Free Choice Items and Alternatives

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Abstract

Extending the proposal made by Schulz (2003), we put forward a pragmatic account of the meaning of existential and universal FC items, where the 'ignorance or indifference' inference triggered by the former and the 'universal' inference triggered by the latter are treated as implicatures obtained by standard gricean reasoning formalized in terms of the two operations *grice* and *competence*. On this account, the implicatures of a sentence are generated with respect to a number of relevant alternatives. The difference between existential and universal FCs is due only to the choice of these alternatives.

1 Introduction

In this article, following Chierchia (2004), we distinguish between two kinds of free choice (FC) items:

(1) a. *existential* FC items, like German *irgendein*, or Italian *uno qualsiasi*;

b. *universal* FC items, like English FC *any*, or Italian *qualsiasi*.

As an illustration of the difference between existential and universal FC items, consider the following examples.

(2) a. Gianni hat *irgendein* Buch gelesen. (G read a book whatever)

b. Gianni ha letto *un* libro *qualsiasi*.

(3) a. Gianni read *any* book with a red cover.

b. Gianni ha letto *qualsiasi* libro con la copertina rossa.

Sentences (2a) and (2b) are interpreted existentially: Gianni read a book with a red cover. The FC particle indicates that it is unknown (in (2a)) or indifferent (in (2a-b)) which book it was/is. Indeed, it would be pragmatically incorrect to ask 'which book?' after these sentences. Sentences (3a) and (3b) are understood universally: Gianni read all books with a red cover.

In Kratzer & Shimoyama (2002) (henceforth K&S) and Chierchia (2004), free choice items are treated as indefinites with the pragmatic instruction to widen the domain of quantification (cf. Kadmon and Landman (1993) for *any*). An important aspect of these accounts is that domain widening should be for a reason. The avoidance of false exhaustivity claims is proposed by K&S as a reason for domain widening in the case of existential FC items. By telling that the indefinite ranges over a wide domain one signals the intention of not ruling out any conceivable option. In Chierchia (2004), this idea is extended to universal FC items as well. On his account, both the 'universal' inference of universal FC items and the 'ignorance or indifference' inference of existential FC items should be explained as 'anti-exhaustivity' implicatures.

Both K&S's and Chierchia's versions of 'anti-exhaustivity', however, fail to capture a number of facts about FC sentences. In this paper, we would like to argue that both the 'ignorance or indifference' implicatures triggered by existential FC items and the 'universal' implicatures triggered by universal FC items are better obtained by standard gricean reasoning formalized in terms of minimal models.

The article is structured as follows. In section 2 we discuss K&S analysis of the German *irgendein*, and Chierchia's analysis of the Italian *(uno) qualsiasi*. Section 3 deals with existential free choice items. First we discuss Schulz' (2003) purely pragmatic analysis of free choice inferences. We slightly reformulate her analysis, and show that it can be extended to account not only for the ignorance reading of existential free choice items, but for the indifference reading as well. In section 4 we show that the universal inferences of universal free choice items can also be accounted for in this framework. Somewhat more speculative, we propose there that the difference in meaning between existential and universal free choice items is ultimately due to the different alternatives that they give rise to. Section 5 ends with the conclusions.

2 Background and motivations

2.1 Kratzer and Shimoyama on *irgendein*

Consider the following examples from Haspelmath (1997):

(4) a. Hans: Jemand hat angerufen.
    Somebody has called.

  b. Maria: Wer war es?
    Who was it?

(5) a. Hans: **Irgendjemand** hat angerufen. (Ignorance or indifference)
Irgend-one has called.

b. Maria: *Wer war es?
*Who was it?

In (5), by using **irgendjemand**, Hans conveys that he doesn't know or care about who called, or thinks the identity of the speaker is irrelevant. Maria's question is pragmatically inappropriate there, while it was correct in (4).

The following example is from Akademiegrammatik (1981, p. 667 f.))

(6) a. Hans: Wen soll ich einladen?
Who shall I invite?

b. Maria: **Irgendjemand** / *Jemand.
Sombody or other. Somebody.

In this example, choosing **irgendein**, Maria expresses indifference as to the choice of guests. Anybody in the universe of discourse would be fine with her. **Jemand** would be pragmatically inappropriate. The simple indefinite would merely repeat what the question already presupposes.

Furthermore, **irgendein**, in distinction with **any** for instance, does have a wide-scope interpretation if it is used in a modal sentence. That is, (7a) is ambiguous between (7b) and (7c):

(7) a. Mary musste **irgendeinen** Mann heiraten.
Mary had-to marry irgend-one man.

b. There is some man Mary had to marry, the speaker doesn't know or care who it was.

c. Mary had to marry a man, any man was permitted marriage option for her.

K&S argue that the distribution effect illustrated in (7c) is a conversational implicature for two reasons. The *first* reason is that it can be *cancelled*:

(8) Du musst **irgendeinen** Arzt heiraten, und das darf niemand anders sein als Dr. Heintz.
You must marry some doctor or other, and it can't be anybody but Dr. Heintz.

Their *second* argument is that the distribution effect *disappears in downward entailing contexts*. We won't go into this argument here.

Now, how do they derive the implicature that from (7a) one can conclude (7b) or (7c)? Well, here is their reasoning for a sentence of the form $\Box(A \vee B)$:

> Why didn't the speaker say '$\Box(A)$', which would have led to a stronger claim? It might be that $\Box(A)$ is false. Or else, it might be that $\Box(A)$ is true, but its exhaustive inference $\neg\Box(B)$ is false. We infer $\Box(A) \rightarrow \Box(B)$. The same kind of reasoning can be given for why she didn't claim $\Box(B)$ and we infer $\Box(B) \rightarrow \Box(A)$. Thus, we conclude $\Box(A) \leftrightarrow \Box(B)$. Together with $\Box(A \vee B)$ we conclude that $\Diamond(A)$ and $\Diamond(B)$.

This analysis doesn't exactly work for possibility statements like $\Diamond(A \vee B)$. Here their reasoning goes as follows:

> Why didn't the speaker say '$\Diamond(A)$', which would have led to a stronger claim? Suppose $\Diamond(A)$ is false. Then the speaker would have said $\Diamond B$. She didn't because that would have given rise to the exhaustivity inference $\neg\Diamond A$. So, we conclude that $\Diamond A$ is true. Now, then why didn't the speaker say so? Well, because that would have given rise to the false exhaustivity inference that $\neg\Diamond B$ is false. So, the latter is true. Thus, we conclude $\Diamond(A) \rightarrow \Diamond(B)$. Analoguesly, we conclude $\Diamond(B) \rightarrow \Diamond(A)$. Together with the assertion we conclude that both $\Diamond(A)$ and $\Diamond(B)$ are true.

2.1.1 Remarks and Problems

There are a few things to say about K&S's account of the distribution effect as a conversational implicature. First we will discuss some minor issues, and later some more serious problems.

A first thing that should be mentioned is that K&S explicitly claim that the Hamblin-style analysis of indefinites is crucial for the analysis (p. 22). But at least for the pragmatic reasoning this doesn't seem to be the case. The same reasoning for the free-choice effects works also if one assumes a standard analysis of indefinites using '$\exists$'.

