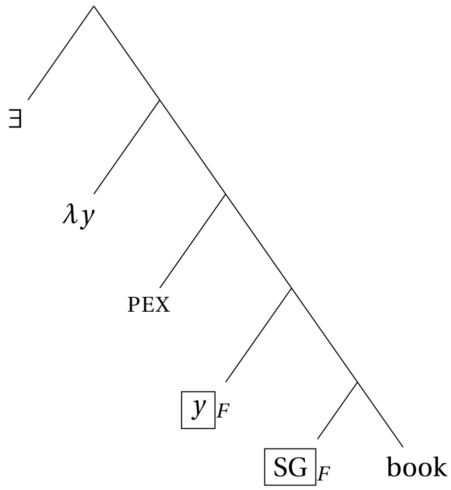
a. $$= \begin{cases} \textbf{prs:} \quad \exists a\, [a \in [\![\text{*book}]\!] \wedge \neg\text{ATOM}(a) \wedge \forall b \in *D_e\, [b \sqcap a = \emptyset \rightarrow b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ \qquad\quad \vee\ \forall c\, [\text{Jen read } c \rightarrow c \notin [\![\text{*book}]\!]] \\ \textbf{asr:} \quad \forall c\, [\text{Jen read } c \rightarrow c \notin [\![\text{*book}]\!]] \end{cases}$$

b. $$= \begin{cases} 1 & \text{if } \forall c\, [\text{Jen read } c \rightarrow c \notin [\![\text{*book}]\!]] \\ 0 & \text{if } \exists a\, [[\![a]\!] \in [\![\text{*book}]\!] \wedge \neg\text{ATOM}(a) \wedge \forall b \in *D_e\, [b \sqcap a = \emptyset \rightarrow b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ \# & \text{otherwise} \end{cases}$$

3.2.3 Explaining singular definites

Let us come back now to where we started – the case of sentences containing singular definites. My treatment of this case will be very much along the lines of the case if plural definites discussed above. The difference in the inferences we draw from singular definites will accordingly follow from the general semantic difference between plural and singular nouns, and specifically the atomicity requirement that the singular feature imposes. The basic structure of a singular definite is demonstrated in (28) below. Again, the defining feature of definites, and what sets *the book* apart from *a book*, is the focus placement, and specifically the focus on the NP-internal trace.

(28) the book



Similarly to the plural case, the additional focused element expands the set of formal alternatives to the prejacent of PEX, which in turn strengthens the presupposition triggered by PEX. This expanded alternative set is given in (29) below. It contains an alternative in which the singular head is substituted by a plural head, as in the case of singular indefinites, but it now additionally contains alternatives in which the trace y is replaced by any other pronoun. Which of these alternatives is innocently excludable? The plural alternative [y [PL book] cannot be innocently excluded – it expresses a proposition weaker than that expressed by the prejacent, and therefore negating it would give rise to contradiction. The same is true for any plural alternative in which y is replaced by a pronoun referring to a sum of individuals which contains $[\![y]\!]$ (we assume that $[\![y]\!]$ is atomic, as entailed by the meaning of the prejacent). That is because negating that a certain sum of individuals is in the extension of *book.PL* entails that none of their atomic parts is in the extension of *book.SG*. We are left with the subset given in (30) below.

(29) $\text{ALT}([y_F\ [\text{PL}_F\ \text{book}]) = \{[y\ [\text{PL book}]]\} \cup \{[x\ [\text{PL book}]|\ [\![x]\!] \in *D_e\} \cup \{[x\ [\text{SG book}]|\ [\![x]\!] \in *D_e\}$

(30) $IE([y\ [\text{SG book}]], \text{ALT}([y_F\ [\text{SG}_F\ \text{book}]) =$

$= \{[x\ [\text{SG book}]]|\ [\![x]\!] \in *D_e \wedge [\![x]\!] \neq [\![y]\!]\} \cup \{[x\ [\text{PL book}]]|\ [\![x]\!] \in *D_e \wedge [\![y]\!] \not\sqsubseteq [\![x]\!]\}$

To see that all alternatives in this subset are indeed innocently excludable, let us describe a world which satisfies both the prejacent and the negation of each alternative in the subset in (30). Imagine a world w in which $[\![y]\!]$ is the only book on our domain. Given an alternative of the form [x [SG book]], where $[\![x]\!] \neq [\![y]\!]$, its negation, stating that x is not a book, is inevitably true in w by our assumption that there are no books other than $[\![y]\!]$. Alternatives of the form [x [PL book]], where $[\![y]\!] \not\sqsubseteq [\![x]\!]$, are true in w for the same reason – since $[\![y]\!] \not\leq [\![x]\!]$ entails that $[\![x]\!] \neq [\![y]\!]$, and since only y is in the extension of *book.PL* (given our assumption that there is only one book in the domain in w, *book.SG* and *book.PL* denote the same set), the negation of these alternatives is also satisfied in w. We conclude that the subset in (30) is indeed the set of innocently excludable alternatives. The semantic that this conclusion yields for the constituent [PEX [y [SG book]]] is given in (31) below. In addition to the assertion that $[\![y]\!]$ is an atomic book, we now presuppose that if $[\![y]\!]$ is a book then it is the only book.

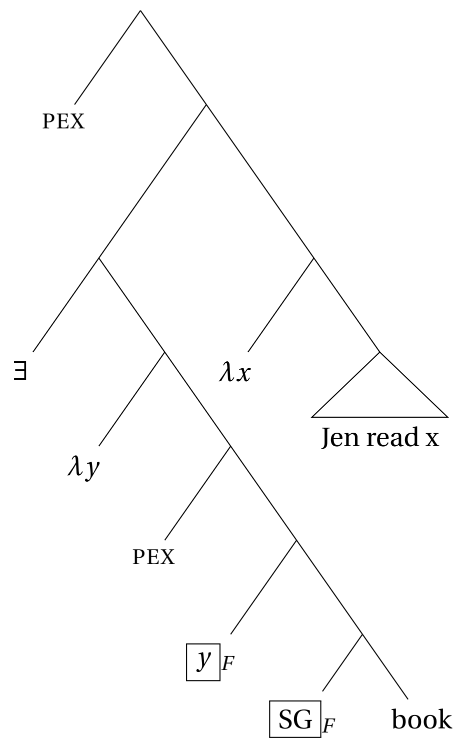
(31) $[\![\text{pex } [\text{y}_F \text{ [book SG}_F]]]\!] =$

a. $$= \begin{cases} \textbf{prs:} & ([\![y]\!] \in [\![\text{book}]\!] \wedge \textsc{atom}([\![y]\!])) \rightarrow [\forall a \in *D_e\ [[\![y]\!] \not\leq a \rightarrow a \notin [\![\text{*book}]\!]] \\ \textbf{asr:} & [\![y]\!] \in [\![\text{book}]\!] \wedge \textsc{atom}([\![y]\!]) \end{cases}$$

b. $$= \begin{cases} 1 & \text{if } [\![y]\!] \in [\![\text{book}]\!] \wedge \textsc{atom}([\![y]\!]) \wedge \forall a \in *D_e\ [[\![y]\!] \not\leq a \rightarrow a \notin [\![\text{book}]\!]] \\ 0 & \text{if } [\![y]\!] \notin [\![\text{book}]\!] \wedge \textsc{atom}([\![y]\!]) \\ \# & \text{otherwise} \end{cases}$$

