Emphatic NPI/FCI and adversative discourse relations, a probabilistic approach*

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Abstract. This paper deals with the discursive effects of the use of *emphatic* Negative Polarity Items and Free Choice Items such as *any*. In this work, we show that the use of the emphatic *any*, be it an NPI or an FCI, has a direct effect on the introduction of subsequent discourse segments. Our theoretical observations are backed up by experimental results. To account for the data, an explicit link between two previously unrelated probabilistic approaches to natural language semantics is proposed. The first one deals with the semantics of NPIs and FCIs, respectively van Rooy (2003), Jayez (2010), and the second one tackles the interpretation of discourse markers Merin (1999). It is shown that, modulo some formal tinkering, the two accounts interact nicely together to explain the data.

The meaning of NPIs, FCIs or ambivalent items such as *any* has long been studied, mainly in terms of denotation and alternative based semantics. The discursive effects of these elements have been less discussed. It is the point of this paper to investigate some of the discursive effects conveyed by the use of *any*.

Section 1 sets up the empirical domain we are interested in. The results of an experimental investigation are presented. They confirm that the data we study is stable and coherent. They also give an experimental basis for distinguishing *emphatic* uses of the element *any*.

In Sect. 2, various approaches to the semantics of NP/FCI are detailed and Sect. 3 does the same with the semantics of the discourse marker *but*. The analyses proposed share the characteristic of being based on probabilistic models: van Rooy (2003), Jayez (2010) for the semantics of NPIs and FCIs respectively, and Merin (1999), Winterstein (2010) for the semantics of discourse markers.

This enables us to formally link the two kinds of approaches in Sect. 4. To our knowledge, there is so far no attempt that tries to establish an explicit link between such accounts. One of the results of this paper is thus to evaluate the merits of integrating both propositions.

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1 The empirical landscape of NP/FCIs and adversative relations

This section is empirical. Its main point is to show that the use of emphatic NPIs or FCIs carries with it some discursive effects. These effects can be observed by the (im)possibility to use certain discourse markers to introduce a subsequent discourse segment once an NP/FCI has been used.

1.1 Emphatic NP/FCIs

The prototypical example of NP/FCI that we use in this work is given by *any*. In Sect. 2 we give a detailed overview of some of the proposals that have been proposed to account for the semantics of this item. In this section, we only give an intuitive description of what *any* marks in linguistic contexts where its use would not be mandatory (i.e. in cases where we shall qualify the use of *any* as being *emphatic*).

Roughly, we call an item *emphatic* when its use in a certain context is not grammatically required but satisfies discursive means, see the following examples:

(1) a. I was lost all alone in the middle of a desert I didn't have any idea where to go.
b. *I was lost all alone in the middle of a desert I didn't have some/an idea where to go.

(2) a. I was lost all alone in the middle of a desert I was lucky that I got any help (at all)!
b. I was lost all alone in the middle of a desert I was lucky that I got some help!

The comparison between (1-a) and (1-b) on one hand and (2-a) and (2-b) on the other hand shows a contrast between two kinds of use of the NPI *any*. In (1) the use of *any* is grammatically required since the use of another neutral determiner, like *some* or *a*, instead is odd. In (2) the use of *any* is not grammatically required since *some* is also grammatical, therefore *any* must have been used in order to induce particular argumentative effects. Furthermore the use of *any* in (1-a) sounds more natural to English native speakers if it is stressed or modified by the emphatic discourse marker *at all*. We will come back to the definition in more detail in section 2.

The difference between the interpretations of (2-a) and (2-b) relies on the nature of the help provided to the speaker. In (2-b) the speaker received substantial help, whereas in (2-a) the speaker received the minimal amount of help.

1.2 Observations

Our main observation pertains to the contrast observed in (3).

(3) a. #I'm glad you got us any tickets at all, but they're not front row.
b. I'm glad you got us tickets, but they're not front row.

