Monotonicity, Closure and the Semantics of *few*

Stephanie Solt
The CUNY Graduate Center

1. Introduction

It is now common to analyze indefinite DPs as requiring both quantificational (type ⟨⟨e,t⟩,t⟩) and predicative (type ⟨e,t⟩) interpretations, with the two related by a set of type shifting rules (Partee 1986). In one direction, the BE operation maps generalized quantifiers to the corresponding predicates, while in the other, A or Existential Closure (Heim 1982) "lifts" predicates to generalized quantifiers.

(1) a. BE: $BE(\mathcal{P}) = \lambda x[\mathcal{P}(\lambda y[y=x])]$
b. Existential Closure (EC): $EC(P) = \lambda Q \exists x[P(x) \wedge Q(x)]$

But it is well known that these operations fail to yield intuitively correct results for non-monotone-increasing expressions (de Swart 2001; Landman 2004; among others). As an example of the most recognized aspect of this problem, the application of Existential Closure to a predicative interpretation of *at most 3 cats*, as in (2), yields a result which has as a consequence that (3a) entails (3b), and (more fatally) fails to ensure that (3a) is incompatible with (3c):

(2) a. $[\![(\text{at most 3 cats})_{\langle e,t\rangle}]\!] = \lambda x[*cat(x) \wedge |x| \leq 3]$
b. $EC([\![(\text{at most 3 cats})_{\langle e,t\rangle}]\!]) = \lambda Q \exists x[*cat(x) \wedge |x| \leq 3 \wedge Q(x)]$

(3) a. At most three cats are in the garden
b. A cat is in the garden
c. More than three cats are in the garden

In the present paper, I examine this issue with particular reference to one lexical item, *few*. As one of only a small number of morphologically simple monotone decreasing expressions in English, *few* is a particularly relevant subject for study, since it presents this problem in its most simple form. Beyond this, as will be seen below, *few* exhibits several other characteristics that provide input to deciding between possible analyses.

In what follows, I argue for an analysis of *few* as decomposable into a positive cardinality predicate and a negation operator that can (but does not always) take separate and higher scope. I show that this approach not only yields correct results under type shifting, but also accounts for other apparently unrelated facts, notably the relationship of the pair *few*/*a few*.

2. Basic Facts about *few*

Before proceeding to the main topic of this paper, it is necessary to introduce some basic facts relating to *few*. To start, *few* is vague and features a contextual dimension to its interpretation (Keenan & Stavi 1986; Partee 1989; Lappin 2000). A sentence such as (4) thus seems to convey that the number of students passing does not exceed some contextually determined upper bound.

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(4) Few students passed the test

It has often been noted that *few* can be paraphrased as *not many*, as in (5), and some accounts have analyzed it formally as such (Klima 1964; Barwise & Cooper 1981; McNally 1998).

(5) Few students passed the test ≈ Not many students passed the test

Although intuitions vary, diagnostics also show that *few* can be none (Horn 1989). It is not obvious that this interpretation is available in examples such as (4). However, suppose I make you the bet in (6); if it subsequently turns out that no students pass, I would argue that I have won the bet.

(6) I'll bet you that few students will pass the test

Turning to the properties most relevant to the present paper, *few* is monotone decreasing, as seen by the pattern of entailment in (7a), and thus licenses negative polarity items, as in (7b):

(7) a. Few Mormons smoke ⇒ Few Mormons smoke and drink
b. Few Mormons have ever had a cigarette

As evidence that an expression such as *few students* is like other plural indefinites in requiring an interpretation at type ⟨e,t⟩, *few* is allowable in positions in which indefinites, but not truly quantificational expressions, may occur; the most notable example is *there*-insertion contexts, which have been analyzed as requiring DPs with predicative interpretations (McNally 1998):

(8) There is/are a/some/three/many/few/*every/*most/*both cat(s) in the garden

Furthermore, as has been noted by Partee (1989), Kayne (2005) and others, *few* (like *many*) exhibits adjectival characteristics, in that it has comparative and superlative forms (9a), can be preceded by determiners (9b), may appear in predicative position (9c), and may be conjoined with adjectives (9d):

(9) a. fewer, fewest
b. those few students; his few friends; the few advantages of his theory; a few people
c. his good qualities are few
d. the flowers are few and small but readily identifiable by their uniquely marked lip

This suggests that a semantic representation at the modifier rather than determiner type is required.[1]

3. Three Puzzles – And Some Possible Solutions

Having established the basic semantic facts relating to *few*, in the present section I introduce three puzzles that a semantic analysis must address, and discuss some proposals to capture them.