Second, the above reasoning does not rule out that from assertion $\Box(A \vee B)$ we can conclude that $\Box A$ is the case. Perhaps this is actually what they didn't want to rule out, to account for reading (7b) of (7a). However, such an account would be problematic, because if $\Box A$ is the case then also $\Box B$ should be true, and thus $\Box(A \wedge B)$. This is perhaps not intended, but it is unclear how it should be ruled out.

Third, K&S's analysis is based on an assumption that is not made fully explicit. We can reason from the fact that that the speaker didn't say $\Box A$ that the latter is false, only if we assume that the speaker *knows* what the addressee must or may do. So, the inference mechanism requires an assumption of *competence* on what the agent is allowed to do (cf. Zimmermann, 2001). This should be made explicit.

A more serious problem is that the claim that 'irgendein' shows that an exhaustivity inference doesn't go through needs to be qualified, or made precise. Suppose that we argue in the same way for a sentence like '$A \vee B$'. Then it is unclear why we would not predict that $A \wedge B$ is true:

> $A \vee B$ is true. Why didn't the speaker say 'A'?, which would have been a stronger claim? Perhaps because A is true, but the exhaustivity inference $\neg B$

is false. We infer $A \rightarrow B$. By the same kind of reasoning, we conclude that $B \rightarrow A$ and thus that $A \leftrightarrow B$. Together with $A \vee B$ we conclude that $A \wedge B$ is true.

An analogue argument would work if we assumed the same kind of reasoning as for possibility statements.

We end up with similar strange predictions if we embed disjunctions (or existential quantifiers) under conjunctives (or universals). From $\forall x : \exists y_D : R(x, y)$ we conclude by pragmatic reasoning that $\forall y \in D : \exists x : R(x, y)$.

Finally, and most seriously, Kratzer and Shimoyama cannot account for the difference between (4) and (5a). In particular, they cannot account for the fact that (5a) gives rise to the indifference or ignorance reading, because they can do so only in case **irgendein** appears in the scope of a modal. Because this 'under the scope of' now means '*semantically* under the scope of', they neither can account for reading (7b) of sentence (7a).

Thus, K&S implicitly assume that the speaker *knows* the 'accessibility-relation' that models the modalities involved, and it appears that K&S's analysis works only for those examples where 'irgendein' is embedded under a modal. Moreover, the reasoning to the FC inference for modal sentences is appealing, but looks rather 'case-by-case'. It would be nice if the free-choice effect would *follow* from a general mode of interpretation. As we will see in section 3, this, indeed, is possible. But first, however, we will discuss the Italian data.

2.2 Chierchia on *(uno) qualsiasi*

In a recent article, Chierchia discusses the meaning of free choice items in Italian. Interestingly, on his account, a slightly modified version of K&S 'anti-exhaustivity' is used to derive not only the implicatures of existential FC-items, but also of universal ones. In this section, we first present the Italian data and then discuss Chierchia's account.

2.2.1 Italian data

Italian[1] has two types of FC-items:[2]

(9) a. *qualunque/qualsiasi N* (resembles FC *any* or *whatever*)

b. *un N qualunque/qualsiasi* (resembles *irgendein*)

These two items contrast in quantificational force: *qualunque/qualsiasi* has **universal** force, while *uno qualunque/qualsiasi* has **existential** force, as the following minimal pair illustrates.

(10) a. Gianni ha letto qualsiasi libro con la copertina stracciata.
Gianni has read whatever book with the cover torn
Gianni read any book with a torn cover.

b. Gianni ha letto *un* qualsiasi libro con la copertina stracciata.
Gianni has read a whatever book with the cover torn
Gianni read a book whatever with a torn cover.

Sentence (10a) is understood universally: G read all books with a torn cover. Sentence (10b) is interpreted existentially: G read a book with a torn cover. The FC particle indicates that it is indifferent to the speaker (or to Gianni) which book it was.

Existential and universal FC-items also differ in distribution:

(11) a. *Gianni ha letto qualsiasi libro. (*episodic*)
(G read any/whatever book)

b. Gianni ha letto qualsiasi libro che avesse la copertina stracciata.
(Gianni read any book that had a torn cover)

c. Gianni ha letto *un* libro qualsiasi.
(Gianni read a book whatever)

The universal *qualsiasi* requires a (post-nominal) modifier to be acceptable in episodic sentences (cf. *subtrigging effect* LeGrand (1975) and Dayal (1998)). No similar effect is detectable with the existential *uno qualsiasi*.

Consider now the following examples of an imperative and a possibility statement.

(12) a. Apri qualsiasi porta! (*imperative*)
(Open any door!)

b. Apri *una* porta qualsiasi!
(Open a door whatever!)

(13) a. Gianni può aprire qualsiasi porta. (*possibility*)
(Gianni may/can open any door)

b. Gianni può aprire *una* porta qualsiasi.
(Gianni may/can open a door whatever)

In imperatives or possibility sentences both universal and existential FC items are licensed and their difference in quantificational force bleaches. E.g. both sentences (12a) and (12b) can be paraphrased as: ‘Open a door, you may choose which!’. And both (13a) and (13b) have the free choice inference that for each door, John can open it.[3] The sentences (12a) and (13a) also have a stronger ‘universal’ inference ‘You may open all doors’.

In the scope of a necessity operator, again, *qualsiasi* requires a modifier to be grammatical. *Uno qualsiasi* doesn’t.

(14) a. *Gianni deve aprire qualsiasi porta. (*necessity*)

(Gianni must open any door)

b. Gianni deve aprire qualsiasi porta che sia chiusa.

(Gianni must open any door that is closed)

c. Gianni deve aprire *una* porta qualsiasi.

(Gianni must open a door whatever)

To conclude, Italian has two FC-items with different distribution, and different meanings, but a common core, which Chierchia's analysis presented in the following section attempts to characterize.

2.2.2 Chierchia's analysis

On Chierchia's account, *qualsiasi* is analyzed, like *irgendein* or *any*, as an indefinite carrying the pragmatic instruction to widen the domain of the corresponding noun. *Uno qualsiasi* is like *qualsiasi* plus an 'exactly one' implicature triggered by the overt indefinite morpheme *uno*. Reason for domain widening in both cases is to induce an 'anti-exhaustivity' implicature à la Kratzer & Shimoyama. This 'anti-exhaustivity' implicature also explains why *qualsiasi* gets a universal meaning. A consequence of this analysis is that the existential *uno qualsiasi* is then felicitous only in modal contexts because only there the universal implicature carried by *qualsiasi* and the scalar implicature carried by *uno* can be combined. Let us have a closer look.

K&S's anti-exhaustivity reasoning in modal contexts, can be summarized as follows (existential sentences can be seen as generalized n-ary disjunctions. Following K&S, for ease of reference, we consider the case of just two disjuncts):

(15) a. $\Box(A \vee B)$ (sentence)

b. $\Box A \leftrightarrow \Box B$ (K&S implicature)

c. $\Diamond A \wedge \Diamond B$ (follows from a and b)

(16) a. $\Diamond(A \vee B)$ (sentence)

b. $\Diamond A \leftrightarrow \Diamond B$ (K&S implicature)

c. $\Diamond A \wedge \Diamond B$ (follows from a and b)

The sentences in (a) carry the implicatures in (b), a number of alternatives to (a) are implicated to be equivalent to each other. Sentence (a) and (b) together imply (c), which correctly characterize the free choice effect of existential FC items in modal contexts.