Whereas the version in (3-b) appears natural enough, the use of an NP/FCI in the noun phrase in (3-a) seemingly forbids the speaker to criticize the placement on the tickets. The second segment is introduced by the connective *but* which in this case must receive a denial of expectation (also called argumentative) interpretation rather than a purely contrastive one (see Lakoff (1971), Umbach (2005), Winterstein (2010) for more about the distinction between these uses). This denial of expectation interpretation entails that the conjunct introduced by *but* must go against or contradict a conclusion that is made manifest by the first conjunct.

Thus, the intuitive explanation for the degraded character of (3-a) is that the use of *any* marks that the speaker is glad of his tickets, regardless of their nature. Introducing an exception to that with the use of *but* goes against the conventionally marked equality between the tickets, which makes the speaker sound dissonant.

1.3 Experimental approach

In order to confirm our intuitions about the data presented above, we ran an experiment on native English speakers.

Experimental design Twenty-six subjects agreed to participate in an online judgment task. They did not receive any compensation for their time. The subjects were asked to judge the naturality of sentences appearing on their screens. Naturality was judged by means of a scrolling bar without explicit graduation, except for the mentions *Weird* at the far left side and *Natural* at the far right side. The score on the bar translated to a figure between 0 and 100. In total, the subjects were shown fifteen screens, a third of which contained fillers. The sentences were presented after an introduction explaining the expected task, with examples to illustrate this task.

The target sentences were given in pairs: one that contained an emphatic item (usually *any*), and another that did not (labeled as "bare" sentences). Both versions included an exceptive segment introduced by *but*. It was assumed and confirmed by native speaker (but not tested) that without the *but*-introduced segment both versions were equally acceptable, albeit with a difference meaning. For example, both versions of (3) were presented on the same screen. The relative order of the sentences on one screen was randomized, and the relative order of the screens was also randomized, with a homogeneous distribution of fillers between the targeted items.

Results The main results are presented on Fig 1 : the given figures correspond to the average of the scores attributed to the sentences of the "bare" type and the ones that contained an NP/FCI, in emphatic and non emphatic contexts.

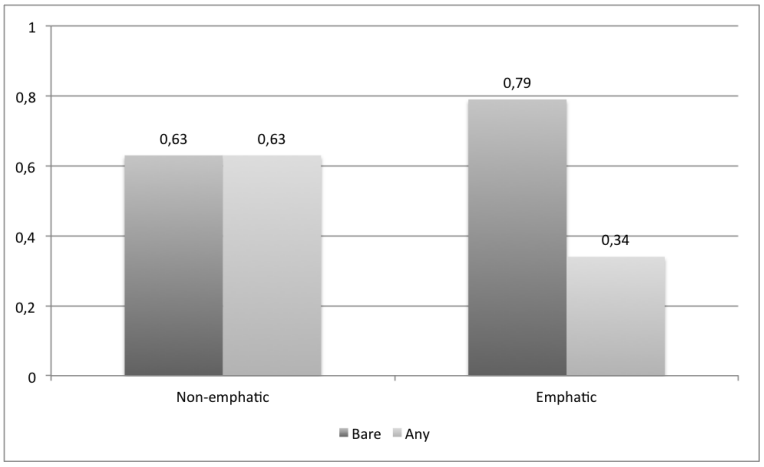

Fig. 1. Comparison between NP/FCI and bare sentences in emphatic and non-emphatic contexts

As can be seen on the figure, the difference appears much larger in the emphatic contexts compared to the non-emphatic. The following table shows the results of the Mann-Whitney/Wilcoxon test. The results show that the difference is highly significant in the emphatic case.

Table 1. Significance of the differences between NP/FCI and bare sentences

	Test statistic	p-value
Non-emphatic	7501	0.498
Emphatic	491.5	3.124e-15

The fillers provided the baseline for what is an acceptable and an agrammatical sentence. Acceptable sentences received an average score of 0.84 and agrammatical ones the average score of 0.08. In both cases, the standard deviation was low, confirming the non-controversial status of these sentences.

