Broaden Your Views: Implicatures of Domain Widening and the ''Logicality'' of Language

Gennaro Chierchia

This article presents a unified theory of polarity-sensitive items (PSIs) based on the notion of domain widening. PSIs include negative polarity items (like Italian *mai* 'ever'), universal free choice items (like Italian *qualunque* 'any/whatever'), and existential free choice items (like Italian *uno qualunque* 'a whatever'). The proposal is based on a ''recursive,'' grammatically driven approach to scalar implicatures that breaks with the traditional view that scalar implicatures arise via post-grammatical pragmatic processes. The main claim is that scalar items optionally activate scalar alternatives that, when activated, are then recursively factored into meaning via an alternative sensitive operator similar to *only*. PSIs obligatorily activate domain alternatives that are factored into meaning in much the same way.

Keywords: scalar implicatures, negative polarity, free choice, alternative semantics

1 Introduction

Over the past few years, substantive progress has been made in our understanding of the semantics of negative polarity items (NPIs).[1] There has also been (quite recently, in fact) important progress in the analysis of free choice items (FCIs).[2] As is well known, a strong link exists between these two types of polarity-sensitive item (PSI). Robust typological considerations point in that direction. According to Haspelmath (1997), roughly half of the approximately 150 languages he surveyed

[1] I have in mind, in particular, Kadmon and Landman 1993, Krifka 1995, and Lahiri 1998. For background, see references therein.

[2] See especially Dayal 1998 and Kratzer and Shimoyama 2002. For relevant background and alternatives, see references therein.

employ the *same* morphemes for both negative polarity and free choice (FC) uses of PSIs, English being among them. The other half employ different series for the two uses, as is the case in Romance. If so many unrelated languages select the same morphemes for such seemingly diverse functions, the link between those functions cannot be accidental. FCIs and NPIs must form grammatical classes that, although not identical, have a deep systematic relationship to one another. However, the exact nature of this relationship remains the object of an intense debate that has not yet reached firm conclusions (see, e.g., Horn 1999 for a critical discussion of various positions). Here is, for example, an outstanding puzzle. There are NPIs like English *ever*/Italian *mai* that (together with minimizers and N(egative)-words; on the latter, see, e.g., Laka 1990) disallow FC uses, and there are FCIs like *qualunque* in Italian that disallow negative polarity uses; in contrast with this, there are words like *any* (or *irgendein* in German) that have both negative polarity and FC uses. Why? Let P1 be the property that characterizes NPIs that disallow FC uses (*mai*) and P2 the property that characterizes FCIs that disallow negative polarity uses (*qualunque*). Such properties must be *in*compatible: having P1 (being an NPI like *mai*) must entail not having P2 (being an FCI like *qualunque*). Obviously, then, we cannot say that *any* has *both* P1 *and* P2, for such properties are incompatible. We could say that *any* can have either property: it can be either an FCI or an NPI. This is tantamount to saying that *any* is ambiguous. But as we know from Haspelmath's survey, roughly one language out of two is like English: it has PSIs that do double duty. So the equivalent of *any* is lexically ambiguous in every second language. And which other lexical ambiguity works that way?

In the present article, I attempt to contribute to this ongoing debate by offering a precise hypothesis about the semantics and syntax of NPIs and FCIs and their relationship to one another. Among other things, such a hypothesis should explain why some morphemes allow only one of the two uses, why other morphemes allow both, and why items of the first kind so often mutate into items of the second kind. Building on the work cited in footnotes 1 and 2, I claim that *domain widening*, properly construed, indeed constitutes a unifying basis for understanding PSIs. It also turns out that domain widening (through the role it plays in the grammar of polarity-sensitive relations) also constitutes an important source of insight into the relationship between pragmatics and the computational system of grammar.

In the remainder of this introduction, I will informally flesh out the main issues surrounding these questions and discuss in what ways they are of interest for the architecture of Universal Grammar.

The domain-widening hypothesis, since first proposed by Kadmon and Landman (1993), has been the main semantic insight around which investigations of PSIs revolve. The intuition behind it is this. It is well known that as we communicate, we select domains of discourse as our subject matter. Nonreferential DPs like *every student*, *a student*, and *some student* are used with such domains in mind. For example, when we say, ''Some student doesn't know me,'' we mean something like 'some student in D' (or 'some student$_D$', for short), where D is a set of individuals salient in the context of use (e.g., students on this campus/in this city/in this country/etc.).[3] What

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[3] A standard reference in this connection is Westerstahl 1988.

Kadmon and Landman propose is that NPIs are indefinites (with a core semantics similar to that of *some student* or *a student*), with the addition of an instruction to consider domains of individuals broader than what one would otherwise have considered.

(1) a. a/some student$_D$
     b. any student$_{D+}$
         where $D \subseteq D+$

If use of a plain indefinite *a/some student* would have naturally led the hearer to focus on some salient domain D (say, the students around here), use of *any student* invites the hearer to consider a set possibly larger than D along some relevant dimension, with the inclusion of cases that might have otherwise been considered marginal (visiting students, students on leave, or what have you).

This rather simple idea has the potential for explaining why NPIs like being in ''negative'' environments. Consider a typical contrast:

(2) a. *There is any student$_{D+}$ (in that building).
     b.   There isn't any student$_{D+}$ (in that building).

In a positive context, like (2a), widening the domain of an existential leads to a statement that is *weaker* (i.e., less informative) than what we would obtain with a plain indefinite. Suppose, for example, that the set of new students is salient and that we would therefore be thinking of them in uttering ''There is a student in that building.'' Then, if our utterance is in fact true, it remains so for any larger domain (say, one that contains new or old students). So what could be the point of widening the quantificational domain in such a case? If one is willing to accept an existential statement over some domain D, one should be ready to accept it for any broader domain. Domain widening seems purposeless in positive contexts.

Things are different within the scope of negation. In such a case, consideration of a broader domain leads to a *stronger* (hence more informative) statement. For example, it may be used to convey that if you were focusing on new students, not only are there none of those around, but also there are no old students around. In other words, there simply isn't *any* student (new or old) around. Broadening our view is a sensible thing to do; in fact, it is a linguistic move we know we can make in more than one way (*There wasn't a single student*, *There weren't students at all*, etc.). So domain widening provides a natural ''functional'' basis for explaining the contrast in (2).

The appeal of this line of explanation can perhaps be best appreciated as follows. It was discovered in the 1970s that NPIs often like being in contexts that share a certain rather abstract property with negation—namely, downward entailment: the capacity to license inferences from sets to subsets (*John is not a smoker* entails *John is not a Marlboro smoker*, etc.). Now we have a simple hypothesis about the communicative function of NPIs (i.e., domain widening) that makes us readily see why such items would want to be used in downward-entailing (DE) contexts. Only there do they seem to serve a reasonable communicative practice: maximize information content.

This insight, of course, has to be turned into a ''real'' grammatical constraint: how does one go from basic ''functionalistic'' intuitions based on domain widening to actual grammatical

conditions, that is, pieces of the computational system (that, say, rule sentences like (2a) out and sentences like (2b) in)? There is disagreement on how to accomplish that. Kadmon and Landman (1993) stipulate a construction-specific semantic/pragmatic constraint that limits domain widening to occurring only in contexts where it leads to strengthening (in a sense, they try to make it part of the lexical meaning of *any*). Krifka (1995), instead, links domain widening directly to quantity implicatures. An NPI activates alternatives with smaller domains; this triggers an implicature, in accordance with Gricean principles, that the alternative selected is the strongest the speaker has evidence for. Finally, Lahiri (1998) proposes that the alternatives associated with NPIs play a role similar to the one they play in focus semantics (cf. Rooth 1985, 1992); more specifically, NPIs have as part of their lexical meaning something that resembles the meaning of the focus particle *even*. *Even John drank* indicates that John was the least likely person to drink. An indefinite with a widened domain does the same. *There is(n't) any student* is interpreted roughly as 'There is(n't) even one student' (which makes sense only in DE contexts).

   The key issue that arises in this connection is this: how does the pragmatics of communication interact with specific lexical/grammatical conditions that license the presence of certain items in certain structures and not in others? Why do pragmatically driven conditions, which usually can be overridden, give rise in the case at hand to unsavable grammaticality contrasts such as those in (2)? By studying PSIs, we can hope to learn more about this fundamental issue.

   Kratzer and Shimoyama (2002) have argued that domain widening may also play a role in the analysis of FCIs. They study in particular the German FC indefinite *irgendein*. One of its canonical uses is illustrated in the following example:

   (3) Ich werde irgendeinen   Doktor heiraten.
        I   will   a whatsoever doctor marry
        'I will marry any doctor.'

Intuitively, (3) indicates that I intend to marry a doctor, and that I am not at all choosy about who that might be: any doctor whatsoever is possible. Kratzer and Shimoyama propose that this too might be an implicature triggered by domain widening. They argue that strengthening is not the only reason why one might want to widen a certain domain. Extreme uncertainty and hence reluctance to rule out even the most far-fetched possibility might be another sensible reason for exploiting domain widening. By telling you that the indefinite ranges over a wide domain, I signal to you my intention not to rule any conceivable option out—whence the FC interpretation that any doctor is an option. This line of reasoning insightfully extends the domain-widening idea to FC uses. It also raises questions parallel to those we encountered in our brief discussion of the grammar of ''pure'' NPIs. How can pragmatic, conversation-driven processes determine strict morphosyntactic patterns? And what is the relation between two apparently very different uses of domain widening?

   Against this general background, there are additional specific issues in the grammar of FCIs that stand out as particularly controversial and that may play an important role in advancing our understanding. One concerns their relation to modality. FCIs seem to be felicitous basically in

the presence of (certain kinds of) modals, a point forcefully made by Dayal (1998). Even when such modals are not overtly present, some kind of modality seems to be required to attain interpretability. Take for instance the following German example:

(4) Gestern hat irgendein Student für dich angerufen.
    yesterday has a whatever student for you called
    'Yesterday a student (I don't know/don't care who) called for you.'

Even though this is clearly an episodic sentence (i.e., not modalized by anything like an implicit generic), it indicates that the speaker doesn't know or doesn't care about the identity of the caller, so it requires the presence of a covert epistemic modal of some sort for its interpretation. Consider, by the same token, the following typical example of an FC use of English *any*:

(5) Yesterday Mary saw any student that wanted to see her.

Sentence (5), like sentence (4), is episodic. Still, such a sentence seems to invite counterfactual conclusions: if, say, Joe had fancied seeing Mary, she would have seen him. This effect is subtly but robustly apparent more with *any* than with its cousin and near synonym *every* (see Dayal 1998 for arguments). Where does this implicit modality come from? Why does it pattern in such peculiar ways?

A related issue concerns the quantificational force of FCIs. German *irgendein* appears to be definitely existential. Sentence (3) indicates my willingness to marry one doctor, and sentence (4) indicates that just one student called. In contrast, FC *any*, as exemplified by sentences like (5), appears to be definitely universal. If one student wanted to see Mary and didn't, sentence (5) would be false.[4] At the same time, even FC *any* (which is so clearly amenable to being understood universally) appears to acquire an existential flavor in certain contexts. As Giannakidou (2001) observes, imperatives are one such context.

(6) To continue, push any key.

A sentence like (6) does not typically constitute an instruction to push all keys.

Summing up, a host of intriguing open questions surround polarity sensitivity. The main ones I intend to pursue are these:

(7) a. Can domain widening constitute a semantic insight capable of unifying all cases of polarity sensitivity (from NPIs to FCIs)?

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[4] The universal character of English *any* is argued for more extensively in Dayal 1998. Similar arguments have also been developed for FCIs in Scandinavian by Sæbø (2001).

     b. Can domain widening, in particular, explain why different types of FCIs vary in their quantificational force and in their link to modalities?

     c. Domain-widening-based accounts are always pragmatically driven. What can we learn from domain widening about the relation between the computational system and the pragmatics of communication?

The article is organized as follows. In section 2, I identify more explicitly the pattern of FC constructions in Italian, which bears out and justifies the claim that there are at least two types of FCIs, an ''existential'' one and a ''universal'' one, with distinct scope properties. This pattern provides a rich testing ground for the hypothesis to be developed. In section 3, I present some background assumptions on the role of implicatures in grammar. This provides a general framework for addressing the role of pragmatics in the grammar of polarity sensitivity. Hopefully, the functioning of PSIs will flow naturally out of the grammar of implicatures. This idea is explored in the subsequent sections. In section 4, I discuss NPIs, and in sections 5 and 6, the two types of FCIs, ''existential'' and ''universal.'' In section 6, I offer some tentative general conclusions. Formal details are worked out in the appendix.

2 Some Italian Data: Two Types of Free Choice Items

Italian (and, more generally, Romance) turns out to be a good language with which to investigate the quantificational force of FC elements, for it has two related but clearly different such elements. The first is [*un N qualunque/qualsiasi*], which closely resembles German *irgendein*. The second is [*qualunque/qualsiasi N*], which more closely resembles FC *any*. They clearly contrast in quantificational force. Here is a minimal pair:

(8) a. ?Sono uscito in strada   e mi sono messo a bussare come un matto
       (I) went out on the street and started knocking   like a madman
       ad una porta qualsiasi con i battenti in legno.
       at a door whatever   with wooden shutters

     b. Sono uscito in strada   e mi son messo a bussare come un matto
       (I) went out on the street and started knocking   like a madman
       a qualsiasi porta con i battenti in legno.
       at whatever door with wooden shutters

Out of the blue, (8a) is slightly marginal; however, it can be interpreted if we imagine a context in which the agent goes out without knowing what to do and acts upon a door selected randomly. In such a (semimodalized) context, (8a) is interpreted existentially: I knocked on one door. The modifier *con i battenti in legno* 'with wooden shutters' can readily be construed in a nonrestrictive manner. Sentence (8b) is instead understood universally (I knocked on all doors with wooden shutters), and the modifier has to be construed restrictively. The existence of different constructions (ultimately involving different lexical items) with different quantificational force clearly needs to be understood better: if domain widening is systematically involved in FCIs, how can it give rise to such diverse effects?

Schematically, this is the form of FCIs in Italian:

(9) a. [INDEF NOUN FCI]⁵

    un   dolce   qualsiasi/qualunque

    a   sweet   whatever

    due   dolci   qualsiasi/qualunque

    two   sweets whatever

    . . .

  b. [FC   NOUN]

    qualunque/qualsiasi dolce

    whatever   sweet

The constructions in (9a) and (9b) are probably syntactically related, though I will not attempt any serious analysis of their syntactic structure here. From a semantic point of view, these constructions have a common core (which I will try to bring out). However, as pointed out above, they also clearly differ in quantificational force, with (9a) interpreted existentially and (9b) interpreted much more universally (if one may say so). This was illustrated for episodic contexts in (8). Under modals, we find a similar pattern (with one distinction, as we will see directly).

(10) *Future*

  a. Domani   interrogherò   qualsiasi studente   ∀, ∃

     tomorrow (I) will interrogate whatever student

     che mi capiterà a tiro.

     that I will lay my eyes on

  b. Domani   interrogherò   uno studente qualsiasi.   ∃

     tomorrow (I) will interrogate a   student   whatever

    Imperative

  c. Prendi qualunque dolce.   ∀, ∃

     take   any   sweet

  d. Prendi un dolce qualunque.   ∃

     take   a sweet whatever

    Modals of possibility

  e. Puoi   prendere qualunque dolce.   ∀, ∃ (?)

     (you) can take   any   sweet

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⁵ The order [INDEF FC NOUN] is also found.

  (i) un qualsiasi/qualunque uomo
      a   whatever   man

In this order, however, the only possible realization for INDEF is the indefinite article. Numerals are disallowed.

  (ii) *due qualsiasi uomini
       two whatever men

I do not know why this is so.

   f. Puoi   prendere un dolce qualunque.   ∃
      (you) can take   a   sweet whatever

   Modals of necessity
   g. Devi   prendere qualunque dolce con il liquore.   ∀, ∃ (?)
      (you) must take   any   sweet with   liquor
      [∃-favoring context: If you go to Naples, you must go to
      Scaturchio]
   h. Devi   prendere un dolce qualunque con il liquore.   ∃
      (you) must take   a   sweet whatever   with   liquor

Take a sentence with [*qualunque/qualsiasi N*] like (10a). It uncontroversially admits a universal reading: (10a) can readily be used to express my intention to interrogate all students. However, within the scope of a modal (unlike what happens in episodic contexts such as (8)), [*qualsiasi N*] also seems to admit an existential reading; for example, I can also use (10a) to express my intention to interrogate just one student. With some modalities (e.g., with imperatives), this ambiguity is very clear. In other cases (e.g., in (10g)), the universal reading seems to be favored and a special context might be called for in order to get the existential reading.

   So, there is a sharp and systematic contrast between the [*qualsiasi N*] and [*un N qualsiasi*] structures. The former always admits a universal reading; however, in the scope of an overt modal, it also seems to be able to have an existential reading (at least, often enough). The latter is always existential and is interpreted universally, if at all, in highly marked circumstances.