As we have already noticed, in episodic contexts, surprisingly, if we apply the same reasoning, we get the following:

(17) a. $A \vee B$ (sentence)

b. $A \leftrightarrow B$ (K&S implicature)

c. $A \wedge B$ (follows from a and b)

So in an episodic context, an existential sentence by means of K&S implicature can get a universal meaning.

(18) $\exists x\phi$ + K&S implicature $\models \forall x\phi$

Chierchia uses the result in (18) to derive the universal meaning of FC item *qualsiasi* in subtrigging constructions like (19a):

(19) a. Gianni ha aperto qualsiasi porta (che fosse chiusa)
G opened any door (that was closed)

b. meaning: $\exists x(door(x) \wedge open(g, x))$ (G opened a door)

c. K&S implicature: $\forall x(door(x) \rightarrow open(g, x))$ (G opened all doors)

Note that, as a consequence of this, the existential *uno qualsiasi* is predicted to be ungrammatical in episodic contexts, because the universal implicature of *qualsiasi* cannot be combined with the 'exactly one' implicature of *uno* (unless we assume there is only one door).

(20) a. Gianni ha aperto *una* porta qualsiasi (G opened a door whatever)

b. meaning: $\exists x(door(x) \wedge open(g, x))$ (G opened a door)

c. K&S implicature: $\forall x(door(x) \rightarrow open(g, x))$ (G opened all doors)

d. scalar implicature: $\exists! x(door(x) \wedge open(g, x))$ (G opened exactly one door)

A covert modal operator must be assumed to account for the intuitive acceptability of sentence (20a), which will be analyzed as in (21).

(21) a. $\Box$ Gianni ha aperto *una* porta qualsiasi ($\Box$ G opened a door whatever)

b. meaning: $\Box\exists x(door(x) \wedge open(g, x))$

Consider now what happens if a disjunction (or an existential) occurs in the scope of a universal quantifier.

(22) a. $\forall y(A \vee B)$ (sentence)

b. $\forall yA \leftrightarrow \forall yB$ (K&S implicature)

c. $\exists yA \wedge \exists yB$ (follows from a and b and *not* $\forall y(A \wedge B)$)

For these sentences, the universal implicature gets lost. This is bad for Chierchia's purposes because the quantificational force of *qualsiasi* in the following sentence is as in (19) universal.

(23) Ogni uomo ha aperto qualsiasi porta (che fosse chiusa).

Every man opened any door (that was closed)

Sentence (23) means that every men opened all doors which were closed, and not that for each door there was a man which opened it.

So K&S anti-exhaustivity makes the wrong predictions concerning these sentences. For this reason Chierchia modifies K&S's proposal by adding to the alternative sentences (which are implicated to be equivalent to each other), the sentence itself.

(24) a. $A \vee B$ (sentence)

b. $(A \vee B) \leftrightarrow B$, $(A \vee B) \leftrightarrow A$ (Chierchia's implicature)

c. $A \wedge B$ (follows from a and b)

(25) a. $\forall y(A \vee B)$ (sentence)

b. $\forall y(A \vee B) \leftrightarrow \forall yB$, $\forall y(A \vee B) \leftrightarrow \forall yA$ (Chierchia's implicature)

c. $\forall y(A \wedge B)$ (follows from a and b)

This move solves the problem with sentences like (23), as illustrated in (25), but has dramatic consequences for (existential free choice items in) necessity sentences, which instead of conjunctions of possibilities, now implicate conjunctions of necessity statements.

(26) a. $\Box(A \vee B)$ (sentence)

b. $\Box(A \vee B) \leftrightarrow \Box B$, $\Box(A \vee B) \leftrightarrow \Box A$ (Chierchia's implicatures)

c. $\Box A \wedge \Box B$ (follows from a and b)

The following sentences are predicted then to have the implicature in d rather than the weaker (and intuitively correct) implicature in e.

(27) a. $\Box$ Maria ha sposato un dottore qualsiasi. ($\Box$ M married a doctor whatever)

b. Maria deve sposare un dottore qualsiasi. (M must marry a doctor whatever)

c. meaning: $\Box\exists x\phi$ (M must marry a doctor)

d. Chierchia's implicature: $\Box\forall x\phi$ (M must marry every doctor)

e. K&S's implicature: $\forall x\Diamond\phi$ (for each doctor M may marry him)

Thus, on Chierchia's analysis, in order to account for universal FC-items, K&S reasoning has been modified in such a way that has made it less suitable to account for the existential cases.

2.3 Conclusion

To summarize the content of the previous two sections, intuitively, the implicatures we would expect for existential, and universal, FC items are the following.

(28)

Existential FC-items	Universal FC-items
a. $A \vee_{\exists} B \mapsto \Diamond A \wedge \Diamond B$	a′. $A \vee_{\forall} B \mapsto A \wedge B$
b. $\Box(A \vee_{\exists} B) \mapsto \Diamond A \wedge \Diamond B$	b′. $\Box(A \vee_{\forall} B) \mapsto \Box(A \wedge B)$
c. $\Diamond(A \vee_{\exists} B) \mapsto \Diamond A \wedge \Diamond B$	c′. $\Diamond(A \vee_{\forall} B) \mapsto \Diamond(A \wedge B)$

Both K&S's and Chierchia's versions of 'anti-exhaustivity', however, fail to capture these intuitions. Chierchia's version accounts for the implicatures of universal FC items but fails to account for the existential cases. K&S's version, – meant only for the existential *irgendein* – wrongly predicts for the existential (28a) the universal implicature $A \wedge B$. In the next sections, we will argue that both the ignorance or indifference implicatures triggered by existential free choice items and the 'universal' implicatures triggered by universal free choice items are better obtained by standard gricean reasoning formalized in terms of minimal models.

3 Existential free choice items

3.1 Epistemic analysis of existential FC items

In section 2.1 we saw that to account for the distribution inference of existential FC items, K&S implicitly assume that the speaker *knows* the 'accessibility-relation' that models the modalities involved, and it appears that K&S's analysis works only for those examples where the existential free choice item is embedded under a modal.

In this section we assume with K&S that the distribution effect of existential FC-items should be thought of as a pragmatic inference. Following Schulz (2003), we will account for the data in section 2.1 by (i) assuming that 'or' denotes ordinary disjunction and the existential free choice item '(irgend)ein' an ordinary existential quantifier; (ii) making the role of *competence* explicit; (iii) using a general mode of interpretation; and (iv) account also for the free-choice effect for sentences like (5a).