Discussion While still preliminary, the experimental results confirm our intuitions regarding the interplay of the emphatic use of items such as *any* and the subsequent introduction of an exception with a *but*-segment. This strongly suggests that NP/FCI in emphatic contexts have a bearing on the discourse structure.

A more comprehensive survey would require to test the pairs of sentences without the *but*-segment in order to verify that adding the exception does not

significantly affect the score of the "bare" sentences whereas it does for the NP/FCI sentences.

2 Probabilistic accounts for NPIs and FCIs

Since Kadmon & Landman (1993) NPIs and FCIs are taken to have the same meaning and the same function in their respective licensing contexts. The authors assume that NPIs, FCIs or ambivalent items, like *any*, obey two constraints: a *widening* and a *strengthening* constraint. This analysis relies on a comparison between common noun phrases (NPs) hosting plain indefinites (like *some N(s)*) and those hosting an NPI or an FCI (like *any N(s)*). Indeed, NPs of the form *any N* are said to range over a wider quantificational domain than *some N* kind of NPs, including in their quantificational domain 'extreme cases' or 'exceptions' (*widening* effect). And those widening-based NPs are licensed only if the statement of the sentence they occur in entails the statement of the same sentence with a plain indefinite (*strengthening* requirement), see (4) and (5).

(4) Negative polarity *any*
YOU: - Will there be French fries tonight?
ME: - No, I don't have [potatoes]$_D$
YOU: - Have you just a couple of potatoes that I could take and fry in my room?
ME: - Sorry, I don't have [ANY potatoes]$_{D'}$

(31) in Kadmon & Landman (1993)

(5) Free choice *any*
A: - [An owl]$_D$ hunts mice.
B: - A healthy one, that is?
A: - No, [ANY owl]$_{D'}$. (38) in Kadmon & Landman (1993)

Where:

- D is a subset of D' (*widening*).
- $S_{D'}$, the host sentence of the NP ranging over the enlarged domain D', entails S_D, the host sentence of the NP ranging over D(*strengthening*).

This analysis has been really successful and many accounts on NPIs and FCIs are built on Kadmon & Landman (1993)'s proposal. Among them, both van Rooy (2003) and Jayez (2010) respectively reinterpret *strengthening* and *widening* in a probabilistic framework.

2.1 van Rooy (2003): *strengthening* as *entropy*

It has been already noted by Kadmon & Landman (1993) that for two assertions *strengthening* has to be defined in terms of *entailment*, but that this definition doesn't hold anymore for questions. van Rooy (2003) notes that the only way one could understand the notion of entailment between two questions Q' and Q

is the following one: Q' entails Q if the set of answers to Q is a subset of the set of answers to Q'. But for two questions Q' and Q, with Q' stronger than Q because it ranges over a wider set of possible answers than Q, it is not true that the set of answers to Q will be a proper subset of the set of answers to Q', van Rooy (2003).

Following Krifka (1995), van Rooy (2003) assumes that in questions NPIs are used in order to reduce the bias towards a negative answer. For example, in a scenario where a speaker does not consider it to be highly probable that his addressee has ever been in China, she would better ask (6-b) than (6-a).

(6) a. Have you been in China (recently)?
b. Have you *ever* been in China (in your life)? (11) in van Rooy (2003)

Using the NPI *ever*, the speaker enlarges the domain of situations over which the question ranges. Intuitively, *widening* makes a question more general and in our scenario less biased. More precisely, the *widening* effect in a negatively biased question consists in increasing the probability of the positive answer and decreasing the probability of the negative one. In order to formalize this idea, van Rooy (2003) borrows from Information Theory the notion of *entropy*. In this framework *entropy* is a measure of uncertainty on the result of a certain experiment that is calculated on the sum of the probability of each possible outcome. Intuitively, if one outcome is more probable than another, you have more information on the result of your experiment and *entropy* is low but if all possible outcomes are equiprobable you are as ignorant as possible and *entropy* is maximal. According to van Rooy, an NPI makes its hosting question stronger in the sense that it increases its entropy and makes its possible answers, on average, more informative.