   From now on, I will reserve *existential FCIs* for the structures in (9a), and I will use *universal FCIs* for those in (9b). These are intended as descriptive labels (without prejudging the analysis).

   Another interesting difference between existential and universal FCIs concerns what has come to be known as the ''subtrigging'' effect,[6] illustrated by the following paradigm:

(11) a. ??Ieri   ho   parlato con un qualsiasi filosofo.
         yesterday (I) have spoken with a   whatever philosopher
         'Yesterday I spoke with a philosopher (I don't know/don't care who).'
     b. ??Ieri   ho   parlato con un qualsiasi filosofo   che fosse
         yesterday (I) have spoken with a   whatever philosopher that was.SUBJUNC
         interessato a parlarmi.
         interested in speaking with me
         'Yesterday I spoke with a philosopher (I don't know/don't care who) that was
         interested in speaking with me.'
     c. ??Ieri   ho   parlato con qualsiasi filosofo.
         yesterday (I) have spoken with any   philosopher
         'Yesterday I spoke with any philosopher.'

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[6] This terminology is from LeGrand 1975.

d. Ieri   ho   parlato con qualsiasi filosofo   che fosse
   yesterday (I) have spoken with any   philosopher that was.SUBJUNC
   interessato a parlarmi.
   interested in speaking with me
   'Yesterday I spoke with any philosopher that was interested in speaking with me.'

Sentence (11a), in which the existential FCI appears unmodified, is marginal out of the blue (unless a special context is provided); if anything, the addition of a relative clause makes things worse (11b). Also, when unmodified, as in (11c), the universal FCI is marginal (unless a special context is provided); however, the addition of a relative clause as in (11d) makes it completely acceptable. A modifier seems to restore full grammaticality for universal FCIs in episodic sentences. No similar effect is detectable with existential FCIs.

A final pattern that we will discuss involves the interaction of Italian FCIs with negation. This pattern is potentially telling, as it reveals further scope differences between the two types of FCIs. A sentence like (12), for example, where negation has scope over a universal FCI, typically is acceptable only with the special intonation associated with the so-called rhetorical reading.

(12) Non leggerò   qualunque libro.
     (I) won't read (just) any book

Sentence (12) says that it is not the case that I will read every book (i.e., $\neg \forall$) and suggests that I am going to read some special one. If we add a modifier and make the FCI more heavy (i.e., perhaps more topical), things change. The rhetorical 'not just any old one' reading remains possible. But next to it, a novel one appears.

(13) Non leggerò   qualunque libro che mi consiglierà Gianni.
     (I) won't read any book   that Gianni will recommend to me

Sentence (13) can also express that I simply won't read any book suggested by Gianni (i.e., a $\forall \neg / \neg \exists$ reading).

So universal FCIs, at least in certain cases, display a scopal ambiguity vis-à-vis negation. In contrast, an existential FCI embedded under negation has only the rhetorical reading.

(14) Non leggerò   un libro qualunque (che mi consiglierà Gianni).
     (I) won't read a book whatever   (that Gianni will recommend to me)

Sentence (14) can only mean that I won't read any old book (recommended by Gianni). This fact is particularly interesting as it differs from what Kratzer and Shimoyama (2002) report about German *irgendein* (which is otherwise so similar to Italian *uno qualunque*). Under negation, German *irgendein* is ambiguous between a rhetorical and a nonrhetorical/NPI-like reading (as is the case with (13) in Italian).[7] Anyway, on top of this interesting crosslinguistic contrast, we see

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[7] As Kratzer and Shimoyama underscore, the 'not just anyone' reading requires a special intonation or the presence of a focus particle.

that in Italian, universal and existential FCIs behave differently under negation, a difference whose rationale we would like to understand.

Thus, Italian FCIs display a rather interesting and in certain regards puzzling pattern, which enables us to integrate the generalizations presented so far in the literature. In particular, the existence (in fact, coexistence) of two kinds of FCIs (contrasting in existentiality vs. universality) with distinct scopal properties seems to be empirically supported. The interesting theoretical question is how exactly these two types of FCIs are related to each other and to other polarity phenomena.

3 Background: Pragmatics in Grammar

As pointed out in section 1, the semantically based approaches to polarity sensitivity that we are considering all appeal to pragmatics, in some form or other. The problem that arises in this connection is how pragmatic and morphosyntactic processes interact with each other in a modular system. With respect to this problem, I will be assuming that certain pragmatic processes (i.e., processes involving the speaker's intentions and other aspects of the conceptual/intentional system) are visible to (and accessed by) the computational system. More specifically, (some) implicatures are computed recursively and compositionally, on a par with ordinary meaning computation (and therefore are not part of a postgrammatical process). The main motivation for such an assumption, in a nutshell, is twofold. First, NPI licensing can occur at any level of embedding. If implicatures play a role in such licensing, they must be computed at the relevant embedded site, on a par with compositional semantic processes and other cyclic (or phase-driven) syntactic processes. Second, *scalar* implicatures play a key role in deriving the properties of FCIs, as we will see. If so, then *scalar* implicature computation must be part of (or accessible to) the computational system that determines the syntactic distribution of FCIs.

An early approach to pragmatics along these lines was developed by Gazdar (1979). Recently, similar ideas have been revived in work on ''maximization'' (Landman 1998) and other scalar implicatures (Chierchia 2004).[8] Some general consequences of these views for modern pragmatics are addressed by Recanati (2003). The approach to polarity sensitivity to be developed here has to rely on frameworks of this sort. For explicitness' sake, I will now outline a compositional system of scalar implicature calculation, as an example of ''recursive pragmatics.'' I will do so in informal terms, leaving formal details to the appendix. The system I will present is a slight (?) modification of the one developed in Chierchia 2004. It retains many features that are speculative and approximate.

3.1 A Recursive Approach to Pragmatics

Each expression (or rather, its LF representation) is associated with its meaning/denotation in familiar ways. For example, (15a) is interpreted, say, as in (15b).

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[8] A bibliographical remark. The basic ideas in Chierchia 2004 were elaborated in 1999 (and presented at a series of workshops and other venues); a written form essentially identical to the published version has been circulating since 2001.

(15) a. Many of your students complained.

　　b. ‖many of your students complained‖ = many$_D$ (of your students)(complained)

I use logical formulas as stand-ins for the corresponding denotations (see section A1 of the appendix). The inferential process through which the (canonical scalar) implicature arises, according to the familiar Gricean proposals, is often characterized along the following lines. First, when (15a) is uttered, typically the set of alternatives in (16a–c) is being considered; this prompts the inference in (16i–vi).[9]

(16) a. Some of your students complained.

　　b. Many of your students complained.

　　c. All of your students complained.

　　　i. The speaker chose to utter (b) over (a) or (c), which would have also been relevant.

　　　ii. (c) entails (b), which entails (a) [the quantifiers form a scale].

　　　iii. Given that (c) is stronger than (b), if the speaker had the information that (c) holds, she would have said so [quantity].

　　　iv. The speaker has no evidence that (c) holds.

　　　v. The speaker is well informed on the relevant facts.

　　　Therefore

　　　vi. The speaker has evidence that it is not the case that (c) holds.

Notice that the last step, unlike the previous ones, is not readily justifiable on the basis of Grice's maxims and (pure) logic. It seems to require a ''leap of faith'' about the information state of the speaker. Such a leap, called by Sauerland (2005) the *epistemic step*, is tantamount to a sort of neg-lowering, that is, to pushing negation across an epistemic modal (from *not has evidence that* to *has evidence that not*). This step is crucial in deriving scalar implicatures and will also play a key role below in deriving the implicature characteristic of FCIs.

　It is evident that the process in (16) does not consciously take place whenever an implicature comes about. Rather, it seems to be automatic and unconscious in hearers/speakers just like so many other aspects of semantic interpretation. This suggests that it may be wrong to limit processes of this sort to root sentences. It is true that the reasoning in (16) concerns the effects of *utterances*. But embedded clauses are, after all, potential utterances. And surely speakers do routinely work out the possible conversational effects of potential utterances. So it is conceivable that we run through a process like (16) in a cyclic manner, computing the ''utterance potential'' of embedded clauses compositionally. I will pursue this idea here, by assuming that there are operations that ''enrich'' basic meanings and freely take place at scope sites. Such operations (together with certain assumptions regarding functional application) constitute the core of recursive pragmatics.

　A crucial part of (16) is the observation that a sentence is typically considered against the background of a set of alternatives. Once the alternative set (e.g., (16a–c)) is salient to illocutionary agents, choosing a particular sentence will be per se informative. In this connection, Krifka (2003)

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[9] The source is Grice 1989. Also see Horn 1989, Levinson 2000, and references therein.

speaks of ''motivated interpretation of alternatives,'' typically guided by the awareness that one could have made weaker or stronger assertions. We can imagine a function $\| \ \|^{ALT}$ that associates any item with its scalar alternatives. For example:

> (17) $\|$many of your students complained$\|^{ALT}$ =
> { some$_D$ (of your students)(complained), many$_D$ (of your students)(complained), every$_D$ (of your students)(complained) }

We compute such a set of alternatives using the same operations we use to compute plain meanings. In fact, this set can be computed in the same way as alternative semantics for questions (Hamblin 1973) or focus (Rooth 1985, 1992). And something like (17) can, accordingly, be thought of as specifying one of the questions/issues under discussion, namely, the question ''Roughly how many of your students complained?''

Alternatives keep growing until they are factored into meaning by some operation that produces pragmatically enriched interpretations. In the case of scalar alternatives, such an operation can be characterized rather simply. The speaker suggests that the one she picks and its entailments is the *only* alternative she regards as true.

> (18) $\|$many of your students complained$\|_S$ =
> a. many$_D$ (of your students)(complained) $\wedge$
> $\forall$p p$\in\|$many of your students complained$\|^{ALT} \wedge$ p $\rightarrow$
>   many$_D$ (of your students)(complained) $\subseteq$ p   (where ''$\subseteq$'' stands for 'entails')
> b. many$_D$ (of your students)(complained) $\wedge \neg$ all$_D$ (of your students)(complained)

It is easy to see that (18a) is equivalent to (18b). The format in (18b) (adopted in Chierchia 2004, building on Krifka 1995) makes the scalar reinforcement transparent. The format in (18a) (proposed in Fox 2003, building on Groenendijk and Stokhof 1984) brings out the relationship between scalar enrichment and adding a silent *only* to the basic meaning. In other words, it is as if scalar items bring to salience a question of the form ''Roughly how many . . . ?'' and the sentence winds up being taken as an *exhaustive* answer to such a question.

Putting all this together, and adopting the abbreviation in (19a), we can define enrichment as in (19b).

> (19) a. O$_C$ [q] = q $\wedge$ $\forall$p [[p$\in$C $\wedge$ p] $\rightarrow$ q $\subseteq$ p]
>   (*O* is a mnemonic for *only*: q and its entailment are the only members of C that hold)[10]
> b. $\|\phi\|_S$ = O$_C$ [$\|\phi\|$], where C = $\|\phi\|^{ALT}$

At this point, the parallel with focus semantics becomes hard to miss. The only difference is that scalar alternatives are lexically driven and not necessarily activated by any special accentual pattern.

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[10] I will assume that, for any p, O$_C$ (p) is defined only if a suitable set of alternatives (in the case at hand, scalar ones) is available.

A characteristic of scalar inferences is that they can be suspended. If we assume that scalar terms activate alternatives by default and that alternatives must be factored into meaning, how is suspension of implicatures possible? We must assume that the default activation of alternatives can be, in turn, suspended. A simple way to achieve suspension is to assume that each scalar item comes in two variants (say, thanks to an abstract morphological feature $[\pm\sigma]$, where σ is a mnemonic for *strong*): $many_{[\pm\sigma]}$, $or_{[\pm\sigma]}$, and so on; a $[+\sigma]$ item (e.g., $many_{[+\sigma]}$) has active alternatives and must lead to enrichment, while a $[-\sigma]$ item (e.g., $many_{[-\sigma]}$) has no active alternatives and cannot lead to enrichment. Speakers choose the feature setting that fits the context best.[11] $[+\sigma]$ corresponds to the $[\pm F]$-feature commonly used in focus semantics; but whereas F is phonologically interpreted, σ is not (or not necessarily).

Actually, there is a further difference between implicatures and focus that makes things even more interesting (as it requires thinking of enrichment recursively). Under embedding, implicatures are sometimes preserved and sometimes ''recalibrated.'' Let us see how this works by looking at an example. Consider a sentence like (20a). In principle, it can be enriched in two ways, represented by (20b–c) and (20d–e).

(20) a. John believes that many of your students complained.
  b. John believes that many of your students complained and it is conceivable for all that John believes that not all did.
  c. O_C [believe (j, $many_D$ (of your students)(complained))] =
    believe (j, $many_D$ (of your students)(complained))
    $\wedge \neg$ believe (j, all_D (of your students)(complained))
  d. John believes that many, though not all, of your students complained.
  e. believe (j, O_C [$many_D$ (of your students)(complained)]) =
    believe (j, $many_D$ (of your students)(complained))
    $\wedge \neg all_D$ (of your students)(complained)

Working things out will reveal that enriching at the root level as in (20b) yields a rather weak interpretation (compatible with John's believing that it is possible that all students complained). Enriching at the level of the embedded clause as in (20d–e) results in something considerably stronger (it entails (20b)). I think that (20d), the version with the embedded implicature, is the preferred reading. Whether this is right or not, (20d–e) is certainly a possible interpretation, and to obtain it we must countenance that *believe* applies to the enriched interpretation of its complement. That is, we countenance an application rule of the following form:

(21) $\|$believe that S$\|_S$ = $\|$believe$\|_S$($\|$that S$\|_S$)

Here, we see the recursion taking shape.

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[11] This may look pretty close to an approach that regards scalar items as being ambiguous between a strong and a weak construal. But as we will see in discussing DE contexts, it is not so. The distribution of readings of scalar items in a DE context is clearly beyond the scope of any simple-minded ambiguity approach.

Things change considerably if we consider a sentence like (22a). Here, the embedded implicature corresponds to (22b–c), and the matrix one to (22d–e) (I am representing *doubt* as $\neg$ *believe*).

(22) a. John doubts that many of your students complained.
    b. John doubts that many but not all of your students complained.
    c. $\neg$ believe (j, O_{ALT} many$_D$ (of your students)(complained))
    d. John doesn't believe that many of your students complained but believes that some did.
    e. $O_C \neg$ believe (j, many$_D$ (of your students)(complained)) $=$
          $\neg$ believe (j, many$_D$ (of your students)(complained))
          $\wedge$ believe (j, some$_D$ (of your students)(complained))

Sentence (22a) hardly ever has an interpretation like (22b). This interpretation is only available in special contexts (and with the help of appropriate stress on *many*); more normally, if (22a) implicates anything, it implicates something like (22d). Here, the original (embedded) implicature disappears—and a new one surfaces.[12]

When (20) is compared with (22), it is immediately clear that the factor responsible for this pattern must be the monotonicity properties of *doubt*, which is a DE function (more or less assimilable to "not believing"). Roughly speaking, (canonical) implicatures (like those from *many* to *many but not all*) may well be preserved under embedding within non-DE (i.e., non-"negation-like") functions, while typically they are recalibrated when embedded in DE functors (a generalization we will refine shortly). This means that the semantics we use to compute the strong meaning in cases like (20)–(22) is this:

(23) $\|\text{doubt that S}\|_S = O_C \|\text{doubt}\|(\|\text{that S}\|)$

Putting (21) and (23) together, then, we get something like this:[13]

(24) $\|\alpha \ \beta\|_S = \begin{cases} \|\alpha\|_S(\|\beta\|_S) = \|\alpha\|_S(O_C \ \|\beta\|), \text{ if } \alpha \text{ is not DE} \\ O_C \ \|\alpha\|(\|\beta\|), \text{ otherwise} \end{cases}$

While this implementation is open to the allegation of being ad hoc, and one can surely try to improve on it, it embodies a rather neat generalization.

(25) In enriching a meaning, accord preference to the strongest option (if there is nothing in the context/common ground that prevents doing so).[14]

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[12] That negation affects implicature computation was already observed by Gazdar (1979). Horn (1989) generalized Gazdar's observation to all DE contexts. For detailed presentation and discussion of the relevant facts, see Chierchia 2004. For relevant discussion, also see Levinson 2000.
    The coming about of the implicature in (22d) is what a simple-minded ambiguity approach cannot account for.
[13] See section A3 of the appendix for a more precise formulation.
[14] See Dalrymple et al. 1998 for use of a similar principle in a different domain.

This principle predicts the preference for the embedded enrichment in (20) and for the root one in (22), which seems in line with intuitions and, if true, vividly exposes the ''spontaneous logicality'' of language. In adding scalar implicatures, speakers seek to optimize information content (= logical strength) in a way that keeps track of the effect of entailment-reversing contexts (like the DE ones).

Notice that this reasoning can apply iteratively (i.e., recursively). For example, we can embed a sentence like (22a) further; and if the embedding function is not DE, then we can well get an embedded implicature. Consider the following example:

(26) a. I am sure that John doubts that all of your students complained.
     b. I am sure that John disbelieves that all of your students complained but he believes that some did.

