Exclusivity, Uniqueness and Definiteness*

Elizabeth Coppock and David Beaver

February 20, 2012

1 Introduction

This paper deals with two puzzles concerning the interaction between exclusives and definiteness. The exclusives in question are *sole* and adjectival *only,* and the puzzles are as follows.

1.1 Puzzle 1: anti-uniqueness effects

Use of a definite description of the form *the F* requires that there be no more than one entity satisfying the description *F*. For example, all of the examples in (1) imply that there is no more than one author.

(1) a. John is the author. [1 author]
b. John is not the author. [0-1 author]
c. Is John the author? [0-1 author]
d. If John is the author, then... [0-1 author]

However, by inserting an exclusive, one can increase the number of *F*s.

(2) a. John is the **sole/only** author. [1 author]
b. John is not the **sole/only** author. [1+ authors]
c. Is John the **sole/only** author? [1+ authors]
d. If John is the **sole/only** author, then... [1+ authors]

An utterance of (2a) means of course that there is only one author – indeed, that is most likely one's point when one uses (2a). But (2b) can mean that there is strictly more than one author, on the reading that can be paraphrased *it's not the case that only John is an author*. In (2c) the question may concern the number of authors; if the answer is *no,* then there is more than one; likewise, in (2d) it is supposed that there is only one author but the sentence is consistent with the falsehood of that supposition, so there might be more authors.

In general, sentences of the form *X is F* have two readings, a *predicative* and an *equative* one. For example, the predicative reading of (2a) is *only he is an author*. The equative reading can be paraphrased *he is the same person as the sole or only author,* or brought out by a continuation, *No, really, they are the same guy!,* as discussed by Wang and McCready

*Presented at Colloque de Syntaxe et Sémantique à Paris, September 21, 2011

(2005). It is on the predicative reading of (2b) that we get the implication that there is more than one author, and this is the phenomenon that we seek to explain. We will refer to this phenomenon as an *anti-uniqueness effect*.

1.2 Puzzle 2: *a sole/*only*

Even though *sole* and *only* both give rise to anti-uniqueness effects, they differ with respect to whether or not they can occur with the indefinite article. This is illustrated in (3)-(5).

(3) If the business is owned by a(n) **sole**/***only** owner (the business is not a corporation or LLC), only the owner is eligible to be the managing officer.

(4) This company has a(n) **sole**/***only** director.

(5) There was a(n) **sole**/***only** piece of cake left.

The challenge is to give lexical entries for *sole* and *only* that capture their common behavior with respect to the first puzzle, as well as this difference between them.

1.3 Preview

Our solution to these puzzles lies, of course, in the analysis of the definite and indefinite articles, and of *sole* and *only*. Our proposal for *only* is fairly straightforward; the more radical aspect of our solution to the puzzle lies with our analysis of *the*. The main idea is that definites are fundamentally predicative and presuppose a weak form of uniqueness (*weak uniqueness*), which is an implication from existence to uniqueness: if there is an F, then there is only one. By weakening the presuppositions of *the,* we render the definite article compatible with exclusive descriptions. In fact, according to what we propose, the definite article contributes almost nothing in examples such as those in (2), and the anti-uniqueness inferences arise from the interaction between negation and the meaning of the exclusive.

We propose that both the definite article and the indefinite article are fundamentally identity functions on predicates, without any existence implication. The existence component of a definite or indefinite description comes into play when it is used referentially, typically in an argument position, either by combining with a choice function as Winter (2001) proposes or through association with a discourse referent. The two articles differ only in that the definite article presupposes weak uniqueness.

Because definite and indefinite articles are presuppositional variants, they compete under *Maximize Presupposition!* which favors the presuppositionally stronger variant (the definite article in this case) *ceteris paribus.* This explains why *only* is incompatible with the indefinite article, but leaves unexplained why *sole* is compatible with it. In §3.1, we argue that the indefinite uses of *sole* can be divided into two categories, quantificational and non-quantificational. For the non-quantificational uses, we discuss two alternative solutions. The first solution, presented in §3.2, is inspired by Herdan and Sharvit's (2006) analysis of superlatives. The second possibility, presented in §3.3, is that *sole,* along with other adjectives that one might be inclined to analyze as exclusives including *unique* and *single,* has a use as a *cardinality* adjective, denoting singular cardinality. The cardinality-based solution explains not only their ability to occur with indefinites but also several other properties distinguishing them from adjectival *only,* including compatibility with plural nouns and the ability to be used emphatically in superlative predications.

2 The anti-uniqueness effect

2.1 A closer look at the problem

Recall the contrast between (1) and (2), showing that by inserting an exclusive into a definite description, one increases the number of entities implied to satisfy the nominal predicate. At first glance, this would seem to suggest that the insertion of the exclusive eliminates the uniqueness implication normally associated with definite descriptions. But on closer inspection, it turns out to be the *existence* implication of the definite article that is absent.

To see this, it might help to have some lexical entries. For *only* and *sole,* we can use the following:

(6) $\text{ONLY} = \lambda p \,.\, \lambda x : p(x) \,.\, \forall y[x \neq y \rightarrow \neg p(y)]$

Applied to *author* this gives:

(7) $\text{ONLY}(\text{AUTHOR}) = \lambda x : \text{AUTHOR}(x) \,.\, \forall y[x \neq y \rightarrow \neg \text{AUTHOR}(y)]$

In (6) we analyze adjectival *only,* like its adverbial cousin, in terms of two meaning components, a negative universal which is its at-issue content, and a presupposition. For adverbial *only*, if we ignore its discourse function, the presupposition is essentially the so-called 'prejacent', i.e. the proposition that would be expressed by the clause containing adverbial *only*, if the *only* were not there. For adjectival *only* we analyze the presupposition analogously, as a proposition derived from the nominal that *only* modifies.[1] Evidence for the presuppositional meaning component comes from sentences we have already seen: a negated *only* predication as in (2b) implies that the subject bears the nominal property. The presupposition plays an essential role in deriving anti-uniqueness effects, as we will see in §2.3.