3.1 Type shifting anomalies

The first problem is the one we began with. Whether the predicative or quantificational type is taken as primary, the application of the type shifting operations in (1) to expressions formed with *few* yields incorrect results. Thus (10) shows the application of Existential Closure to a predicative

[1] The claim that *few* has a non-quantificational interpretation is not, however, universally accepted (see in particular Herburger (1997) for an argument that *few* has exclusively determiner semantics, and Hackl (2000) for a similar point about *many*). Another influential proposal, originating with Partee (1989), is that *few* is lexically ambiguous between a cardinal reading (with adjectival semantics) and a proportional reading (with determiner semantics). Here I rely on the facts of (8) and (9) to conclude that *few* must have an interpretation at the modifier type; I leave open the possibility that there is a separate determiner *few* responsible for proportional readings.

interpretation of *few students* (here as a first approximation I take *few* to be interpreted as "less than some contextually specified value *n*"). As was the case in (2) and (3) above, the result implies that *few* entails existence (contra (6) above). Furthermore, (10b) fails to exclude values exceeding the contextually determined upper bound *n* (because if more than *n* students satisfy a given predicate, there must be a subset of this group of cardinality less than *n* who also satisfy it).

(10) a. $[\![(\text{few students})_{\langle e,t\rangle}]\!] = \lambda x[*\text{student}(x) \wedge |x| < n]$ for some contextually specified value n
b. $EC([\![(\text{few students})_{\langle e,t\rangle}]\!]) = \lambda Q \exists x[*\text{student}(x) \wedge |x| < n \wedge Q(x)]$

It is perhaps less recognized that the quantificational-to-predicate shift is also problematic. (11) shows the result of applying BE to a generalized quantifier *few students*; the result of this operation is a predicate which, if thought of in set terms, is a set that contains individuals other than students. Below we will see that this is not only counterintuitive, but also yields an incorrect interpretation in certain contexts.

(11) a. $[\![(\text{few students})_{\langle\langle e,t\rangle, t\rangle}]\!] = \lambda P[|P \cap *\text{student}| < n]$
b. $BE([\![(\text{few students})_{\langle\langle e,t\rangle, t\rangle}]\!]) = \lambda x \neg [*\text{student}(x) \wedge |x| \geq n]$

Regarding the problem of incorrect results upon the application of Existential Closure, several proposals are current in the literature. In the first approach, a monotone decreasing predicate is decomposed into a positive expression and a negation operator which can take separate scope, above the existential operator introduced via the type shift. In the context of an analysis of *there*-insertion constructions, McNally (1998) proposes that *few* be treated as a version of *many* which must appear within the scope of abstract clausal negation. Landman (2004) similarly analyzes *no* as composed of a positive indefinite and a negation operator that is "stored" until it can take sentential scope.

These accounts draw on a long tradition of "decompositional" analyses of negative indefinites (e.g. Jacobs 1980). With respect to *few*, there is considerable support for this approach. As noted above, several authors have analyzed *few* as formally equivalent to *not many*. In support of the position that *few* is negative, Klima (1964) points out that expressions formed with *few* exhibit the characteristics of sentential negation; for example, like overtly negative expressions they take *either* rather that *too* tags (12), and give rise to inversion when preposed (13):

(12) a. Men like Brussels sprouts, and women do, ✓too/*either
b. Men don't like Brussels sprouts, and women don't, *too/✓either
c. Few men like Brussels sprouts, and few women do, *too/✓either

(13) a. In many cases, serious side effects have been found
b. In no cases have serious side effects been found
c. In few cases have serious side effects been found

In light of this, the representation of *few* in terms of a negation operator seems reasonable.