2.2 Jayez (2010): *widening* as *entropy*

Jayez (2010) also makes use of the notion of *entropy* but in order to reinterpret the notion of *widening*. According to many authors *widening* is a far too strong constraint that doesn't hold in many kinds of contexts. For example, this constraint doesn't hold anymore when the domain over which the NP ranges is contextually restricted (7-b), that is to say cannot be widened.

(7) a. You can pick [an apple]$_D$ in this basket
b. You can pick [any apple]$_{D'}$ in this basket Vendler (1967)
Where $D = D'$

According to Jayez (2010) the so-called *widening* effect doesn't arise when the quantificational domain is enlarged but rather when all the alternatives in that domain are considered to be equivalent with respect to the satisfaction of the proposition. Here again the *widening* constraint is interpreted as an increase of the equivalence between all domain alternatives over which an NP like *any N* ranges and is formalized in terms of *entropy*.

2.3 Unification of the probabilistic analyses

van Rooy's analysis aims at an interpretation of strengthening applied to the specific case of NPIs. On the other hand Jayez's main interest is on FCIs and their widening effect. Kadmon and Landman's foundational claim is that a unique analysis for the NP and FC uses of *any* is possible and is given in terms of a two-sided strengthening/widening constraint (where widening and strengthening are dependent). Since van Rooy and Jayez base their analyses on the Kadmon and Landman account, it seems natural to try to unify the two accounts.

Under Jayez's analysis, the entropic effect is on the probability for each possible value of an FCI to satisfy some property. van Rooy's entropic effect applies on the probability to answer *yes* or *no* to a polar question hosting an NPI. If we adopt both analyses, it entails that the entropic effects occur on two distinct levels. The case of (8) illustrates this.

(8) a. I'm glad you got us any tickets.
b. I'm glad you got us tickets.

In (8-a) the use of *any* marks that, the speaker had a low expectation about being glad to get tickets, i.e. that there was a bias in favour of him not being glad to get tickets. By using *any* all tickets are considered to be equally satisfactory for the speaker (which matches Jayez's analysis). This has the effect of raising the probability of the speaker being glad to get tickets, i.e. it reduces the bias between him being glad or not glad (this parallels van Rooy's proposition regarding the effect of NPIs in questions).

It is important to notice that the aforementioned accounts are especially meaningful on the specific case of *emphatic* NP/FCI, as formally defined in the next section.

2.4 Emphatic NPIs

An analysis in terms of *widening* and *strengthening* fits particularly well the description of the meaning of NPIs or FCIs that are used emphatically. Indeed, Kadmon & Landman (1993)'s key examples are typically examples of *emphatic* items. In their examples the licensing contexts of NP- and FC-*any* are dialog contexts where (i) *any* must be stressed and (ii) it is used in order to provide a correction to a misinterpretation of a previous negative or generic sentence, see (9) and (10).

(9) a. An owl hunts mice
b. ANY owl hunts mice!

(10) a. I don't have potatoes
b. I don't have ANY potatoes!

By *emphatic* we mean NPIs or FCIs that are used within an NP in a context where a neutral NP could have been used instead, that is a bare plural NP or a singular *some/a N* NP. NPIs and FCIs are not always emphatic, they might

be required by the computation of the meaning of their host sentence. In the following sentences, an NP of the form *any N* is required and a more neutral NP gives rise either to the ungrammaticality of the sentence (11) or to a specific reading of the NP under question, see (c) in each cases (12) for the NPI use (13) for the FCI use:

(11) *I didn't have some idea where to go.