We can now derive the truth conditions of a sentence like *Jen read the book*, whose LF is give in (32) below. As in the case of plural definites, we can simply apply the Strong Kleene paradigm of presupposition projection from the restrictor of an existential quantifier, repeated below in (33), to the meaning we have derived in (31). This gives rise to the truth conditions given in (34) below. They state that the sentence *Jen read the books* is true if and only if there exists a book such that there is no other book in the domain, and Jen read it; it is false if and only if Jen did not read any book; it is undefined otherwise.

(32) Jen read the book



(33) **SK projection from the restrictor of an existential quantifier:**

A sentence of the form $\exists x[p_\pi(x) \wedge q(x)]$ presupposes:

$\exists x[p_\pi(x) = 1 \wedge q(x) = 1] \vee \forall x[q(x) = 1 \rightarrow p_\pi(x) = 0]$

(34) $[\![(32)]\!] =$

a. $$= \begin{cases} \textbf{prs:} & \exists a\ [a \in [\![\text{book}]\!] \wedge \textsc{atom}(a) \wedge \forall b \in *D_e\ [a \not\subseteq b \rightarrow x \notin [\![\text{book}]\!]] \wedge \text{Jen read } a] \\ & \quad \vee \forall c\ [\text{Jen read } c \rightarrow \neg(c \in [\![\text{book}]\!] \wedge \textsc{atom}(c))] \\ \textbf{asr:} & \exists a\ [a \in [\![\text{book}]\!] \wedge \textsc{atom}(a) \wedge \text{Jen read } a] \end{cases}$$

b. $$= \begin{cases} 1 & \text{if } \exists a\ [a \in [\![\text{book}]\!] \wedge \textsc{atom}(a) \wedge \forall b \in *D_e\ [a \not\subseteq b \rightarrow b \notin [\![\text{book}]\!]] \wedge \text{Jen read } a] \\ 0 & \text{if } \forall c\ [\text{Jen read } c \rightarrow \neg(c \in [\![\text{book}]\!] \wedge \textsc{atom}(c))] \\ \# & \text{otherwise} \end{cases}$$

Let us now see how the truth conditions in (34) above can account for the inferences we draw from sentences containing singular definites. They are repeated in (35) below. Similarly to the case of plural definites, they all follow directly from the conditions under which the sentence is true: the existence inference follows from the demand that there exist a book, the uniqueness inference follows from the demand that there be no other book in the domain, and the predicational inference follows from the demand that Jen read that book. We can now see that the effect of the interaction between the presuppositional exhaustification and the focused trace mimics the semantics of Sharvy's maximality operator – it requires there to be a single individual in the extension of the noun which contains all other individuals in it, which in the case of singular nouns translates to a uniqueness requirement. However, as in the case of plural definites, the presupposition we eventually derive is weaker than that traditionally assumed, since it is conditionalized on the proposition that Jen read a book.

(35) Jen read the book.

a. **Existence inference:** the extension of *book* is not empty.

b. **Uniqueness inference:** the extension of *book* contains at most one individual.

c. **Predicational inference:** that individual is such that Jen read it.

3.3 Predictions

3.3.1 The projection of definiteness

So far, we have seen how the assumption that definites are simply NPs in which the internal trace is focused allows us to derive the inferences we draw from them in simplex sentences. We have also seen that the *homogeneity* pattern displayed by plural definites under negation follows from that assumption as well. Both of these results follow from the meaning we have ascribed for definites, which, as in the case of indefinites, involves existential quantification, but one top of that bear what may be described as conditional-maximality presupposition. A general statement of this presupposition is given in (36) below. It is useful to divide it into two cases – singular and plural. In the singular case, given in (36-a), my predicted presupposition conveys that if there exists and individual in the extension of the noun which satisfies the predicate, then the existence and uniqueness inferences are true as well. In the plural case, given in (36-b), my predicted presupposition conveys that if there exists any individual in the extension of the noun which satisfies the predicate, then all three of the existence, uniqueness and predicational inferences are true. These presuppositions are obviously different from the ones predicted by Sharvy's standard account.

(36) **Presupposition of a sentence of the form *the N P*, as predicted by my account:**

a. **Singular noun:** $[\![N]\!] \cap [\![P]\!] \neq \emptyset \rightarrow |[\![N]\!]| = 1$

b. **Plural noun:** $[\![N]\!] \cap [\![P]\!] \neq \emptyset \rightarrow (|[\![N]\!]| > 1 \wedge [\![N]\!] \subseteq [\![P]\!])$

(37) **Presupposition of a sentence of the form *the N P*, as predicted by Sharvy's account:**

a. **Singular noun:** $|[\![N]\!]| = 1$

b. **Plural noun:** $|[\![N]\!]| \geq 1$

We have seen in the previous section that in simplex sentences, both accounts predict the same inferences to arise. That is because, although they predict a different division of labor between presupposition and assertion, the differences between the accounts are neutralized after collapsing presupposition and assertion. In other words, the two accounts predict simplex sentences to have the truth value 1 in the same conditions, and differ only when it comes to 0 and #. Under the assumption that our intuitive judgments are not sensitive to the difference between falsity and undefinedness, this means that simplex sentences cannot help us distinguish between the two accounts. However, as is standard practice in the literature on presuppositions, embedding our simplex examples in certain environments should allow us to tease apart the accounts.

The admittance conditions of negated sentences

Let us begin by the case of embedding under negation. By the standard account, negated singular sentences like *Jen didn't read the book* are predicted to be true if there exists a unique book, and Jen did not read it. The prediction of my account is given in (46) below. It posits weaker conditions for the sentence to be true – the only demand is that Jen did not read any books. Crucially, no information about the existence of books in the domain or their cardinality is conveyed. Does this mean that we should expect negated sentences like (46) to not give rise to any existence or uniqueness inference? Not quite. As pointed out by e.g. I. Heim (2006), Fox (2013), Mandelkern & Rothschild (2019), the inferences we draw from presuppositional sentences are sometimes stronger than their semantics demands, for reasons related to the nature of presupposition accommodation. I will address this issue in more detail by the end of this section. For now, in order to control for the noise stemming from accommodation, let us be more explicit about the common ground under which our examples are to be evaluated.