On the other hand, not all researchers have been as willing to accept lexical decomposition of this sort (e.g. Geurts 1996; de Swart 2000). An alternate approach to resolving the issues exemplified in (10) and (11) is to introduce more complex type shifting operations, with separate clauses applying to increasing and decreasing expressions. Thus to capture the correct interpretations of decreasing expressions such as *at most 3 cats*, Landman (2004) supplements Existential Closure with an additional operation, Maximalization, given in simplified form in (14):

(14) $MAX(P) = \lambda Q[P(\sqcup(\lambda x[P(x) \wedge Q(x)]))]$

In a similar vein, de Swart (2001) reserves Existential Closure for increasing predicates, introducing a separate operation, Universal Closure, for decreasing predicates (in de Swart's theory, these closure operations take effect at the sentential level, rather than as type shifts at the DP level):

(15) Existential Closure: $\exists C: \lambda x Q(x)(P_{min}) \rightarrow \exists x[P(x) \wedge Q(x)]$ monotone increasing
Universal Closure: $\forall C: \lambda x Q(x)(P_{max}) \rightarrow \forall x[Q(x) \rightarrow P(x)]$ monotone decreasing

However, this approach clearly adds complexity; it seems desirable to seek a solution that captures the same set of facts without multiplying the number of type shifts employed. A further issue is how to constrain the application of these multi-part rules. Landman must introduce an additional mechanism to prevent the application of Maximalization to DPs formed with cardinal numbers, as this would incorrectly block an "at least" reading. For de Swart, predicative DP interpretations are derived from quantificational interpretations via BE, allowing the monotonicity of the underlying quantifier to determine which of the two rules in (15) will apply. But this depends crucially on BE yielding a predicate with the correct interpretation, which we will see below is problematic.

3.2 Split scope readings

A somewhat related puzzle is how to account for what have come to be known as "split scope" readings with *few* and other non-increasing quantificational expressions. As an example, (16a) can most naturally be paraphrased with the split scope (16b), where the negation has scope over the modal verb *need*, which in turn scopes over "large number of reasons." This is distinct from the true wide scope reading in (16c), which could be captured via quantifier raising, and from the narrow scope (16d), where *few reasons* remains entirely within the scope of *need*.

(16) a. They need few reasons to fire you
b. (To fire you) it is <u>not</u> the case that they <u>need</u> <u>a large number</u> of reasons Split
c. …there are <u>not</u> <u>a large number</u> of (specific) reasons that they <u>need</u> Wide
d. …they <u>need</u> there <u>not</u> to be <u>a large number</u> of reasons Narrow

Under a decompositional approach to *few*, an account for this readily suggests itself: The negation operator is able take separate and higher scope from the remainder of the DP, above the modal verb. Analyses along these lines have been suggested by several authors (Larson, den Dikken & Ludlow 1997; Van Geenhoven & McNally 2005), and in fact the existence of split scope readings has been cited as support for decompositional analyses (Landman 2004). See also Hackl (2000) and Heim (2000) for analyses of split scope readings in comparative constructions as resulting from the movement of a degree operator associated with the comparative form (though the existence of this phenomenon with the morphologically simple *few* suggests that it cannot be attributed to the comparative morphology itself).

On the other hand, in theories that do not allow lexical decomposition, some separate account of split scope readings must be introduced. De Swart (2000) proposes an analysis based on quantification over higher types, an approach which adds further complexity beyond the necessity for multiple type shifting rules described in Section 3.1 above.

3.3 Det + few

The final puzzle, which has received far less attention in the literature, relates to the properties of *few* when it is preceded by a determiner, including *a*, *the*, or a possessive pronoun. As can be seen, *few* in these contexts differs in syntactic behavior and semantic interpretation from 'bare' *few*.

First, *few* in these cases must minimally specify a plurality of individuals. Thus to establish the truth of (17a-c), *a few students*, *the few students who were invited* and *his few friends* must be more than one individual; this contrasts with *few students*, which I argued above can be <u>no</u> students:

(17) a. A few students came to the party
b. The few students who were invited came to the party
c. His few friends came to the party

In fact, *a few* marginally allows an "at least" reading – in contrast to the upper-bounded *few*:

(18) A few students passed the test; in fact, lots of them did

Few in these contexts does not license negative polarity items (19). Nor does it exhibit the characteristics of sentential negation, in that it takes *too* rather than *either* tags (20), and does not allow inversion when preposed (21):

(19) *A few Mormons/the few Mormons I know/his few Mormon friends have ever had a cigarette

(20) a. A few students came to the party, and a few professors did ✓too/*either
b. The few Greek students came to the party, and the few Greek professors did ✓too/*either
c. His few friends came to the party, and her few friends did ✓too/*either

(21) a. *In a few cases have severe side effects been found
b. *In the few reported cases have severe side effects been found
c. *With his few jobs would John be satisfied

Of these various Det + *few* sequences, the most interesting is *a few*. The standard assumption would seemingly be that *a few* is a fixed, idiomatic unit (though see Kayne 2005 for an exception). But there is considerable evidence that *a few* is not an idiom, but is in fact closely related (derivationally as we will see) to *few*.