(12) a. Mary doesn't teach any class this semester.
b. Mary doesn't teach a/some class this semester
c. $\exists x(C(x) \wedge \neg T(Mary,x))$

(13) a. Mary has to marry any doctor
b. Mary has to marry a/some doctor
c. $\exists x(D(x) \wedge \Box M(Mary,x))$

The conditions under which an NPI or an FCI might be used emphatically seem to depend on many factors relative to a certain language we cannot present in detail in this work. Just as an illustration, we can compare the use of the English negative polar pronoun *anything* with the French negative polar pronoun *quoi que ce soit*. The English NPI *anything* sounds neutral in negative sentences, while *nothing* is emphatic. We observe the opposite scenario in French where the N-word *rien* is neutral while *quoi que ce soit* is emphatic:

(14) a. I didn't eat anything
b. I ate nothing

(15) a. Je n' ai rien mangé
I NEG_1 have nothing eaten
'I didn't eat anything'
b. Je n' ai pas mangé quoi que ce soit
I NEG_1 have NEG_2 eaten anything
'I didn't eat ANYTHING'

It is not clear how our distinction between emphatic and non-emphatic NPIs or FCIs would match Krifka (1995) or Zwarts (1996)'s hierarchies of NPIs. First of all, contrary to Krifka (1995) and Zwarts (1996) we take into account the emphatic uses of FCI. Our distinction does not necessarily match Krifka's distinction between stressed and unstressed uses of *any-* forms. In other words, we have not tested whether the uses of emphatic *any* should necessarily be stressed and/or modified by a discourse marker such as *at all*. We will also have to verify if our proposition matches the distinction that Zwarts (1996) proposes between weak and strong NPIs on the basis of their licensing contexts.

3 Probabilistic accounts for discourse markers

The probabilistic approach to discourse markers we will consider here corresponds to the one proposed by Merin (1999). Merin's goal was to give a concrete interpretation to the notion of *argumentation* as pioneered by Anscombre & Ducrot (1983).

One of the most famous example of argumentative item is given by the adversative connective *but*. Its description goes as follows (with a definition of "is an argument" to be precised below):

(16) A sentence of the form A *but* B is felicitous iff. there exists an argumentative goal H such that:

- A is an argument in favor of H
- B is an argument against H

This characterization makes the clear assumption that the core meaning of *but* is its denial of expectation reading. While the question of the "basic" meaning of *but* is disputed in the literature Blakemore (2002), Sæbø(2003), Umbach (2005), Winterstein (2010), we will stick to the proposition above since all the uses we cover are denial of expectations and so this description easily fits our needs. To see how (16) covers cases of semantic contrast, the reader is invited to consult Winterstein (2010).

To give a concrete interpretation of the relation of *being an argument*, Merin proposes a probabilistic framework inspired by the works of Carnap. In this setting this relation is of a Bayesian nature. If A is an argument in favor of H, it means that the knowledge of A increases the subjective probability of H: $P(H|A) > P(A)$ (it is then said to be positively *relevant* to H). If this knowledge decreases the same probability, then A is an argument against H. The probability measure is one on epistemic states and corresponds to the intuitive speaker judgement about the likelihood of various situations. To measure effectively the impact of an assertion to the probability of the goal, Merin uses a *relevance* function r, such that $r_H(A)$ is positive iff. A argues in favor of H. The precise definition of r can vary, as long as it satisfies certain rules (see van Rooij (2004) for various examples of building such a relevance function).

The reconstruction of the goal H (termed "*abduction*") is often presented as a problematic feature of such approaches. In Winterstein (2010) it is shown that this reconstruction is not purely contextual as proposed by Merin, but that it is constrained by explicit clues such as the informational structure of the considered utterance.

Another important feature of this approach is that any type of speech act carries with it some argumentative goal. Questions, in particular, are seen as oriented towards a specific goal, and a question is relevant to a goal H, iff. one of its answers is relevant to H.

Finally, this approach has been shown to be effective to account for the combinations of discourse markers such as *but* and *too*. As such, it appears sensible to try to go for an articulation with elements that go beyond discourse structure marking, but that stay in a probabilistic descriptive model.

4 Bridging the two accounts

4.1 Questions and probabilities

Before going on an example involving both NP/FCI and discourse markers, we will show that the probabilistic effects of *but* interact with the expectations of the speakers regarding the answers to his question. This is illustrated in (17) where, out of the blue, the use of *but* to indicate that the potatoes are rotten (17-b) is better than a plain juxtaposition (17-a).