It is not hard to imagine a situation in which one would utter (26a) with the intention of conveying something like (26b).

So, in a compositional characterization of the notion of enriched meaning, the switch from (20) to (22) can be obtained by a ''clever'' definition of functional application. This gives an idea of how the pragmatics of scalar implicatures may be set up recursively. To complete the picture, I need to say something about multiple scales and implicatures embedded in the wrong place, as it were. I do this in the following two subsections.[15]

3.2 Multiple Scales

Often enough, one particular sentence contains more than one scalar item; and if all such items have active alternatives, multiple implicatures arise.
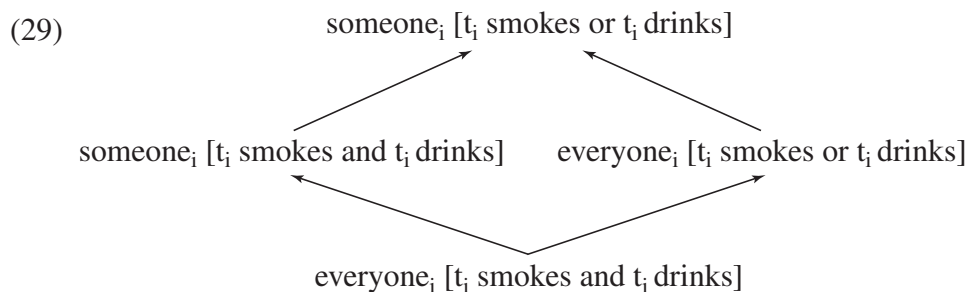
(27) a. Someone$_{[+\sigma]}$ smokes or$_{[+\sigma]}$ drinks.
     b. Someone (though not everyone) smokes or drinks (but not both).

The strong meaning of (27a) is something like (27b). How can we obtain it? And how do we keep track of multiple scales? The simplest way seems to me to allow multiple cyclic application of enrichment at clausal nodes. So assuming an LF representation like (28a) for (27a), we want something like (28b) as its strong meaning.

(28) a. someone$_{[+\sigma]i}$ [t$_i$ smokes or$_{[+\sigma]}$ t$_i$ drinks]
     b. O [some$_{[+\sigma]}$ (one) λx_i O [smoke(x$_i$) $\vee_{[+\sigma]}$ drink(x$_i$)]]

Now, if we consider the scales of both *some* and *or* as part of the same set of alternatives to (27a), we get the following picture:

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[15] ''Globalistic'' alternatives to this view can be found in Sauerland 2004 and Spector 2003. See Chierchia 2004 for arguments against globalism. I should add, however, that it is technically feasible to adopt the algorithms proposed by Sauerland or Spector and use them in a cyclic manner, along the lines suggested here.

(29)   someone$_i$ [t$_i$ smokes or t$_i$ drinks]

someone$_i$ [t$_i$ smokes and t$_i$ drinks]   everyone$_i$ [t$_i$ smokes or t$_i$ drinks]

everyone$_i$ [t$_i$ smokes and t$_i$ drinks]

The spatial arrangement and arrows indicate the entailment relations. What happens, then, is that if we try to compute the implicature at the root level in sentences like (27a), we will not find a *unique* scale among the alternatives activated by the lexical entries. A natural stipulation to make in this connection is that in such a situation we would not know which scale to pick; hence, we would not know how to strengthen. On the other hand, if we apply strengthening cyclically, handling implicature triggers in the order in which they are introduced (as in (27b)), we deal with a unique scale each time, which simplifies things greatly. As this procedure seems natural enough, I will adopt it:

(30) a. To strengthen via O, the scale must be uniquely determined.
     b. $\|\phi\|_S = O_C (\|\phi\|)$, where C is ϕ's scale in $\|\phi\|^{ALT}$

If there is more than one scale for ϕ in ALT, the definite description ''ϕ's scale in $\|\phi\|^{ALT}$'' fails to be proper and consequently strengthening fails. This forces us to choose the strengthening represented in (27b), a welcome result.

The full power of the present system can be appreciated even more if we consider multiple occurrences of scalar items within DE contexts. Here is a moderately complicated example:[16]

(31) a. No one who smokes and$_{[+\sigma]}$ drinks lives to 80$_{[+\sigma]}$.
     b. There are people who smoke or drink (but not both) and live to 80.
     c. There are people who smoke and drink and live to an age sufficiently close to 80.

Assuming that the scalar terms *and* and *80* have active alternatives, (31a) implicates (31b) and (31c). This is indeed what our definition of application predicts; and it is perhaps worth underscoring that the intended result cannot be obtained through a *single* application of the O-operator. We have to use it twice, as follows:

(32) a. O [O [no (λx_i one(x_i) $\wedge$ smoke(x_i) $\wedge$ drink(x_i))](lives to 80)]
     b. O [no (λx_i one(x_i) $\wedge$ smoke(x_i) $\wedge$ drink(x_i))]

The square brackets in (32a) indicate the scope of O. Consider in particular the most embedded occurrence of O, isolated in (32b). As the type of *no one smokes and drinks* is $\langle\langle e, t\rangle, t\rangle$, we have

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[16] The following paragraph is not essential to understanding the basic workings of the system. See section A3 of the appendix for details.

to generalize O to this type (cf. Rooth 1985). So, in working (32b) out, we would be considering alternatives of this form:

(33) { λP . no one who smokes and drinks P, λP . no one who smokes or drinks P }, P a variable over properties

As usual, O says that the only alternative that will hold is the one (that will be) uttered. So we get the following derivation:

(34) O [no (λx one(x) ∧ smoke(x) ∧ drink(x))]
= λP [no (λx one(x) ∧ smoke(x) ∧ drink(x))(P) ∧
¬ no (λx one(x) ∧ (smoke(x) ∨ drink(x)))(P)]
= λP [no (λx one(x) ∧ smoke(x) ∧ drink(x))(P) ∧
some (λx one(x) ∧ (smoke(x) ∨ drink(x)))(P)]

When the argument corresponding to the VP comes in, the second occurrence of O takes its usual course and, at the end of the day, we get the intended strengthened reading for (31a). The fact that the strengthening of expressions headed by a DE function requires this stepwise, argument-by-argument, subclausal application of O suggests that making it part of the definition of application itself is indeed correct (per definition (24)). Contrary to what happens for non-DE contexts, the application of strengthening to DE contexts cannot be readily accomplished via a clausal application of O.[17]

Consideration of multiple scalar implicatures thus yields interestingly complex patterns that can be handled in systematic ways, in spite of their complexity. The basic generalizations I propose are (a) that enrichment takes place cyclically from the bottom up and (b) that when a function f is applied to an argument A, if f is not DE, the argument f(O [A]) is enriched; if f is DE, the result O [f(A)] is enriched (''recalibration''). In either case, addition of scalar implicatures leads to strengthening.

While this seems to be generally correct, there are also cases of enrichment that do not lead to strengthening. Such cases too must somehow fit into the picture.

3.3 ''Frozen'' Implicatures

Consider an example like this:

(35) If many students complained, we are in trouble.

Within (35), the clause *many students complained* appears embedded in the antecedent of a conditional, a DE context. And in fact the (most salient) enriched interpretation of (35) is not something like (36a) but, if anything, something like (36b).

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[17] An even more complicated case (discussed in Chierchia 2004; also see section A3 of the appendix) is this:

(i) Few people that smoke and drink live to 80.

This has also the implicature ''some do . . . ''. Scalar enrichments of this complexity are not discussed in proposals alternative to the present one, as far as I know.

(36) a. If many but not all students complained, we are in trouble.
  b. If many students complained, we are in trouble, while if few students complained, we are OK.

If we express these options using the O-operator, here is what we get:

(37) a. if O [many students complained], we are in trouble
  b. O [if many students complained, we are in trouble]

The scopes in (37a–b) correspond to the interpretations (36a–b), respectively. The preference for the interpretation represented by (37b) is in line with the preference for the strongest interpretation (i.e., the option we have already encountered and discussed). However, there are cases in which a reading isomorphic to (37a) seems to emerge. Consider, for example, the following discourse:

(38) If many students complained, then we are better off than if all did.

For (38) to make sense, the antecedent has to be interpreted as follows:

(39) If many though not all students complained, then we are better off than if all did.

This type of case (discussed in Levinson 2000) seems to involve an interpretation isomorphic to (37a). Now, as the reader can readily verify, interpretations of this sort are in fact weaker than the plain assertion. In general, it is easy to show that

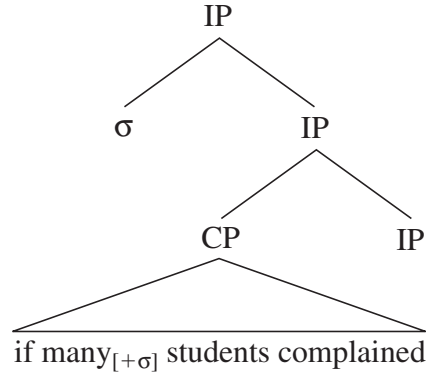(40) $[p \rightarrow q] \subseteq [O [p] \rightarrow q]$

So (37a) is an example of an *enriched* meaning that is not a *strengthened* meaning. The proposed system is designed to obtain strengthened meanings. And, as it stands, it does not afford us interpretations like (37a). In Chierchia 2004, I suggested that they are to be obtained through something like domain selection. Here I wish to explore a different possibility, directly inspired by Fox (2003). We can imagine introducing at LF something like a ''strongest meaning'' operator. So far, O has been used only in the semantic metalanguage; we might want to introduce an analogue of O at LF. Such an operator, call it ''σ,'' would be an abstract assertoric operator that quite literally ''freezes'' or ''locks in'' the implicatures. σ [S] has as its (plain) meaning the (strongest) *enriched* meaning of S. Once σ applies to a constituent, the implicature of that constituent becomes part of its meaning and hence can no longer be removed or recalibrated. Formally:

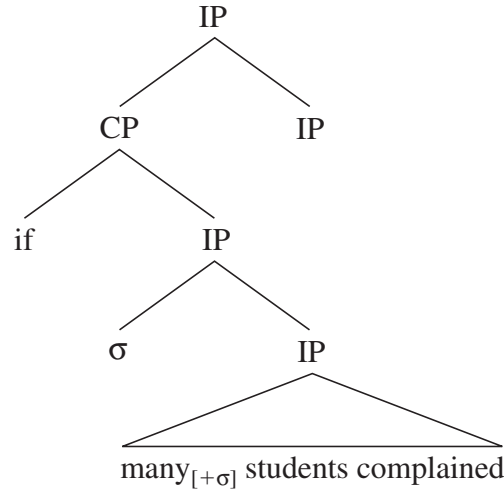(41) $\|\sigma\ S\| = \|S\|_S$[18]

In this connection, it is in fact tempting to adopt one of the familiar syntactic modes of projecting LF operators. For example, we might say that the feature $[\pm\sigma]$ associated with scalar items is uninterpretable and needs to be checked by an (interpretable) abstract operator σ (and vice versa: σ has to have a $[+\sigma]$ element in its scope). In the case under discussion, (35), such an operator can be attached at different sites, as in (42).

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[18] This is a simplification. See the appendix for technical details.

(42) a.

IP
├── σ
└── IP
    ├── CP
    │   └── if many$_{[+\sigma]}$ students complained
    └── IP

b.

IP
├── CP
│   ├── if
│   └── IP
│   ├── σ
│   └── IP
│   └── many$_{[+\sigma]}$ students complained
└── IP

It should be observed, moreover, that σ is not a direct syntactic projection of the enrichment operation O. For example, it can be shown that if p and q both contain scalar terms, then the following equivalence holds:

(43) a. $\|\sigma\ [p_{[+\sigma]} \rightarrow q_{[+\sigma]}]\|\ =\ O\ [p \rightarrow O\ q]$

b. *Example*

σ [if John drinks and$_{[+\sigma]}$ drives, he gets two$_{[+\sigma]}$ months' probation]

$=\ O$ [if John drinks and drives $\rightarrow O$ he gets two months' probation]

$=$ If John drinks and drives, he gets two months' (and no more) probation, while if he does only one of the two, he does not get two (or more) months' probation.

This is so because a single occurrence of σ can simultaneously check several occurrences of $[+\sigma]$ (by analogy with *wh*-dependencies). The present approach also rules out representations of the following sort, as cases of feature mismatch (where the second is a violation of minimality/intervention, however one wants to implement it):

(44) a. *σ [John smokes or$_{[-\sigma]}$ drinks]

a′. O_C (smoke(j) $\vee$ drink(j)) $=$ undefined

b. *σ [John is smoking or$_{[-\sigma]}$ grading some$_{[+\sigma]}$ assignments]

b′. O [smoke(j) $\vee_{[-\sigma]}$ some$_{[+\sigma]}$ (assignments) λx grade(j, x)]

These are welcome results. LF representation (44a) would be interpreted as (44a′); this would be semantically undefined (for the alternatives are not active). In (44b), the situation is different (and worst). An LF representation like (44b) would be interpreted as (44b′), where the alternatives associated with *some* are active, but those associated with *or* are not. As can readily be computed, (44b′) entails that John is not smoking, something we clearly do not want as a possible meaning for a sentence like (44b) (for further discussion, see Chierchia 2004, Fox 2003). I should also emphasize that these results are obtained using completely standard assumptions on feature checking (or whatever subsumes its effects).

The introduction of a strong assertion operator, which, as noted above, has several antecedents in the literature and is most directly inspired by proposals in Fox 2003, constitutes a departure from Chierchia 2004. The link between that proposal and the present one is, however, quite trivial. It boils down to definition (41): σ is defined in terms of the recursively characterized notion of enriched interpretation, $\| \ \|_S$ (which remains essentially the same as before). This is all quite sketchy (something only partially remedied in the appendix), but perhaps sufficient for present purposes. What I have tried to do in this section is to set up a sufficiently explicit formal machine (which can be provided with some independent motivation) in order to formulate a (partly new) theory of polarity phenomena building on the idea of domain widening. Let us now turn to formulating such a theory.

4 Negative Polarity

In this section, I will examine ''pure'' NPIs, namely, items like *mai/ever* that disallow FC uses (minimizers like *lift a finger* also fall into this category), using the framework presented in section 3. As I will show, such a framework allows us to readily conceptualize the role of the implicatures associated with PSIs. For convenience, I will illustrate the proposal mostly with English *any*, focusing on its negative polarity facet. The reader should bear in mind that a more adequate characterization of items of the *any* type will have to wait until section 5.

4.1 ''Large'' Domain-Alternatives

Recursive pragmatics enables us to systematize (and, in a sense, integrate) the proposals by Kadmon and Landman (1993), Krifka (1995), and Lahiri (1998) on NPIs. To show how, I will start out with a proposal close to Krifka's. Then I will modify it in ways that will bring out its connections to the others. Recall the basic idea: (negative polarity) *any* in English has the same meaning as an indefinite like *some*, plus domain widening. I will work toward my proposed implementation of this insight through an example.

Let us assume that every predicate carries a world variable, which is filled according to general principles (see Groenendijk and Stokhof 1984; for a more recent proposal, see Percus 2000). Furthermore, let us assume that quantification (and abstraction) can be restricted to contextually salient domains. Here is a simple example:

(45) a. I saw a/some boy.
   b. $\lambda w \exists x \in D_w \ [boy_w(x) \wedge saw_w(I, x)]$

Formula (45b) is the proposition expressed by (45a).[19] I use set variables (D, D′, etc.) to mark the (salient) quantificational domain associated with DPs. D typically includes individuals whose existence we are sure about, along with individuals we may be less sure about. Take, for example, our neighbor Fred. For all we know, he might or might not have sons. So, depending on specific aspects of the conversational dynamics, D might include Fred's possible sons or not. Given a set D, D_w are those members of D that actually exist in w. Fred's sons will be in D_w only if it turns out that in fact they exist in w. Adding (45b) to a common ground (the set of worlds that, for all the illocutionary agents mutually believe, might be actual) excludes from such common ground the worlds w′ in which no member of D existing in w′ is a boy I saw.[20] Nothing new or particularly controversial so far (within a possible-worlds semantics).

Now, the core meaning of a sentence involving *any* is just like (45b) plus domain widening. I believe that domain widening takes place along two dimensions. First, we pick the largest possible quantificational domain among the reasonable candidates. This means that all entities that for all we know might exist are factored in. Second, our uncertainty about quantificational domains may also have qualitative aspects. Take Fred again, and consider now his nephew John. We are sure that John exists, but we may be uncertain whether he is a man or still a boy. This means that in some worlds compatible with what we know, he is a boy; in others, he isn't. Using *any boy*, we might signal that our claim extends to him.

How do we express this formally? Let us consider sheer domain size first. The only way to measure domain size is by comparison; this entails that the meaning of *any* must be inherently relational. It must involve comparison among D-alternatives. It is useful to visualize this with a toy example.

(46) *A system of ''large'' domains*
D = { a, b, c }   widest domain
D1 = { a, b }
D2 = { b, c }
D3 = { a, c }

Suppose D1–D3 are candidate domains for what's around here; then *any* would be associated with their union, D = D1 ∪ D2 ∪ D3. In choosing our quantificational domain in this way, we still have anchoring to a specific D, with the understanding that it is the largest one (among the alternatives at stake).