Note first that *a few* does not act like a syntactic unit: *a* and *few* may be separated by an adverb *(a very few students*) or by an adjective modifying the head noun (*a lucky few students*). Since *a few* is apparently formed in the syntax, a compositional semantic treatment, where *a few* is analyzed as *a* + *few*, is likewise desirable.

As further evidence of the close relationship between *few* and *a few*, *a few* occurs in some contexts where we would expect *few*. For example, Klima (1964) notes that while *few* can typically be replaced by *not many*, in certain contexts, *not many* corresponds to *a few*:

(22) Not many/*(a) few years ago, I lived in Paris

Finally, consider the contrast exemplified in (23) below:

(23) a. Not every student passed the test
b. Not many students passed the test
c. Not a student passed the test
d. Not five minutes later, the professor walked in
e. Not a few students passed the test

In (23a-d), *not* + quantifier + N specifies a number of individuals smaller than quantifier + N; thus *not many students* is less than many students, and so forth. But in (23e), *not a few students* is more than a few students; in fact, *not a few* has precisely the interpretation that we would expect from *not few*.

Here, then, it seems that we have found a context where *a few* is actually interpreted as *few*. This fact makes the pair *few*/*a few* of particular interest for semantic analysis.

Turning back to the discussion of alternative semantic treatments of negative indefinites, it can be seen that the facts in this section are problematic for analyses of *few* as composed of a positive term and a clausal negation operator. Clearly, sentences such as (17a-c) cannot be paraphrased with wide scope (sentential) negation. That Det + *few* does not license NPIs and fails tests of sentential negation similarly suggests that an analysis in terms of clausal negation cannot be correct in these cases.

In this respect, it seems that accounts which introduce a separate type shifting operation for non-increasing expressions would have an advantage, since the differing generalized quantifier interpretations of *few students* and (say) *a few students* could be localized in the semantics of this type shift compared to the semantics of the determiner in question. But here, the availability of the correct predicative interpretation is crucial. In this light, consider again the result of deriving the predicative interpretation of *few students* from a generalized quantifier via the type shift BE, as in (11). Without

concerning ourselves at present with the formal details, if we take *the* to denote a maximalization operator (Link 1983; Landman 2004), applying it to a predicate of the form in (11b) yields a result that would predict that (24a) could be paraphrased as (24b):

(24) a. The few Greek students came to the party
b. The individuals who are not large groups of Greek students came to the party

Instead, it seems that the correct predicative interpretation of *few students* must be closer to that given in (10a). But this cannot be derived via BE (see Landman 2004 for a related discussion); furthermore, with this as a starting point, de Swart's Universal Closure operation would not yield the correct results. In this respect Landman's theory fares better, since it takes the predicative interpretations of indefinites to be primary, though it is not clear how this account would address *a few*.

Thus none of the theories of negative indefinites discussed here captures the complete range of facts presented in this section. In the following section, I introduce a new analysis of *few* that holds promise of a more complete solution.

4. The Proposal

In the analysis to follow, I adopt Link's (1983) lattice-theoretic approach to plurality, in which the domain of individuals is extended to include plural individuals. I further follow the tradition of decompositional analyses of negative indefinites (Klima 1964; Jacobs 1980; McNally 1998). I then propose the following as the lexical entry for *few*:

(25) **PROPOSAL**: *few* is a one-place cardinality predicate (type ⟨e,t⟩) which is composed of a truth-functional negation operator and a positive component. The negation may be realized in one of two ways (terminology from Klima 1964 and many later authors):

a. **Sentential Negation:** The negation takes sentential scope

$[\![\text{few}_{\langle e,t \rangle}]\!] = \neg\ldots..\lambda x[\text{large}^C(|x|)]$, where large^C is some contextually defined value[2]

b. **Constituent Negation:** The negation operator and positive term form a unit

$[\![\text{few}_{\langle e,t \rangle}]\!] = \lambda x[\neg\text{large}^C(|x|)]$

In Section 5, I will propose that it is an interaction of syntactic and semantic factors that determines the choice between these two options in a given context; for now, I assume that (25a) is the default, with (25b) available only if (25a) is disallowed.