(38) [\![Jen didn't read the book]\!] =

$$\text{a.} \quad = \begin{cases} \textbf{prs:} \quad \exists y\, [y \in [\![\text{book}]\!] \wedge \text{ATOM}(y) \wedge \forall x \in {*D_e}\, [y \not\sqsubseteq x \rightarrow x \notin [\![\text{book}]\!]] \wedge \text{Jen read } y] \\ \qquad \vee\, \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \\ \textbf{asr:} \quad \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \end{cases}$$

$$\text{b.} \quad = \begin{cases} 1 \quad \text{if } \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \\ 0 \quad \text{if } \exists y\, [y \in [\![\text{book}]\!] \wedge \text{ATOM}(y) \wedge \forall x \in {*D_e}\, [y \not\sqsubseteq x \rightarrow x \notin [\![\text{book}]\!]] \wedge \text{Jen read } y] \\ \# \quad \text{otherwise} \end{cases}$$

The truth conditions in (46) provide us with a clear prediction regarding the admittance conditions of sentences like *Jen didn't read the book* – uttering them should be felicitous in any context that entails that if Jen read a book, then there exists only one book. Compare this to the prediction of the standard account, that this sentence could only be uttered felicitously if the context entails that there exists a unique book. Therefore, if we can construct a context such that it is common ground that if Jen read a book, then there exists only one book, but it is not common ground that there exists only one book, this context would tease apart the two accounts. My account predicts that the sentence should be judged felicitous in this context, while the standard account predicts infelicity, or at least a need to accommodate a stronger common ground. It is not easy, however, to establish a common ground in which the existence of a single book is somehow dependent on Jen reading it. To make the example more natural, let us therefore switch to a different sentence of the same form – a negated sentence with a singular definite in argument position. An attempt to construct this kind of a sentence, along with a context that is predicted by my account to admit it, is given in (39) below.

(39) **Context:** The Singleton Academy is an elementary school founded on the belief that having more than one kid is immoral and dangerous. Accordingly, the school accepts only children who do not have any siblings (or half-siblings). Beatriz, who has five children, finds this ideology offensive and refuses to befriend anyone who sends their kid to the Singleton Academy. She wonders whether to invite her new neighbor Jen, who she knows nothing about, to her birthday. She consults on this issue with her friend Matt, who knows more about Jen.

Matt: It's OK, Jen didn't send her kid to the Singleton Academy (because she has no kids / because she has multiple kids).

Let us see more closely how this example helps us tease apart the accounts. In Matt's sentence, the presence of the singular definite *her kid* is predicted by my account to trigger a presupposition that if Jen sent her kid to the Singleton Academy, then she has exactly one kid. This presupposition is satisfies by the given context, since we assume as common ground that the Singleton Academy only accepts only children. The standard account, on the other hand, predicts the sentence to presuppose simply that Jen has exactly one kid, which is not common ground in this context since Beatriz knows nothing about Jen. We therefore expect this sentence, under the standard analysis of definites, to be judged infelicitous, or at least give rise to the inference that Jen has exactly one kid (making the continuations in parentheses contradictory). The judgment is subtle, but Matt's utterance, including either of the continuations in parentheses, seem to me quite felicitous.

There is, however, a confound in this example – the availability of local accommodation. Local accommodation (I. R. Heim, 1982; **?**) is the process by which an embedded presupposition is treated by the compositional system as if it was asserted content. An example of this process is given in (40). Assuming that *Matt is aware that Celtics won* presupposes that the Celtics won, we expect this presupposition to project from under negation. However, it seems felicitous to deny that the Celtics won in the same breath without giving rise to infelicity. This is presumably because of an available parse of (40) in which the presupposition of the embedded sentence is locally accommodated under the negation, giving rise to a sentence which is true if it is not the case that both the Celtics won and Matt believes that the they won, and false otherwise. A scenario in which the Celtics did not win therefore renders this parse true, thus licensing the following statement. The nature and mechanics of this process are still debated (see **?** for discussion on the different proposals), but for our purposes here, what matters is only its result.[7]

(40) Matt is not aware that the Celtics won, because they did not win.

In the case of our example in (39), a parse with local accommodation under negation would render the two accounts indistinguishable, as both predict the same truth conditions when collapsing presupposition and assertion; both would predict the sentence with this parse to be felicitous in the given context.

[7] Another proposal of the apparent cancellation of presuppositions under negation in certain cases is the idea of *metalinguistic negation*, first proposed by L. Horn (1989). For our purposes here, it is equivalent to local accommodation, and I will therefore not discuss it in detail.

For that reason, it is not clear whether such examples can really tease apart the accounts, and the answer seems to depend on our assumptions about local accommodation. Specifically, if we assume that local accommodation has some signature that can be detected by our linguistic intuitions, then it should presumably allow us to filter out parses with local accommodation. Since it is unclear to me whether that is the case, I will leave this strategy for future research.

Before moving on to other diagnostics, let us turn to look at the case of definite plurals. The truth conditions predicted by my account are given in (41) below. Crucially, it predicts negated sentences like *Jen didn't read the books* to be true if Jen did not read any book, similarly to the singular case. The standard account predicts a different condition – that there are multiple books, and Jen did not read all of them. We can therefore see an important aspect in which my account arguably fares better than the standard account – it straightforwardly predict the all-or-nothing homogeneity pattern discussed above. Under Sharvy's semantics, the predicational inference predicted is too strong, as it predicts the sentence to possibly be true even if Jen read some of the books. It therefore needs a supplementary mechanism to strengthen the predicational inference. Whether this is a welcome result or not depends on the question of how convincing the mechanisms proposed in the literature are (see Križ (2015), Križ & Spector (2021), Bar-Lev (2021) for prominent proposals).