Consider next the inclusion of ''marginal'' boys. This must amount to a kind of modalization: we take into consideration all those individuals that for all we know might be boys and might be in D.[21] Putting all this together, a sentence like (47a) (if it was grammatical) would have (47b) as its meaning. This has to be considered against the alternatives in (47c).

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[19] Here and throughout I ignore the (important) differences between *a* and *some*.

[20] The main reference on the notion of common ground is Stalnaker 1978. The proposal in the text, which uses world-bound domains, can perhaps be viewed as a way of representing ''domain vagueness,'' which Dayal (1998) argues is characteristic of FCIs. Notice, in fact, the resemblance to supervaluations (where each alternative corresponds to a partial interpretation). For further discussion, see section 5.

[21] This too can be viewed as generalizing what Dayal (1998) proposes for FC *any*.

(47) a. *I saw any boy.
  b. *Meaning*
    $\exists w' \exists x \in D_{w'} [boy_{w'}(x) \wedge saw_w(I, x)]^{22}$
  c. *Alternatives*
    $\exists w' \exists x \in D_{i,w'} [boy_{w'}(x) \wedge saw_w(I, x)]$, where $1 \leq i \leq 3$

Active alternatives must be used to enrich plain meaning. But what kind of enrichment is appropriate for *any* on the basis of the type of alternative that by hypothesis it associates with? Given that D-alternatives do not form a scale, use of O (i.e., exhaustivization) seems inappropriate. Still, in choosing among alternatives, speakers do tend to go for the strongest one they have evidence for. If this happens also in the case of (47a), we wind up saying that even the most liberal (i.e., broad) choice of D makes the sentence true: in other words, the base meaning will acquire an *even*-like flavor (as both Krifka (1995) and Lahiri (1998) propose).[23] Let us spell this implicature out:

(48) *Implicature*
  $\exists w' \exists x \in D_{w'} [boy_{w'}(x) \wedge saw_w(I, x)] \subseteq_c$
  $\exists w' \exists x \in D_{i,w'} [boy_{w'}(x) \wedge saw_w(I, x)]$, where $1 \leq i \leq 3$ and $p \subseteq_c q = p$ is stronger (hence, less likely) than q relative to the common ground c

However, given the way the domains are chosen, (48) is logically false: all of the alternatives in (47c) are logically stronger than the statement (47b); therefore, the latter statement *cannot* be less likely than its alternatives. Sentence (47a) enriched by implicature (48) is inconsistent, whence its deviance.

Contrast this with what would happen in a negative (DE) context.

(49) a. I didn't see any$_D$ boy.
  b. *Statement*
    $\neg \exists w' \exists x \in D_{w'} [boy_{w'}(x) \wedge see_w(I, x)]$
  c. *Implicature*
    $\neg \exists w' \exists x \in D_{w'} [boy_{w'}(x) \wedge see_w(I, x)] \subseteq_c$
    $\neg \exists w' \exists x \in D_{i,w'} [boy_{w'}(x) \wedge see_w(I, x)]$

---

[22] Formula (47b) ought to be relativized to an epistemic accessibility relation, which I am omitting for simplicity. Also, from now on, and when no confusion arises, I will omit λw from formulas. So, for example, the formula in (47b) is to be understood as a short form for (i).

  (i) $\lambda w \exists w' \exists x \in D_{w'} [boy_{w'}(x) \wedge saw_w(I, x)]$

[23] Actually, my proposal corresponds to what Krifka proposes for what he calls ''emphatic'' *any*. For nonemphatic *any*, he proposes a purely scalar approach, according to which, asserting a sentence like (47a) leads to the simultaneous negation of all weaker alternatives (as in scalar reasoning). However, in positive contexts the result is contradictory, since it is impossible for an existential statement to be true in D without also being true in some of its subdomains. On the contrary, in negative contexts a sensible meaning results. Such an approach makes wrong predictions for sentences like (i).

  (i) *There must be any student in that building.

The presence of a modal makes Krifka's proposed implicature coherent (something I must leave to the reader to verify). Consequently, (i) is predicted to be grammatical, contrary to fact. Krifka's proposal for emphatic *any* does not run into such a problem.

The statement (49b) and the implicature are consistent. This constitutes a green light to add them to our common ground. This addition informs us that no matter what subset of D might turn out to be the actual domain, I saw nothing in that domain that could possibly be a boy. Domain widening yields its effects.

The appeal of this general line of argument should be fairly clear. The *even*-like implicature flows from general principles of sensible use of alternatives (once one sees what the alternatives under consideration are). And it is also immediately clear that such an implicature cannot be met in positive contexts, which explains the distribution of NPIs. But with this, a potential problem comes readily to mind: implicatures that clash with the assertion do not generally yield ungrammaticality; they are simply removed (exploiting clashes of this sort is, in fact, *the* way implicatures are typically canceled). So why is a sentence like (47a) (an NPI-licensing violation) ungrammatical? There is an impasse here between the way domain widening explains the distribution of NPIs (using Gricean principles) and the way such principles are typically taken to work.

Evidently, while scalar alternatives can be deactivated by the context, D-alternatives cannot. Within ''recursive'' pragmatics, we have a possibly principled way of addressing this issue. This approach to scalar implicatures has led us to posit two variants of scalar terms: a strong $[+\sigma]$ variant, with active alternatives that need to be used for enrichment; and a weak $[-\sigma]$ variant with no active alternatives, for which no σ is necessary (or possible). In this setup, it is indeed natural to expect that there will be items associated with alternatives that *cannot* be deactivated: $[+\sigma]$ items with no weak variant. *Any* is $[+\sigma]$ and lacks a weak variant (or, one might say, its weak variant is $some_{[-\sigma]}$, or some other weak indefinite). The effect of this is that such items will *have to* occur within the scope of σ; their implicature has to be frozen in place, through an abstract operator σ. From a functionalistic standpoint, this makes sense. If the role of domain widening is to induce an implicature, using an NPI in a context where such an implicature could not arise is self-defeating. Therefore, we can assume that NPIs carry an (uninterpretable) feature (specifically, a piece of possibly abstract negative morphology)[24] that needs to be checked by an appropriate (interpretable) operator (namely, σ). NPIs must be checked by σ (i.e., one might say, enter an agreement relation with σ). In a way, the fact that NPIs need σ provides independent evidence for it.

4.2 An Implementation

Let me spell this out. I assume that besides O (whose definition is given again in (50b)), another available mode of enrichment is E (for *even*), defined as in (50a).

(50) a. $E_C(p) = p \wedge \forall q \in C [p \subseteq_c q]$, where $C = ALT$
    b. $O_C(p) = p \wedge \forall q \in C [q \rightarrow p \subseteq_c q]$, where $C = ALT$

This format shows how close in meaning these two functors are. The choice between them is dictated by the nature of the alternatives: if (and, ideally, only if) C contains a scale (unique for p), O is felicitous; if (and, ideally, only if) C contains partially ordered propositions, like D-

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[24] Call it $[+\sigma$ D-MAX], to differentiate it from the feature of scalar items.

variants, E is felicitous.[25] In (51a), I specify an ''official'' lexical entry for *any* (but cf. section A2 of the appendix) and the alternatives it activates; in (51b), I spell out the specific form of pragmatic strengthening associated with domain widening.

(51) a. *Lexical entry for* any
   i. $\|any_D\| = \lambda P \lambda Q \lambda w\ [\exists w' \exists x \in D_{w'}(P_{w'}(x)) \wedge Q_w(x)]$
   ii. $ALT(\|any_D\|) = \{\ \lambda P \lambda Q \lambda w\ [\exists w' \exists x \in D'_{w'}(P_{w'}(x) \wedge Q_w(x))]$:
    $D' \subseteq D \wedge D'$ is large $\}$
   iii. *Any* has an uninterpretable feature $[+\sigma]$.
  b. $\|\phi\|_S = E_C(\|\phi\|)$, where $C = \|\phi\|^{ALT}$

As with O, use of E shrinks the set of alternatives. Now, let us go back to the ungrammatical example (47a). In virtue of (51aiii), it must occur in the scope of σ. Here is what we get:

(52) a. *I saw any boy.
  b. σ [I saw any boy]
    ⌞_____⌟
  c. $E_C(\exists w' \exists x \in D_{w'}\ [boy_{w'}(x) \wedge see_w(I, x)])$
  d. $\exists w' \exists x \in D_{w'}\ [boy_{w'}(x) \wedge see_w(I, x)] \subseteq_c \exists w' \exists x \in D_{i,w'}\ [boy_{w'}(x) \wedge see_w(I, x)]$

Any carries a feature that needs to be checked by σ. As σ can be adjoined to clausal nodes, we do so in (52b) and the syntactic requirement on *any* is duly met. However, σ locks in the implicature. Thus, the interpretation of (52b) is (52c)—which is an unusable contradiction (as the implicature it carries, (52b), is necessarily false). No way out. Contrast this with what happens in a negative context (like (49), repeated here).

(53) a. I didn't see any boy.
  b. σ ¬ [I see any boy]
    ⌞_____⌟
  c. $E_C(\neg \exists w' \exists x \in D_{w'}\ [boy_{w'}(x) \wedge see_w(I, x)])$
  d. $\neg \exists w' \exists x \in D_{w'}\ [boy_{w'}(x) \wedge see_w(I, x)] \subseteq_c \neg \exists w' \exists x \in D_{i,w'}\ [boy_{w'}(x) \wedge see_w(I, x)]$

In a sentence like (53a), we have an additional site at which the feature associated with *any* can be checked, namely, after negation. The semantics we get this time is perfectly sensible, and domain widening comes happily to fruition (in the sense that it has led to something stronger than the available alternatives). This generalizes to all DE contexts. We now see exactly how the computational system forces NPIs to occur in DE contexts.

  Two observations may be appropriate. First, σ can be thought of as what makes negation (and other DE heads) ''strong'' or ''affective'' (giving precise semantic content to this notion). Second, one might expect the special morphology that induces checking or agreement with the

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[25] Notice that if C contains scalar alternatives, $E_C(p)$ yields a noncontradictory statement only if p is the strongest member of the scale. Perhaps we might require that a form of enrichment is felicitous only if it can yield meaningful results for all the alternatives at stake.

implicature-freezing operator σ to be sometimes ''visible.'' Cases of ''negative concord'' can be viewed in this light.

(54) a. Non   ho   visto nessuno studente parlare a nessun professore.
     (I) not have seen no   student speak to no   professor
     'I haven't seen any student speak with any professor.'
 b. σ ¬ [I saw any student speak with any professor]

It is tempting (following the insights of Laka 1990 and Ladusaw 1992 embedded in a new framework) to explain negative concord along the following lines. N-words in languages like Italian have roughly the same semantics as (NPI) *any*. They are, therefore, domain-widening existentials. This forces checking by σ, which can yield something interpretable only in conjunction with negation and other negation-like operators. That is why negation must be present and can affect more than one N-word (without resulting in multiple negations). Moreover, since in the case of N-words, the NPI actually carries a piece of *overt* negative morphology, the locality conditions on checking and the range of heads that can sustain σ and do the job may be more narrowly defined than those associated with *any*. This, in fact, seems to be supported by language-internal evidence as well: *nessuno*, lit. 'no one', has a narrower distribution than *any* (e.g., it is not licensed in the restriction of *ogni* 'every'); *mai* 'ever', which has no overt negative morphology, instead has a distribution very similar to that of *any*. There is obviously a lot of work to be done in this connection; nevertheless, the division of labor between syntax and semantics looks promising.

A general criticism that has been leveled against the domain-widening idea is that widening does not seem to always have to take place. This is particularly evident with N-words. Just like its English translation, a sentence like (54a) can be used when the speaker has a specific salient domain in mind, and it does not *necessarily* require expanding this domain to include marginal cases. As it turns out, this is in fact consistent with the use of domain widening adopted here. The lexical entry for an NPI (see (51)) contains an implicit reference to a specific domain, just like the entry for any other quantifier. So *nessuno* (or *any*) will be relativized to a specific, pragmatically set domain. However, alternatives are activated, and they automatically generate the relevant implicature—which cannot be canceled. This mechanism sometimes reflects real uncertainty about the quantificational domain. But this doesn't have to always happen: sometimes we merely have a formal requirement. Power of grammaticization, one might say. Domain widening, as implemented here, is a *potential* for domain widening.

The main thrust of the present attempt is to place the semantics of *any* within a general theory of implicature projection, in an alternative-based, multidimensional semantics. There are just a few lexical options that Universal Grammar makes available: the kinds of alternatives an item activates (so far we have scalar alternatives and ''large domain'' alternatives) and whether or not weak variants are available. Alternatives determine the form of enrichment (O vs. E); the presence of weak variants determines whether such alternatives can be inert. The rest is set by the computational system. Scalar and domain alternatives interact in rich ways. We will see one effect of such interactions below. The full scale of such interactions is quite broad. For example,

in Chierchia 2004 it is argued that the intervention effect on NPIs is due precisely to such interaction. While the present framework does lend itself to checking the viability of such claims,[26] exploring it fully is more than I can do in this article, where the main focus remains the comparative grammar of PSIs. What I have done, in this connection, is to implement the domain-widening idea in recursive pragmatics.

5 The Birth of Universal Readings

In this section, I will examine FCIs of the *any* type (which allow negative polarity uses) and of the *qualunque* type (which disallow negative polarity uses) and discuss where their properties and quantificational force come from. Then I will come back to the relation between these elements and pure NPIs.

5.1 Antiexhaustiveness

One of the classic puzzles surrounding FC uses of elements like *any* is why they seem to switch so naturally to a universal or quasi-universal force, as the following standard examples illustrate:

(55) a. Any cat meows.
     b. Yesterday, any student that was around dropped by.

Dayal (1998) makes a convincing case that the universal force of FCIs cannot be derived from a quantificational adverb as a sort of quantificational variability effect (see, e.g., Kadmon and Landman 1993, Giannakidou 2001); rather, it must be endogenous to *any* itself. She proposes that FCIs be analyzed as modalized universals. I want to argue that the effects of Dayal's analysis can be derived as a further implicature of domain widening, elaborating on an insight of Kratzer and Shimoyama (2002). In this section, I will extend (a variant of) Kratzer and Shimoyama's proposal for German (existential) FC *irgendein* to universal FCIs (namely, Italian [*qualsiasi N*] and FC *any*), postponing discussion of existentials until the next section.

Imagine that the alternatives under consideration are not domains of approximately equal size, but rather *all* of the possible choices (on a given maximal domain). Imagine, in other words, that the structure of the alternative domains is roughly this:

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[26] A referee points out interesting cases of this sort:

(i) Everyone who knows any mother of two children should tell her about this tax benefit.

The interest of this example lies in the fact that both O and E must be at work and that the canonical implicature associated with *two* is absent (the sentence in fact implicates that it is not the case that people who know mothers of a single child should do anything). The LF representation and semantic interpretation of (i) should be as follows:

(ii) σ [everyone who knows any mother of two children should tell her about this tax benefit]

(iii) O E (every (one who knows any mother of two children)(should tell her about this tax benefit))

The inverse order, E O (φ), yields a contradiction (for *only* creates a nonmonotonic context, while E works only in a monotone setting). So, when we look at the structure of (i), where *any mother* c-commands *two children*, it seems that alternatives must be factored into meaning as in a pushdown stack: the last one in is the first one out. This has rich consequences for intervention contexts that, I think, corroborate the general line explored in Chierchia 2004. A full discussion of the relevant issues must be deferred to another occasion, however.

(56) $D = \{\,a,\,b,\,c\,\}$

$D1 = \{\,a,\,b\,\}$ $D2 = \{\,b,\,c\,\}$ $D3 = \{\,a,\,c\,\}$
$D4 = \{\,a\,\}$ $D5 = \{\,b\,\}$ $D6 = \{\,c\,\}$

Suppose that from among this finely structured range of alternatives you were to pick one—say, $D3 = \{\,a,\,c\,\}$ (by saying, for example, that someone in D3 is the culprit). What would that convey to your hearer? Clearly, that you are excluding other options; and, in particular, that you are excluding D5 (i.e., the complement of D3). The same holds for any other choice. Conversely, what would the choice of D, the *maximal* option, convey? Plausibly, it would convey the opposite, namely, that you do not exclude any option whatsoever.

This lays out the intuition. Now let us reconstruct it formally.

(57) a. (Yesterday) I saw any student (that wanted to see me).
   b. *Assertion*
       $\exists w' \exists x \in D_{w'} \,[\text{student}_{w'}(x) \wedge \text{see}_w(I, x)]$
       Abbreviated as: $\text{some}_D\,(\text{student})(\lambda x\ I\ \text{saw}\ x)$
   c. *Potential alternative assertion*
       $\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x)$, for any $D_i \subset D$
   d. *Strengthened alternative assertions*
       $O\,(\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x))$
       $= \text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x) \wedge \neg\ \text{some}_{D_j}\,(\text{student})(\lambda x\ I\ \text{saw}\ x)$, for any D_j
       $\subseteq D - D_i$

Clearly, asserting (57b) will induce the hearer to assume that the speaker has no evidence that any strengthened alternative like (57d) holds. By the epistemic step, the hearer will therefore conclude that (57d) does not hold.

