Exclusivity, uniqueness, and definiteness

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1. Introduction

This paper deals with two puzzles concerning the interaction between definiteness and exclusives. The exclusives in question are *sole* and *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 *F*. For example, all of the examples in (1) imply that there is no more than one author of *Waverley*.

(1)   a.   Scott is the author of *Waverley*.   [1 author]

        b.   Scott is not the author of *Waverley*.   [$\leq$1 author]

        c.   Is Scott the author of *Waverley*?   [$\leq$1 author]

        d.   If Scott is the author of *Waverley*, then ...   [$\leq$1 author]

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

(2)   a.   Scott is the **sole/only** author of *Waverley*.   [1 author]

        b.   Scott is not the **sole/only** author of *Waverley*.   [>1 author]

        c.   Is Scott the **sole/only** author of *Waverley*?   [$\geq$1 authors]

        d.   If Scott is the **sole/only** author of *Waverley*, then ...   [$\geq$1 authors]

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

In general, sentences of the form *X is F* have two readings, a *predicative* one and an *equative* one. For example, the predicative reading of (2a) is 'Only he is an author of *Waverley*'. The

Empirical Issues in Syntax and Semantics 9, ed. Christopher Piñón, pp. 59–76

equative reading can be paraphrased, 'He is the same person as the sole author of *Waverley*,' or brought out by a continuation, 'No, really, they are the same guy!,' as discussed by Wang and McCready (2005). It is on the predicative reading of (2b) that the implication that there is more than one author arises, 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(n) 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).[1,2]

(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 the first puzzle lies mainly in the analysis of the definite article. Our proposal for *only* is fairly straightforward; the more radical aspect of our solution lies with *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 our proposal, the definite article contributes almost nothing in examples such as those in (2), and this allows anti-uniqueness inferences to arise from the interaction between negation and 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 in an argument position. 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, we argue that the indefinite uses of *sole* can be divided into several categories. One is the 'anti-comitative' use, on which it signifies being without any other entities in a salient group (§3.1). We argue in §3.2 that *sole* can also be used as an expression of singular cardinality

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[1] An idiosyncratic exception to this rule is the idiom *only child,* which allows an indefinite determiner. But *only child* in this sense does not tolerate modification between *only* and the noun, as in **an only smart child,* and *child* must be interpreted relationally in this context. Furthermore, *child* cannot be replaced by other kinship terms such as *cousin, sister,* or *grandchild.* According to some speakers *an only son* is possible, but not *an only daughter.*

[2] The opposite order of *only* and the indefinite article, as in *only an owner,* is of course acceptable, and here we have the NP-modifying use of *only,* rather than adjectival *only.*

like *single* and *one*. Since *sole* performs double-duty as an exclusive adjective and a cardinality adjective, it has the positive properties of both: Like *only,* and unlike *single* and *one,* it can combine with plural noun phrases (*the only/sole/*single/*one people I trust*), and like *single* and *one,* it can be used emphatically in superlative constructions (*That was the #only/sole/single/one deadliest assault since the war began*). Finally, we argue in §3.3 that there is a quantificational use of *sole* meaning '(only) one', which can be derived as a special case of 'anti-comitative' *sole*.

2. Anti-uniqueness effects
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 an 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 missing.

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

(6) **Proposed lexical entry for *sole/only* (first version)**
$$\text{ONLY} = \lambda P . \lambda x : P(x) . \forall y[x \neq y \rightarrow \neg P(y)]$$

Applied to 'author of *Waverley*', which we represent simply as AUTHOR, this gives:

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

Thus we analyze adjectival *only,* like its adverbial cousin, in terms of two meaning components, a negative universal which is its at-issue content (nothing other than *x* is *P*), and a presupposition (*x* is *P*). For adverbial *only*, the presupposition is typically what is referred to as the 'prejacent', viz. 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.[3] Evidence for the presuppositional status of this meaning component comes from sentences we have already seen: a negated *sole/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 (1950:320) 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,

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[3]In general, Coppock and Beaver (2011) argue that exclusives all presuppose that there is some true answer to the current question under discussion (CQ) 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 CQ. Adjectival *only* requires the question to be 'What things are *P*?', where *P* is the property denoted by the modified nominal, 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).