The sentences that we want to analyze might involve modalities like *may* and *must*. To formalize this, we make use of a (propositional)[4] language extended with two modal operators, '$\Box$' and '$\Diamond$', where $\Box\phi$ represents that ϕ must be the case and $\Diamond\phi$ that ϕ may be the case. In fact, we will also make use of a formula of the form $\mathbf{K}\phi$, which means that the speaker knows that ϕ. The formula of the enriched language are interpreted with respect to *Kripke pointed models* of the form $\langle M, w\rangle = \langle W_M, R^{\Diamond}_M, R^s_M, w\rangle$, where W denotes a set of possible worlds, $R^{\Diamond}$ is an accessibility relation between those worlds that represents what is (epistemically, deontically,...) possible, R^s_M a reflexive, transitive, and symmetric accessibility relation that represents what the *speaker* think is possible, and w an element of W that represents the actual world. We assume that worlds themselves also serve as interpretation functions from predicates (or atomic propositions) to their denotations. All sentences are interpreted in the standard way with respect to pointed models, where the modal component is only relevant for sentences of the form $\mathbf{K}\phi$, $\Box\phi$, and $\Diamond\phi$. The first two sentences are counted as true in $\langle M, w\rangle$ if and only if ϕ is true in all worlds in W_M accessible from w according to R^s_M and $R^{\Diamond}_M$, respectively. The latter is true if there is at least a world accessible from w in which ϕ is true.

The semantic meaning of a sentence consists as always of the set of its verifying states. Having pointed models as verifying states means that the semantic meaning of a sentence consists of a set of such pointed models. Thus, we define for each sentence ϕ its semantic meaning $[\phi]$ as $\{\langle M, w\rangle : \langle M, w\rangle \models \phi\}$.

Following Schulz (2003), we will account for the free-choice pragmatic inferences by implementing Grice's (1967) maxims of Quality and his first submaxim of Quantity by means of a minimal model analysis. Grice's maxim of Quality says that the speaker always *knows* (or believes) what he says, while his first submaxim of Quantity (and Relevance) assumes that the speaker said as much as he can (about the relevant alternatives). Obviously, to implement these maxims, we need to take the knowledge state of speakers into account. And that is what we did above, by introducing sentences of the form $\mathbf{K}\phi$ and interpreting with respect to accessibility relation R^s_M. Let us now assume that speakers obey the Gricean maxim of Quality: they only utter sentences they know are true. Thus, if our designated speaker utters ϕ, we can conclude that the actual pointed model is one that verifies $\mathbf{K}\phi$. Thus, it is one of the following: $\{\langle M, w\rangle | \forall v \in W_M : \langle w, v\rangle \in R^s_M \rightarrow \langle M, v\rangle \models \phi\}$. This, of course, already accounts for the inappropriateness of sentences like 'John came, but I don't know that he came.'

To account for the Gricean first submaxim of Quantity which demands speakers to say as much as one can, following Schulz (2003) and van Rooij and Schulz (2004) we are going to define an ordering relation between pointed models defined in terms of sets of alternative propositions the speaker knows:

Definition 1 *(Ordering knowledge states)*

$$\langle M, w\rangle \leq^{\mathbf{K}}_{Alt(\phi)} \langle M', w'\rangle \quad \textit{iff} \quad \{\psi \in Alt(\phi) | \langle M, w\rangle \models \mathbf{K}\psi\} \subseteq \{\psi \in Alt(\phi) | \langle M', w'\rangle \models \mathbf{K}\psi\}$$

So, $\langle M, w\rangle$ is at least as minimal as $\langle M', w'\rangle$ iff all alternatives known in $\langle M, w\rangle$ are also known in $\langle M', w'\rangle$.

Following Schulz (2003) and van Rooij and Schulz (2004) again, we propose to implement Grice's maxim of Quality and his first sub-maxim of Quantity saying that the speaker is maximally informed with respect to the relevant alternatives as follows:

Definition 2 *(Grice)*

$$grice(\phi, Alt(\phi)) = \{\langle M, w\rangle \in [\mathbf{K}\phi] | \forall \langle M', w'\rangle \in [\mathbf{K}\phi] : \langle M, w\rangle \leq^{\mathbf{K}}_{Alt(\phi)} \langle M', w'\rangle\}$$

So, the speaker knows that ϕ, but knows of as few as possible of the alternatives that they are true (as long as this is consistent with $[\mathbf{K}\phi]$). Now we say that ψ is an implicature of ϕ, if $\phi \not\models \psi$, but ψ is true in all minimal models of ϕ, i.e. in all elements of $grice(\phi, Alt(\phi))$. It follows that if the speaker utters '$[\text{John}]_F$ smokes' she conversationally implicates that she knows that John smokes, and that she doesn't know that any of the alternatives to 'John smokes' is true.

How does this work for 'Fritz sah irgendeinen Mann', abbreviated by ϕ? Well, we assume that the alternatives to ϕ are now all elements of the set $\mathcal{L}$, where $\mathcal{L}$ is the set of sentences defined by the following BNF $\phi ::= Man(a) \rightarrow Saw(f, a)$ $(a \in N) \mid \vee$, where it is assumed that we only have finitely many individuals and a finite set N of names for these individuals such that every name denotes exactly one individual. Thus, $Alt(\phi)$ consists of all sentences of the form 'If a is a man, Fritz saw him', and it is assumed that this set is closed under disjunction. Let us assume that we know that there are only three men, named by a, b and c, and let us abbreviate predicate $\lambda x Man(x) \rightarrow Saw(j, x)$ by P. Then, we can abbreviate 'Fritz sah irgendeinen Mann' by '$Pa \vee Pb \vee Pc$', and the set of alternatives is the following set: $\{Pa \vee Pb \vee Pc, Pa \vee Pb, Pa \vee Pc, Pb \vee Pc, Pa, Pb, Pc\}$. What happens if we apply the above Gricean pragmatic interpretation rule? That is, what is $grice(Pa \vee Pb \vee Pc, Alt(Pa \vee Pb \vee Pc))$?

Well, the minimal pointed model $\langle M, w\rangle$ will be such that it verifies $\mathbf{K}(Pa \vee Pb \vee Pc)$, but falsifies each of the following: $\mathbf{K}(Pa \vee Pb), \mathbf{K}(Pa \vee Pc), \mathbf{K}(Pb \vee Pc), \mathbf{K}Pa, \mathbf{K}Pb, \mathbf{K}Pc$. Defining $\mathbf{P}\phi$ as $\neg\mathbf{K}\neg\phi$, we can conclude from this that $\mathbf{P}(Pa \vee Pb), \mathbf{P}(Pa \vee Pc), \mathbf{P}(Pb \vee Pc), \mathbf{P}Pa, \mathbf{P}Pb$, and $\mathbf{P}Pc$. But this is just as desired, because we interpret $\mathbf{P}\phi$ as saying that the speaker takes it to be possible that ϕ is the case.[5]