In order to analyze (1) and (2), we need a lexical entry for *the* that is compatible with predicative definite descriptions. These are not quite like definite descriptions in argument position, as Strawson (1950) points out at the beginning of *On Referring,* by way of setting these aside:

> [I]f I said, "Napoleon was the greatest French soldier", I should be using the word "Napoleon" to mention a certain individual, but I should not be using the phrase, "the greatest French soldier" to mention an individual, but to say something about an individual I had already mentioned. It would be natural to say that in using this sentence I was talking *about* Napoleon and that what I was *saying* about him was that he was the greatest French soldier. But of course I *could* use the expression, "the greatest French soldier", to mention an individual; for example, by saying: "The greatest French soldier died in exile". (Strawson 1950, p. 320)

[1] In general, Coppock and Beaver (2011) argue that exclusives all presuppose that there is some true answer to the current Question Under Discussion that is at least as strong as p, and assert that there is no true answer that is stronger than p, where p is the prejacent. Exclusives differ with respect to semantic type (adjectival exclusives like *only* and *mere* being of type $\langle et, et \rangle$) and constraints imposed on the current QUD. Adjectival *only* requires the question to be 'What things are P?', where P is the property denoted by the modified noun, so the way that it instantiates the general schema for exclusives is equivalent to the lexical entry in (6) (which is much simpler than the statement of it that brings out how it instantiates the schema).

Graff (2001) articulates what Strawson was getting at in a more precise way, arguing that definites can serve as predicates, that is, functions from individuals to truth values. Strong evidence that definites can have this type was given by Doron (1983), who shows that definites pattern with other predicate-denoting expressions in being able to function as the second argument of *consider*:

(8) John considers this woman competent / a good teacher / the best teacher / his girlfriend / *Mary / *some good teacher I know / *you.

Furthermore, as Doron (1983) shows, definites and indefinites can be used without an overt copula in Hebrew, but the copula is obligatory with proper names, pronouns, and *eize* 'some' indefinites; this can be understood under the assumption that definites can denote properties.

Winter (2001) gives an analysis on which predicative definites are type $\langle e, t\rangle$, as suggested by this data. According to his analysis, definites are initially predicative, and become quantificational in argument position by combining with a choice function. He gives two versions of the definite article, one Russelian and one Strawsonian; the Strawsonian one is as follows:

(9) **Predicative version of Frege-Strawson analysis** (Winter 2001, pp. 153–4)
$\text{THE}^{sg}_{\langle et,et\rangle} = \lambda P \,:\, |P| = 1 \,.\, P$

On the Russellian version, the cardinality constraint $|P| = 1$ is part of the asserted content. Under both versions, existence and uniqueness are simultaneously encoded in a single statement.

Let us represent the meaning of (2b) as follows:

(10) $\neg\text{THE}(\text{ONLY}(\text{AUTHOR}))(\text{J})$

Intuitively, (2b) is true if John is an author, and so is x, distinct from John. If that is the case then $|\text{AUTHOR}| > 1$. But neither John nor x is an 'only author', because for both there is a distinct individual who is an author. So there is no 'only author', i.e. $|\text{ONLY}(\text{AUTHOR})| = 0$. Whenever there is more than one author, $\text{ONLY}(\text{AUTHOR})$ fails to meet the presuppositional requirements of THE. So, under this analysis, the sentence is predicted to introduce a presupposition failure in exactly those scenarios where, intuitively, it is true.

Which presupposition is failing, existence or uniqueness? The cardinality-one requirement $|P| = 1$ expresses uniqueness and existence at once; let us break this apart into a uniqueness component $|P| < 2$ and an existence component $|P| > 0$. Our problem is not that there are *too many* satisfiers of the predicate 'only author'; the problem is that there are *too few*; again, $|\text{ONLY}(\text{AUTHOR})| = 0$. Thus it is the *existence* presupposition that is causing our problem, not the uniqueness presupposition, as it may have appeared at first.

2.2 Proposed theory of *the*

The solution now presents itself: get rid of the existence presupposition for the definite article. This proposal might make the reader nervous, in light of the long and venerable tradition of assuming that definites presuppose existence. But there is no reason to worry. For argumental definites as in *The author is sick,* we may assume that existence comes into play when the definite enters argument position, either through the introduction of a choice function, as Winter (2001) proposes, or as a result of the process by which

the predicate denoted by the definite description gets associated with a discourse referent (see below). And the assumption that predicative definites do not presuppose existence is welcome on independent grounds. There are other uses of predicative definites that do not imply uniqueness, such as (11) and (12).

(11) You're not the queen of the world.

(12) Is this your boyfriend?

An utterance of (11) does not commit the speaker to the proposition that there is a queen of the world; seeing someone with an unfamiliar man, one could ask (12) without implying that the addressee has a boyfriend.

We therefore propose that the definite article lexically imposes a *weak uniqueness* condition, which precludes multiplicity, but does not require existence.[2] Effectively, we are *splitting up the existence and uniqueness components of the meaning of the definite article,* so that uniqueness is contributed by all uses of definites, predicative and non-predicative alike, but existence only comes in when definites are used referentially, typically in argument position.

Our proposed lexical entry is given in (13). It takes as input a predicate, and returns the same predicate, as long as the input predicate satisfies UNIQUE, where UNIQUE is defined as in (14).

(13) $\text{THE} = \lambda P : \text{UNIQUE}(P) \,.\, P$

(14) $\text{UNIQUE} = \lambda P \,.\, \forall x, y[P(x) \wedge x \neq y \rightarrow \neg P(y)]$

(Alternatively, we could define UNIQUE as $\lambda P \,.\, |P| < 2$.)