'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'.

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 Russellian and one Strawsonian. The Strawsonian one is as follows.

(9)   **Winter's lexical entry for *the*** (Winter 2001:153–4)
        THE $= \lambda P \,:\, |P| = 1 \,.\, P$

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.

If it is defined, the meaning of (2b) 'Scott is not the only author of *Waverley*' is as follows.

(10) $\neg$THE(ONLY(AUTHOR))(S)

Intuitively, (2b) is true if Scott is an author of *Waverley,* and *Waverley* has at least one additional author. If that is the case then $|\text{AUTHOR}| > 1$. But neither Scott nor the additional author is an 'only author', because for both, there is a distinct individual who is an author. So there is no 'only author', i.e. $|\text{ONLY(AUTHOR)}| = 0$. Whenever there is more than one author, ONLY(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, $|\text{ONLY(AUTHOR)}| = 0$. 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 is a bold suggestion, in light of the long and venerable tradition of assuming that definites presuppose existence. But existence will only be eliminated as a presupposition for predicative definites. For argumental definites as in *The author is sick,* we assume that existence is introduced through general type-shifting operations that apply to both definites and indefinites (Coppock and Beaver 2012). 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 the following:

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

(12)   7 is not the largest prime number.

An utterance of (11) does not commit the speaker to the existence of a queen of the world, nor does (12) commit the speaker to the existence of a largest prime number.

We therefore propose that the definite article lexically imposes a *weak uniqueness* condition, which precludes multiplicity, but does not require existence.[4] 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 has a cardinality no greater than one.

(13)   **Proposed lexical entry for *the***
$$\text{THE} = \lambda P : |P| \leq 1 \,.\, P$$

Thus *the* presupposes uniqueness (in a sense), but not existence.

2.3. Definites and exclusives

Now, the meaning of (2b) 'Scott is not the only author of *Waverley*' is as follows.

(14) $\neg\text{THE}(\text{ONLY}(\text{AUTHOR}))(\text{S})$
$$= \neg[[\lambda P : |P| \leq 1 \,.\, P](\lambda x : \text{AUTHOR}(x) \,.\, \forall y[y \neq x \rightarrow \neg\text{AUTHOR}(y)])(\text{S})]$$

The presupposition of the definite article will be defined if $|\text{ONLY}(\text{AUTHOR})| \leq 1$. If x satisfies the predicate $\text{ONLY}(\text{AUTHOR})$, then there is no y distinct from x that also satisfies that predicate, so indeed $|\text{ONLY}(\text{AUTHOR})| \leq 1$. So (2b) turns out to be equivalent to $\neg\text{ONLY}(\text{AUTHOR})(\text{S})$, giving rise to the presupposition that Scott is an author, and being true if there is some y distinct from Scott that is also an author. It implies that there are multiple *authors* of *Waverley*, even though there is no *sole author* of *Waverley*. So there is no inherent conflict in the meaning of the sentence, and we get the anti-uniqueness inference, namely, that Scott is an author of *Waverley* and somebody else is too.

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[4]Büring (2011) makes a similar proposal, and attributes similar ideas to Schwarzschild (1994) and Löbner (2000).

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.

> 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, the property of being teachers holds of all subsets of the teachers, so *the teachers* should also fail to denote.[5]

To remedy this, we make use of Link's (1983) analysis of plurals. First, we assume that the domain of individuals contains non-atomic sums of individuals, so, for example, the sum of a and b is written $a \oplus b$. Individuals are parts of their sums, and the part-of relation is written $\sqsubseteq_i$. For example, $a \sqsubseteq_i a \oplus b$. Individuals that have no individuals as parts are called *atoms*. For the meanings of plural nouns, we use a cumulativity operator '$*$', 'working on 1-place predicates P, which generates all the individual sums of members of the extensions of P' (Link 1983:130). Link defines the extension of $*P(x)$ as the complete join-subsemilattice in the domain of individuals generated by the extension of P. This boils down to the following:

(15)   **Cumulativity operator (definition)**
       For all x, $*P(x)$ iff for all atoms y such that $y \sqsubseteq_i x$, $P(y)$.