(58) $\neg\,O\,(\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x))$, for all D_i

Now, let us work out (58) by putting the universal quantifiers over domains in the appropriate places.

(59) a. $\forall D_i\,\forall D_j\ \neg\,[\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x) \wedge \neg\ \text{some}_{D_j}\,(\text{student})(\lambda x\ I\ \text{saw}\ x)]$[27]
   b. $\forall D_i\,\forall D_j\ [\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x) \rightarrow \text{some}_{D_j}\,(\text{student})(\lambda x\ I\ \text{saw}\ x)]$

In essence, this says that if *I saw a student* is true in some domain D, it must be true in any other domain (containing a possible student). This, together with the assertion, entails (60).

(60) $\forall D\,[\text{some}_D\,(\text{student})(\lambda x\ I\ \text{saw}\ x)]$, where D contains possible students

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[27] To be precise, (59a) should be spelled out like this:
(i) $\forall D_i\,\forall D_j \subseteq D - D_i\ \neg\,[\text{some}_{D_i}\,(\text{student})(\lambda x\ I\ \text{saw}\ x) \wedge \neg\ \text{some}_{D_j}\,(\text{student})(\lambda x\ I\ \text{saw}\ x)]$
I use (59a) to enhance readability. The point in the text is not affected by this simplification.

A quasi-universal reading thereby comes about. The assertion by itself doesn't make it happen, and the implicature by itself doesn't either. The universal force stems from putting, as it were, two and two together (the assertion and the implicature). In doing so, we are using nothing more than plausible Gricean principles and domain widening, on the assumption that the D-alternatives form a ''complete'' lattice structure of the form in (56).

So what does the difference between pure NPIs (like *ever* or Italian N-words) and *any* amount to? We are playing here with two kinds of implicatures. The NPI implicature is an *even*-like implicature (as suggested by Krifka (1995) and Lahiri (1998)); the FC implicature is antiexhaustiveness (as suggested by Kratzer and Shimoyama (2002)).[28] The latter comes out of two factors: insisting on using domain widening in positive contexts (which excludes E as a possible enrichment operation) and activating alternatives of any size (down to the smallest domains). It is thus plausible to maintain that if a certain item lexically activates alternatives of any size (including ''small'' ones), the form of enrichment that gets triggered is antiexhaustiveness.

Here is a possible implementation of all this. A reasonable candidate for the lexical entry of FC *any* might be this:

(61) a. $\text{any}_D = \lambda P \lambda Q \exists w' \exists x \in D_{w'} [P_{w'}(x) \wedge Q_w(x)]$
      b. $\text{ALT}(\text{any}_D) = \{ \lambda P \lambda Q \exists w' \exists x \in D'_{w'} [P_{w'}(x) \wedge Q_w(x)]: D' \subseteq D$
          $\wedge D' \cap \lambda x \exists w'[P_{w'}(x)] \neq \varnothing \}$

We have simply replaced the condition that the domains be ''large'' with the one that alternative domains must stand a chance (namely, contain things that might possibly satisfy the restriction). As a result, now even a D containing a single possible student (in the case of (57a)) will be in the alternative set. And the strengthening operation that naturally goes with alternatives of this sort is antiexhaustiveness.

(62) *Antiexhaustiveness*
      $\|\phi\|_S = O^-_C \|\phi\|$, where $C = \|\phi\|_S^{ALT}$ and $O^-_C(p) = p \wedge \forall q, q' \in C [q \rightarrow q']$[29]

It is plausible to maintain that O^- can apply felicitously only when the alternative set of domains forms a complete join semilattice as in the example in (56).

Summing up so far, pure NPIs (like Italian N-words) are associated with large D-alternatives. This triggers an *even*-like enrichment, E. Use of E confines pure NPIs to DE contexts. FCIs like *any* are associated with alternatives of any size (including small ones), which trigger O^-. Everything else stays the same. Both NPIs and FCIs must be checked by the implicature-freezing operator. Here is a sample derivation involving FC *any*:

(63) a. I saw $\text{any}_{[+\sigma]}$ student (that wanted to see me).
      b. σ [I saw $\text{any}_{[+\sigma]}$ student]

[28] Kratzer and Shimoyama (2002) actually discuss the FC implicature only in the context of what are called existential FCIs. Exploiting it to derive universal readings is, as far as I am aware, an idea developed here for the first time.

[29] A formulation like this would make the antiexhaustive character of O^- more transparent:

(i) $\forall q \in C \neg O_{C'}[q]$, where C' must be restricted as in footnote 27

I owe this idea to suggestions by Danny Fox and Jon Gajewsky.

    c. some_D (student) λx I saw x $\wedge$

      $\forall D_i \, \forall D_j \, [\text{some}_{D_i} \, (\text{student})(\lambda x \text{ I saw } x) \rightarrow \text{some}_{D_j} \, (\text{student})(\lambda x \text{ I saw } x)]$

    d. $\forall a \in$ possible student $\cap$ D [I saw a]

(I continue to ignore, for simplicity, the modifier *that wanted to see me*.) Formula (63d) constitutes a semiformal rendering of the assertion and the implicature together, which I will use from now on for convenience.

    Next, it is interesting to consider what happens to an FC element like *any* under negation. In principle, a sentence like (64a) might have two scope options. The first is illustrated in (64b).

(64) a. I didn't see any student (that wanted to see me).

      b. $\neg \, \sigma$ [I saw any student]

      c. $\neg \, \forall a \in$ possible student $\cap$ D [I saw a]

Here negation has scope over the implicature-freezing operator. Accordingly, we first lock the implicature in, then negate. The interpretation of (64b) is (roughly) as in (64c). This corresponds to the ''rhetorical'' reading (64a): the 'I didn't see just any student' type.[30] But there is also another possibility, illustrated in (65). We can first negate, then ''check'' the implicature.

(65) a. $\sigma \, \neg$ [I saw any$_{[+\sigma]}$ student]

      b. *Statement*

         $\neg \, \text{some}_D$ (student) λx I saw x

      c. *Implicature*

         $\forall D_i \, D_j \, [\neg \, \text{some}_{D_i} \, (\text{student})(\lambda x \text{ I saw } x) \rightarrow \neg \, \text{some}_{D_j} \, (\text{student})(\lambda x \text{ I saw } x)]$

Now notice that (65b) entails (65c). To see this, drop the universal quantifier from (65c), instantiating it as an arbitrary D_i in the alternative sets.

(66) $\neg \, \text{some}_{D_i} \, (\text{student})(\lambda x \text{ I saw } x) \rightarrow \neg \, \text{some}_{D_j} \, (\text{student})(\lambda x \text{ I saw } x)$

If D is (per our hypothesis) the largest domain, it is clearly impossible for (65b) to be true and (66) false, for (65b) entails both the antecedent and the consequent of (66). Conclusion: the implicature is automatically satisfied in any situation where the statement is true. Just as with ''pure'' NPIs, in negative contexts we are left solely with domain widening; the FC implicature vanishes.

    The conclusion is simple and, arguably, compelling: a lexical item with an entry like (61) is predicted to have a quasi-universal force in positive contexts and to act like an NPI in negative contexts. Its (similarity to and) difference from pure NPIs is very explicitly laid out: it is a difference in the type of alternatives activated. This explains why some languages might choose different lexical entries to signal association with different alternative sets, while others might opt to have one item covering both domains. It also explains why an item may start as a pure

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[30] It needs to be explained why the rhetorical reading generally requires a special intonational contour. It would be desirable to derive this effect from the interaction of a principled proposal about FCIs (such as the present one arguably is) and the theory of focus. But this will have to wait for another occasion.

NPI and then turn into an FCI (by expanding its alternative sets) and vice versa. Finally, we also see that it is incorrect to think of *any* as ''ambiguous'' between NPI and FC interpretations: English *any* has a unitary meaning, (61), which simultaneously accounts for its NPI uses (in DE contexts) and its FC uses (in non-DE contexts).

5.2 *Subtrigging*

Dayal (1998) carefully lays out several of the key generalizations about FCIs like *any*. As we have seen, she concludes that English *any* is ''inherently'' modalized, universally quantified, and domain vague. That insight seems to be basically correct. In fact, it fits with a view of polarity that is perhaps more general than one could hope for. The ''inherent'' part of her proposal needs to be qualified. The quantificational force of FC *any* is not written into its lexical entry. It stems from an implicature, triggered by the domain alternatives activated by it. Dayal also proposes an account of subtrigging that, as far as I can make out, is the only one among those currently available that stands a chance of being right. This section is devoted to showing how her account extends to the proposal made here.

Consider sentence (67a) and its semantics, according to the present proposal (67b).

(67) a. *I saw any student.
  b. $\forall D \; \exists w' \exists x \in D_{w'} \; [\text{student}_{w'}(x) \wedge \text{see}_w(I, x)]$, where D contains at least a possible student

What does (67b) actually say? In essence, that any possible student is such that I saw her. This is an extremely strong statement—perhaps too strong to ever be true. I can only see actually existing students; I cannot see something that does not exist. Because of our liberal take, D is surely going to include some such nonexisting entities. But this makes (67b) much too strong to ever be true. There is a kind of presupposition clash here between the modalized character of the restriction and the episodic/actualistic character of the scope. It is as if we have gone too far with our domain widening, to the point of obtaining a restriction unsuitable to be used in episodic statements.

Now, consider an occurrence of *any* ''subtrigged'' by a relative clause, as in (68a). What would the structure of the restrictor be? While I do not have a full-fledged analysis, something like (68b) looks like a reasonable outcome.

(68) a. I saw any student that wanted to see me.
  b. $\forall D \; \exists w' \exists x \in D_{w'} \; [\text{student}_{w'}(x) \wedge \text{want}_w(x, \lambda w'' \text{see}_{w''}(x, me)) \wedge \text{see}_w(I, x)]$
  c. $D \cap \lambda x \exists w' \; [\text{student}_{w'}(x) \wedge \text{want}_w(x, \lambda w'' \text{see}_{w''}(x, me))] \neq \varnothing$
  d. $\lambda x \; [\text{student}_{w'}(x) \wedge \text{want}_w(x, \lambda w'' \text{see}_{w''}(x, me))]$

In (68b), we find *three* world variables. One is associated with the head noun *student* and gets bound (i.e., ''modalized'') by *any* (as is generally the case). A second one is associated with the embedded infinitival clause [*PRO see me*]. The third one is associated with the relative clause (presumably through the tense associated with the main verb *want* in the relative clause). This variable eventually gets associated with the actual world. The exact details of how this happens

depend on specifics of the semantics of postnominal modifiers and tense sequencing. However, the outcome of this process will, plausibly, give rise to a restriction of the form shown in (68c) (obtained through an intermediate stage that will look roughly like (68d)). Such a restriction will contain possible students who *in fact* wanted to see me (hence, they must be actual students). This results in a perfectly natural statement, one that can be satisfied: every possible student who in fact wanted to see me (and hence must be actual) indeed saw me. Thus, subtrigging provides the anchoring we need to be able to use (modalized) FC items in episodic contexts. The general fact that FC items can be used in episodic contexts only subject to specific restrictions typically provided by a relative clause (but sometimes perhaps also by information present in the context) seems to receive a reasonable account.[31]

5.3 ''Pure'' Free Choice Items

With this in place, we can now look at an interesting difference between Italian FC *qualsiasi/qualunque* and English *any*. The difference lies primarily in the behavior of *qualsiasi/qualunque* under negation. As noted in section 2, an unmodified *qualunque* when negated seems to have only the rhetorical 'not just anyone' reading. For example:

(69) a. (?)Non   ho   visto qualunque studente.
         (I) not have seen whatever   student
         'I didn't see just any student.'
     b. $\neg\, \sigma$ [I saw any student]
     c. $\neg\, \forall a \in$ possible student $\cap$ D [I saw a]

Out of the blue, (69a) is awkward, unless intonation and/or context warrants a 'not just anyone' interpretation. In present terms, this means that (69a) admits only the LF representation in (69b), which results in the interpretation in (69c). The other option, which is available for *any* (see (64a), repeated here as (70)), seems not to be available for *qualunque*.

(70) a. $\sigma\, \neg$ [I saw any$_{[+\sigma]}$ student]
     b. *Statement*
        $\neg$ some$_D$ (student) λx I saw x
     c. *Implicature*
        $\forall D_i\, D_j\, [\neg$ some$_{D_i}$ (student)(λx I saw x) $\rightarrow \neg$ some$_{D_j}$ (student)(λx I saw x)]

In commenting on (70), I observed that the implicature in (70c) is entailed by the assertion and

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[31] Dayal (1998:460) further discusses the following interesting pattern involving FCIs with partitive restrictions:

  (i) You may pick any of the flowers.
  (ii) *You must pick any of the flowers.
  (iii) *Mary picked any of the flowers.

FCIs of the *any* type seem incompatible with partitives, unless a possibility modal is present. This is what prompts Dayal to introduce the concept of domain vagueness. I cannot address this pattern within the limits of this article. Relevant discussion can be found in Menendez-Benito 2005.

hence ''disappears.'' This makes *any* act like an NPI in negative contexts. In contrast, *qualunque* seems to be a ''pure'' FC element, which does not ''double up'' as an NPI, since it disallows reading (70a). The question then becomes, how are such construals ruled out? Addressing this question will help us pinpoint the exact difference between English and Italian FCIs.

A not unreasonable way to rule out (70) for *qualunque* is by insisting that the strengthening must be *proper*; that is, adding the implicature must lead to something that is indeed stronger than the plain statement without implicature. In other words, the strengthened statement must *asymmetrically* entail the plain one. Clearly, this does not happen in (70). In contrast, if the implicature is introduced in a positive context, proper strengthening results.

(71) a. Vedrò   qualunque studente.
        (I) will see whatever   student
     b. *Statement*
        $some_D$ (student) λx I will see x
     c. *Strengthened statement*
        i. *LF*
           σ [I will see any student]
        ii. *Interpretation*
            $some_D$ (student)(λx I will see x) $\wedge$
            $\forall D_i D_j [some_{D_i}$ (student)(λx I will see x) $\rightarrow$
            $some_{D_j}$ (student)(λx I will see x)]
            $= \forall a \in$ possible student $\cap$ D [I will see a]

So (69) is admitted because at the time when the implicature is factored in (i.e., when we compute σ [*I saw any student*]), we are in a positive context, where adding the implicature properly strengthens the assertion. Negation comes in subsequently.

Technically, the requirement that strengthening be proper can be viewed as a presupposition on the version of the freezing operator selected by *qualunque*.

(72) $\|\boldsymbol{\sigma} \phi\| = \|\sigma \phi\|$, if $\|\sigma \phi\|$ asymmetrically entails $\|\phi\|$; undefined otherwise.

Boldface $\boldsymbol{\sigma}$ is just like σ with a presupposition tacked on: $\boldsymbol{\sigma}$ yields a felicitous statement only if the result of freezing the implicature returns something strictly stronger than the unenriched statement. We stipulate that ''pure'' FC elements like *qualunque* select for $\boldsymbol{\sigma}$ (as opposed to σ). As a consequence, the implicature associated with *qualunque* can only be frozen successfully in positive contexts (the result can then, of course, be embedded further as in (69a)).[32]

Evidence for this analysis comes from the puzzling facts observed in (12)–(13), repeated here.

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[32] So $\boldsymbol{\sigma}$ yields a sort of positive polarity effect, a notion that otherwise has no independent formal status on the present approach.

(73) a. Non leggerò   qualunque libro. $\neg \forall$ (rhetorical)
        (I) won't read whatever book
     b. Non leggerò   qualunque libro $\forall \neg (/ \neg \exists); \neg \forall$
        (I) won't read any book
        che mi consiglierà Gianni.
        that Gianni will recommend to me

The factual generalization is that while the rhetorical reading is the only option for unmodified FC *qualunque*, another option becomes available when such items are modified (options that make such items start to act like NPIs). Now, we just saw how the rhetorical reading for (a sentence like) (73a) is obtained and why the NPI reading is absent. However, a further option is expected, since, in principle, it should be possible to scope the embedded DP out. The corresponding LF representation would be (74b).

(74) a. [qualunque libro]$_i$ non leggerò t$_i$
     b. σ [qualunque libro]$_i$ non leggerò t$_i$
     c. $\forall a \in$ possible book $\cap$ D $\neg$ [I will read a]

If we lock the implicature in after having scoped the object out, as in (74b), the presupposition of the σ-operator is met (i.e., we obtain something that asymmetrically entails the unenriched interpretation of (74a)). However, the result constitutes a subtrigging violation. Consequently, it will be ruled out by whatever rules out sentences like *I read any book*. This immediately predicts that subtrigging will rescue sentences like (74a), on the intended reading. This is indeed what the grammaticality of (73b) on the $\forall \neg$ reading seems to show. The relevant analysis is given in (75).