According to the definitions in (25), *few* is not inherently quantificational. I propose that in either case, quantificational force arises via the application of Existential Closure as defined in (1b), the difference being in whether this operation applies within the scope of the negation operator (in (25a)) or above it (in (25b)). To formalize the scope-taking characteristics of the negator in the former case, I make use of a version of Landman's (2004) mechanism of type-driven storage and retrieval:

(26) **Negation Storage and Retrieval:** The negation operator enters the derivation "stored," and is retrieved and applied at the first point at which the derivation reaches type t.

Finally, in (25), both $\text{large}^C(|x|)$ and $\neg\text{large}^C(|x|)$ are taken to be predicates over plural (i.e. non-atomic) individuals, thus excluding elements of cardinality 0 and 1 from their domains.

With this in place, we are in a position to address the puzzles introduced in Section 3.

[2] It may, in fact, be appropriate to define *few* as ¬*many*, as has been done by previous authors. However, intuitions vary as to whether *few* is identical in meaning to *not many*; as this point is not central to the present analysis, I do not make this explicit claim here.

4.1 Few and type shifting

I start with the problem introduced in Section 3.1, namely obtaining the correct results upon type shifting of a DP such as *few students*. Since *few* is defined in (25) as a predicate, this amounts to deriving the correct generalized quantifier interpretation. In this case, I make use of the sentential negation option for *few* from (25a). Then a sentence such as (27a) receives the derivation in (27b):

(27) a. Few students passed the test

b. $[\![\text{few}_{\langle e,t\rangle}]\!] = \lambda x[\text{large}^C(|x|)]$ store: ¬ from (25a)

$[\![(\text{few students})_{\langle e,t\rangle}]\!] = \lambda x[\text{large}^C(|x|) \wedge *\text{student}(x)]$ store: ¬

$[\![(\text{few students})_{\langle\langle e,t\rangle,t\rangle}]\!] = \text{EC}([\![(\text{few students})_{\langle e,t\rangle}]\!])$ from (1a)
$= \lambda P \exists x[\text{large}^C(|x|) \wedge *\text{student}(x) \wedge P(x)]$ store: ¬

$[\![$ few students passed the test $]\!] =$
$= \exists x[\text{large}^C(|x|) \wedge *\text{student}(x) \wedge \text{passed}(x)]$ store: ¬
$= \neg\exists x[\text{large}^C(|x|) \wedge *\text{student}(x) \wedge \text{passed}(x)]$ Neg Retrieval
'it is not the case that a large number of students passed'

(27b) is true if a small number of students passed, if a single student passed, or if no students at all passed, which is intuitively correct. In particular, while *few* is a predicate of plural individuals, in argument position *few N* can be none, as I argued above is required. With the proposal in (25), we have therefore captured the correct quantificational interpretation of *few students*, without recourse to type shifts beyond Existential Closure.

4.2 Split scope readings

I turn now to the puzzle of split scope readings introduced in Section 3.2. Here I draw on Zimmermann's (1993) analysis of intensional verbs as expressing a relationship between an individual and a property (type ⟨s,⟨e,t⟩⟩) (for similar proposals, see Larson, den Dikken & Ludlow 1997; Landman 2004; and Van Geenhoven & McNally 2005). Then we have the following:

(28) $[\![\text{need}]\!] = \lambda P \lambda x[\text{need}(x, P)]$

(29) a. They need few reasons

b. $[\![(\text{few reasons})_{\langle e,t\rangle}]\!] = \lambda x[\text{large}^C(|x|) \wedge *\text{reason}(x)]$ store: ¬

$[\![$ need few reasons $]\!] =$
$= \lambda y[\text{need}(y, \hat{}\lambda x[\text{large}^C(|x|) \wedge *\text{reason}(x)])]$ store: ¬ from (28)

$[\![$ they need few reasons $]\!] =$
$= \text{need}(\text{they}, \hat{}\lambda x[\text{large}^C(|x|) \wedge *\text{reason}(x)])$ store: ¬
$= \neg\text{need}(\text{they}, \hat{}\lambda x[\text{large}^C(|x|) \wedge *\text{reason}(x)])$ Neg Retrieval
'it is not the case that they need a large number of reasons'

Here, the requirement that the stored negator in (25a) be applied to the first expression of type t encountered in the derivation correctly yields the split scope reading for (29a), in which the negator scopes over the intensional verb, which in turn scopes over 'large number of reasons.'