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:

(16)   **Maximum sort (definition)**
       $\text{MAX\_SORT} = \lambda P . \lambda x . P(x) \wedge \forall y [x \sqsubset_i y \rightarrow \neg P(y)]$

The symbol $\sqsubset_i$ signifies the proper individual-part relation; $a \sqsubset_i b$ iff $a \sqsubseteq_i b$ and $a \neq b$. Applied to a cumulative predicate such as $*\text{TEACHER}$, MAX_SORT yields a predicate characterizing the singleton set containing the largest individual sum composed of teachers. Applied to a non-cumulative predicate such as TEACHER, this yields a predicate charcterizing the set of maximal individuals which are themselves teachers. In the singular case, the uniqueness presupposition of *the* is satisfied if there is no more than one teacher; in the plural case, the uniqueness presupposition is satisfied if the individual-part lattice over teachers has no more than one maximal element (which is always the case).

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 (17) and (18).

(17)   Scott and Ballantyne are the **only/sole** authors of *Waverley*.

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[5]The Sharvy quotation notwithstanding, we do not attempt an analysis of mass terms here.

(18)   Scott and Ballantyne are **not** the **only/sole** authors of *Waverley*.

Our lexical entry in (6) applied to the starred predicate $*$AUTHOR yields the following.

(19)   ONLY$(*$AUTHOR$)$
$= \lambda x : *$AUTHOR$(x) . \forall y[x \neq y \rightarrow \neg \, *$AUTHOR$(y)]$

Let us represent *Scott and Ballantyne* as the sum individual S $\oplus$ B, and consider what happens when this function is applied to S $\oplus$ B. If Scott and Ballantyne are both authors, then the presupposition of ONLY$(*$AUTHOR$)$ will be satisfied, and the function will yield true iff $\forall y[$S $\oplus$ B $\neq y \rightarrow \neg \, *$AUTHOR$(y)]$. But this is too strong. S $\neq$ S $\oplus$ B and $*$AUTHOR holds of S if it holds of S $\oplus$ B. The following lexical entry solves that problem.[6]

(20)   **Proposed lexical entry for *sole/only* (generalized)**
ONLY $= \lambda P . \lambda x : P(x) . \forall y[x \sqsubset_i y \rightarrow \neg \, *P(y)]$

Applied to $*$AUTHOR, (20) gives the following:[7]

(21)   ONLY$(*$AUTHOR$) = \lambda x : *$AUTHOR$(x) . \forall y[x \sqsubset_i y \rightarrow \neg \, *$AUTHOR$(y)]$

So if S $\oplus$ B satisfies ONLY$(*$AUTHOR$)$, then it is not ruled out that S satisfies $*$AUTHOR; it is only ruled out that some larger sum, like S $\oplus$ B $\oplus$ M does. Notice the similarity with MAX_SORT; the only difference is that ONLY has a presupposition where MAX_SORT has an ordinary at-issue condition.

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.

(22) $\neg$THE$($ONLY$($AUTHOR$))($S$)$
$= \neg[[\lambda P : |P| \leq 1 . P](\lambda x : $AUTHOR$(x) . \forall y[x \sqsubset_i y \rightarrow \neg \, *$AUTHOR$(y)])(S)]$
$= \neg[\forall y[$S $\sqsubset_i y \rightarrow \neg \, *$AUTHOR$(y)]]$ if $|$ONLY$($AUTHOR$)| \leq 1$ and AUTHOR$($S$)$;
undefined otherwise

Thus indeed, (2b) is still correctly predicted to presuppose that Scott is an author of *Waverley* and make an at-issue contribution that someone else is, too.

2.4.3. Plurals, definites, and exclusives

Now let us consider (17) and (18) with these lexical entries in hand. Plural definite descriptions with exclusives, as in these examples, are slightly different from singular ones, because when the nominal is plural it is not the case that the property that the definite article combines with has an empty extension. For example, the property denoted by *only authors* denotes some

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[6]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 on the true answers to the current question under discussion (CQ) and it asserts that $P(x)$ is an upper bound on the true answers 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.