2.3 Definites and exclusives

Now, (10) will be expanded as follows:

(15) $\neg\text{THE}(\text{ONLY}(\text{AUTHOR}))(\text{J})$
$\iff \neg[[\lambda P : \text{UNIQUE}(P) \,.\, P](\lambda x \,:\, \text{AUTHOR}(x) \,.\, \forall y[y \neq x \rightarrow \neg\text{AUTHOR}(y)])(\text{J})]$

The presupposition of the definite article will be defined if $\text{ONLY}(\text{AUTHOR})$ satisfies UNIQUE. If x satisfies the predicate $\text{ONLY}(\text{AUTHOR})$, then there is no y distinct from x that also satisfies that predicate, so indeed $\text{ONLY}(\text{AUTHOR})$ satisfies UNIQUE. So (2b) turns out to presuppose that John is an author and be true if there is some y distinct from John that is also an author. It implies that there are multiple *owners*, even though there is no *sole owner*. So there is no inherent conflict in the meaning of the sentence, and we get the anti-uniqueness inference, namely that John is an owner and so is somebody else.

2.4 Plurals

2.4.1 Plural definites

The uniqueness condition that is often attributed to the definite article does not work straightforwardly with plurals and mass terms, as Sharvy (1980) points out:

[2] Büring (to appear) makes a similar proposal, and attributes similar ideas to Schwarzschild (1994) and Löbner (2000).

> Phrases like 'the coffee in this room' and 'the gold in Zurich' are common and ordinary definite descriptions, and are often "proper," in the sense that they denote single objects – a single quantity of coffee or a single quantity of gold. Yet their contained predicates, 'is coffee in this room' and 'is gold in Zurich', apply to more than one object.

So, given our lexical entry for *the*, *the gold in Zurich* should fail to denote. Likewise, 'teachers' holds of subsets of all the teachers, so *the teachers* should also fail to denote.

Our solution to this problem, which is not new, is based on Link's (1983) analysis of plurals. First, we assume that the domain of individuals contains non-atomic sums of individuals, so e.g. the sum of a and b is written $a \oplus b$. Individuals are parts of their sums, and the part-of relation is written $\sqsubseteq$, so that, for example, $a \sqsubseteq a \oplus b$. For the meanings of plural nouns, we use a cumulativity operator '$*$', which satisfies the following axioms:

(16) Definitional axioms for the cumulativity operator *
(i) $P(x) \rightarrow {}^*P(x)$
(ii) $P(x) \wedge P(y) \rightarrow {}^*P(x \oplus y)$

For example, if $\text{TEACHER}(a)$ and $\text{TEACHER}(b)$ then $^*\text{TEACHER}(a \oplus b)$ (even though the unstarred predicate TEACHER might not hold of that sum). Following Winter (2001), we assume that a *maximum sort* filter applies before THE:

(17) $\text{MAX\_SORT} = \lambda P \,.\, \lambda x \,.\, P(x) \wedge \forall y \in P[x \sqsubseteq y \rightarrow x = y]$

This filters out all but the topmost element in the part-of lattice, the supremum. So, we can also define MAX_SORT in terms of supremum (written $\sqcap$):

(18) $\text{MAX\_SORT} = \lambda P \,.\, \lambda x \,.\, x = \sqcap P$

(This should return the characteristic function of the empty set if P has no supremum.)

2.4.2 Exclusives and plurals

We have to complicate our analysis of adjectival *only* as well in order to account for sentences with plurals like (19) and (20).

(19) John and Mary are the only/sole owners.

(20) John and Mary are not the only/sole owners.

Our lexical entry in (6) applied to the starred predicate *OWNER yields:

(21) $\text{ONLY}(^*\text{OWNER})$
$= \lambda x : {}^*\text{OWNER}(x) \,.\, \forall y[x \neq y \rightarrow \neg\, {}^*\text{OWNER}(y)]$

Let us represent "John and Mary" as the sum individual $\text{J} \oplus \text{M}$, and consider what happens when this function is applied to $\text{J} \oplus \text{M}$. If John and Mary are both owners, then the presupposition of $\text{ONLY}(^*\text{OWNER})$ will be satisfied, and the function will yield true iff $\forall y[\text{J} \oplus \text{M} \neq y \rightarrow \neg\, {}^*\text{OWNER}(y)]$. But this is too strong. $\text{J} \neq \text{J} \oplus \text{M}$ and *OWNER holds of J if it holds of $\text{J} \oplus \text{M}$. The following lexical entry solves that problem:[3]

[3]This more complex variant is still a simplification of the lexical entry for *only* proposed by Coppock and Beaver (2011), according to which, like its other exclusive brethren, it presupposes that $P(x)$ is a lower bound

(22) $\text{ONLY} = \lambda P \,.\, \lambda x : P(x) \,.\, \forall y[x \sqsubset y \rightarrow \neg\, {}^*P(y)]$

Applied to *OWNER, this gives (since $^{**}P = {}^*P$ for all P by transitivity of the mereological part relation):

(23) $\text{ONLY}(\text{*OWNER}) = \lambda x : \text{*OWNER}(x) \,.\, \forall y[x \sqsubset y \rightarrow \neg\, \text{*OWNER}(y)]$

So if J $\oplus$ M satisfies this predicate, it is not ruled out that J satisfies it; it is only ruled out that some larger sum, like J $\oplus$ M $\oplus$ S does.

We can simplify (22) by saying that this predicate characterizes the supremum of the starred predicate to which it applies:

(24) $\text{ONLY} = \lambda P \,.\, \lambda x : P(x) \,.\, x = \sqcap {}^*P$

So as it turns out, ONLY = MAX_SORT with an additional presupposition, whenever it applies to a cumulative predicate.