4.3 Det + few

Finally, we come to the problem of obtaining the correct interpretation for *few* when it is preceded by a determiner. I focus in particular on *a few*, with some brief comments about *the few* below.

Here I take the position that *a* does not itself introduce existential quantification, but that an expression such as *a student* or *a few students* acquires quantificational force via Existential Closure (Heim 1982). However, I propose that in the case of *a few*, *a* does have a semantic impact, in that in its presence, only the constituent negation option for *few*, i.e. (25b), is available. In Section 5, I will discuss a possible syntactic explanation for this restriction.

Then we have the following as the derivation of the predicate *a few students* [3]:

(30) $[\![\text{few}_{\langle e,t\rangle}]\!] = \lambda x[\neg \text{large}^C(|x|)]$ from (25b)
$[\![\text{a few}_{\langle e,t\rangle}]\!] = \lambda x[\neg \text{large}^C(|x|)]$
$[\![(\text{a few students})_{\langle e,t\rangle}]\!] = \lambda x[\neg \text{large}^C(|x|) \wedge *\text{student}(x)]$

In (30), *a few* is first composed as a constituent, before combining with the noun: (*a few*)(*students*). An alternate possibility is to allow *few* to combine first with the noun, before the addition of *a*: (*a*)(*few students*). It is the latter option that allows a noun modifier to intervene between *a* and *few*, as discussed earlier. In either case, Existential Closure and application to a predicate proceed as follows:

(31) a. A few students passed the test

b. $[\![(\text{a few students})_{\langle\langle e,t\rangle,t\rangle}]\!] = \text{EC}([\![(\text{a few students})_{\langle e,t\rangle}]\!])$ from (1b)
$= \lambda P \exists x[\neg \text{large}^C(|x|) \wedge *\text{student}(x) \wedge P(x)]$

$[\![\text{a few students passed the test}]\!] =$
$= \exists x[\neg \text{large}^C(|x|) \wedge *\text{student}(x) \wedge \text{passed}(x)]$
'a not-large number of students (plural) passed'

Thus while *few* in (29b) is interpreted as 'not a large number,' *a few* in (31b) is 'a not-large number,' which appropriately captures the difference in their meaning. Note in particular that the specification that $\neg \text{large}^C(|x|)$ is a predicate of plural individuals correctly ensures that *a few* is at least a plurality.

In Section 3.3 I introduced the curious fact that *not a few* unexpectedly means <u>more</u> than a few. The present account provides an explanation. I first assume (32) as the interpretation of *not* applied to a predicate:

(32) $[\![\text{not P}]\!] = \lambda x \neg P(x)$

Then (33a) has the derivation in (33b):

(33) a. Not a few students passed the test

b. $[\![\text{a few}_{\langle e,t\rangle}]\!] = \lambda x[\neg \text{large}^C(|x|)]$ from (30)

$[\![\text{not a few}_{\langle e,t\rangle}]\!] = \lambda x[\neg\neg \text{large}^C(|x|)] = \lambda x[\text{large}^C(|x|)]$

$[\![(\text{not a few students})_{\langle\langle e,t\rangle,t\rangle}]\!] = \lambda P \exists x[\text{large}^C(|x|) \wedge *\text{student}(x) \wedge P(x)]$

$[\![(\text{not a few students passed the test}]\!] =$
$= \exists x[\text{large}^C(|x|) \wedge *\text{student}(x) \wedge \text{passed}(x)]$
'a large number of students passed'

(33b) can be compared to (31b) and (27b) to see that we have accurately interpreted *not a few* as more than *a few*, and in particular as equivalent to what we would expect for *not few*. Without analyzing *a few* as derived from a predicate *few*, it is not apparent how this result could have been obtained.