[7]We have reduced $**$AUTHOR to $*$AUTHOR because $**P = *P$ for all P. The cumulativity operator is closed under sum formation, so the extension of $**P$ cannot contain any elements that are not already in the extension of $*P$.

group of people constituting the only authors even if Scott and Ballantyne are not the only individuals in that group. 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 in this case, because the description still characterizes a single entity.

The predicate that THE combines with is $\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR}))$, which turns out to be equal to $\text{ONLY}(*\text{AUTHOR}))$. To see this, let us expand the expression:

(23) $\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR}))$
$= \lambda x \, . \, [\text{ONLY}(*\text{AUTHOR})(x) \wedge \forall y[x \sqsubset_i y \rightarrow \neg\text{ONLY}(*\text{AUTHOR})(y)]]$
$= \lambda x : *\text{AUTHOR}(x) \, . \, \forall y[x \sqsubset_i y \rightarrow \neg*\text{AUTHOR}(y)] \wedge \forall y[x \sqsubset_i y \rightarrow \neg\text{ONLY}(*\text{AUTHOR})(y)]$

The first at-issue condition on the final line ($\forall y[x \sqsubset_i y \rightarrow \neg*\text{AUTHOR}(y)]$) requires that nothing that x is a part of satisfies $*\text{AUTHOR}$. The second condition ($\forall y[x \sqsubset_i y \rightarrow \neg\text{ONLY}(*\text{AUTHOR})(y)]$) requires that nothing that x is a part of satisfies $\text{ONLY}(*\text{AUTHOR})$. Nothing that fails to satisfy $*\text{AUTHOR}$ can satisfy $\text{ONLY}(*\text{AUTHOR})$, so the second condition is implied by the first condition. Hence:

(24) $\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR}))$
$= \lambda x : *\text{AUTHOR}(x) \, . \, \forall y[x \sqsubset_i y \rightarrow \neg*\text{AUTHOR}(y)]$
$= \text{ONLY}(*\text{AUTHOR})$

In other words, $\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR}))$ and $\text{ONLY}(*\text{AUTHOR})$ are equivalent.

Furthermore, they are both guaranteed to satisfy the weak uniqueness presupposition of the definite article. For any x such that $\text{ONLY}(*\text{AUTHOR})(x)$, there is no y distinct from x such that $\text{ONLY}(*\text{AUTHOR})(y)$. Thus $|\text{ONLY}(*\text{AUTHOR})| \leq 1$, so $|\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR})) \leq 1$ as well. This means that $\text{THE}(\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR})))$ is $\text{ONLY}(*\text{AUTHOR})$. Hence 'the only authors of *Waverley*' has the following denotation.

(25) $\text{THE}(\text{MAX\_SORT}(\text{ONLY}(*\text{AUTHOR})))$
$= \text{THE}(\text{ONLY}(*\text{AUTHOR}))$
$= [\lambda P : |P| \leq 1 \, . \, P](\text{ONLY}(*\text{AUTHOR}))$
$= \text{ONLY}(*\text{AUTHOR})$

If we apply this predicate to $\text{S} \oplus \text{B}$, we get the following denotation for 'Scott and Ballantyne are the only authors of *Waverley*':

(26) $\text{ONLY}(*\text{AUTHOR})(\text{S} \oplus \text{B})$

This is defined if $*\text{AUTHOR}(\text{S} \oplus \text{B})$, and true if there is no y such that $\text{S} \oplus \text{B} \sqsubset_i y$ and $*\text{AUTHOR}(y)$. In other words, it is correctly predicted that (17) presupposes that Scott and Ballantyne are authors of *Waverley*, and has as its at-issue content that there are no more authors of *Waverley*. The negated version (18) retains the presupposition that Scott and Ballantyne are authors of *Waverley*, and has as its at-issue content that it is *not* the case that there are no more authors of *Waverley*; hence, there are authors of *Waverley* other than Scott and Ballantyne. 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?

Coppock and Beaver (2012) argue that the meaning of argumental definites and indefinites can be derived from the corresponding predicative meanings using general mechanisms that introduce existence. Existence is generally at-issue with argumental indefinites and presupposed with argumental definites; both the non-negated and the negated variants of (27) imply the existence of a (salient) baby zebra, whereas only non-negated variant of (28) implies this.