Before moving onto the plural case, let us make sure that we have not lost our solution to the problem for the singular case. (10) will now be expanded as follows:

(25) $\neg\text{THE}(\text{ONLY}(\text{AUTHOR}))(\text{J})$
$\iff \neg[[\lambda P : \text{UNIQUE}(P) \,.\, P](\lambda x \,:\, \text{AUTHOR}(x) \,.\, \forall y[x \sqsubset y \rightarrow \neg\, \text{*AUTHOR}(y)])(\text{J})]$

Indeed, this will still presuppose that John is an author and assert that it is not the case that no-one else is an author, as the reader may verify.

2.4.3 Plurals, definites, and exclusives

Now let us consider (19) and (20) with these lexical entries in hand. Plural definite descriptions with exclusives, as in these examples, are slightly different from singular ones, because there it is not the case that the property that the definite article combines with has an empty extension. In the case of plurals, there is some group of people constituting the only owners. But our solution does not rely on the emptiness of the extension of the description containing the exclusive; it works here too. The presupposition of the definite article is satisfied here as well, because the description still characterizes a unique entity.

The predicate that THE combines with is $\text{MAX\_SORT}(\text{ONLY}(\text{*OWNER}))$, which turns out to be equal to $\text{ONLY}(\text{*OWNER})$:

(26) $= \text{MAX\_SORT}(\text{ONLY}(\text{*OWNER}))$
$= \text{MAX\_SORT}(\lambda x : \text{*OWNER}(x) \,.\, \forall y[x \neq y \rightarrow \neg\, \text{*OWNER}(y)))$
$= \text{MAX\_SORT}(\lambda x : \text{*OWNER}(x) \,.\, x = \sqcap \text{*OWNER})$
$= [\lambda P \,.\, \lambda x' \,.\, x' = \sqcap P](\lambda x : \text{*OWNER}(x) \,.\, x = \sqcap \text{*OWNER})$
$= \lambda x' \,.\, x' = \sqcap[\lambda x : \text{*OWNER}(x) \,.\, x = \sqcap \text{*OWNER}]$
$= \lambda x \,:\, \text{*OWNER}(x) \,.\, x = \sqcap \text{*OWNER}$

This predicate characterizes the singleton set consisting of the sum of all owners or the empty set. Hence for any x such that $\text{ONLY}(\text{*OWNER})(x)$, there is no $y \neq x$ such that $\text{ONLY}(\text{*OWNER})(y)$. Since $\text{ONLY}(\text{*OWNER})$ satisfies UNIQUE, $\text{MAX\_SORT}(\text{ONLY}(\text{*OWNER}))$

on the true answers to the current Question Under Discussion (CQ) and it asserts that $P(x)$ is an upper bound on the true answer to the CQ. Under Coppock and Beaver's (2011) analysis, adjectival *only* requires the CQ to be "What things are $^*P$?" with answers ranked in a way that corresponds to a boolean lattice of individuals. For example, '$^*P(a \oplus b)$' is a stronger answer than '$^*P(a)$'. Here we have omitted any reference to the CQ, as it only serves to bring out the parallels between adjectival *only* and other exclusives.

satisfies UNIQUE, and the uniqueness presupposition of the definite article is satisfied in this case.

Because ONLY(*OWNER) satisfies UNIQUE, THE(MAX_SORT(ONLY(*OWNER))) is defined, so the meaning of *the only owners* will then be ONLY(*OWNER) as well:

(27) $\begin{aligned}&\text{THE}(\text{MAX\_SORT}(\text{ONLY}(*\text{OWNER})))\\ &= \text{THE}(\text{ONLY}(*\text{OWNER}))\\ &= [\lambda P : \text{UNIQUE}(P) \,.\, P](\text{ONLY}(*\text{OWNER}))\\ &= \lambda x \;:\; *\text{OWNER}(x) \,.\, x = \sqcap *\text{OWNER}\end{aligned}$

If we apply this predicate to J $\oplus$ M, we get:

(28) ONLY(*OWNER)(J $\oplus$ M)

which is defined if *OWNER(J $\oplus$ M), and true if there is no y such that J $\oplus$ M $\sqsubset$ y and *OWNER(y). In other words, is correctly predicted that (19) presupposes that John and Mary are owners, and has as its at-issue content that there are no more owners. The negated version (20) retains the presupposition that John and Mary are owners, and has as its at-issue content that it is *not* the case that there are no more owners; hence, there are owners other than John and Mary. Our assumptions therefore correctly capture anti-uniqueness effects with both singular and plural definite descriptions containing exclusives.

2.5 Definites in argument position

We have argued that definites have a predicative meaning under which they presuppose uniqueness but not existence. But definites in argument positions (e.g. subject position) do presuppose existence. How do they acquire the existence component?

There are at least two ways one can go with this. According to Winter (2001), predicative definites are of category NP, and when they are in argument position they become DPs, and at that point they combine with a choice function. This approach effectively gives us a Russellian analysis of (the existence component of) definite descriptions, because the existence of the choice function is part of the at-issue content (even if we use Winter's "Strawsonian" cardinality-one presupposition).

An alternative view is as follows: the existence implication that arises with a definite (or indefinite) in an argument position is intimately tied to the presence of a discourse referent to which the description applies. In argument position, the predicate fundamentally denoted by a definite (or indefinite) description must be ascribed to the discourse referent. Whether the discourse referent is old or new, whether the ascription is at-issue or presupposed, an existence implication will arise. If the discourse referent is old and the ascription is presupposed, then existence will be a presupposition; otherwise it will be at-issue. For definites, existence is typically presupposed, but we can assume that the discourse status of the existence component can be influenced by the question under discussion (Simons et al. 2010).