(41) $[\![\text{Jen didn't read the books}]\!] =$

a. $$= \begin{cases} \textbf{prs:} \quad \exists a\, [a \in [\![\text{*book}]\!] \wedge \neg\textsc{atom}(a) \wedge \forall b \in *D_e\, [b \sqcap a = \emptyset \to b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ \qquad \vee \forall c\, [\text{Jen read } c \to c \notin [\![\text{*book}]\!]] \\ \textbf{asr:} \quad \forall c\, [\text{Jen read } c \to c \notin [\![\text{*book}]\!]] \end{cases}$$

b. $$= \begin{cases} 1 \quad \text{if } \forall c\, [\text{Jen read } c \to c \notin [\![\text{*book}]\!]] \\ 0 \quad \text{if } \exists a\, [[\![a]\!] \in [\![\text{*book}]\!] \wedge \neg\textsc{atom}(a) \wedge \forall b \in *D_e\, [b \sqcap a = \emptyset \to b \notin [\![\text{*book}]\!]] \wedge \text{Jen read } a] \\ \# \quad \text{otherwise} \end{cases}$$

Let us focus again on the presuppositions. Again, the two accounts differ in the kind of common ground that this sentence is predicted to demand in order to be admitted. Specifically, in a context where it is common ground that if Jen read any book then there are multiple books and she read all of them, but it is not common ground that there are multiple books, my account predicts the sentence to be admitted, while the standard account predicts it to demand accommodation. We can therefore construct an example similar to the one we constructed for (39). It is given in (42) below. Given the school's policy of only accepting kids who have siblings, and accepting them only together with all of their siblings, this context satisfies the presupposition predicted by my account that if Jen sent a kid of hers to the Fertile Soil Institute, then she has multiple kids and she sent them all. It does not satisfy, however, the presupposition predicted by the standard account that Jen simply has multiple kids, since Beatriz does not know anything about Jen. To the extent that Matt's utterance is felicitous, and to the extent that we can filter out a local accommodation reading, we can conclude that my account fares better on this point. The judgment again seems to me subtle but felicitous, as in the case of the singular sentence. But again, since controlling for local accommodation is not necessarily possible, I take this example to be inconclusive.

(42) **Context:** The Fertile Soil Institute is an elementary school founded on the belief that children can only be properly educated when they are surrounded by their siblings. Accordingly, the school accepts only children who have siblings, and demands that all siblings in the family go attend it. Beatriz, who has only one kid, finds this ideology offensive and refuses to befriend anyone who sends their kid to the Fertile Soil Institute. She wonders whether to invite her new neighbor Jen, who she knows nothing about, to her birthday. She consults on this issue with her friend Matt, who knows more about Jen.

Matt: It's OK, Jen didn't send her kids to the Fertile Soil Institute (because she has no kids / because she has only one kid).

Proviso strengthening

We have seen that trying to manipulate the common ground in order to test the admittance conditions, in a sense the most straightforward approach, runs into the problem of local accommodation. Can the strategy of testing the inference we draw from out-of-the-blue sentences deliver more conclusive results? The judgments do seem to me much clearer, and are summarized in (43)-(44) below. Importantly, the existence and uniqueness inferences in the case of the singular example, and the existence and anti-uniqueness in the case of the plural example, seem to project from under negation. Taken at face value, this seems like a bad prediction of my account, since neither of these inferences are part of the predicted truth condition of these sentences. I will argue, however, that there is another source that they may stem from.

(43) Jen didn't read the book.

a. **Existence inference:** the extension of *book* is not empty.

b. **Uniqueness inference:** the extension of *book* contains at most one individual.

c. **Predicational inference:** That individual is such that Jen did not read it.

(44) Jen didn't read the books.

a. **Existence inference:** the extension of *book* is not empty.

b. **Uniqueness inference:** the extension of *book* contains at most one individual.

c. **Predicational inference:** That individual is such that Jen did not read it.

Let us demonstrate this process with the plural sentence in (44). I assume a context in which the addressee is ignorant with respect to each component in our presupposition – they do not have any knowledge of the number of books in the domain, knowledge of Jen's book-reading, or knowledge of the connection between them. Given that the common ground, as it is defined by Stalnaker (1970), contains only information taken to be shared knowledge by all discourse participants, the presupposition of the sentence in (44) is not satisfied according to either of the accounts. In order for the sentence to satisfy Stalnaker's Bridge, we therefore need to evaluate it with respect to a different common ground, namely accommodate its presupposition. This process of accommodation has been a topic of debate since the first discussion of presupposition in the context of formal pragmatics (see Karttunen (1974); Lewis (1979); Soames (1982) for early discussions, and Von Fintel (2008) for a more recent survey). I will adopt here an approach proposed by Beaver (1999) and further developed by Fox (2013), according to which accommodation relies on the willingness of discourse participants to act as if certain pieces of information are common ground, even though they are not so in reality.

Going back to our example, the question at this point is – what kind of common ground can we accommodate to satisfy our presupposition? One possibility, of course, is to simply filter out worlds in which the presupposition does not hold, namely worlds in which there is only one book in the domain and Jen read it, and worlds in which Jen read some but not all books in the domain. But since the process of accommodation essentially means, under the Beaver/Fox view, pretending to be in a certain state of knowledge corresponding to a common ground that would satisfy the sentence's presupposition, the hypothetical source of this knowledge becomes relevant. In particular, a common ground which entails that either Jen read no books, or there are multiple books in the domain and Jen read them all, but does not entail any of these disjuncts, reflects a state of knowledge in which discourse participants believe that there is some causal dependency between the two disjuncts. Recall that in the school scenarios we considered above, the contexts were constructed especially to make this kind of causal connection plausible. But in our current example, and in out-of-the-blue context, it is hard to imagine how a dependency between Jen's reading of books and their existence in the domain could become common knowledge. We therefore need to consider accommodating a different common ground, one which would still admit the sentence's presupposition, but that would reflect a more plausible state of knowledge.

Beaver (1999) discusses the class of examples which constitute the pattern known as *proviso strengthening*. The details of the cases Beaver attempts to explain are irrelevant to our discussion here, but they importantly have two properties which are reminiscent of the case discussed above: (i) they carry a conditional presupposition of the form $p \rightarrow q$, and (ii) it is intuitively implausible for a speaker to believe that $p \rightarrow q$ without believing either that $\neg p$ or that q. Beaver argues that in this kind of cases, accommodating the presupposition by simply intersecting the context set with the proposition $p \rightarrow q$ is not plausible for the same reasons discussed above. To avoid the problem that these cases pose, Beaver argues, the addressee must accommodate a stronger presupposition than what is formally demanded by Stalnaker's Bridge; in many cases of this sort, this amounts to simply accommodating q.

The case of sentences like (44) discussed above, while slightly more complicated, can be viewed as a part of the process described by Beaver. We can think of the presupposition in (27) as the proposition $p \rightarrow q \wedge p \rightarrow r$, where p is the proposition that Jen read at least one book, q is the proposition that there exist multiple books in the domain, and r the proposition that Jen read all of them. Let us set r aside for the moment and focus on the conditional $p \rightarrow q$, namely the proposition that if Jen read at least one book then there exist multiple books in the domain. It is clear that intersecting our common ground with this proposition would result in an implausible state of knowledge – it is hard to imagine how one could believe that there exist multiple books in the domain if Jen read at least one book without believing either that she read no books or that there are multiple books in the domain. We are therefore forced to accommodate a stronger presupposition, which would constitute a more natural state of knowledge. Accommodating that Jen read no books would give rise to a common ground that entails that the sentence itself is false, and is therefore ruled out. It therefore seems that the only way out of this situation is to accommodate that there are multiple books in the domain. This, I argue, is the source of the existence and the anti-uniqueness inferences.