(27) a.   I saw the baby zebra yesterday.

b.   I didn't see the baby zebra yesterday.

(28) a.   I saw a baby zebra yesterday.

b.   I didn't see a baby zebra yesterday.

However, there are cases where existence is at-issue even with definites. For example, (29) can be used to communicate that there was more than one invited talk.

(29)   Chris didn't give the only invited talk.

On the reading of (29) on which it is implied that there were multiple invited talks, we have an anti-uniqueness effect in argument position, and existence of something that satisfies the predicate 'only invited talk' is not implied. To account for this, Coppock and Beaver (2012) propose that two type shifts are generally applicable to both definites and indefinites: Partee's (1986) IOTA type-shift ($P \mapsto \iota x P(x)$), which introduces an existence presupposition, and the A type-shift ($P \mapsto \lambda Q . \exists x [P(x) \wedge Q(x)]$), which does not. Usually, IOTA is used with definites and A is used with indefinites; because of Maximize Presupposition (see below), the IOTA option will not be used with indefinites, and there is a general preference for IOTA, so IOTA is used for definites whenever existence is common ground. But in cases where existence is at-issue, IOTA is not available for definites, and in that case A applies; hence the primary reading of (29).

2.6. Summary

We have assumed the meaning in (20) for *sole* and adjectival *only* and the meaning in (13) for *the*, repeated here:

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

(31)   THE $= \lambda P : |P| \leq 1 . P$

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 predicate.

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 differ with respect to their ability to occur in indefinite noun phrases, as shown above in (3)–(5), repeated here.

(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 *sole* and *only* to behave in the same way if they have the same meaning.

In particular, what we have said so far predicts both *sole* and adjectival *only* to be incompatible with the indefinite article, if we adopt the Maximize Presupposition principle (Heim 1991). One possible formulation of this principle is as follows.

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

Let us assume futhermore that definite and indefinite determiners are predetermined to compete in the relevant sense, and have 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, because the definite determiner would always win out. 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*.

We will suggest in §3.1 that *sole* has an 'anti-comitative' meaning; that is, it signifies being without any other entities in a salient group. This analysis yields an analogy between exclusives and superlatives: *only* is to superlatives à la Heim (1999) as *sole* is to superlatives à la Herdan and Sharvit (2006). We furthermore argue for the existence of two additional uses of *sole,* of which one can be derived as a special case. One of these additional uses, discussed in §3.2, is an expression of singular cardinality like *single* and *one*. The other, discussed in §3.2, is a quantifier meaning '(only) one'.

3.1. Anti-comitative *sole*

In this section, we propose that one sense of *sole* is, roughly, 'unaccompanied', and we refer to this as its *anti-comitative* sense. A sole owner, for example, is unaccompanied by any other owners, or is in a group of owners consisting of only one individual. We assume that anti-comitative *sole* depends on a salient method of grouping individuals provided by the context, e.g. 'individuals that have the same hair color' or 'individuals that live together'. We refer to this salient equivalence relation as **W** (for 'with'), and the set of sets of individuals that stand in this relation to each other as **S**, as in Herdan and Sharvit's (2006) analysis of superlative adjectives.

Herdan and Sharvit observe that the problem of compatibility with indefinite determiners also arises with superlatives. 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 (36).

(36) **Meaning of *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 **C**, *y* enjoys no degree of wealth exceeding *x*'s, and it is defined only if the *P* holds of *x* and *x* is in **C**. This always characterizes a unique entity (ignoring the possibility of a tie at the top), so it predicts that superlatives cannot occur with an indefinite article.

But there are examples in which superlatives occur with indefinite articles, such as (37), and Herdan and Sharvit provide (38) and (39).

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

(38) 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)]

(39) 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 (38), for example, 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 (40).

(40) **Meaning of *richest^ii*** (Herdan and Sharvit 2006)
$\lambda P \, . \, \lambda x : \exists X \in \mathbf{S}[x \in X] \wedge P(x) \, .$
$\exists X \in \mathbf{S}[x \in X \wedge \forall y \in X[\forall d[\text{RICH}(d)(y) \rightarrow \text{RICH}(d)(x)]]]$

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.