We are partial to the latter view but we will not develop it here; for the purposes of the current paper, we only wish to commit ourselves to the separation between existence and uniqueness, and to the claim that existence implications arise only in argument position.

2.6 Summary

We have assumed the following meaning for *sole* and adjectival *only*:

(29) $\text{ONLY} = \lambda P \,.\, \lambda x : P(x) \,.\, \forall y[x \sqsubset y \rightarrow \neg\, {}^*P(y)]$

and the following meaning for *the*:

(30) $\text{THE} = \lambda P : \text{UNIQUE}(P) \,.\, P$

(31) $\text{UNIQUE} = \lambda P \,.\, \forall x, y[P(x) \wedge x \neq y \rightarrow \neg P(y)]$

Further, we have assumed that plurals denote cumulative predicates, and that MAX_SORT applies to a predicate prior to combining with THE. (We assume that this is a filtering operation that is generally available.) With these assumptions, we can account for the fact that inserting an exclusive into a negative predication of a singular or plural definite description increases the number of entities that are implied to bear the nominal predication.

3 *A(n) sole/*only*

The solution to the previous problem gives rise to a new problem. We have given the same lexical entry for *sole* and *only,* but they behave differently when it comes to indefinites:

(32) If the business is owned by a(n) **sole**/***only** owner (the business is not a corporation or LLC), only the owner is eligible to be the managing officer.

(33) This company has a(n) **sole**/***only** director.

(34) There was a(n) **sole**/***only** piece of cake left.

We would expect them to have the same behavior if they have the same meaning.

In particular, we predict both *sole* and adjectival *only* to be incompatible with the indefinite article, if we assume some form of *Maximize Presupposition!* (Heim 1991). One possible formulation would be as follows:

(35) **Maximize Presupposition!**
Among a predetermined set of competitors whose LFs have the same assertive content relative to the context, choose the one that marks the strongest presupposition compatible with the common ground.
(adapted from Schlenker 2011)

Let us assume futhermore that definite and indefinite determiners are "predetermined" to compete, and give rise to LFs with the same assertive content relative to the context (e.g. the indefinite article in a predicative indefinite is an $\langle et, et\rangle$ identity function). This predicts that *only* and *sole* cannot occur with indefinite determiners, given the common lexical entry that we have given for these two words. This is partly good, because *only* cannot occur with indefinite determiners, as shown above. But it is also partly problematic, because it is incorrect for *sole*.

In §3.1, we argue that the indefinite uses of *sole* can be divided into two categories, quantificational and non-quantificational. For the non-quantificational uses, we discuss two alternative solutions. The first solution, presented in §3.2, is inspired by Herdan and Sharvit's (2006) analysis of superlatives. The second possibility, presented in §3.3, is that *sole,* along with other adjectives that one might be inclined to analyze as exclusives including *unique* and *single,* has a separate use as a *cardinality* adjective, denoting singular

	relational Ns	multiple sets	NPIs in VP	allows *some*	DP-mod. *not*
sole$_P$	typically	yes	no	yes	no
sole$_Q$	typically not	no	marked	no	yes

Table 1: Properties of *sole*$_P$ and *sole*$_Q$

cardinality. The cardinality-based solution explains not only the ability of *sole, unique* and *single* to occur with indefinites but also several other properties distinguishing them from adjectival *only,* including compatibility with plural nouns and the ability to be used emphatically in superlative predications.

3.1 Quantificational *sole*

In this section we argue that the indefinite uses of *sole* can be split into two categories: quantificational and non-quantificational. The *sole* that typically occurs with relational nouns as in *sole author* and *sole proprietor*, we call *sole*$_P$, and the *sole* that we see in (36), we call *sole*$_Q$.

(36) There was a sole piece of cake left.

There are several properties that distinguish these two, in addition to the fact that one typically occurs with a relational noun and the other does not. (i) The determiner *some* is fine with the relational noun *author* but not good with the non-relational noun *piece of cake*:

(37) There was some sole author at the party. [*sole*$_P$]

(38) ??There was some sole piece of cake left. [*sole*$_Q$]

(ii) NPIs such as *ever* are not licensed in the VP when *sole* modifies a relational noun, but improve quite a bit with a non-relational noun like *employee*.

(39) *A sole author ever complained about the mess. [*sole*$_P$]

(40) ?A sole employee ever complained about the mess. [*sole*$_Q$]

(iii) DP-modifying *not* is out with relational nouns, as shown in (41), but OK with non-relational nouns as in (42).

(41) *Not a sole author came. [on common reading of *sole author*] [*sole*$_P$]

(42) Not a sole person came. [*sole*$_Q$]

These properties are summarized in Table 1.

We propose that *sole*$_Q$ functions as a quantifier of type $\langle et, \langle et, t\rangle\rangle$, and it means *only one*:

(43) *sole*$_Q$
$\lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.|\{x : P(x) \wedge Q(x)\}| = 1$

This analysis explains the constellation of properties we have attributed to it. Because it is a quantifier, DP-modifying *not* is compatible with it. The determiner *some* is incompatible with it because *some* requires a property for its first argument. And it licenses NPIs in the

VP because it has scope over the entire sentence, although it does require some contextual help. As Larry Horn (p.c.) has pointed out to us, NPIs can be licensed by for example percentages, when the percentage is surprisingly low (cf. {*?30%,*75%*} *of voters ever read the newspaper*); we assume that the same mechanism is at work with $sole_Q$.

As for $sole_P$, we will consider two possible analyses, one inspired by Herdan and Sharvit's (2006) analysis of superlatives, on which it relates to a contextually salient set of sets (§3.2), and another according to which it ascribes singular cardinality (§3.3).

3.2 Inpiration from superlatives

The problem of compatibility with indefinite determiners also arises with superlatives, interestingly. Standard theories of superlatives predict that they cannot occur with the indefinite article. For example, Heim's (1999) analysis of the superlative *richest*, liberally construed, is given in (44).