Turning back to the second conjunct in our presupposition – $p \rightarrow r$, which can be paraphrased as *Jen did not read only some of the books* – it intuitively corresponds to a more plausible state of knowledge. More importantly, as pointed out by Fox 2018, strengthening this presupposition as well would result in presupposing $q \wedge r$, namely that there are multiple books in the domain, and Jen read all of them. This is equivalent to the conditions under which the sentence is true, and therefore accommodating it would render the sentence trivial (see discussion in chapter 1 on Post-Accommodation Informativity). We are therefore prevented from making this kind of strengthening. The only stable point between accommodating an implausible state of knowledge and accommodating so much that the assertion does not contribute anything is, it seems, accommodation of the proposition $q \wedge (p \rightarrow r)$, namely that there exist multiple books, and that if Jen read any of them, she read all.

Let us now turn to the case of negated sentences containing singular definites. As stated in (45) below, the existence inference and the uniqueness inference seem to remain intact; the predicational inference, in comparison, flips, conveying now that Jen did not read the single book in the domain. Can we account for these inferences? Assuming that the presupposition triggered by PEX projects from under negation, we get the truth conditions in (46). This immediately accounts for the predicational inference – if Jen did not read any book, as is demanded by the conditions under which the negated sentence is true, then it follows that if there exists only one book, she did not read it. As in the previous case, the more difficult question is what gives rise to the other two inferences.

(45) Jen read the book.

a. **Existence inference:** the extension of *book* is not empty.

b. **Uniqueness inference:** the extension of *book* contains at most one individual.

c. **Predicational inference:** That individual is such that Jen did not read it.

(46) $[\![(35)]\!] =$

a. $= \begin{cases} \textbf{prs:} \quad \exists y\, [y \in [\![\text{book}]\!] \wedge \text{ATOM}(y) \wedge \forall x \in {*D_e}\, [y \not\sqsubseteq x \rightarrow x \notin [\![\text{book}]\!]] \wedge \text{Jen read } y] \\ \qquad \vee\, \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \\ \textbf{asr:} \quad \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \end{cases}$

b. $= \begin{cases} 1 & \text{if } \forall y\, [\text{Jen read } y \rightarrow \neg(y \in [\![\text{book}]\!] \wedge \text{ATOM}(y))] \\ 0 & \text{if } \exists y\, [y \in [\![\text{book}]\!] \wedge \text{ATOM}(y) \wedge \forall x \in {*D_e}\, [y \not\sqsubseteq x \rightarrow x \notin [\![\text{book}]\!]] \wedge \text{Jen read } y] \\ \# & \text{otherwise} \end{cases}$

I argue that proviso considerations of the sort discussed above (adopting Beaver's (1999) approach) are responsible for the existence and uniqueness inferences as well. Notice that the presupposition of the negated sentence, stated in (46) above, can be paraphrased as a conditional proposition: if Jen read any books, then there exists exactly one book in the domain. Uttered in a context in which we know nothing about the number of books in the domain, an addressee faces the question of what kind of common ground the speaker expects them to accommodate. Simply intersecting the context set with that presupposition would satisfy Stalnaker's Bridge, but would also lead to a common ground which entails that the number of books in the domain depends on Jen reading a book; this is arguably an implausible knowledge state. A more plausible proposition for the addressee to accommodate would be the consequent of the conditional presupposition of the sentence, namely that there is exactly one book in the domain. This explains why the existence and the uniqueness inferences arise even when embedded under negation.

Projection from non-monotonic environments

The general conclusion from our discussion on the case of negated sentences containing indefinites is that, contra to initial appearance, they cannot straightforwardly tease apart my proposed account of definites from the standard account of Sharvy. I would like to suggest another environment which does not suffer from the same confounds that plagued our previous attempts. That is the case of sentences embedded in non-monotonic environments, and specifically in the scope of the quantifier *exactly one*. Recall that in chapter 1, I have used this kind of environment to argue that indefinites give rise to a conditional presupposition. The same can be done, I will argue, with the case of definites. Consider the sentences in (47)-(48) below, which feature a sentence containing the definite *her book(s)* embedded under *Exactly one girl in my class.*

(47) Exactly one girl in my class sent me her book.

(48) Exactly one girl in my class sent me her books.

Before discussing our predictions for these sentences, let us flesh out some assumptions. As in the previous chapters, I assume the Strong Kleene theory of projection. In the case of projection from the non-monotonic environment in (48)-(47), the predicted projection is stated in (49) below. It is essentially a universal projection – for the presupposition of the entire sentence to be satisfied, each girl in my class should satisfy the presupposition of the embedded sentence.[8] Moreover, I assume that the semantics of *exactly one girl in my class* simply asserts that one girl in my class is such that the proposition expressed by the scope is true for her, and the rest are such that it is false.

(49) **Projection from the scope of *exactly one of girl in my class*:**
A sentence of the form [exactly one girl in my class λx [$\phi_\pi(x)$]] (where $[\![\phi]\!](x)$ presupposes $p(x)$) has the following presupposition: $\forall x$ [x is a girl in my class $\rightarrow p(x)$]

We can now derive the prediction of each of the accounts for the sentences in (48)-(47). The presupposition predicted for the simplex sentences in the scope of the quantifier by each account are repeated in (50) (51) below. Let us start with the singular case. Setting aside local accommodation for the moment, the standard account predicts that entire sentence should presuppose that each of the girls in my class has exactly one book, and assert that one of them sent it to me, and the rest did not. My account, on the other hand, predicts the sentence to presuppose that each girl in my class who sent me any books has exactly one book, and assert that one girl sent me a book and the rest did not. That means that for the sentence to be judged true, it needs to be the case that one girl in my class has exactly one book and sent it to me, and the rest did not send me any books; importantly, the number of books that the rest of the girls have is not indicated by the meaning of the sentence. It is therefore clear that my account predicts a strictly weaker inference from sentences like (48). There should therefore exist a scenario in which the sentence is predicted to be true by my analysis, but not by the standard account. Such a scenario is one in which one girl in my class has exactly one book and sent it to me, and the rest are such that some have

[8]As noted in chapter 1, the prediction is actually a bit more involved – the sentence is predicted to presuppose the following:

- $\forall x$ [x is a friend of mine $\rightarrow p(x)$] $\vee \exists_2 x$ [x is a friend of mine $\wedge p(x) \wedge \neg[\![\phi]\!](x)$]

Since for our purposes here we only care about the conditions under which the sentence is true, this presupposition can be thought of as equivalent to the simple universal one given in (49).

no books, some of exactly one, and some have multiple books, but none of them sent them to me. The sentence seems to me to be judged true in this scenario.