Above we have assumed that the set of alternatives is closed under disjunction. In Schulz (2003) however, it is assumed that it is closed under *negation* as well. Notice that this is very much in line with Gazdar's (1979) analysis of *clausal* implicatures. What do we get for the above sentence if we assume that for a non-modal sentence ϕ, $Alt(\phi)$ is closed under negation? Well we get immediately that except for the formula mentioned above, all of $\mathbf{K}\neg(Pa \vee Pb), \mathbf{K}\neg(Pa \vee Pc), \mathbf{K}\neg(Pb \vee Pc), \mathbf{K}\neg Pa, \mathbf{K}\neg Pb, \mathbf{K}\neg Pc$ are false as well. But notice that the falsity of these sentences immediately means the truth of the following sentences: $\mathbf{P}(Pa \vee Pb), \mathbf{P}(Pa \vee Pc), \mathbf{P}(Pb \vee Pc), \mathbf{P}Pa, \mathbf{P}Pb, \mathbf{P}Pc$. But this set of conclusions we could derive as well without assuming that $Alt(\phi)$ was closed under negation. So, it seems that for our example it does not make a big difference to account for the FC reading whether we assume that the set of alternatives is closed under negation or not.[6,7]

Now consider a sentence like 'Ich weiss, dass Fritz irgendeinen Mann gesehen hat'. How should we proceed to interpret this sentence? Well, we have here exactly the same sentence as before, but now embedded under 'Ich weiss dass' (I know that). We can represent the latter by $\mathbf{K}$. Notice that because we assume that speakers know what they know, i.e., have an 'introspective' knowledge state,[8] it will be the case that for any sentence ϕ and pointed model $\langle M, w\rangle : M, w \models \mathbf{K}\mathbf{K}\phi$ if and only if $M, w \models \mathbf{K}\phi$. Thus, we predict that the sentence 'Ich weiss, dass Fritz irgendeinen Mann gesehen hat' gives rise to exactly the same 'pragmatic meaning' as the sentence we have discussed explicitly before: ‘Fritz hat irgendeinen Mann gesehen’.

Next, let us consider ‘Es kann sein, dass Fritz irgendeinen Mann gesehen hat’. Most naturally, this should be represented by ‘$\mathbf{P}(Pa \vee Pb \vee Pc)$’. If we now apply the above Gricean interpretation rule and assume that the set of alternatives of this sentence is $\{\mathbf{P}\phi | \phi \in Alt(Pa \vee Pb \vee Pc)\}$, then it is easy to see that things go wrong: we see that for each alternative to $\mathbf{P}(Pa \vee Pb \vee Pc)$ (except the sentence itself, of course) there is a model that makes $\mathbf{P}(Pa \vee Pb \vee Pc)$ true but not this alternative, but that there is no model that falsifies all these alternatives together. Now we might use Gazdar’s (1979) rule of satisfiable incrementation and say that in such a case all implicatures are cancelled, because assuming any of them might (in combination with others) lead to inconsistency. We would then fail to account for the free choice effects of disjunctive possibility statements.

Schulz (2003), however, proposes a different way to go: she proposes that one always only considers necessity statements. In combination with her earlier assumption that the language $\mathcal{L}$ is closed under negation, this means that we now also have as alternatives statements of the form $\Box\neg\psi$. Why should we take for a sentence like $\Diamond(A \vee B)$ sentences like $\Box(\neg A)$ and $\Box(\neg B)$ to be alternatives? Well, these alternatives are equivalent to $\neg\Diamond A$ and $\neg\Diamond B$, respectively, which taken in combination with the assertion $\Diamond(A \vee B)$, are equivalent to $\Diamond B \wedge \neg\Diamond A$ and $\Diamond A \wedge \neg\Diamond B$. These sentences, of course, are natural candidates for being alternatives to $\Diamond(A \vee B)$. So, we see that Schulz’s choice of alternatives is, in fact, not very unnatural.

Schulz (2003) proposes that if we have an embedded sentence of the form $\Box_i(Pa \vee Pb \vee Pc)$ or $\Diamond_i(Pa \vee Pb \vee Pc)$, where ‘$\Box$’ and ‘$\Diamond$’ are any kind of modalities (epistemic, deontic, or whatever), the set of alternatives will always be of the following type: $\{\Box_i\phi | \phi \in Alt(Pa \vee Pb \vee Pc)\}$. In terms of this set, we now define the ordering as in definition 1, and the Gricean implicatures as in definition 2. What do we get?

Look at the sentence ‘Es kann sein, dass Fritz irgendeinen Mann gesehen hat’ again. This sentence contains a modality, and can be represented as $\Diamond_i(Pa \vee Pb \vee Pc)$. Given that we are dealing here with an epistemic modality of the *speaker*, we can also represent it by $\mathbf{P}(Pa \vee Pb \vee Pc)$. Similarly, the alternatives of the form $\Diamond_i\phi$ and $\Box_i\phi$ are now really $\mathbf{P}\phi$ and $\mathbf{K}\phi$, respectively. Now consider what $\mathbf{KP}\phi$ and $\mathbf{KK}\phi$ mean. Because of introspection, they mean the same as $\mathbf{P}\phi$ and $\mathbf{K}\phi$, respectively. But then it is easy to see that by definition 2 we predict that the minimal model verifies $\mathbf{P}(Pa \vee Pb \vee Pc)$, but that it falsifies each of the following: $\mathbf{K}(Pa \vee Pb \vee Pc), \mathbf{K}(Pa \vee Pb), \mathbf{K}(Pa \vee Pc), \mathbf{K}(Pb \vee Pc), \mathbf{K}Pa, \mathbf{K}Pb, \mathbf{K}Pc$, and $\mathbf{K}\neg(Pa \vee Pb), \mathbf{K}\neg(Pa \vee Pc), \mathbf{K}\neg(Pb \vee Pc), \mathbf{K}\neg Pa, \mathbf{K}\neg Pb, \mathbf{K}\neg Pc$. Because $\neg\mathbf{K}\neg\phi \equiv \mathbf{P}\phi$ we correctly predict – just as for the sentences ‘$Pa \vee Pb \vee Pc$’ and ‘$\mathbf{K}(Pa \vee Pb \vee Pc)$’ – that a sentence of the form ‘$\mathbf{P}(Pa \vee Pb \vee Pc)$’ gives rise to the free choice effect that (among others) $\mathbf{P}Pa, \mathbf{P}Pb$, and $\mathbf{P}Pc$ are all true.

Let us now consider a variant where the modality is *not* epistemic, but, let us say, deontic. That is, let us consider sentences of the form ‘Fritz darf irgendeine Frau heiraten’ and ‘Fritz muss irgendeine Frau heiraten’. What do we get here? Notice first that according to our above proposal, the set of alternatives for both examples should now be of the form

$\{\Box_f \psi | \psi \in Alt(\phi)\}$, where '$\phi$' now stands for 'Fritz heiratet irgendeine Frau'. What we get out of the analysis is that the minimal model that verifies the 'muss'-variant falsifies all of the following: $\mathbf{K}\Box_f(Pa \vee Pb), \mathbf{K}\Box_f(Pa \vee Pc), \mathbf{K}\Box_f(Pb \vee Pc), \mathbf{K}\Box_f Pa, \mathbf{K}\Box_f Pb, \mathbf{K}\Box_f Pc$ and $\mathbf{K}\Box_f \neg(Pa \vee Pb), \mathbf{K}\Box_f \neg(Pa \vee Pc), \mathbf{K}\Box_f \neg(Pb \vee Pc), \mathbf{K}\Box_f \neg Pa, \mathbf{K}\Box_f \neg Pb, \mathbf{K}\Box_f \neg Pc$ and that the 'darf'-variant also falsifies $\mathbf{K}\Box_i(Pa \vee Pb \vee Pc)$ and $\mathbf{K}\Box_i \neg(Pa \vee Pb \vee Pc)$.