(44) *richest*^{i} [Heim 1999, liberally construed]
$\lambda P.\lambda x : P(x) \ \wedge x \in \mathbf{C} \ . \ \forall y \in \mathbf{C}[\forall d[\text{RICH}(d)(y) \rightarrow \text{RICH}(d)(x)]]$

This takes a property P and returns a property that holds of x if for all y in some contextually sailent group $\mathbf{C}$, y enjoys no degree of wealth exceeding x's, defined if the P holds of x and x is in $\mathbf{C}$. This always characterizes a unique entity, so it predicts that superlatives cannot occur with a definite article.

But there are examples in which superlatives occur with indefinite articles, such as (45), and Herdan and Sharvit provide (46) and (47).

(45) This class has a **best** student.

(46) The dean praised some **best** student. He happened to be the best student in the class of 2005. The best students in the other classes were not praised at all. [Herdan and Sharvit's (6)]

(47) Sonia decided that she would marry some **richest** eligible bachelor, preferably the richest bachelor among the tennis players, but he could also be the richest bachelor among the art collectors or the richest bachelor among the yacht-owners. [Herdan and Sharvit's (8)]

In for example (46), there are multiple sets of students in the context, one for each class. Herdan and Sharvit call this set of sets **S** and propose that superlatives like *richest* should be analyzed as in (48).

(48) *richest*^{ii} [Herdan and Sharvit's analysis]
$\lambda P \lambda x : \exists X \in \mathbf{S}[x \in X] \wedge P(x) \ .$
$\exists X \in \mathbf{S}[x \in X \wedge \forall y \in X[\forall d[\text{RICH}(d)(y) \rightarrow \text{RICH}(d)(x)]]]$

This takes a property P and returns a property that is true of x if there is an X in **S** such that x is richest in X. This analysis accounts for the ability of superlatives to take both the definite and the indefinite determiner as follows: If **S** contains multiple sets, then *richest bachelor* doesn't pick out a unique referent, so it is appropriate to use the indefinite article. Otherwise, if **S** contains only one set, then there is only one richest bachelor, so the definite article is appropriate.

The idea we explore in this section is to apply Herdan and Sharvit's analysis of exclusives to *sole*. Suppose that *only* relates to a set of individuals **C**, whereas *sole* relates to a set of sets **S**. For example, if there are multiple sole proprietors (or authors), then there is a different establishment (or book) for each one, and each establishment (or book) corresponds to a set in **S**.

Indeed, according to Herdan and Sharvit, adjectival *only* doesn't allow an indefinite determiner precisely because it picks out a unique member of a salient set **C** of individuals, rather than a member of a set in a set of sets **S**. Their analysis of *only* is given in (49).

(49) *only* [Herdan and Sharvit's analysis]
$\lambda P.\lambda x : \wedge x \in \mathbf{C}\ .\ [\{y \in \mathbf{C} | P(y)\} = \{x\}]$

This analysis isn't quite sufficient for our purposes; a variant that is closer to what we have proposed already, taking into consideration the idea of a contextually salient set of individuals, is given in (50).

(50) *only* [equivalent to our analysis $+\mathbf{C}$]
$\lambda P.\lambda x : \exists y[x \sqsubseteq y \wedge {}^*P(y)] \underbrace{\wedge\ x \in \mathbf{C}}\ .$
$\quad \forall y[{}^*P(y) \underbrace{\wedge\ y \in \mathbf{C}} \rightarrow y \sqsubseteq x]$

Now the idea is that there is an analogy between superlatives and exclusives such that Heim's analysis of *richest* is to Herdan and Sharvit's analysis of *richest* as *only* is to *sole*:

$$\textit{richest}^{i} : \textit{richest}^{ii} :: \textit{only} : \textit{sole}$$

Completing this analogy gives us the lexical entry in (51) for *sole*.

(51) *sole* [a variant of (50) using **S** instead of **C** as in (48)]
$\lambda P.\lambda x : \exists y[x \sqsubseteq y \wedge {}^*P(y)] \underbrace{\wedge \exists X \in \mathbf{S}[x \in X]}\ .$
$\quad \underbrace{\exists X \in \mathbf{S}}[\underbrace{x \in X \wedge} \forall y[{}^*P(y) \underbrace{\wedge\ y \in X} \rightarrow y \sqsubseteq x]]$

This takes a property P and returns a property that holds of x if there is some set X in **S** in which x is the maximal element in ${}^*P$.

Like Herdan and Sharvit, we can say that when **S** contains multiple sets, the indefinite article is possible, and that when **S** contains only one set, the definite article is used. So, this predicts that *sole* can occur with either the definite or the indefinite article. Note that we have not lost a solution to our first puzzle, because when there is only one set in **S** and the definite article is used, there is basically no difference in meaning between *only* and *sole*.[4]

3.3 Cardinality terms vs. exclusives

Besides the ability to occur with the indefinite article, there are several other properties that set *sole* apart from *only,* and group it with other adjectives including *unique* and *single*. In this section we will suggest that a distinction should be drawn between *exclusive* (uses of) adjectives on the one hand, and *cardinality* (uses) on the other, and that these other adjectives are (typically) cardinality adjectives rather than exclusives.

Like *sole*, the words *unique, single,* and *one* are incompatible with an indefinite article:

[4]One remaining question is where the set of sets comes from; it seems connected to the noun. For example, in *a sole author*, each set contains the authors of a given book. But this is an issue that arises both for superlatives and exclusives.

	indef. art	anti-uniqueness	plural	emph. sup.
only	no	yes	yes	no
sole$_P$	yes	yes	yes	yes
single	yes	yes	no	yes
unique	yes	yes	no	yes

Table 2: Properties of exclusive and cardinality adjectives

(52) There was a(n) *only/sole/?unique/single/*one piece of cake left.