(75) a. [qualunque libro che mi consiglierà Gianni]$_i$ non leggerò t$_i$
     b. σ [qualunque libro che mi consiglierà Gianni]$_i$ non leggerò t$_i$
     c. $\forall a \in$ possible book that Gianni will recommend to me $\cap$ D $\neg$ [I will read a]

Since (75b) is equivalent to a $\neg \exists$ structure, it gives the impression that *qualunque* all of a sudden takes on the behavior of an NPI. As a matter of fact, however, this isn't so; and we now see why. An intricate pattern seems to fall into place in a rather principled fashion.

It is worth summarizing where we stand so far. The system of PSIs can be schematized as follows:

(76) *The system of polarity-sensitive items*
     σ[D-MAX]: pure NPIs   (alcuno, mai, ever)
     σ[D-MIN]: NPIs/FCIs   (any)
     σ[D-MIN]: pure FCIs   (qualsiasi)

What the elements in (76) have in common is that they (a) activate domain (D-) alternatives and (b) select for the implicature-freezing operator. The latter is a device that prevents the implicature (induced according to general Gricean principles) from being removed, a mechanism motivated on the basis of scalar implicature projection. Where the items in (76) differ is (a) in the size of

the D-alternatives (MIN/MAX) and (b) in the particular implicature-freezing operator selected. MAX-alternatives are ''large'' domains (expressing our agreement on core cases and doubts about marginal cases). Selection of MAX-alternatives triggers an *even*-like implicature. Such an implicature can be sustained only in DE environments (in non-DE environments, it results in contradiction). MIN-alternatives include all possible domains, down to the smallest ones, thereby indicating a more radical uncertainty. This results in a different implicature, antiexhaustiveness. Such an implicature, added to the assertion, precipitates a universal reading. Finally, implicature freezing can come about in two ways: with or without the presumption that the result is *properly* stronger than its input. That is, there are two variants of σ: a strong (presuppositional) one and a weak (presupposition-free) one. Lexical items freely select (through agreement) either variant.[33] If an item takes the ''weak'' option, it displays ''double dealer'' behavior: negative polarity in negative contexts, FC in positive contexts. If an item takes the ''strong'' option, it displays pure FC behavior.

So it seems that systematicity perhaps raises its noble head. Several problems remain, however. In particular, recall that under certain types of modalities (e.g., imperatives), the ''universal'' force of *any* seems to vanish: *Push any button!* Moreover, there is a whole class of FCIs for which a universal interpretation is out of the question (German *irgendein*, Italian *uno qualunque*). What about them?

6 Existential Readings Strike Back

In this section, I discuss existential FCIs. The main idea to be developed draws even more directly from Kratzer and Shimoyama 2002 than the one discussed in section 5. I will first present their proposal, then discuss how it relates to the one I am making here.

6.1 Combined Effects of Free Choice and Indefinite Morphology

Existential FCIs differ from universal ones in quantificational force. A further characteristic of existential FCIs, noted in section 1, is that their marginality in episodic contexts cannot be rescued by subtrigging.

> (77) a. ??Ieri   ne ho discusso   con un qualunque filosofo
>   yesterday (I) of-it have discussed with a whatever philosopher
>   (che fosse disposto ad ascoltarmi).
>   (that wanted to listen)
>   b. Ieri   ne ho discusso   con qualunque filosofo
>   yesterday (I) of-it have discussed with whatever philosopher
>   che fosse disposto ad ascoltarmi.
>   that wanted to listen

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[33] As readers can check by themselves, if an item triggers the *even*-like implicature, the presupposition of σ can never be met; hence, pure NPIs can only select for presuppositionless σ.

  c. Avrei dovuto discuterne   con un qualunque filosofo.
      (I) should have discussed of-it with a whatever philosopher

Out of the blue, (77a) is marginal, and the relative clause, if anything, makes things worse, in contrast to what happens with universal FCIs (see (77b)). An overt modality can rescue existential FCIs (as in (77c)). In fact, a way to rescue an existential FCI that is not overtly modalized, like the one in (77a), is to embed it (or imagine it embedded) in a context broadly construable as ''modal.'' The generalization that emerges is that existential FCIs are ungrammatical in the absence of a modal of some sort, a modal that sometimes can be covertly supplied (perhaps in the form of an abstract assertoric modality; on this, see also Kratzer and Shimoyama 2002). This generalization could be directly built into the grammar of existential FCIs (as Kratzer and Shimoyama in fact do). We could simply state that an existential FCI *must* occur in the scope of a modal. But it would be more interesting if this link to modalities could be derived from what we have found out so far about FC in general and some other property of existential FCIs. Where should we be looking for such a property?

An even superficial glance at the form of existential FCIs reveals that they are composed of the FC morphology (*irgend* in German, *qualunque/qualsiasi* in Italian) plus overt indefinite morphology (*ein* in German, any numeral in Italian). In the best of all possible worlds, the behavior of existential FCIs should follow from the grammar of FCIs (which we have, let us suppose, independently established) plus the standard contribution of overt indefinite morphology. The latter, typically, contributes two things: (a) existentiality and, importantly, (b) an ''exactly'' scalar implicature.[34]

  (78) a. A man walked in.
       b. *Interpretation*
           $\exists x$ [man(x) $\wedge$ walked in(x)]
       c. *(Scalar) implicature*
           $\neg$ two$_D$ (man) λx [x walk in]

The existential semantics in (78b) is already part of the semantics of universal FCIs, so that cannot be what is specific to existential FCIs. That leaves us with the scalar implicature (78c)—which must therefore be the culprit. Implausible as this may appear prima facie, it seems to follow that existential FCIs must be characterized by three things: (a) existentiality, (b) an antiexhaustiveness implicature over domains, and (c) a scalar (uniqueness) implicature. These three properties jointly should suffice to explain the special relation between existential FCIs and modals, as well as the other differences between existential and universal FCIs. As we will see, this is nearly on the mark.

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[34] I assume that the indefinite article has roughly the same semantics as the first numeral *one* and therefore competes with numerals; I write [$\exists$nx . . .] for ''there are at least n x's . . . ''

To make things concrete, let us consider a hypothetical example.

(79) a. ??Ho   sposato un qualsiasi   dottore.
          (I) have married a   whatsoever doctor
    b. *Basic assertion*
       $\exists w' \exists 1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$
    c. *Alternatives*
       { $\exists w' \exists 1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$, $\exists w' \exists 2x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$, . . .
          $\exists w' \exists 1x \in D^i_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$, $\exists w' \exists 2x \in D^i_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$, . . . }

The basic meaning of an existential FCI like (79a) is identical to that of its universal FC counter-part, (79b). The alternatives, however, are different: an existential FCI is also a scalar term, so its alternatives will contain both scalar (rows) and domain (columns) alternatives, as shown in (79c). These alternatives must be used up through appropriate forms of enrichment (so that the requirement that FC morphology be checked by σ can be duly met).[35] Accordingly, the scalar alternatives must use O, and the D-alternatives must use O⁻. The result is shown in (80).

(80) ‖σ ho sposato un dottore qualsiasi‖
     $= O^- (O (\exists w' \exists 1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)))$[36]

Let us unpack the effects of this complex form of enrichment, proceeding compositionally from the innermost operator. As we know, O adds exhaustivity over the relevant scale.

(81) a. $O^- (\exists w' \exists 1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x) \wedge \neg \exists w' \exists 2x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x))$
    b. $O^- (\exists w' \exists !1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x))$
    c. *Alternatives*
       { $\exists w' \exists !1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$,
         $\exists w' \exists !1x \in D^i_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$,
         $\exists w' \exists !1x \in D^j_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)$,
         . . . }

So the inner formula in (81a) says that I marry exactly one doctor in the relevant domain (abbreviated as in (81b)). At this point, the alternatives will be the ones shown in (81c); that is, they will be all the D-variants of (81b). Working out the effects of O⁻ at this point gives (82a–b).

(82) a. $\forall D^i \forall D^j [\exists w' \exists !1x \in D^i_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x) \rightarrow$
          $\exists w' \exists !1x \in D^j_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)]$
    b. $\forall D [\exists w' \exists !1x \in D_{w'}(\text{doctor}_{w'}(x) \wedge \text{I marry}_w x)]$

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[35] See section A3 of the appendix for formal details. Also, as mentioned in footnote 26, the proper handling of complex alternative sets requires more work, especially in connection with intervention-type effects. What is provided in the text is therefore particularly tentative insofar as the handling of multiple alternatives is concerned.
[36] I believe that reversing the scope of O and O⁻ leaves things unchanged. I will leave this for the reader to check.

We see the usual effect of the FC implicature: formula (82b) must be true of every domain that contains a possible doctor. Now, if our alternative domains contain more than one doctor (which they surely will, for otherwise there would not be D-alternatives), then (82b) is inconsistent, for it says that the sentence *I marry exactly one doctor* must be true of every doctor. This seems to provide us with an account of why existential FCIs in plain episodic contexts are marginal (and cannot be rescued by subtrigging): the FC implicature clashes with the scalar one.

But now let's contrast this with what happens in a modal context. We start by embedding (79a) under an (overt) modal and computing its interpretation.

(83) a. Posso sposare un qualsiasi   dottore.
       (I) can marry   a   whatsoever doctor
    b. *Basic meaning*
       $\exists w\ R(w_0, w)\ [\exists w'\exists 1x\in D'_{w'}(doctor_{w'}(x) \land I\ marry_w\ x)]$
       'There is an accessible world w, in which I marry a doctor.'

The presence of the modal gives us a further site at which to compute the FC implicature.[37]

(84) a. $O^-\ (\exists w\ R(w_0, w)\ [O\ (\exists w'\exists 1x\in D'_{w'}(doctor_{w'}(x) \land I\ marry_w\ x))])$
    b. $\exists w\ R(w_0, w)\ [\exists w'\exists !1x\in D_{w'}(doctor_{w'}(x) \land I\ marry_w\ x)] \land$
       $\forall D'\ [\exists w\ R(w_0, w)\ [\exists w'\exists !1x\in D'_{w'}(doctor_{w'}(x) \land I\ marry_w\ x)]]$

It is not hard to see that (84b) is consistent. First, the assertion says that there is some accessible world w in which something in D is a doctor I marry (and there are no two such things). Second, antiexhaustiveness says that for every subdomain D' of D containing a doctor, there is a world in which I marry that person. We obtain, in other words, a distribution of doctors across worlds: any possible doctor constitutes an option for me to marry. Here is the picture:

(85) *Worlds*   *Doctors I marry*
     w1   d1
     w2   d2
     . . .
     wn   dn
     . . .

That is, the doctors must distribute over the worlds in such a way that in each world I marry a different one, so that each possible doctor winds up being the chosen one in some world or other (and, of course, uniqueness prevents there being just one world in which I marry all of the doctors).

This is a neat result. Without any stipulation whatsoever, the interaction of modalities and the FC implicature (antiexhaustiveness) yields the right kind of meaning. For (83a) plus its implica-

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[37] I am simplifying things considerably. For example, I am ignoring the outermost scalar item (i.e., the modal *posso* '(I) can' itself). Furthermore, there are other a priori conceivable orders of application of the relevant operators—though I do not think they affect the main point. At any rate, as noted earlier, multiple alternative sets require principles of computation that cannot be properly explored within the limits of this article.

tures says that I must marry one doctor, and any conceivable doctor is a possible option. This is, in essence, Kratzer and Shimoyama's insight. What my proposal adds is that we do not have to worry about stipulating that existential FCIs must occur in the scope of a modal. For if it contains no modal, a sentence with an existential FCI is unusable.[38]

6.2 A Novel Intervention Effect

We have concluded that in nonmodal contexts, existential FCIs give rise to contradictory implicatures, rescuable by the insertion of a modal. This derives their meaning and distribution in a seemingly principled manner. However, potentially there is another way to rescue existential FCIs, namely, by inserting a quantified DP between the implicature-freezing operator and the FCI.

(86) a. (??)Un linguista ha sposato un qualunque dottore.
              a linguist   has married a   whatever   doctor
     b. σ [un linguista$_i$ [un qualunque dottore$_j$ [t$_i$ ha sposato t$_j$]]]
     c. $\forall D'$ [$\exists y$ linguist$_w$(y) $\land$ $\exists w' \exists!1x \in D'_{w'}$(doctor$_{w'}$(x) $\land$ y marry$_w$ x)]
     d.   For every doctor a, some linguist marries a and only a

Out of the blue, (86a) is odd (unless some ''modalizing'' context is provided). But it is not hard to see that (86c) is not contradictory (as the informal paraphrase in (86d) illustrates). So, if nothing is added, we would be predicting that sentences like (86a) are grammatical, which is not correct. Only modals can provide a suitable environment for existential FCIs. We had hoped—indeed, claimed—that it was not necessary to build this in as a stipulation specific to the grammar of FCIs, once the contribution of various implicatures is properly dissected.[39] Given facts like (86), though, it looks like we do have to stipulate something. We must stipulate that no other DP can intervene between σ and the DP that σ associates with (i.e., the DP whose alternatives σ operates on). A modal in the same position is fine. However, this type of restriction has a ring familiar from much work in syntax: it sounds like a minimality effect. If this is so, our hope not to have to say anything construction specific for existential FCIs would seem not to be misplaced after all.

It is worth recalling some of the basic traits of the present proposal. We are assuming that FC morphology is semantically associated with (minimal) D-alternatives, which must be factored into the meaning. We are implementing this by assuming that the FC morphemes carry an uninterpretable feature [$+\sigma$ D-MIN] that must be checked by the (interpretable) σ-operator. This has the effect of locking the FC implicature in place. Accordingly, the abstract structure of a sentence like (86a) will be as in (87a), while the structure of a sentence with a modal will be as in (87b).

(87) a. *σ [DP$_{[-\sigma\ \text{D-MIN}]}$ [. . . DP$_{[+\sigma\ \text{D-MIN}]}$ . . .]]
     b. σ [can [. . . DP$_{[+\sigma\ \text{D-MIN}]}$ . . .]]

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[38] This extends to universal modals. See section A4 of the appendix for a worked-out example.
[39] This point was made to me by Danny Fox, Jon Gajewsky, and Philippe Schlenker.

Even though a constraint like (87a) is a stipulation, it indeed has a form familiar from much work on locality. The relation between σ and its associated DP is disturbed by the intervention of another, somehow unhomogeneous DP. Modals in the same configuration do not intervene. Perhaps this is for good reasons. For one thing, such modals cannot carry the feature [+σ D-MIN], since they are not associated with D-alternatives. Hence, they lack the relevant property that may interfere.[40] Moreover, modals are heads, and here we are clearly dealing with XP (maximal projections) intervention. As Rizzi (1990, 2004) argues extensively, heads can intervene only with respect to other heads and maximal projections with respect to other maximal projections. (See Rizzi's work for evidence and a detailed implementation.)

Notice, furthermore, that multiple FCIs can of course occur in the same sentence.

(88) a. Un qualsiasi cittadino può sollevare una qualsiasi questione.
      a   whatever citizen   can raise   a   whatever question
   b. σ [can [a citizen$_{[+\sigma\ \text{D-MIN}]}$ [raise a question$_{[+\sigma\ \text{D-MIN}]}$]]]

The LF representation of (88a) is something like (88b); the modal *può* 'can' licenses the occurrence of both FCIs. And neither the modal itself nor the first FCI intervenes between the σ-operator and the second FCI, as we would expect.

Summing up, if the present approach is on the right track, it will provide (a) a reason why in plain nonmodal contexts existential FCIs are marginal (an implicature clash), (b) a reason why modals remove the interpretive obstacle (distribution over worlds), and (c) a reason why DPs that could in principle also remove the interpretive obstacle fail to do so (intervention). Even if this approach turns out to be wrong or does not tell the whole story, it is still likely that the observations in (86)–(88) point, at the very least at a descriptive level, in the direction of some sort of minimality effect.

6.3 Further Consequences and Remarks

The idea of a sort of ''distribution across worlds'' is present in different forms in previous work on FCIs. One finds it, for example, in Dayal 1998, Giannakidou 2001, and Sæbø 2001 (with disagreements on the nature of the modality involved). The first attempt to ''deduce'' this effect from Gricean principles was made by Kratzer and Shimoyama (2002). They, however, do not discuss the relation between existential and universal FCIs, nor do they derive the differences among them from the presence versus absence of a scalar implicature. There are other differences as well between the present proposal and theirs. Kratzer and Shimoyama adopt an alternative semantics. Here, I stay within the boundaries of a multidimensional semantics (along the lines of Rooth's (1985, 1992) approach to focus or Krifka's (1995) proposal on NPIs, for example). Also, even though I would like to stay as neutral as I possibly can on details of implicature projection, the present proposal requires something like implicature freezing and, to the extent

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[40] Modals are of course associated with scalar alternatives; hence, they carry the feature [±σ scal]. This feature, however, does not cause problems.

to which it is successful, provides evidence for it. The implicature-freezing operator bears a family resemblance to Rooth's (1992) ~-operator for focus; and it also resembles Fox's ''abstract'' *only*. As we saw, however, it has somewhat different properties from either of them.