(50) **Presupposition of a sentence of the form *the N P*, as predicted by my account:**

a. **Singular noun:** $[\![N]\!] \cap [\![P]\!] \neq \emptyset \rightarrow |[\![N]\!]| = 1$

b. **Plural noun:** $[\![N]\!] \cap [\![P]\!] \neq \emptyset \rightarrow (|[\![N]\!]| > 1 \wedge [\![N]\!] \subseteq [\![P]\!])$

(51) **Presupposition of a sentence of the form *the N P*, as predicted by Sharvy's account:**

a. **Singular noun:** $|[\![N]\!]| = 1$

b. **Plural noun:** $|[\![N]\!]| \geq 1$

One may suspect, however, that local accommodation in the scope of the quantifier is at play here. As we have seen above, locally accommodating the presupposition of a sentence of the form *x sent her book* would yield, under both accounts, a sentence which is true if $[\![x]\!]$ has exactly one book and sent it to me, and false if she either have a different number of books or did not send me any books. It of course does not carry any presupposition. That means that assuming a parse where the presupposition of the scope if locally accommodated, the entire sentence in (48) is predicted by both accounts to be true if one girl in my class is such that she has exactly one book and sent it to me, and the rest either have a different number of books, or did not send my any books. Notice that this predicts a weaker inference even than what the one predicted by my account, let alone the standard account.

An example of a scenario in which this parse is predicted to be true while my account predicts the sentence without local accommodation to be false is the following: one girl in my class has exactly one book and sent it to me, another girl has three books and sent me all three of them, and the rest have no books. Interestingly, there does not seem to be a way to interpret the sentence in (48) to be judged true in this scenario. I take it as an indication that the process of local accommodation as described above is blocked for some reason. I will not attempt here to explain this, but just note that if the locally accommodated parse described above is indeed not available, this means that the confounding factor that made the negated cases inconclusive is no longer present in this case. We can therefore conclude that the prediction of my account for the sentence in (48) fits our intuitive judgments better than that of the standard account.[9]

[9] In Doron et al. (2025), we argue for a novel theory of local accommodation, in which for certain triggers, the presupposition

Let us now consider the plural sentence in (47). We can again compare the predictions of each of the accounts. The standard account predicts that the presupposition of the embedded sentence should be satisfied for each of the girls in my class. That means that the entire sentence is predicted to presuppose that every girl in my class has multiple books, and assert that one of them sent all of them, and the other sent none.[10] Compare that to my account, which predicts that the entire sentence should presuppose that each girl in my class who sent me any books has multiple books, and assert that one girl sent me all of her books and the rest sent none. Similarly to the singular case, this means that the sentence is predicted to be true if one girl in my class has multiple books and sent them to me, and the rest did not send me any books; again, the number of books that the rest of the girls have is not specified.

An example of a scenario which distinguishes the predictions of the two accounts is the following: one girl in my class has three books and sent me all three, and the rest are such that some have no books, some exactly one, and some multiple books, but none of them sent them to me. As in the previous case, the sentence in (47) seems to me to be true in this scenario, confirming the prediction of my account. We can again check whether local accommodation is possible by observing its predicted result. Locally accommodating a sentence of the form *x sent me her books* would yield a proposition which is true if $[\![x]\!]$ has multiple books and sent me all of them, and false otherwise. When put in the scope of the quantifier in (47), the resulting sentence is true if one girl has multiple books and sent me all of them, and the rest either do not have multiple books, or did not send all of them to me. This is satisfied, for example, in a scenario in which one girl has three books and sent them all to me, another girl has one book and sent it to me, and the rest have no books. This, again, does not seem like a possible reading of the sentence in (47), and we therefore conclude that local accommodation is ruled out in this case as well, for unknown reason.

3.3.2 A puzzling MP effect

Another area in which my account gives different predictions from the standard account relate to the generalization dubbed *Maximize Presupposition (MP)* (Heim, 1991) . This generalization, given in (52)

is not completely canceled, but conditionalized on the assertion. Interestingly, a combination of this view of local accommodation with the standard account of definites would predict exactly the presupposition I derive here from my analysis of definites. The sentences in (48)-(47) can be therefore taken not as evidence for my account of definites, but for our account of local accommodation. Teasing apart these two options is a task I leave for future research.

[10] To be as charitable as possible to the standard account, I assume that homogeneity projects from this environment, namely that a scenario in which some of the girls sent some but not all of their books is ruled out. This does not follow from Sharvy's analysis, but can presumably be derived from the same mechanism that gives rise to homogeneity in simple sentences.

below, can be thought of as stemming from a pragmatic pressure to presuppose as much as possible. It states that given two contextually-equivalent sentences, the one whose presupposition is stronger is preferred. It is demonstrated in (53) below. Given the assumption that it is common ground that there exists only one sun in the domain, MP can account for the infelicity of (53-b) in comparison to (53-a). Assuming, for simplicity, that the sentence in (53-a) has no presupposition, and assuming that the sentence in (53-b) presupposes that there is a unique sun in the domain, the two sentence are contextually equivalent; since (53-a) carry a stronger presupposition, and since it is satisfied in the context, (53-b) is rendered infelicitous.

(52) **Maximize Presupposition (MP)**:

A sentence ϕ presupposing p is infelicitous in a context c if there exists a sentence $\psi \in$ ALT(ϕ) presupposing q such that:

a. $[\![\phi]\!]$ and $[\![\psi]\!]$ are contextually equivalent.

_q$asymmetricallyentails$p

q$issatisfiedby$c

(53)b. a. The sun is shining.

b. #A sun is shining.

(Heim, 1991)

Of course, this example does not rule out my analysis of definites – even under the assumption that (53-a) presupposes that if there is a sun that shines then there is a unique sun in the domain, its presupposition is still stronger than that of (53-b) (trivially, since (53-b) presupposes nothing, except, sometimes, anti-multiplicity, as discussed in chapter 1, which is still weaker than the presupposition I predict for definites). However, under the assumption that MP is sensitive to the presupposition itself, and not to its intersection with the assertion or any proviso strengthening it undergoes, this allows us to construct examples that could tease apart the two analyses. Imagine a scenario in which the common ground admits my conditional presupposition, but not the standard, unconditional one. This would have been the case of the world was such that the the sun can either exist or not exist, but whenever it exists, it shines. The standard analysis would then predict that in this scenario, the indefinite sentence in (53-b) should be felicitous, since the uniqueness presupposition of the definite sentence in (53-a) is not met by the context. My analysis, on the other hand, would predict MP to block the sentence in (53-b).

As it turns out, the prediction of my analysis is borne out by an observation originally due to Percus (2006), developed in more detail by Anvari (2018). It is demonstrated in (54) below. Given our world knowledge that a chess game can either have a single winner or no winners at all, this example has exactly the property described above, which allows it to be used to tease apart the two analyses.