Herdan and Sharvit's analysis can be recast in terms of an equivalence relation **W**, which is interdefinable with Herdan and Sharvit's **S** as follows:

$$\mathbf{W}(x,y) \iff \mathbf{W}(y,x) \iff \exists X \in \mathbf{S}[x \in X \wedge y \in X]$$

Assume furthermore that **W** induces a partition on the entire domain of entities, so the presupposition that *x* is part of some equivalence class is unneccessary. Then we can write Herdan and Sharvit's analysis of *richest* in terms of **W** as follows.

(41) **Meaning of *richest^ii*** (recast using **W**)
$\lambda P \, . \, \lambda x : P(x) \, . \, \forall y[\mathbf{W}(x,y) \rightarrow \forall d[\text{RICH}(d)(y) \rightarrow \text{RICH}(d)(x)]]$

Because it requires fewer symbols, we use this formulation as a basis for comparison to our analysis of *sole*.

Heim's analysis of *richest* is to Herdan and Sharvit's analysis of *richest* as *only* is to what we propose here for *sole*:

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

Completing the analogy gives us the lexical entry in (42) for *sole*.

(42)   **Lexical entry for anti-comitative *sole***
       AC-SOLE $= \lambda P . \lambda x : P(x) . \forall y[\mathbf{W}(x,y) \rightarrow y \sqsubseteq_i x]$

If the input property P applies only to atoms, then x must be an atom, in which case (42) implies that x is the only member of its equivalence class. If the input property can apply to non-atomic individuals, then (42) requires that the only other elements of the equivalence class are mereological parts of x.

Now, *sole P* is not guaranteed to be unique; there may be several individuals x which satisfy the predicate, because there may be several equivalence classes containing a single element. For example, suppose that each set in S is a set of people who own the same business. If Harry is the sole owner of 'Harry's bikes' and Bill is the sole owner of 'Bill's pizza', then Harry will be the sole element of one of these sets, and Bill will be the sole element of another. Thus the extension of *sole N*, unlike that of *only N*, may have cardinality greater than one, and we correctly predict that *sole* is possible with an indefinite determiner in such a case. 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 must be used.

The salient equivalence relation may correspond to the modified predicate P, so that individuals who have the same value for P are grouped together. Suppose $\mathbf{W}(x,y)$ holds if and only if $[P(x) \leftrightarrow P(y)]$. Applied to P, (42) then boils down to the following:

$$\lambda x : P(x) . \forall y[P(y) \rightarrow y \sqsubseteq_i x]$$

This is equivalent to ONLY(P):

$$\lambda x : P(x) . \forall y[x \sqsubset_i y \rightarrow \neg \ ^*P(y)]$$

Hence the intuitive equivalence between *He is the sole person I trust* and *He is the only person I trust*, and the fact that *sole* gives rise to anti-uniqueness effects.

3.2. Cardinality terms versus exclusives

There are several properties that set *sole* apart from *only*, and group it with *single*. These three words are near-synonyms; the following example is attested with *single* but *sole* or *only* can be used instead without a change in truth conditions:

(43)   That document is the **only/sole/single** source of truth.

However, 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, that *single* is a cardinality term, and that *sole* is ambiguous between an exclusive and a cardinality term.

Sole patterns with *single* and against *only* in several respects. First, both *sole* and *single* are compatible with an indefinite article while *only* is not.

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

Second, *sole* and *single* can both be used emphatically in superlative constructions such as the following, whereas *only* cannot be.

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	indef. art	plural	emph. sup.
only	no	yes	no
sole	yes	yes	yes
single	yes	no	yes

Table 1: Properties of exclusive and cardinality adjectives

(45)   This is the **#only/single/?sole** greatest threat.

Notice that the cardinal *one* can also be used in this construction, along with other cardinals, as we will discuss below.

   Single, like the cardinal number *one*, differs from *only* and *sole* in that they are incompatible with plural nominals.

(46)   They are the **only/sole/#single/*one** people I trust.

Notice that, as illustrated in (43), analogous examples in which the modified nominal is singular are acceptable with *single*. Likewise, *one* is far more acceptable in a version of (46) in which the modified nominal is singular:

(47)   She is the **one** person I trust.