What we would like is that from both kinds of sentences we derive the free choice reading: $\Diamond_f Pa$, $\Diamond_f Pb$, and $\Diamond_f Pc$. Of course, this doesn't follow yet. But now assume with Zimmermann (2001) and Schulz (2003) that the speaker is competent about what Fritz muss or darf. Having represented Fritz' deontic accessibility relation by $R^{\Diamond}_M$ and the speaker's epistemic accessibility relation by R^s_M, this can be formalized as follows. We say that the speaker is competent on what Fritz must or can do in w iff $\forall v \in R^s_M(w) : R^{\Diamond}_M(v) = R^{\Diamond}_M(w)$. Intuitively, this assumption means that the speaker thinks it is *possible* that Fritz can or must do a if and only if the speaker *knows* that Fritz can or must do a. In formulas: $\mathbf{P}\Box_f \phi \equiv \mathbf{K}\Box_f \phi$ and $\mathbf{P}\Diamond_f \phi \equiv \mathbf{K}\Diamond_f \phi$.

Remember that for both the 'muss' and the 'darf' statement, the minimal model falsifies $\mathbf{K}\Box_f \neg Pa$. But this means that for both kinds of statements $\mathbf{P}\neg\Box_f \neg Pa$ has to be true. The latter, in turn, is equivalent to $\mathbf{P}\Diamond_f Pa$. By competence we can now immediately conclude to $\mathbf{K}\Diamond_f Pa$, from which we can derive $\Diamond_f Pa$ for both kind of sentences. Thus, following Schulz' (2003) minimal modal analysis, we get the free choice effect as a pragmatic inference.

Schulz (2003) accounted for the last step of the pragmatic inference by making a constraint on models: consider only models where the speaker knows the (deontic) accessibility relation of the agent. But we can also account for the strengthening inference more in line with standard pragmatics as a defeasible assumption. In van Rooij & Schulz (2004) it is shown that we can account for the strength with which scalar implicatures are generated by Gazdar (1979) without making a formal distinction between different kinds of implicatures by making use of (a slight variant of) the following principle of maximizing competence. This principle can be formulated as follows (where X is $grice(\phi, Alt(\phi))$, and $\overline{Alt(\phi)} = \{\neg\psi | \psi \in Alt(\phi)\}$):

Definition 3 *(Maximizing competence)*

$$Comp(X, Alt(\phi)) = \{\langle M, w\rangle \in X | \neg\exists \langle M', w'\rangle \in X : \langle M, w\rangle \leq^{\mathbf{K}}_{\overline{Alt(\phi)}} \langle M', w'\rangle\}.$$

What maximizing competence does it to maximize the speaker's knowledge of the alternatives as far as this is compatible with *grice*. Thus, we conclude that the speaker knows of as many alternatives in $Alt(\phi)$ as possible (consistent with $grice(\phi, Alt(\phi))$) that they are false. Now we say that ψ is an implicature of ϕ that depends on compentence iff $\phi \not\models \psi$, but ψ is true in all elements of $Comp(grice(\phi, Alt(\phi)), Alt(\phi))$. Notice that by adding maximizing competence we still derive the implicature from $A \vee B$ that both A and B are possible. By using $Comp$, however, we can now also account for the strengthening of the pragmatic inferences of $\Diamond(A \vee B)$, and $\Box(A \vee B)$ from $\mathbf{P}(\Diamond A) \wedge \mathbf{P}(\Diamond B)$ to $\mathbf{K}(\Diamond A) \wedge \mathbf{K}(\Diamond B)$, which accounts for the free-choice inferences.

3.2 The indifference reading of existential free choice items

So far we have talked about the ignorance readings of existential FC items. In order to express the indifference reading of *irgendein* and *uno qualsiasi*, we introduce two new sentential operators: **D** and its dual **E**. Sentences involving these operators will be interpreted with respect to a new accessibility relation R_D. We will assume that w' is R_D-accessible from w iff w' is among the most relevant, or desirable, worlds in w. The sentence $\mathbf{D}\phi$ is true in w iff ϕ is true in all w' which are R_D-accessible from w and $\mathbf{E}\phi$ is true in w if and only if there is a w' among the R_D-accessible worlds from w where ϕ is true. Thus, $\mathbf{D}\phi$ should be interpreted as: It matters to, or it is relevant for (the current purposes of) the relevant agent that ϕ, while $\mathbf{E}\phi$ means that it is (or could be) indifferent to the relevant agent that ϕ.

To account for the indifference reading, there are now (at least) two ways to proceed. First, we can assume that, in general, it is taken to be relevant, or desirable, for either the speaker or the agent of the sentence that the content of what the speaker says is true. The second way to proceed would be to assume that the speaker says as much as she can about what is desirable for her. In this section we will work out both accounts, and show how they can deal with the indifference inferences.

Let us assume, first, that it is taken it to be relevant, or desirable, for the relevant agent that the content of what is said is true. It follows that we should represent a sentence like $A \vee B$ really as $\mathbf{D}(A \vee B)$. Now, the indifference inference is easy to account for: By *grice* we conclude from $\mathbf{D}_(A \vee B)$ to $\mathbf{KD}(A \vee B) \wedge \neg\mathbf{KD}\neg A \wedge \neg\mathbf{KD}\neg B$. By maximizing competence we can then derive $\mathbf{KD}(A \vee B) \wedge \mathbf{K}\neg\mathbf{D}\neg A \wedge \mathbf{K}\neg\mathbf{D}\neg B$. Because $\neg\mathbf{D}\neg\phi$ is equivalent to $\mathbf{E}\phi$, we can conclude to the desired indifference inference that $\mathbf{E}A \wedge \mathbf{E}B$.

Now look again at the difference in acceptability between (4a)-(4b) versus (5a)-(5b) repeated below.

(4) a. Hans: Jemand hat angerufen.
Somebody has called.

b. Maria: Wer war es?
Who was it?

(5) a. Hans: **Irgendjemand** hat angerufen. (Ignorance or indifference)
Irgend-one has called.

b. Maria: *Wer war es?
*Who was it?

Given the above derived indifference inference it is easy to account for the unacceptability of question (5b) after assertion (5a). By asserting (5a) Hans makes clear (by conversational implicature) that he doesn't think it is relevant, or important for the conversation, who had called. As a result, Maria's question (5b) is inappropriate.[9] But why, then, *is* the same question appropriate after (4)? Indeed, we would not be able to explain this, if we analyzed 'Jemand' simply as an existential quantifier, or a n-ary disjunction.

But, then, we think that unmarked ordinary indefinites should not be treated in this way: we feel that with a typical use of 'Jemand' by Hans in (4), Hans has a specific individual in mind (whether this should be accounted for semantically or pragmatically is left open here), and it is the identity of exactly this individual that Maria wants to know more about.