(17) *A:* Do you have potatoes?

a. ?*B:* Yes, rotten ones.

b. *B:* Yes, but rotten ones.

This is explained in the following manner:

- By asking its question, the speaker has a goal H in mind, to which the question must be relevant. Since the question is polar, each of the two answers must have an effect on H (either increase or decrease its probability). For simplicity, let's assume that H is a goal positively affected by the *yes* answer.
- Out of the blue, the kind of things one wants to do with potatoes involves them not being rotten (the most plausible one is eating the said potatoes). So the probability of H is raised iff. one has non-rotten potatoes. In Jayez's terms, the potatoes are not all equivalent to satisfy H.
- Thus, the *yes* answer indeed raises the probability of H: it excludes the worlds without potatoes, and by itself augments the chances to do H. But having rotten potatoes is a counter argument to this same H, which means that the conditions of use of *but* are met in this context. This explains the preference to use it, since, as noted for example by Asher & Lascarides (2003), the so-called *denial of expectation* uses of *but* make the use of an adversative connective mandatory.

4.2 Discourse markers and NP/FCI

The case of (18) shows that the use of *but* is no longer preferred if the speaker uses a NPI in his question instead of plain quantification.

(18) *A:* Do you have any potatoes?

a. *B:* Yes, rotten ones.

b. *B:* Yes, but rotten ones.

The improved character of (18-a) is due to the fact that the use of *any* is an indication that all potatoes are equal regarding the goal H that the speaker has in mind. Thus, them being rotten is no longer a counter argument for H, as it was in (17), and the use of *but* is not triggered. It is still possible to use *but* in this case, and by doing so, B indicates more clearly that he assumes that rotten potatoes might not be suitable for whatever purpose A has in mind.

This effect of *any* can also be seen outside questions, as in (19) and (20): its use in (20) ensures that all books by Chomsky, even non-linguistic ones, are equally valid for the explicit purpose of validating the class.

(19) To validate the linguistics class, you need to write one review on a book by Chomsky. Did John get the credits?

a. John read one such book, but it was "Manufacturing consent". So he didn't get the credits.

(20) To validate the linguistics class, you need to write one review on any book by Chomsky. Did John get the credits?

a. ?John read one such book, but it was "Manufacturing consent". So he didn't get the credits.

In probabilistic terms, this use of *any* maximizes the entropy on the possible books, i.e. it ensures that as long as a book is written by Chomsky it will be enough to validate the class. In other terms, the probability of validating the class is raised in the same manner for all the b_i books written by Chomsky. Using Merin's relevance function, it entails: $\forall i, j : r_{H_{class}}(R(b_i)) = r_{H_{class}}(R(b_j))$ and $r_{H_{class}}(R(b_i)) > 0$, where $R(b_i)$ is the proposition of reading the book b_i and H_{class} corresponds to the goal of validating the linguistics class. Since all the books are seen as arguments for H_{class}, the degraded nature of *but* in (20-a) is accounted for: here having read "Manufacturing consent" can no longer be seen as a counter-argument to H_{class}, precisely because of the use of *any*, and thus it cannot be opposed to the first segment that argues in favor of H_{class}.

5 Conclusion

In this work, we proposed, following van Rooy, to reinterpret strengthening as a special case of the information-theoretic principle according to which the less likely an assertion, the more informative it is. This general principle is directly derived from the widening effect of emphatic NP/FCIs that we propose to interpret in informational-theoretic terms as mark of equiprobability on the alternative values over which an emphatic NP/FCI ranges.

Support for this hypothesis, is given by the way probabilistic accounts of discourse markers can interact with our account of emphatic NP/FCI to formulate explicit predictions on some discursive sequences.

More precisely, the maximization of entropy induced by *any* can be seen as being made relatively to some particular goal that actually matches the argumentative goal defended by the speaker. As a consequence, this affects the use of discourse connectives such as *but*, that make an explicit reference to this goal in their semantics.

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