(54) **Context:** There are two possible outcomes in chess, checkmate (one winner) or draw (no winners).

I just saw two people playing chess...

a. The winner was Iranian.

b. #A winner was Iranian.

(Anvari, 2018)

To see that, compare the presupposition each analysis derives for the definite sentence in (54-a). The predictions are given in (55) below. The standard analysis ascribes it the presupposition that there exists a unique winner. Crucially, this presupposition does not hold in the context, since we know that the game could end without any winner. For that reason, we predict the indefinite sentence in (54-b) to be felicitous. In my analysis, on the other hand, the presupposition of the definite sentence in (54-a), stated in (55-b), is satisfied – if there exists an Iranian winner, or any kind of winner for that matter, it must be a unique winner. We therefore predict, given my analysis, that the indefinite in (54-b) should be infelicitous due to MP. I take the fact that it is indeed infelicitous as an advantage of my analysis over the standard one.

(55) The winner was Iranian.

a. **Presupposition predicted by standard account:** $|[\![\text{winner}]\!]| = 1$

b. **Presupposition predicted by my account:** $\exists x\ [x \in [\![\text{winner}]\!] \wedge x \in [\![\text{Iranian}]\!]] \rightarrow |[\![\text{winner}]\!]| = 1$

3.3.3 Definites without definiteness

My analysis of definites relies on the assumption that the definite article does not correspond to any semantically-contentful morpheme, but is simply a part of the spell out of NPs in which the internal trace is focused. This claim is repeated in (56) below. So far, I have discussed the effects of that focused placement when it interacts with a local instance of PEX. But we can also ask – is the same spell out rule active when it comes to other focus-sensitive operators? I argue that the answer is positive, and that it is evident from a puzzling observation made by Coppock & Beaver (2012) and Sharvit (2015).

(56) **Spell out rule for NPs:**

a. If the trace inside the NP is focused, the DP is spelled out as definite

b. Otherwise, it is spelled out as indefinite.

Consider the examples in (57) below. Let us look first at (57-a). The first sentence in this example contains a definite singular. Both the standard analysis and the analysis presented here predict this sentence to give rise to the presupposition that there exists a unique boy in the context. It is therefore not surprising that the second sentence in (57-a), which contradict this presupposition, is judged as infelicitous – after accommodating the presupposition of the first sentence, we are left with a common ground which contradicts the second.

(57) a. John is not the boy I talked to. #I talked to three boys.

b. John is not the only boy I talked to. I talked to three boys.

(Sharvit, 2015)

The surprise comes when we move on to the example in (57-b). The first sentence there is almost identical to the first sentence in (57-a), differing only in that the definite description contains the additive *only*. I will lay out below the meaning I assume for *only*, but note that it does not really matter what exactly we assume – given that *only* is embedded inside a singular indefinite, standard analysis predicts a uniqueness presupposition to arise. It is therefore unexpected that a sentence which denies this hypothetical uniqueness presupposition is completely felicitous.

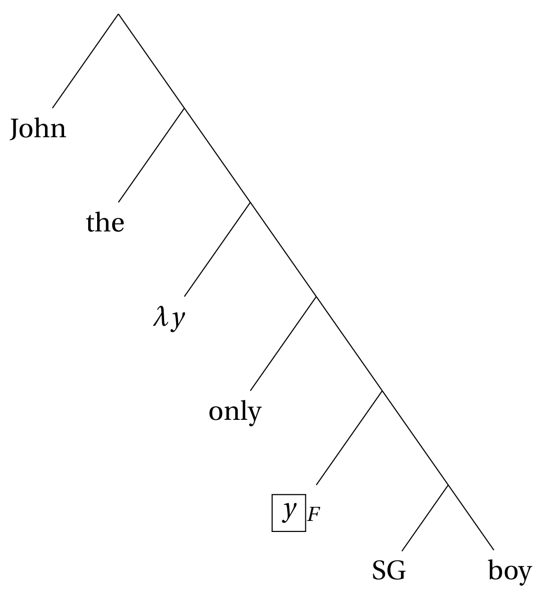
Let us be more explicit about the semantics of *only*, so we can see the problem facing standard definite semantics. I will assume a semantics for *only* based on the analysis of Rooth (1992), in combination with Fox & Katzir's (2011) characterization of innocent exclusion. It is essentially the inverse of PEX – a propositional operator which presupposes the prejacent and asserts the negation of the innocently excludable alternatives. Let us also assume, following Singh et al. (2008), that *only* and PEX are in complementary distribution – since both are merged at the same position in the structure, an instance of one blocks the other. It is therefore natural to assume, under standard analysis of definiteness as stemming from the definite article, the LF in (59) for the sentence *John is the only boy* (a simplified version of Sharvit's example. In this LF, *only* takes the position which occupied PEX in previous examples. It focus-associates with the NP-internal trace (possibly in addition to other focus-correlates), to yield the assertion that there are no boys except for y.

(58) $[\![\text{only } \phi]\!] =$

$$\text{a.} \quad = \begin{cases} \textbf{prs:} & \bigwedge\{\neg[\![\psi]\!] | \psi \in IE(\phi, \textsc{alt}(\phi))\} \rightarrow [\![\phi]\!] \\ \textbf{asr:} & \bigwedge\{\neg[\![\psi]\!] | \psi \in IE(\phi, \textsc{alt}(\phi))\} \end{cases}$$

$$\text{b.} \quad = \begin{cases} 1 & \text{if} \quad [\![\phi]\!] = 1 \bigwedge\{[\![\psi]\!] = 0 | \psi \in IE(\phi, \textsc{alt}(\phi)\} \\ 0 & \text{if} \quad \bigvee\{[\![\psi]\!] = 1 | \psi \in IE(\phi, \textsc{alt}(\phi))\} \\ \# & \text{otherwise} \end{cases}$$

(59) John is the only boy



This gives rise to the semantics in (60) for the constituent headed by *only*. It presupposes that y is a boy, and asserts that there is no other boy in the domain. The question now facing the naive analysis laid down above is how this semantics interacts with the definite article which takes scope over it. Given that the definite article presupposes that the noun in its scope has exactly one element, we would expect it to "flatten" the presupposition triggered by *only*, namely to presuppose that there exists exactly one boy in the domain. This would make it equivalent to *the boy* – the expression which results from deleting *only*. The fact that *the only boy* does not seem to raise a redundancy violation should already make us suspect this analysis. But even more problematic is the fact with which we began this discussion, namely that the negation of the sentence in (59) does not convey the inference that there is only one boy in the domain. If anything, it conveys the inference that John is a boy.