Hence the problem in (46) seems to be due to the plurality of the nominal.

   The properties distinguishing *only, sole,* and *single* are summarized in Table 1. To explain this pattern, we argue that *only* is a pure exclusive, while *sole* is ambiguous between an exclusive and a cardinality adjective, and *single* is a pure cardinality term (like *one*).

   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.

(48)   **Lexical entry for *seven*** (Krifka 1999, simplified)
       $\lambda P_{\langle e,t \rangle} . \lambda x_e . \#(x) = 7 \wedge {}^*P(x)$

Here, '$\#(x)$ gives the number of atoms that the sum individual *x* consists of' (Krifka 1999:264). We assume that *one* is analogous, and suggest that *single* and *sole* can be given the same analysis.

(49)   **Proposed lexical entry for *one/single/sole***
       $\text{ONE} = \lambda P_{\langle e,t \rangle} . \lambda x_e . \#(x) = 1 \wedge {}^*P(x)$

In the following sections we show how this analysis can be used to account for the differences just observed.

3.2.1. Plurality

   As illustrated above in (46), *only* and *sole* are compatible with plural nominals, but *single* and *one* are not. This can be explained under the assumption that *only* is an exclusive, that *single* and *one* express singular cardinality, and that *sole* is ambiguous between an exclusive is ambiguous between an exclusive and a singular cardinality term.

In the case of a singular definite description, both the cardinal adjective and the exclusive adjective *only* give rise to a singular-cardinality implication. Our proposed representation of *single source (of truth)* is as follows.

(50) $\text{ONE}(\text{SOURCE})$
    $= \lambda x \,.\, \#(x) = 1 \wedge {}^*\text{SOURCE}(x)$

This predicate can be fed as an argument to THE as long as the following condition holds:

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

Prima facie this does not rule out that there is a sum of individuals y such that ${}^*\text{SOURCE}(y)$ 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 one atom, violating (51). Hence, the following is presupposed.

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

Hence a singular-cardinality presupposition is contributed by the definite article in a phrase like *the single source of truth*. As we have seen, the same implication is at-issue for *only,* so both cardinality terms and exclusives imply singularity in one way or another.

When it comes to plurals, exclusives and cardinals diverge further. Exclusives do not give rise to a singular-cardinality implication in this case, and therefore allow plural morphology on the noun, as we saw above. Singular cardinals have a built-in singular-cardinality requirement. Assuming that plural morphology introduces the condition that the number of atoms that the entity in question consists of is greater than one, plural morphology conflicts with the singular-cardinality requirement imposed by *single* and *one*.

3.2.2. Emphatic reinforcement of superlatives

As mentioned above, another empirical property distinguishing *only* from the others involves superlatives. Consider the following example from the New York Times.

(53) 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 modifiers expressing singular cardinality can be used in this construction (*sole*, *one*), but *only* cannot be.

(54) It was the **sole/one/#only** deadliest assault on Americans since the war began.

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, and this prediction is borne out.

(55) These were the **two** deadliest assaults of the war.

Notice that (55) 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 (55) (see Yee 2010 for a detailed analysis of related constructions involving ordinals, e.g. *the third highest mountain*), 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* and *sole* in it provides further evidence that these are cardinal terms.

3.2.3. *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? We have given two reasons. First, *sole* has an 'anti-comitative' meaning, which boils down to the meaning of *only* in one special case, but is more general. When the salient equivalence relation yields multiple equivalence classes with a unique element, the presupposition of the definite article is not satisfied, and the indefinite article is possible. Furthermore, *sole* has a use as a cardinality term like *single* and *one*, while *only* does not. The fact that *sole* is acceptable with plural nominals (as in *They are the only/sole people I trust*) indicates that *sole* does double-duty as both an exclusive (via its anti-comitative use) 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.

3.3. Quantificational *sole*

There are still some remaining puzzles regarding the behavior of *sole*. First, (56) seems to imply that there was only one woman at the party, not that there was a woman and she was alone, or that there was (at least) one woman at the party.

(56)   There was a **sole** woman at the party.

A related puzzle is the contrast between (56) and (57).