One consequence of the present approach is that when an existential FCI is not in the scope of an overt modal, if the resulting sentence is somehow acceptable, the presence of a covert modal operator has to be assumed; otherwise, the implicatures associated with the indefinite would be inconsistent. A sentence like (89a), then, must have an LF representation like the one in (89b).

(89) a. Gianni è uscito di corsa e non sapendo che fare,
        Gianni ran out   and not knowing what to do
        ha bussato ad una porta qualsiasi.
        knocked at a door whatsoever
     b. $\Box_{speaker}$ σ [Gianni knocked at a door]

The abstract assertoric modal in (89) could be interpreted as something like 'it follows from what the speaker knows that Gianni knocked at a door'; the FC implicature would then be ''it is consistent with what the speaker knows that any door might have been the one knocked at.'' This is a first approximation (more work needs to be done on the exact nature of the modalities involved), but it looks like a reasonable move. Notice also that universal FCIs are not subject to a similar requirement. They can be rescued by subtrigging (which does not work for existential FCIs). Evidently, a rescue strategy that employs overt lexical material (subtrigging) is preferred to one that employs null modals as in (89). Null modals must be a last resort.

The present theory has a further consequence or, one might say, makes a further prediction. FCIs must be in the scope of the implicature-freezing operator, which, as we saw, comes in two variants: strong (presuppositional) and weak (nonpresuppositional). The presuppositions of the strong σ-operator can only be met in a positive context. The presuppositionless version can, instead, function in both negative and positive contexts. We should therefore expect a difference between existential FCIs parallel to the one found for universal FCIs (between *any* and *qualsiasi*).

This expectation seems correct. Italian and German existential FCIs seem to differ precisely along these lines (suggesting that we are probably dealing with a generalized parametric variation between Romance and Germanic). Compare (90a) and (90b).

(90) a. Niemand musste irgendjemand   einladen.   NPI reading/rhetorical
        no one   had to a person whatever invite
        'No one had to invite anybody.'
     b. Nessuno è costretto ad invitare una persona qualsiasi.   rhetorical
        no one   had to   invite   a   person   whatever
        'No one had to invite just anybody.'

Kratzer and Shimoyama point out that the preferred interpretation of sentences like (90a), particularly if pronounced without special intonation, is a pure NPI-like reading. A second interpretation, the rhetorical 'not just anyone' reading, is also possible—for example, in the presence of a contrastive intonation of some sort. The Italian counterpart of (90a), shown in (90b), has only

the 'not just anyone' reading (consequently, (90b) *requires* contrastive intonation or a special context of some sort). It does not have the NPI reading.

This follows under present assumptions. At LF, the available options for German are as follows:

(91) *German*

    a. *LF 1*

       no one λx σ MUST some$_D$ (person) λy invite (x, y)

    b. *Interpretation*

       $\neg$ MUST [some$_D$ (person) λy invite (x, y) $\wedge$

       $\forall D$ $\diamond$ some$_D$ (person) λy invite (x, y)][41]

    c. *LF 2*

       σ [no one λx MUST some$_D$ (person) λy invite (x, y)]

    d. *Interpretation*

       $\neg$ MUST [some$_D$ (person) λy invite (x, y)]

In German, implicature freezing can take place at two levels. The first is *before* the negative operator comes in (i.e., in the final structure, the negative operator c-commands σ; thus, σ applies to a positive assertion); the second is *after* negation (i.e., in the final structure, σ c-commands negation and therefore applies to a negative assertion). The first schematic LF representation is given in (91a); here, we first lock in the implicature and then negate the result. The interpretation is roughly 'it is not the case that x must invite somebody and that anybody is an option', a reasonable candidate for the rhetorical interpretation. The second possibility is given in (91c); in this case, the FC implicature is entailed by the assertion and therefore disappears. An NPI-like behavior results.

In contrast with this, Italian selects for **σ**. This choice is incompatible with the LF representation (91c), because it requires that the implicature lead to proper strengthening, which can only happen if freezing applies to something positive (as in (91b)). Thus, Italian has only the LF representation corresponding to (91a) and, under negation, allows only the rhetorical reading.

We are now also in a position to understand why even the most universal of the FCIs, like English *any* or Italian *qualsiasi*, suddenly acquires an existential reading when embedded under certain modals (a reading that in fact sometimes emerges as the preferred one).

(92) a. Taste any doughnut.

     b. Assaggia qualsiasi doughnut.

The LF representation of (92) will clearly contain the modal operator associated with the imperative, whatever that may be. This opens up the possibility of freezing the FC implicature either within the scope of the imperative or at the top level (with scope over the imperative). Schematically:

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[41] For simplicity, I replace *niemand* 'no one' with plain negation.

(93) a. □σ you taste any doughnut
      b. □∀ you taste any doughnut
      c. σ□ you taste any doughnut
      d. □∃ you taste any doughnut ∧ ∀ ◇ you taste any doughnut

In (93a), we first freeze the implicature, obtaining a universal reading. Then the imperative comes in. The result might be paraphrased as 'You must taste every possible doughnut', a possible (if disfavored) reading for (92a–b). In (93c), first the imperative comes in, then we freeze the implicature. The result is fully equivalent to what we usually get with existential FCIs (minus the uniqueness implicature). So the paraphrase is 'It is necessary that you taste a doughnut and for any particular doughnut, it is possible for you to taste it'.[42]

On the whole, the pattern of existential versus universal readings of FCIs is rather intricate—yet it seems to be beginning to yield.

7 Concluding Remarks

The PSIs we have discussed can be pulled together as follows:

(94) *The system of polarity-sensitive items*
      σ[MAX]: pure NPIs   (mai, ever)
      σ[MIN]: NPIs/FCIs (universal)   (any)
      σ[MIN]: pure FCIs (universal)   (qualsiasi)
      σ[MIN, SCAL]: NPIs/FCIs (existential)   (irgendein)
      σ[MIN, SCAL]: pure FCIs (existential) (uno/due/tre/. . . NP qualsiasi)

Let us go through this chart and thereby summarize the main points discussed above. What PSIs of the type studied here have in common is that they all involve domain widening. Since widening is something we only see by comparison, the form widening must take is the activation of a series of alternatives, out of which the largest gets selected. I implement this in a bidimensional semantics in which next to the basic value, we compute a range of alternatives. Such alternatives trigger implicatures, according to general principles. The general point was made by Grice long ago: a conversational move is judged against a background of other a priori conceivable moves. Selecting

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[42] A referee points out that the opposite pattern never arises. For example, the following German example can only have the meaning in the gloss:

(i) Er könnte irgendwas   tun.
     he could   whatever-something do
     'He could do something or other.'

Sentence (i) cannot mean that he could do anything. On the present approach, this fact is derived as follows. Sentence (i) has two possible LF representations, namely, (ii) and (iii).

(ii) [could σ [he do whatever-something]]

(iii) σ [could [he do whatever-something]]

In (ii), σ applies to a nonmodalized sentence and the result is contradictory (see the discussion of (79) in the text). In (iii), σ applies to a modalized sentence, which gives rise to the correct (existential) reading. No other option is available.

one move over another can be very telling. Riding on this, speaker-hearers can enrich communication in highly efficient ways, an opportunity exploited constantly and systematically. However, this does not take place just when an utterance is completed, as one might think. It happens throughout the computation of meaning; implicatures can be factored in a recursive, compositional manner.

The elements in parentheses in (94) are just a mnemonic for the alternatives associated with the relevant entry. It is part and parcel of this general picture that implicatures are determined by the nature of the alternatives. Much work still needs to be done in this domain in order to arrive at general principles (which are not disguised ''just so stories'') on how implicatures come about. Here is, however, the overall picture at this point.

If the alternatives form a scale (i.e., a linearly ordered set), then choosing an element will naturally indicate that all alternatives that are not entailed are deemed not to hold. This closely resembles the behavior of *only*, and to capture this fact we posit (following Fox 2003) a null operator O; I have argued that DE contexts require special care in handling O (essentially, O has to be built into each step of functional application involving DE functors).

If the alternatives do not form a perfect scale, we seem to have at least two plausible options. If we are considering possible domains of similar size, then we ought to choose the one that enables us to make the strongest (and hence least likely) statement; in this case, an *even*-like implicature naturally comes about. I have formalized this via E.

If, on the other hand, we are excluding no alternative of any size, down to the smallest possibility, then it sounds like we are really uncertain; we therefore ought to choose the assertion that excludes the least, the one that enables us to rule out fewer possibilities. From this, the hearer will jump to the conclusion that we are trying to rule in most possibilities (hence, the existential statement being made is likely to hold of *every* alternative). This is formalized via O^-.

The operators E, O, and O^- are not syntactically projected; they are only part of the semantic computation. However, at LF there must be an implicature-freezing operator σ, syntactically real at least to the same extent as focus operators. This operator (which assigns to a sentence the strongest implicature that can be factored in without contradiction) is necessary to obtain the various readings that scalars can give rise to. It is also crucial for PSIs. It gives us a syntactically plausible way to state the requirement that implicatures triggered by PSIs cannot be removed.

The system those proposals give rise to, though in many ways preliminary, unites formal explicitness with conceptual simplicity. Most of the similarities and differences among a fairly extended (and perhaps typologically significant) range of PSIs seem to fall into place.

Appendix: The Formal Theory

In this appendix, I will sketch a formally explicit characterization of the notion ''(pragmatically) enriched meaning,'' building on Chierchia 2004. This characterization does not deal with all aspects of pragmatic enrichment. It takes the form of a recursive definition that to each well-formed LF representation α associate its enriched interpretations $\|\alpha\|_S$. The definition of $\|\alpha\|_S$ is

formulated in terms of the standard definition of (unenriched) meaning $\|\alpha\|$, which I take here for granted. I assume that $\|\ \|$ provides a mapping from LF into a partial version of TY2 (i.e., a typed language with variables over worlds and a semantics with truth value gaps; Gamut 1991). Since the number of enriched meanings is, in the general case, greater than one, $\|\alpha\|_S$ defines a set; that is, $\|\ \|_S$ is to be thought of as a relation, rather than as a function. The notion of enriched interpretation $\|\alpha\|_S$ exploits, in addition to $\|\alpha\|$, the set of alternatives for α. In the general case, the set of alternatives is defined for each expression α, relative to one of its interpretations p (intuitively, the strongest one computed up to that point); so we will be defining α's alternatives via a function $\langle\alpha, p\rangle^{ALT}$, where p is an appropriate description (using, say, a logical form—that is, a TY2 representation) of α's meaning. The functions $\langle\alpha, p\rangle^{ALT}$ and $\|\alpha\|_S$ are defined by simultaneous recursion. Since typically p is the strongest enriched meaning of α, I will abbreviate $\langle\alpha, p\rangle^{ALT}$ as $\|\alpha\|_S^{ALT}$.

In section A1, I outline the main background assumptions. In section A2, I discuss the key lexical entries. In section A3, the main section of this appendix, I provide the recursive definition. Each clause in the definition is matched by one or more examples that illustrate its workings. Finally, in section A4 I discuss the FC effect in the context of modals of necessity.

A1 Basics

Interpretations are represented by formulas of TY2. We assume that every predicate of TY2 that represents a natural language predicate carries a world variable. Translations are set up in such a way that the world variable of the main predicate in a clause is the one abstracted over under embedding (while the world variable associated with arguments can be independently set; see Percus 2000). An example is provided in (95a).

(95) a. I saw some student $\rightarrow \lambda w \exists x \in D_w(student_w(x) \land saw_w(I, x))$
      b. $\lambda g . \|\lambda w \exists x \in D_w(student_w(x) \land saw_w(I, x))\|^g$

Strictly speaking, formulas such as (95a) are shorthand for functions over assignments to variables (ultimately, contexts) of the form given in (95b). Since quantificational domains are the aspect of context most directly relevant to our concerns, I will generally refer to (95) as functions from domains into propositions. Once the proper assignments are plugged in, formulas like (95) are used to increment common grounds, understood as sets of worlds (Stalnaker 1978).

Two formulas are D(omain)-variants iff they are alphabetic variants with respect to some domain variable. Here is a semantic characterization of this notion:

(96) *D-variance*
      a. q is a D-variant of p (in symbols, *D-variant (p, q)*), iff there are some i, j such that for every assignment g, and every domain D, $p(g[i/D]) = q(g[j/D])$.
      b. For any p, we designate the set of its D-variants as *D-variant (p)*.

In the representation language, we want to define both unrestricted and restricted quantification/abstraction. Let U be the domain of individuals and let the set of worlds W be a subset

of U. Furthermore, let D be an arbitrary subset of U. For any world w, D_w is that subset of D containing all members of U existing in w.

(97) a. *Unrestricted quantification*
    i. $\|\exists x \phi\|^{w,g} = 1$ if for some $u \in U$, $\|\phi\|^{w,g[u/x]} = 1$
    ii. $\|\exists x \phi\|^{w,g} = 0$ if for all $u \in U$, $\|\phi\|^{w,g[u/x]} = 0$; undefined, otherwise
  b. *Restricted quantification*
    i. $\|\exists x \in D_w \phi\|^g = 1$ if for some u such that $u \in \|D_w\|^g$, $\|\phi\|^{g[u/x]} = 1$
    ii. $\|\exists x \in D_w \phi\|^{w,g} = 0$ if $\|D_w\|^g \neq \varnothing$ and for all $u \in \|D_w\|^g$, $\|\phi\|^{w,g[u/x]} = 0$; undefined, otherwise
  c. *Restricted λ-abstraction*
    $\|\lambda x \in D_w . \phi\|^g = h$, where for every $u \in U$, if $\|D_w\|^g \neq \varnothing$ and $u \in \|D_w\|^g$, then $h(u) = \|\phi\|^{g[x/u]}$; otherwise, h(u) is undefined

If ϕ_w is a formula whose "main" world variable is w, and R is an accessibility relation, then we express modalities as follows:

(98) *Modalities*
  a. $\forall w' \; R(w, w') \rightarrow \phi_{w'}$ (abbreviated as $\square_w \; \phi_{w'}$)
  b. $\exists w' \; R(w, w') \wedge \phi_{w'}$ (abbreviated as $\diamondsuit_w \; \phi_{w'}$)

Note that for $\square_w \; \phi_{w'}$ to be true, ϕ has to be undefined or true in every world accessible to w; while for $\diamondsuit_w \; \phi_{w'}$ to be true, ϕ has to be true in some world accessible to w.

    We now turn to a characterization of the lexical entries to be used in the recursive definition of *strong meaning of α*, for any expression α.

A2 Lexicon

Here, we will consider two types of lexical entries that activate alternatives: scalar terms and polarity items. Let us start with scalar terms. For each *lexical* entry, we characterize its basic meaning $\|\alpha\|$ and its alternatives ALT(α) by simply listing them.

A2.1 Scalar Items

The lexical entries for scalar items are characterized as follows:

(99) $\|some_{[+\sigma]}\| = \lambda P \lambda Q \lambda w \; some \; (P_w, Q_w) = \lambda P \lambda Q \lambda w \exists x \; [P_w(x) \wedge Q_w(x)]$

    ALT $(some_{[+\sigma]})$ = ALT $(every_{[+\sigma]})$ = . . .
    = { $\lambda P \lambda Q \lambda w \; some \; (P_w, Q_w)$, . . . , $\lambda P \lambda Q \lambda w \; every \; (P_w, Q_w)$ }
    = { $some'$, . . . , $every'$ } (in abbreviated form)

    Let us turn to numerals. Following Ionin and Matushansky (2005), I assume that the basic type of numerals is $\langle\langle e, t\rangle, \langle e, t\rangle\rangle$. Numerals also have a generalized quantifier variant, obtained from the basic type via existential closure. Here is the much simplified characterization of the basic version of numerals we will adopt for present purposes:

(100) $\|\text{one}_{[+\sigma]}\| = \lambda P\lambda x\lambda w\ [1(x) \wedge P_w(x)]$

$\quad\quad\quad \text{ALT}\ (\text{one}_{[+\sigma]}) = \text{ALT}\ (\text{two}_{[+\sigma]}) = \ldots \{\ \lambda P\lambda x\lambda w\ [1(x) \wedge P_w(x)],$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \lambda P\lambda x\lambda w\ [2(x) \wedge P_w(x)], \ldots\ \}$

Here is the generalized quantifier version of numerals:

(101) $\|\text{one}_{[+\sigma]}\| = \lambda P\lambda Q\lambda w\exists x\ [1(x) \wedge P_w(x) \wedge Q_w(x)]$

$\quad\quad\quad \text{ALT}\ (\text{one}_{[+\sigma]}) = \text{ALT}\ (\text{two}_{[+\sigma]}) = \ldots$
$\quad\quad\quad = \{\ \lambda P\lambda Q\lambda w\exists x\ [1(x) \wedge P_w(x) \wedge Q_w(x)],$
$\quad\quad\quad\quad\quad \lambda P\lambda Q\lambda w\exists x\ [2(x) \wedge P_w(x) \wedge Q_w(x)], \ldots\ \}$

I assume the indefinite article *a* has the same meaning as *one*.