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[3] The claim that *a* can combine with a plural NP is perhaps a surprising one. To harmonize this with more standard views, we could follow Kayne (2005) in proposing that syntactically, *few* is the modifier of an unpronounced noun NUMBER, which in the case of *a few* has singular features. In terms of the theory presented here, we could view the semantic contribution of NUMBER as introducing the specification of cardinality.

Finally, the availability of the constituent negation interpretation of *few*, i.e. (25b), also allows the derivation of the correct semantics for *the few*. Here I follow Landman's (2004) definition of *the* as a maximalization operator, as in (34), which (if *few well-prepared students* is defined) gives (35a) the interpretation in (35b):

(34) $[\![\text{the P}]\!] = \sqcup\lambda x P(x)$ iff $\sqcup\lambda x P(x) \in [\![P]\!]$; undefined otherwise

(35) a. The few well-prepared students passed the test
b. $\text{passed}(\sqcup\lambda x[\neg \text{large}^C(|x|) \,\&\, *\text{well-prepared-student}(x)])$

5. *Few* and the Scope of Negation

The discussion in the preceding section demonstrates that a wide range of facts can be captured via a proposal that *few* is a one-place predicate composed of a positive term and a negation operator that can take either constituent or sentential scope. But the obvious question that remains is how to constrain the availability of these two scope options. That is, what rules out the availability of the constituent negation option for *few students*, or the sentential negation option in the case of *a few students* or *the few students*?

Importantly, the alternation between sentential and constituent negation discussed here is not unique to *few*; rather, it is part of a broader phenomenon where a DP-internal negative term may have different possible scopes (Klima 1964; Horn 1989). A classic example is (36), which is ambiguous between a sentential negation reading ("there is no job that John would be happy with") and a constituent negation reading ("John would be happy jobless"):

(36) John would be happy with no job

More closely related to the topic of the present paper, the overtly negative *not many* exhibits much the same behavior as *few*. In argument position *not many* typically has a sentential negation reading, as evidenced by the licensing of NPIs in examples such as (37a). But if it is preceded by a determiner, an awkward but not ungrammatical construction, the negation must take lower scope, as seen by the unavailability of the NPI in (37b); again, this is directly parallel to *few*.

(37) a. Not many Mormons have <u>ever</u> had a cigarette
b. *The not many Mormons I know have <u>ever</u> had a cigarette

If we analyze *many* also as a predicate which receives quantificational force via Existential Closure, we must conclude that this operation can occur within the scope of *not*, just as I have proposed for *few*; conversely, in the presence of an overt determiner, the negation must be able to surface lower.

The topic of sentential and constituent negation has received considerable attention in the syntactic literature (Haegeman 1995, 2002; Kato 2000; Svenonius 2002; among others). One thread in this work has been to examine the relationship of the syntactic position of a negative DP to the availability of a sentential negation reading. As an example, Haegeman's (1995) NEG Criterion holds that in the case of sentential negation, the negative constituent must be in a Spec-Head relationship with a negative head, or form a chain with a null operator in this position.

It is also likely that the syntactic structure of the DP itself, particularly the position of the negative element within it, also plays a role in whether sentential negation obtains. With regards to the present topic, we might as an initial hypothesis propose that the *few* in *few students* and that in (say) *a few students* are in different syntactic positions in the DP, and that this correlates with the availability of sentential versus constituent negation readings. As one possibility, 'bare' *few* might raise to SpecDP (cf. Haegeman 2002 on *not many*), from which position its negative component could take sentential scope. But *a few* might be blocked from this position (perhaps due to a conflict between singular features on *a* and a null D head with plural features), leaving constituent negation as the only option. This appears to be a fruitful direction to pursue, but I must leave a fuller investigation to a later date.

6. Conclusions

This paper began with a problem in applying type-shifting rules to non-monotone-increasing indefinites. Focusing in particular on *few*, I have shown here that a decompositional analysis provides a solution to this problem, while also addressing two seemingly unrelated sets of facts: the availability of split scope readings, and the relationship of the pair *few*/*a few*. I have suggested that an interaction of syntactic and semantic factors is responsible for determining the scope of the negation operator in *few*; a fuller account of these factors remains an interesting topic for further study.

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