(57)??There was **some sole** woman at the party.

This is not due to an across-the-board restriction against using *some* with *sole*; when used in its anti-comitative sense, brought out by a relational noun, *some* is acceptable:

(58)   There was **some sole** author at the party.

Furthermore, there are some uses of *sole* that, at least to some degree, license NPIs in the VP:

(59) ?A **sole** employee **ever** complained about the mess.

But again, this property does not hold across the board with *sole*:

(60) *A **sole** author **ever** complained about the mess.

The lexical entries we have given for *sole* do not create a downward-monotone environment, so the possibility of (59) – at least, the contrast between (59) and (60) – is puzzling.

A further contrast that can be brought out by contrasting relational nouns like *author* with non-relational nouns is the ability to occur with DP-modifying *not*.

(61) **Not** a **sole** person came.

(62) **Not** a **sole** author came.

There is a reading of (62) on which it is acceptable, paraphrasable as 'No authors came'. But this cannot be paraphrased using the most common reading of *sole author,* which can be analyzed using anti-comitative *sole*.

These properties can be explained if *sole* can function as a quantifier of type $\langle et, \langle et, t \rangle \rangle$, and it means *only one*.

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

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, whereas *a* is semantically 'light' enough to be ignored in the semantic composition. This *some* licenses NPIs in the VP to the same extent that *exactly one* does (cf. *?Exactly one student ever came to my office hours*). As Larry Horn (p.c.) has pointed out to us, NPIs can be licensed pragmatically 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 quantificational *sole*.

This version of *sole* does not need to be stipulated through an additional lexical entry; it can be derived either from cardinality *sole* as in (49) (as pointed out to us by Chris Piñon) or from anti-comitative *sole* as defined in (42). We will illustrate the latter strategy. (63) comes about when the salient equivalence relation is determined by the modified N' and the VP predicate, that is, when $\mathbf{W}(x,y)$ holds if and only if $[P(x) \wedge Q(x)] \leftrightarrow [P(y) \wedge Q(y)]$ holds (where P and Q are the N' and VP predicates respectively). For example, the inference that there was only one woman at the party arising from (56) can be derived using anti-comitative *sole* as follows. The meaning of 'A sole woman was at the party' is:

(64) $\exists x[\text{AC-SOLE}(\text{WOMAN})(x) \wedge \text{AT-PARTY}(x)]$

Sole introduces a presupposition on the existentially quantified variable x that it is a woman. We assume that this results in a presupposition that a woman exists, and restricts the existential quantifier so that it ranges only over women. The at-issue-content of (56) can be written:

(65) $\exists x[\text{WOMAN}(x) \wedge \text{AT-PARTY}(x) \wedge \forall y[\mathbf{W}(x,y) \rightarrow y \sqsubseteq_i x]]$

Suppose that $\mathbf{W}$ is instantiated as a relation that holds between x and y if and only if $\text{WOMAN}(x) \wedge \text{AT-PARTY}(x)$ is equivalent to $\text{WOMAN}(y) \wedge \text{AT-PARTY}(y)$. This sort of choice of $\mathbf{W}$ is rational in any context where the goal is to determine the number of Ps that Q. The sentence specifies that x is a woman at the party, so the set of ys that stand in the $\mathbf{W}$ relation to x is the set of women at the party. Hence (65) can be rewritten as:

(66) $\exists x[\text{WOMAN}(x) \wedge \text{AT-PARTY}(x)] \wedge \forall y[[\text{WOMAN}(y) \wedge \text{AT-PARTY}(y)] \rightarrow y \sqsubseteq x]$

This is equivalent to a statement that the cardinality of the set of women at the party is exactly one: $|\text{WOMAN}(x) \wedge \text{AT-PARTY}(x)| = 1$. Thus, with the appropriate choice of $\mathbf{W}$, the quantificational version of *sole* in (63) can be derived as a variant.

4. Conclusions

To summarize, we have argued for two main conclusions:

- Definite noun phrases are fundamentally predicative and contribute a weak uniqueness presupposition (existence → 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. (The quantificational use, however, is derived.)

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* is compatible with the indefinite article while *only* is not. 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.

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