To account for other phenomena, we will assume that the accessibility relation R_D is introspective in the following way: $\forall v, w : v \in R_D(w) \rightarrow R_D(v) = R_D(w)$. Now consider the sentence 'Es ist mir egal, ob Fritz mit irgendeiner Frau heiratet' on the desirability reading for 'irgendein'. Of course, this sentence should be represented by $\mathbf{E}\phi$. Notice that because we have assumed that R_D is introspective, $\mathbf{DE}\phi$ reduces to $\mathbf{E}\phi$. But then it obviously follows by our above reasoning that '$\mathbf{E}(Pa \vee Pb \vee Pc)$' implicates that $\mathbf{E}Pa, \mathbf{E}Pb$, and $\mathbf{E}Pc$.

Now, take 'Ich moechte, dass Fritz irgendeine Frau heiratet', represented by '$\mathbf{D}(Pa \vee Pb \vee Pc)$'. Because $\forall v, w : R_D(v) = R_D(w)$, it holds that $\mathbf{DD}\phi$ is true if and only $\mathbf{D}\phi$ is true, which entails that $\mathbf{E}\phi$ holds. Thus, we can conclude from '$\mathbf{D}(Pa \vee Pb \vee Pc)$' that $\mathbf{E}Pa, \mathbf{E}Pb$, and $\mathbf{E}Pc$.

What if the modality is of somebody else? Let us consider sentences as 'Du musst irgendeine Frau heiraten' and 'Du darfst irgendeine Frau heiraten'. We think these sentences are the same as the ones analyzed before, and should be interpreted in the same way. What if a sentence like 'Fritz muss/darf irgendeine Frau heiraten' is used as a neutral report about what Fritz must or is allowed to do? We think that in these cases the 'irrelevance' is not related to the speaker, or it is used in an epistemic way.

The above account assumed that speakers take it to be relevant, or desirable, that the content of what they say is true. We claimed that there is a second way to account for the indifference readings by assuming that the speaker says as much as he can about what is desirable for him. Below we will briefly sketch how this proposal can account for the above phenomena as well.

On this second proposal, we will make use of definitions analogue to 1 and 2, but now involving desirability instead of knowledge. First we will define an ordering between pointed models.

Definition 4 *(Ordering desirable states)*

$$\langle M, w\rangle \leq^{\mathbf{D}}_{Alt(\phi)} \langle M', w'\rangle \quad \textit{iff} \quad \{\psi \in Alt(\phi) | \langle M, w\rangle \models \mathbf{D}\psi\} \subseteq \{\psi \in Alt(\phi) | \langle M', w'\rangle \models \mathbf{D}\psi\}$$

Thus, we say that one pointed model is at least as minimal as another with respect to desirability iff in the former model less alternative propositions are desirable. Notice that in the minimal model $\langle M, w\rangle$ where $\mathbf{D}\phi$ is true, w will be among the optimal worlds if ϕ itself is true here. Thus, although accessibility relation R_D will in general not be reflexive, in any minimal model where ϕ is true it is.

Now we can define an analogue to our above definition 2 implementing Grice's maxims for desirability. Where definition 2 implemented the intuition that if the speaker said 'ϕ' she doesn't know more than ϕ, now we say that if the speaker says 'ϕ', the speaker only cares about ϕ being true and nothing else. Because the truth of '$\mathbf{D}\phi$' doesn't entail that the speaker knows ϕ, we need to add the truth of $\mathbf{K}\phi$ now explicitly:

Definition 5

$$DD(\phi, Alt(\phi)) = \{\langle M, w\rangle \in [\mathbf{K}\phi \wedge \mathbf{D}\phi] | \forall \langle M', w'\rangle \in [\mathbf{K}\phi \wedge \mathbf{D}\phi] : \langle M, w\rangle \leq^{\mathbf{D}}_{Alt(\phi)} \langle M', w'\rangle\}$$

In a similar way as before, we say that ψ is an implicature of ϕ if $\phi \not\models \psi$, but ψ is true in all elements of $DD(\phi, Alt(\phi))$. In terms of definitions 4 and 5 we could now go over the different examples again. We will only consider a non-modal sentence like '$Pa \vee Pb \vee Pc$' here, and assume that this sentence gives rise to the same set of alternatives as before. By analyzing this sentence by interpretation rule DD, we obtain the reading that, as far as the speaker is concerned, it doesn't matter who of a, b or c has property P.

4 Existential versus universal free choice items

So far we have discussed the case of existential FC items. What about the universal ones? In this section we will show that the universal implicatures of *any* and *qualunque* can also be accounted for in terms of the two operations *grice* and *competence*. The difference between existential and universal free choice items will only lie in the choice of the alternatives.

Following K&S, we assume for a sentence like (29a), expressing a universal FC item, the sets of alternatives in (29b):

(29) a. $\exists_{\forall} x\phi(x)$

b. $\exists_{D'} x\phi(x) \wedge \neg\exists_{(D\setminus D')} x\phi(x)$ for all $D' \neq \emptyset : D' \subset D$

In each alternative we are narrowing down the domain D to a proper subset D' with the exclusion of the remaining part. So for example, if $D = \{a, b, c\}$, our set of alternatives for sentence $\exists_{\forall} xPx$ can be represented as follows:

(30) a. $Pa \wedge \neg(Pb \vee Pc)$

b. $Pb \wedge \neg(Pa \vee Pc)$

c. $Pc \wedge \neg(Pa \vee Pb)$

d. $(Pa \vee Pb) \wedge \neg Pc$

e. $(Pa \vee Pc) \wedge \neg Pb$

f. $(Pb \vee Pc) \wedge \neg Pa$

Intuitively, on this account, choosing a universal FC item amounts to choosing the largest option out of a set of alternative domains. This is taken to imply that one is unable to exclude any possibility from consideration.

Let us see what we obtain by *grice* and *competence* from this choice of alternatives (again for ease of reference we consider the case with only two options):

(31) a. $Pa \vee_\forall Pb$ (sentence)

b. $Pa \wedge \neg Pb$, $Pb \wedge \neg Pa$ (alternatives)

By applying *grice*, we obtain the following:

(32) a. $\neg\mathbf{K}(Pa \wedge \neg Pb)$ (grice)

b. $\neg\mathbf{K}(Pb \wedge \neg Pa)$

By *competence* then, that formalizes the standard 'leap of faith' from 'not knowing' to 'knowing not', we conclude:

(33) a. $\mathbf{K}\neg(Pa \wedge \neg Pb)$ (competence)

b. $\mathbf{K}\neg(Pb \wedge \neg Pa)$

Which, in combination with $\mathbf{K}(Pa \vee Pb)$, leads to:

(34) $\mathbf{K}(Pa \wedge Pb)$ (conclusion)

which gives for our sentence the desired 'universal' implicature:

(35) $Pa \wedge Pb$ (implicature)

Let us now turn to the modal cases. For existential FC items we had to assume for both possibility and necessity statements, necessary alternatives. Here we will assume that they both require possible alternatives: $Alt(\Box/\Diamond\phi_\forall) = \{\Diamond\psi \mid \psi \in Alt(\phi)\}$. In (36) and (37), we see that under this assumption, our predictions turn out to be correct:

(36) a. $\Diamond(Pa \vee_\forall Pb)$ (sentence)

b. $\Diamond(Pa \wedge \neg Pb)$, $\Diamond(Pb \wedge \neg Pa)$ (alternatives)

c. $\neg\mathbf{K}\Diamond(Pa \wedge \neg Pb)$, $\neg\mathbf{K}\Diamond(Pb \wedge \neg Pa)$ (grice)

d. $\mathbf{K}\neg\Diamond(Pa \wedge \neg Pb)$, $\mathbf{K}\neg\Diamond(Pb \wedge \neg Pa)$ (competence)

e. $\mathbf{K}\Diamond(Pa \wedge Pb)$ (follows from d and $\mathbf{K}\Diamond(Pa \vee Pb)$)

f. $\Diamond(Pa \wedge Pb)$ (implicature of a)

(37) a. $\Box(Pa \vee_\forall Pb)$ (sentence)

b. $\Diamond(Pa \wedge \neg Pb)$, $\Diamond(Pb \wedge \neg Pa)$ (alternatives)

c. $\neg\mathbf{K}\Diamond(Pa \wedge \neg Pb)$, $\neg\mathbf{K}\Diamond(Pb \wedge \neg Pa)$ (grice)

d. $\mathbf{K}\neg\Diamond(Pa \wedge \neg Pb)$, $\mathbf{K}\neg\Diamond(Pb \wedge \neg Pa)$ (competence)

e. $\mathbf{K}\Box(Pa \wedge Pb)$ (follows from d and $\mathbf{K}\Box(Pa \vee Pb)$)

f. $\Box(Pa \wedge Pb)$ (implicature of a)

Finally, if we assume as alternatives for a universal sentence $\forall y\phi$ the set $\{\lambda y\psi[d] \mid \psi \in Alt(\phi)\ \&\ d \in D\}$ we obtain for sentence (38a) the implicature in (38c), solving, therefore, K&S's problem regarding example (23) discussed in section 2.2.

(38) a. $\forall x(A \vee_{\forall} B)$ (sentence)

b. $A(d) \wedge \neg B(d)$, $B(d) \wedge \neg A(d)$ for all $d \in D$ (alternatives)

c. $\forall x(A \wedge B)$ (implicature)

To conclude, these are the sets of alternatives we propose to assume for existential and universal FC items:[10]

Definition 6 *(Alternatives of existential and universal free choice items)*

i. $Alt(A \vee_{\exists} B) = \{A, B\}$ *(closed under Boolean connectives)*

ii. $Alt(A \vee_{\forall} B) = \{A \wedge \neg B, B \wedge \neg A\}$

Definition 7 *(Alternatives of modal statements)*

$$\begin{aligned} Alt(\Diamond/\Box\phi)) &= \{\Box\psi|\psi \in Alt(\phi)\} \quad \textit{if } Alt(\phi) \textit{ is closed under Boolean connectives,} \\ &= \{\Diamond\psi|\psi \in Alt(\phi)\} \quad \textit{otherwise.} \end{aligned}$$

5 Conclusion

In this paper we have proposed an account of the meaning of existential and universal FC items, where the 'ignorance or indifference' inference triggered by the former and the 'universal' inference triggered by the latter are treated as implicatures obtained by standard gricean reasoning formalized in terms of the two operations *grice* and *competence*. On this account, the implicatures of a sentence are generated with respect to a number of relevant alternatives. The difference between existential and universal FCs was due only to the choice of these alternatives.

We have further shown that the present analysis is not only theoretically superior to the alternative analyses of K&S (2002) and Chierchia (2004) (e.g. it uses techniques which have a larger range of application), but also empirically better, for example, predicting the right meaning for existential free choice items in episodic sentences without need of any ad hoc assumptions on the logical form of these constructions.

It remains to be seen whether our purely pragmatic analysis can account for the full range of data involving free choice items, for example in questions (see van Rooij (2004)) and imperatives (see Aloni (2003)). But there are obvious connections between our proposal and some traditional analyses. In a footnote we mentioned already a connection with Kadmon & Landman's (1993) domain-extension approach of *any*. More obvious, perhaps, is the similarity in motivation with Krifka's (1995) pragmatic analysis of negative polarity items. The exact relation between these approaches and ours, however, has to be investigated further. Finally, there are two issues that need to be resolved. First, we would like to have a convincing motivation for why existential and universal free choice items give rise to the alternatives as proposed in this paper. Second, we need to explain why existential and universal FC items are 'licensed' in different environments. In particular, we should address the question why universal free choice items are not licensed in episodic sentences if unmodified. But these questions must be left to another occasion.

Endnotes

[1]Notice that Italian uses distinct morphemes for Negative Polarity and Free Choice meanings, *qualunque/qualsiasi* never gets a NPI reading.
[2]*Un qualunque/qualsiasi N* is also possible.
[3]The second sentence, as its German variant, has a further reading with *uno qualsiasi* taking wide scope over the possibility operator. On this reading, (13b) means G can open a door, and it is irrelevant, for the speaker, which.
[4]We assume here for simplicity that existential sentences are just treated as disjunctive sentences.
[5]There is another way in which we can come to this result, but now it is done in a more 'semantic' way. Let us assume that the sentence with the existential free choice item is of the form $\exists x_D Px$ interpreted with respect to a particular domain of quantification D. What is the proposition expressed by this sentence such that for all d the proposition expressed by 'Pd' is compatible with the proposition expressed by $\exists x_D Px$? Obviously, it is the proposition expressed by $\exists x_D Px$ where D contains of *all* individuals; that gives rise to the weakest proposition. And notice that this proposition is the 'same' as the above determined minimal state that verifies the existential free choice sentence. In this paper, however, we will do things pragmatically.
[6]However, we get some additional inferences as well. We can also derive that $\mathbf{P}(Pa \wedge Pb)$ and $\mathbf{P}(Pa \wedge \neg Pb)$, for instance. Perhaps one doesn't want these additional inferences, and we won't use them in this paper. A possible way to get rid of these inferences is by redefining the set of alternatives. Instead of saying that for our example, $\mathcal{L}$ is defined by the following BNF $\phi ::= Man(a) \rightarrow S(f,a) \mid \vee \mid \neg$, and that $Alt(\phi) = \{\psi | \psi \in \mathcal{L}\}$, we say that $\mathcal{L}^0$ is defined by the following BNF $\phi ::= S(f,a) \wedge Man(a) \mid \vee$, and that $\mathcal{L}^1$ is defined by $\psi \in \mathcal{L}^0 \mid \neg$. Then we think of the set of alternatives as $\mathcal{L}^1$: $Alt(\phi) = \{\psi | \psi \in \mathcal{L}^1\}$. On this definitions of $Alt(\phi)$ we don't infer anymore that $\mathbf{P}(Pa \wedge Pb)$, for instance, is true in the minimal model.
[7]Why don't we say that the set of alternatives is closed only under negation, and not under disjunction? Well, in that case we cannot conclude that the speaker doesn't know that $Pa \vee Pb$, for instance, is true. Thus, we don't really get the pointed model with the least information.
[8]This is implemented by our assumption that the accessibility relation R^s_M is reflexive, transitive and symmetric.
[9]Of course, a similar explanation is possible for the ignorance reading of (5a).
[10]Refer to footnote 6 for another possible choice of alternatives for existential FC-items.

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