Nevertheless, *only, sole, unique, single,* and *one* can all be used (if in some cases somewhat marginally) in such constructions, giving rise to the same meaning:

(53) That's the only/sole/?unique/?single/?one reason I came.

And in the corresponding negated versions of (53), they give rise to *anti-uniqueness* inferences; in this case, more than one reason is implied to exist:

(54) That's not the only/sole/?unique/?single/?one reason I came.

Sole patterns with *unique, single,* and *one,* and against *only,* in at least two other respects. First, *only* and *sole* can modify plural nouns, but *unique, single,* and *one* are incompatible with plural nouns.

(55) They are the only/sole/#unique/#single/*one owners.

On the other hand, *only* cannot be used emphatically in superlative constructions whereas the others can be:

(56) This is the #only/?sole/?unique/single/one greatest threat.

These properties are summarized in Table 2.

In this section we argue that these differences can be explained under the assumption that *only* is a pure exclusive, while *sole* is ambiguous between an exclusive and a cardinality adjective, and *unique, single,* and *one* are pure cardinality terms.

What does it mean to be a 'cardinality term'? The analysis of cardinal numbers is a subject over which much ink has been spilled. Without meaning to take a stand on all of the issues that are dealt with in that literature, we follow Krifka's (1999) analysis of cardinals. His analysis of *seven* involves the following ordinary semantic content:

(57) $\lambda P_{\langle e,t\rangle} \,.\, \lambda x_e \,.\, \#(x) = 7 \wedge *P(x)$

We assume that *one,* like its adjectival synonyms *unique* and *single*, is analogous:

(58) $\text{ONE} = \lambda P_{\langle e,t\rangle} \,.\, \lambda x_e \,.\, \#(x) = 1 \wedge *P(x)$

where "$\#(x)$ gives the number of atoms that the sum individual x consists of" (Krifka 1999, p. 264). In the following sections we show how this analysis can be used to account for the differences just observed.

3.3.1 Plurality

As mentioned above, *only* is compatible with plural nouns, but the other words under consideration here are either less so (in the case of *sole*) or not at all compatible with them (in the case of *unique, single,* and *one*).[5]

(59) They are the only/sole/#unique/#single/*one owners.

This can be explained fairly straightforwardly under the assumption that *only* is an exclusive, that *unique, single,* and *one* express singular cardinality, and that *sole* is ambiguous between these two meanings.

Our proposed representation of *single/unique owner* is as follows:

(60) $\text{ONE}(\text{OWNER}) = \lambda x.\#(x) = 1 \wedge *\text{OWNER}(x)$

In a sentence of the form *X is the single/unique owner,* the exclusive inference arises due to the definite article. So if the noun is *single owner*, with the denotation in (60), what is presupposed is:

(61) $\forall x, y[[\#(x) = 1 \wedge *\text{OWNER}(x) \wedge x \neq y] \rightarrow \neg[\#(y) = 1 \wedge *\text{OWNER}(y)]]$

Prima facie this does not rule out that there is a sum of individuals y such that $*\text{OWNER}(y)$ and $\#(y) = 2$, but it follows as an inference; if that were the case, then there would be multiple parts of that plural individual with 1 atom, violating (61). Hence, the following is presupposed:

(62) $\forall x, y[\text{OWNER}(x) \wedge x \neq y \rightarrow \neg[\text{OWNER}(y)]]$

As we saw in (7), this is part of the at-issue content of *only owner*. Thus the cardinal adjective and the exclusive adjective *only* give rise to an exclusive implication in the context of a definite determiner.

But in the plural case, cardinals and exclusives are (correctly) predicted to behave differently. Plural morphology would introduce the condition that the number of atoms that the referent consists of is greater than one, which would conflict with the cardinality-one requirement imposed by the cardinal adjective. Plurals with adjectival *only* work fine, though, as we saw above.

3.3.2 Emphatic reinforcement of superlatives

Consider the following example from the New York Times:

(63) It was the single deadliest assault on Americans since the war began.

If *single* were removed from this sentence, the truth conditions would seem to remain the same. What is it contributing? The purpose seems to be to emphasize that the event in question is unique, hence, newsworthy. But unique among assaults, not among deadliest assaults.

Other adjectives expressing singular cardinality can be used in this construction (*sole*, *unique*), but *only* cannot be:

(64) # It was the only deadliest assault on Americans since the war began.

[5] *Unique* and *single* can apply distributively in (59) so the example is not ungrammatical in these cases. But there is no reading on which *They are the one owners* is acceptable, hence the star.

We can explain this under the assumption that emphatic reinforcement of superlatives may involve cardinality adjectives but not exclusive adjectives.

That assumption would predict that other cardinality expressions can be used in the same way, a predication that is borne out:

(65) This was the one deadliest assault of the war.

(66) These were the two deadliest assaults of the war.

Notice that (66) does not mean that the two assaults in question were both the deadliest; one may have been less deadly than the other, as long as it was deadlier than all the rest. Thus, this construction does not involve quantification over deadliest assaults. It is beyond the scope of this paper to give an analysis of examples like (66) (see Yee 2010 for a detailed analysis of related constructions), but any adequate analysis of those should carry over to examples like *single deadliest assault*, if it is assigned the same meaning as *one deadliest assault*, by analogy to *two deadliest assaults*. The point here is that this construction allows cardinals of all varieties but not pure exclusives, so the use of *single, sole,* and *unique* in it provides further evidence that these are cardinal terms.

3.3.3 *Sole*: Cardinality term *and* exclusive?