(60) $[\![\text{only } [\text{y}_F \text{ [boy SG}_F]]]\!] =$

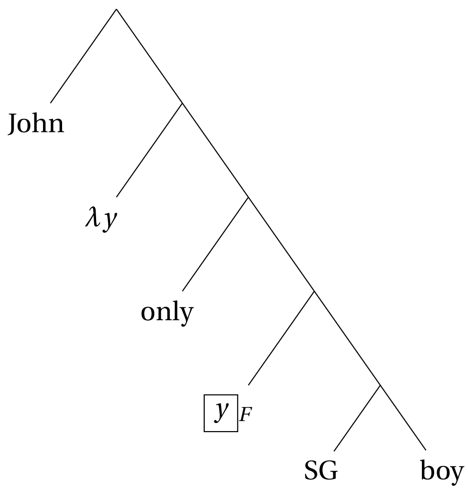
a. $= \begin{cases} \textbf{prs:} & \forall x \in *D_e\ [y \not\sqsubseteq x \rightarrow x \notin [\![\text{*boy}]\!]] \rightarrow (y \in [\![\text{boy}]\!] \wedge \text{ATOM}(y)) \\ \textbf{asr:} & \forall x \in *D_e\ [y \not\sqsubseteq x \rightarrow x \notin [\![\text{*boy}]\!]] \end{cases}$

b. $= \begin{cases} 1 & \text{if} \quad y \in [\![\text{boy}]\!] \wedge \text{ATOM}(y) \wedge \forall x \in *D_e\ [y \not\sqsubseteq x \rightarrow x \notin [\![\text{boy}]\!]] \\ 0 & \text{if} \quad \exists x \in *D_e\ [y \not\sqsubseteq x \wedge x \in [\![\text{*boy}]\!] \\ \# & \text{otherwise} \end{cases}$

The assumption that the definite article in (59) brings with it the semantic import of a definite, and specifically uniqueness presupposition, is therefore deemed problematic. Coppock & Beaver argue that the neutralization of the uniqueness presupposition is expected once we adopt their semantics for the definite article. Since being the only boy is a property that can never be true of more than one individual in the domain, the presupposition of the definite article that the noun in its scope has zero or one individual is trivially satisfied. Sharvit (2015) proposes that *only* raises from its position inside the NP, causing the definite to change to an indefinite at LF (a mechanism argued for by Bhatt in the case of superlatives). I would like to argue that my analysis of definites derives this pattern without any additional assumptions necessary.

Let us assume that the LF of the sentence in (59) is actually as given in (61) below. The presence of the definite article is, in my analysis, simply the reflex of the focus marking on the trace y. Since *only* replaces PEX, which is there by default in the lack of any other focus-sensitive operator and is responsible for the existence and uniqueness inferences, we do not expect them to arise in the case of (61). Plugging in the semantics in (60), we get the truth conditions in (62) for the entire sentence. It is thus clear why the negation of this sentence does not give rise to the inference that there is only one boy – the falsity conditions of the sentence only demand that there exist a boy who is not John. We therefore explain the lack of definiteness in definite NPs containing *only* as a result of the different effects of two focus-sensitive operators – PEX and *only*.

(61) John is the only boy



(62) $[\![(61)]\!] =$

a. $= \begin{cases} \textbf{prs:} & \forall x \in *D_e\ [\text{John} \not\sqsubseteq x \rightarrow x \not\in [\![\text{*boy}]\!]] \rightarrow (\text{John} \in [\![\text{boy}]\!] \wedge \text{ATOM}(\text{John})) \\ \textbf{asr:} & \forall x \in *D_e\ [\text{John} \not\sqsubseteq x \rightarrow x \not\in [\![\text{*boy}]\!]] \end{cases}$

b. $= \begin{cases} 1 & \text{if} \quad \text{John} \in [\![\text{boy}]\!] \wedge \text{ATOM}(\text{John}) \wedge \forall x \in *D_e\ [\text{John} \not\sqsubseteq x \rightarrow x \not\in [\![\text{boy}]\!]] \\ 0 & \text{if} \quad \exists x \in *D_e\ [\text{John} \not\sqsubseteq x \wedge x \in [\![\text{*boy}]\!]] \\ \# & \text{otherwise} \end{cases}$

3.4 Conclusion

In this chapter, I have put forward a novel analysis of definite descriptions, arguing for a return to a quantificational approach. Departing from the dominant referential view, which treats definites as fundamentally type-e expressions, I have proposed that definites and indefinites share the same underlying semantics: they are both existential quantifiers over individuals. The crucial differences in their interpretation, I argued, do not stem from a lexical distinction in the determiner, but rather from a subtle difference in their internal structure and the scalar implicatures this structure gives rise to. This approach unifies the semantics of two seemingly disparate types of DPs and explains the cross-linguistic prevalence of article-less languages where a single form can have both definite and indefinite interpretations.

My analysis derives the classic effects of definiteness – uniqueness for singulars and maximality for plurals – in a fully compositional manner from the interaction of independently motivated components. I posited that noun phrases contain a local presuppositional exhaustivity operator, PEX, which interacts with focused elements to generate scalar inferences. The defining characteristic of a definite description, on this view, is the presence of a focused trace inside the noun phrase. This focused trace expands the set of alternatives that PEX operates on, triggering a scalar presupposition that ultimately enforce the requirement that the existential quantifier ranges over a unique or maximal individual. The definite article is thus not a meaningful lexical item in itself, but merely a part of the spell-out of an NP containing this focused trace.

This structural account makes a number of welcome empirical predictions. First, it allows us to cash out the projection of definiteness from under non-monotonic quantifiers, for which the standard view yields predictions that are too strong. Second, it correctly handles puzzling cases involving Maximize Presupposition, such as the chess winner example, where the weaker, conditional presupposition generated by my analysis is satisfied in contexts where the stronger, unconditional presupposition of the standard analysis is not. Third, it provides a straightforward explanation for cases of "definites without definiteness", where focus-sensitive operators like only appear within a definite description and seem to neutralize the uniqueness inference. On my account, these operators simply occupy the structural position of PEX, thereby bleeding the mechanism that would otherwise generate the definiteness effect. In future research, I intend to extend this analysis to superlatives, which exhibit similar behavior and pose a parallel challenge to standard theories of definiteness.

Despite these advantages, many challenges and open questions remain. The proposed mechanism relies heavily on the notion of a focused trace, but a more constrained theory is needed to explain the licensing and distribution of this focus placement (see also discussion in Sauerland, (2004)). Furthermore, while this analysis provides an account for the homogeneity effects observed with plural definites, it is not immediately clear how it can be extended to other homogeneity-triggering environments, such as conjoined proper names. Given evidence that these constructions exhibit the same all-or-nothing inferential pattern, the ultimate goal must be a unified theory of homogeneity, and it remains to be seen how the quantificational analysis proposed here can contribute to that broader project.

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