Let us return to our original question: why is it that *sole* is compatible with the indefinite article and *only* is not? The answer that we have suggested in §3.3 is that *sole* is a cardinality term while *only* is not. But the fact that *sole* is fairly acceptable with plural nouns (*They are the only/?sole owners*) – slightly less so perhaps than *only*, but more so than *unique* and *single* – suggests that *sole* may be performing double-duty as both an exclusive and a cardinality term. Thus, it has the *positive* properties of both: ability to modify plurals, like exclusives, and ability to emphatically reinforce superlatives and co-occur with an indefinite determiner, like cardinality terms.

3.4 Which analysis of $sole_P$ is better?

We have given two possible answers to the question of how to analyze $sole_P$. In 3.2, we suggested that it be analyzed analogously to how Herdan and Sharvit (2006) analyze superlatives, using a contextually salient set of sets. The lexical entry was given in (51), repeated here:

(67) *sole*
$\lambda P.\lambda x : \exists y[x \sqsubseteq y \wedge {}^*P(y)] \underbrace{\wedge \exists X \in \mathbf{S}[x \in X]}$.
$\underbrace{\exists X \in \mathbf{S}}[\underbrace{x \in X \wedge}\forall y[{}^*P(y) \underbrace{\wedge\, y \in X}_{} \rightarrow y \sqsubseteq x]]$

In §3.3, we explored the alternative that *sole* is (or can function as) a cardinality term, with the meaning of a cardinal determiner. The details would vary depending on what is the right analysis for cardinals in general, but one possible analysis was given in (58), repeated here:

(68) *sole*
$\lambda P_{\langle e,t\rangle}$. λx_e . $\#(x) = 1 \wedge *P(x)$

Which of these should we choose? This is an issue that should be explored further empirically, but purely theoretical considerations seem to favor the cardinality-based analysis. It is theoretically parsimonious insofar as the conceptual machinery necessary for analyzing cardinal numbers can be re-used for cardinal adjectives. It also does not require contextual parameters whose origin and independent motivation is unclear; it seems somehow implausible that a context would provide a salient set of sets. Moreover, the cardinality analysis provides a more unified picture of the two uses of *sole*: one modifies a property P and expresses singular cardinality of P; the other is a generalized quantifier taking two properties P and Q as arguments, and expresses singular cardinality of the intersection between the two. (It would be interesting to consider how one of these uses could be derived from the other.) The cardinality analysis also extends to *single* and *unique,* and helps to explain their incompatibility with plural nouns and their ability to function emphatically in superlative constructions.

4 Conclusions

To summarize, we have argued for two main conclusions:

- The definite article is initially predicative and contributes a weak uniqueness presupposition (existence $\rightarrow$ uniqueness), which is logically independent of existence. Only in argument position does a definite (or indefinite) article signal existence.
- A distinction is to be drawn between pure exclusive adjectives (adjectival *only*) and cardinality adjectives (*single, unique*). *Sole* can function as both, and can also be used as a quantifier.

With these assumptions, we can explain the anti-uniqueness effects that *only* and *sole* give rise to in predicative definite descriptions, and the fact that *sole* but not *only* is compatible with the indefinite article. The distinction between exclusive and singular-cardinality adjectives has broader empirical consequences as well; exclusive adjectives are compatible with plurals but singular-cardinality adjectives are not, and cardinality adjectives can modify superlatives but exclusive adjectives cannot.

References

Büring, D. (to appear). Conditional exhaustivity presuppositions in clefts (and definites). *Semantics and Pragmatics*.

Coppock, E. and Beaver, D. (2011). Sole sisters. In Ashton, N., Chereches, A., and Lutz, D., editors, *Proceedings of the 21st Semantics and Linguistic Theory Conference*. Rutgers University, eLanguage.

Doron, E. (1983). *Verbless Predicates in Hebrew*. PhD thesis, University of Texas at Austin.

Graff, D. (2001). Descriptions as predicates. *Philosophical Studies*, 102:1–42.

Heim, I. (1991). Artikel und definitheit. In von Stechow, A. and Wunderlich, D., editors, *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*. Mouton de Gruyter, Berlin.

Heim, I. (1999). Notes on superlatives. Ms., MIT.

Herdan, S. and Sharvit, Y. (2006). Definite and nondefinite superlatives and NPI licensing. *Syntax*, 9(1):1–31.

Krifka, M. (1999). At least some determiners aren't determiners. In Turner, K., editor, *The Semantics/Pragmatics Interface from Different Points of View*, pages 257–291. Elsevier, Oxford.

Link, G. (1983). The logical analysis of plurals and mass terms: A lattice-theoretical approach. In Bäuerle, R., Schwartze, C., and von Stechow, A., editors, *Meaning, Use, and the Interpretation of Language*, pages 302–323. Walter de Gruyter, Berlin.

Löbner, S. (2000). Polarity in natural language: Predication, quantification and negation in particular and characterizing sentences. *Linguistics and Philosophy*, 23:213–308.

Schlenker, P. (2011). Maximize Presupposition and Gricean reasoning. Ms., UCLA and Institut Jean-Nicod.

Schwarzschild, R. (1994). Plurals, presuppositions and the sources of distributivity. *Natural Language Semantics*, 2:201–248.

Sharvy, R. (1980). A more general theory of definite descriptions. *The Philosophical Review*, 89(4):607–624.

Simons, M., Beaver, D., Tonhauser, J., and Roberts, C. (2010). What projects and why. In *Proceedings of SALT 20*, pages 309–327.

Strawson, P. F. (1950). On referring. *Mind*, 59(235):320–344.

Wang, L. and McCready, E. (2005). Testing predicative definite descriptions. Ms., National Chung Cheng University and Osaka University.

Winter, Y. (2001). *Flexibility Principles in Boolean Semantics*. MIT Press, Cambridge, MA.

Yee, C. (2010). Building DRT lexical entries for superlatives and ordinal numbers. Semantics Archive.