A2.2 Polarity-Sensitive Items

Any can be treated in a manner analogous to *one*, except that it does not impose any cardinality requirement on its argument. It binds the world variable of its argument, and it activates ''large'' subdomain alternatives.

(102) a. $\|\text{any}_{[+\sigma]}\| = \lambda P\lambda x\exists w'\ [x\in D_{w'} \wedge P_{w'}(x)]$
$\quad\quad\quad$ b. $\text{ALT}\ (\text{any}_{[+\sigma]}) = \{\ \lambda P\lambda x\exists w'\ [x\in D_{w'} \wedge P_{w'}(x)] : D' \subseteq D \text{ and } D' \text{ is large }\}$

The entry in (102) has a generalized quantifier variant, obtained via $\exists$-closure.

(103) a. $\|\text{any}_{[+\sigma]}\| = \lambda P\lambda Q\lambda w\exists w'\exists x\ x\in D_{w'}\ [P_{w'}(x) \wedge Q_w(x)]$
$\quad\quad\quad$ b. $\text{ALT}\ (\text{any}_{[+\sigma]}) = \{\ \lambda P\lambda Q\lambda w\exists w'\exists x\ x\in D'_{w'}\ [P_{w'}(x) \wedge Q_w(x)] :$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad D' \subseteq D \text{ and } D' \text{ is large }\}$

Keep in mind that pure negative polarity *any* is a fiction. In fact, English *any* has the FC implicature, so its interpretation is actually more similar to that of Italian *qualunque/qualsiasi*, sketched next.

$\quad\quad$ The FCI *qualsiasi* is an NP modifier. It binds the world variable of its argument; at the same time, it activates domain alternatives. Here is an example:

(104) a. $\|\text{qualsiasi}_{[+\sigma]}\| = \lambda P\lambda x\exists w'\ [x\in D_{w'} \wedge P_{w'}(x)]$
$\quad\quad\quad$ b. $\text{ALT}\ (\text{qualsiasi}_{[+\sigma]}) = \{\ \lambda P\lambda x\exists w'\ [x\in D'_{w'} \wedge P_{w'}(x)] : D' \subseteq D \wedge$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad D' \cap \lambda x\exists w\ [P_w(x)] \neq \varnothing\ \}$

For any lexical entry different from the above, we assume that the set of its lexical alternatives is empty.

(105) For any lexical entry α different from the above, $\text{ALT}(\alpha) = \varnothing$.

A3 Simultaneous Recursive Characterization of $\|\alpha\|_S$ and $\|\alpha\|_S^{\text{ALT}}$

To provide a simultaneous recursive characterization of $\|\alpha\|_S$ and $\|\alpha\|_S^{\text{ALT}}$, we first generalize the definition of application to sets.

(106) *Generalized application*

If B is a set of functions and A a set of arguments of a type appropriate to the functions in B, then

$B(A) = \{ \beta(\alpha) : \beta \in B, \alpha \in A \}$

Next, we introduce the following notational convention:

(107) If p is a proposition and A a set of alternatives to p, then

SCAL (p, A) = p's scale in A (if defined).

Finally, we will use the following enrichment operations:

(108) *Enrichment operations*

a. $O_C (p) = p \wedge \forall q [C(q) \wedge q \rightarrow p \subseteq q]$
b. $E_C (p) = p \wedge \forall q [C(q) \rightarrow p \subseteq q]$
c. $O^-_C (p) = p \wedge \forall q, q' \in C [q \rightarrow q']$, where the domain of q' is included in the complement of the domain of q

Op$_i$ is used to range over any of the above operations. These operations are undefined if the context does not supply a suitable value for the variable C. Typically, such a value will take the form of a recursively specified set of alternatives.

Enriched meanings, $\|\alpha\|_S$, and alternatives, $\|\alpha\|_S^{ALT}$, are sets of objects of the same type. To enhance readability, I will use the following notational convention:

Enriched meanings
$\|\alpha\|_S = \{ 1. \ldots$
$\qquad\quad 2. \ldots \}$

Alternatives
$\|\alpha\|_S^{ALT} = [[A, B, \ldots$
$\qquad\qquad\quad A', B', \ldots]]$

Each rule below is followed by a few examples that illustrate its workings. The examples consist of interpretations of LF structures. The LF structures are simplified and use English words even when the sample sentence is Italian. Throughout, $\|\alpha\|_S$ and $\|\alpha\|_S^{ALT}$ are the *smallest* sets of semantic values of the appropriate type that satisfy the conditions that follow.

Here is the base of the recursion.

(109) If α is a lexical entry, then

$B_S.\ \|\alpha\|_S = \{ \|\alpha\| \}$

$B_{ALT}.\ \|\alpha\|_S^{ALT} = \left\{ \begin{array}{l} ALT\ (\alpha),\ if \neq \emptyset \\ \|\alpha\|_S,\ otherwise \end{array} \right\}$

Example 1

$\|sposare\|_S = \{ marry' \}$
$\|sposare\|_S^{ALT} = [[marry']] = \{ marry' \}$

Example 2

$\|\text{qualsiasi}_{[+\sigma]}\|_S = \{ \lambda P \lambda x \exists w' \, [x \in D_{w'} \wedge P_{w'}(x)] \}$

$\|\text{qualsiasi}\|_S^{ALT} =$

$[[\, \lambda P \lambda x \exists w' \, [x \in D'_{w'} \wedge P_{w'}(x)] : D' \subseteq D \wedge D' \cap \lambda x \exists w \, [P_w(x)] \neq \varnothing \,]]$

For an extension of this example, see example 1 under (114).

Example 3

$\|\text{no}_{[+\sigma]}\|_S = \{ \lambda P \lambda Q \lambda w \, \text{no}' \, (P_w)(Q_w) \} = \{ \text{no}' \}$

$\|\text{no}\|_S^{ALT} = [[\, \text{not all}', \, \text{few}', \, \text{no}' \,]]$

The next step in the recursion is functional application. However, I think the system will be easier to grasp if we jump first to the clause-level enrichment rules (pretending that functional application has been properly defined) and then come back to functional application. (However, readers are welcome to look ahead at (114), where functional application is defined, if they prefer.)

(110) *Scalar enrichment (SC)*
   a. If $\|\alpha\|$ is of type t, then

   $SC_S.$ $\|\alpha\|_S \supseteq \{ O_C \, (\|\alpha\|) : C = SCAL \, (\|\alpha\|, \|\alpha\|_S^{ALT}) \}$

   b. $SC_{ALT}.$ $(O_C \, (\|\alpha\|))^{ALT} = \begin{cases} \{ O_C \, (\xi) : \xi \in \|\alpha\|_S^{ALT}, \, \xi \text{ is a D-variant of } O_C \, (\|\alpha\|) \\ \text{and } C = SCAL \, (\xi, \|\alpha\|_S^{ALT}) \}, \text{ if not a singleton} \\ \{ \|\alpha\| \}, \text{ otherwise} \end{cases}$

Example 1

Some student smokes.

Step 1

$\|\text{some}_{[+\sigma]} \text{ student smokes}\|_S \supseteq \{ \text{some}' \, (\text{student}')(\text{smoke}') \}$

Note: This is derived by the functional application rule, yet to be specified.

$\|\text{some}_{[+\sigma]} \text{ student smokes}\|_S^{ALT} = [[\, \text{some}' \, (\text{student}')(\text{smoke}'), \dots, \text{every}' \, (\text{student}')(\text{smoke}') \,]]$

Step 2

$\|\text{some}_{[+\sigma]} \text{ student smokes}\|_S \supseteq \{ O_C \, (\text{some}' \, (\text{student}')(\text{smoke}')) \} =$

$\{ \, 1. \, \text{some}' \, (\text{student}')(\text{smoke}'),$

$\quad 2. \, O_C \, (\text{some}' \, (\text{student}')(\text{smoke}')) \} \quad$ by SC_S

$\{ \, 1. \, \text{some}' \, (\text{student}')(\text{smoke}'),$

$\quad 2. \, \text{some}' \, (\text{student}')(\text{smoke}') \wedge \neg \, \text{many}' \, (\text{student}')(\text{smoke}') \} \quad$ by def. of O_C

Step 3

$(O_C \, \|\text{some}' \, (\text{student}')(\text{smoke}')\|)^{ALT} =$

$[[\, \text{some}' \, (\text{student}')(\text{smoke}') \,]] = \{ \text{some}' \, (\text{student}')(\text{smoke}') \} \quad$ by SC_{ALT}

Note: The first clause of SC_{ALT} would yield $\{ O_C \, (\text{some}' \, (\text{student}')(\text{smoke}')) \}$, which is a singleton; therefore, we revert to the plain meaning.

Example 2

Few students with two papers have to read anything further.

Step 1 (derived by functional application)

$\|$few$_{[+\sigma]}$ students with two papers$_{[+\sigma]}$ have to read anything$\|_S$

= { 1. few (students with two papers)(have to read some$_D$thing),

   2. few (students with two papers)(have to read some$_D$thing) ∧
      some (student with one paper)(has to read some$_D$thing),

   3. E$_C$ (few (students with two papers)(have to read some$_D$thing)) }

($\|$few$_{[+\sigma]}$ students with two papers$_{[+\sigma]}\|_S$($\|$have to read anything$\|_S$))^{ALT}

= [[not all′ (students with two papers)(have to read something)

   few′ (students with two papers)(have to read something)

   no′ (students with two papers)(have to read something)]]

Step 2

$\|$few$_{[+\sigma]}$ students with two papers$_{[+\sigma]}$ have to read anything$\|_S$

= { 1. few (students with two papers)(have to read some$_D$thing),

   2. few (students with two papers)(have to read some$_D$thing) ∧
      some (student with one paper)(has to read some$_D$thing),

   3. E$_C$ (few (students with two papers)(have to read some$_D$thing)),

   4. O$_C$ (few (students with two papers)(have to read some$_D$thing)) }   by SC$_S$

= { 1. few (students with two papers)(have to read some$_D$thing),

   2. few (students with two papers)(have to read some$_D$thing) ∧
      some (student with one paper)(has to read some$_D$thing),

   3. E$_C$ (few (students with two papers)(have to read some$_D$thing)),

   4. few (students with two papers)(have to read some$_D$thing) ∧
      some (student with two papers)(has to read some$_D$thing) }   reductions

Step 3

(O$_C$ ($\|$few students with two papers have to read some$_D$thing$\|$))^{ALT}

= { $\|$few students with two papers have to read some$_D$thing$\|$ }   by SC$_{ALT}$

   I now turn to the enrichment operation triggered by maximal domains (Max domain enrichment).

(111) *Max domain enrichment (Max)*

   a. If $\|\alpha\|$ is of type t, then

      Max$_S$. $\|\alpha\|_S \supseteq$ { E$_C$ ($\|\alpha\|$) : C = $\|\alpha\|_S^{ALT}$ ∩ D-variant($\|\alpha\|$) }

   b. Max$_{ALT}$. $\|\alpha\|_S^{ALT} =$ $\left\{ \begin{array}{l} \text{{ E}_C \text{ (ξ) : ξ}\in\|\alpha\|_S^{ALT} \text{ and ξ has maximal domain}} \\ \text{and C} = \|\alpha\|_S^{ALT} \cap \text{D-variant(ξ) }, \text{ if not a singleton} \\ \text{{ } \|\alpha\| \text{ }, otherwise} \end{array} \right\}$

Example

John didn't see anything.

Step 1 (from previous computations)
$\|\text{not}\|_S$ ($\|\text{John saw anything}_{[+\sigma]}\|_S$) = { $\neg$ some$_D$ (thing)(λx saw(j, x)) }
($\|\text{not}\|_S$ ($\|\text{John saw anything}_{[+\sigma]}\|_S$))$^{\text{ALT}}$ =
[[$\neg$ some$_D$ (thing)(λx saw(j, x))
   $\neg$ some$_{D'}$ (thing)(λx saw(j, x))
   $\neg$ some$_{D''}$ (thing)(λx saw(j, x))
   . . .]]

Step 2
$\|\text{not John saw anything}_{[+\sigma]}\|_S$
= { 1. $\neg$ some$_D$ (thing)(λx saw(j, x))
     2. E$_C$ ($\neg$ some$_D$ (thing)(λx saw(j, x))) }   by Max$_S$
= { 1. $\neg$ some$_D$ (thing)(λx saw(j, x))
     2. $\neg$ some$_D$ (thing)(λx saw(j, x)) $\wedge$
        $\forall$p$\in$ C [$\neg$ some$_D$ (thing)(λx saw(j, x)) $\subseteq$ p] }   by def. of E$_C$

Step 3
(E$_C$ ($\|\text{not John saw anything}_{[+\sigma]}\|$))$^{\text{ALT}}$
= { $\neg$ some$_D$ (thing)(λx saw(j, x)) }   by Max$_{\text{ALT}}$
Note: Strictly speaking, Max$_S$ gets to be applied only concomitantly with FA$_S$. See below.

Here is the enrichment operation triggered by minimal domains (Min domain enrichment):

(112) *Min domain enrichment (Min)*
      a. If $\|\alpha\|$ is of type t, then

         Min$_S$. $\|\alpha\|_S$ $\supseteq$ { O$^-{}_C$ ($\|\alpha\|$) : C = $\|\alpha\|_S{}^{\text{ALT}}$ $\cap$ D-variant($\|\alpha\|$) }

      b. Min$_{\text{ALT}}$. $\|\alpha\|_S{}^{\text{ALT}}$ = $\begin{cases} \{ \text{O}^-{}_C\ (\xi) : \xi \in \|\alpha\|_S{}^{\text{ALT}} \text{ and } \xi \text{ has a maximal domain and} \\ C = \|\alpha\|_S{}^{\text{ALT}} \cap \text{D-variant}(\xi) \}, \text{ if not a singleton} \\ \{ \|\alpha\| \}, \text{ otherwise} \end{cases}$

Example 1
Gianni può sposare un dottore qualsiasi.
Gianni can marry   a   doctor   whatever
LF: [can [Gianni marry a doctor whatever]]

Let us work out the innermost clause first.

Step 1
$\|\text{[G marry a doctor whatever]}\|_S$ $\supseteq$ { λw$\exists$w'$\exists$1x$\in$ D$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)) }   by previous
computations

$\|\text{[G marry a doctor whatever]}\|_S{}^{\text{ALT}}$ =
[[λw$\exists$w'$\exists$1x$\in$ D$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), λw$\exists$w'$\exists$2x$\in$ D$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), . . .
   λw$\exists$w'$\exists$1x$\in$ D'$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), λw$\exists$w'$\exists$2x$\in$ D'$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), . . .
   λw$\exists$w'$\exists$1x$\in$ D''$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), λw$\exists$w'$\exists$2x$\in$ D''$_{w'}$(doctor$_{w'}$(x) $\wedge$ marry$_w$(G, x)), . . .
   . . .]]

In the above set, the rows are scales; the columns are D-variants.

Step 2

$\|[G \text{ marry a doctor whatever}]\|_S \supseteq$

{ 1. $\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

  2. $O_C (\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x)))$ }   by SC_S

{ 1. $\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

  2. $\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x)) \wedge \neg$

   $\exists w' \exists 2 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$ }   by def. of O_C

{ 1. $\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

  2. $\lambda w \exists w' \exists ! 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$ }   abbreviation

$(O_C \|[G \text{ marry a doctor whatever}]\|)^{ALT}$

$= [[\; O_C (\lambda w \exists w' \exists 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x)))$,   by SC_{ALT}

   $O_C (\lambda w \exists w' \exists 1 x \in D'_{w'}(doctor_{w'}(x) \wedge marry_w(G, x)))$,

   $O_C (\lambda w \exists w' \exists 1 x \in D''_{w'}(doctor_{w'}(x) \wedge marry_w(G, x)))$,

   $\ldots \;]] \; =$

  $[[\; \lambda w \exists w' \exists ! 1 x \in D_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

   $\lambda w \exists w' \exists ! 1 x \in D'_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

   $\lambda w \exists w' \exists ! 1 x \in D''_{w'}(doctor_{w'}(x) \wedge marry_w(G, x))$,

   $\ldots \;]]$

Going further at this stage (i.e., applying O^-) would lead to contradiction. Let us turn, therefore, to the matrix clause.

Step 3

$\|can [G \text{ marry a doctor whatever}]\|_S \supseteq$

{ 1. $\Diamond_w \; \exists w'' \exists 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  2. $\Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$ }   by previous computations

$(\|can\|_S(\|[G \text{ marry a doctor whatever}]\|_S))^{ALT}$

$= [[\; \Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \quad \Box_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \ldots$

   $\Diamond_w \; \exists w'' \exists ! 1 x \in D'_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \quad \Box_w \; \exists w'' \exists ! 1 x \in D'_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \ldots$

   $\Diamond_w \; \exists w'' \exists ! 1 x \in D''_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \quad \Box_w \; \exists w'' \exists ! 1 x \in D''_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)), \ldots$

   $\ldots \;]]$

In the above set, the rows are scales; the columns are D-variants.

Step 4

$\|can [G \text{ marry a doctor whatever}]\|_S \supseteq$

{ 1. $\Diamond_w \; \exists w'' \exists 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  2. $\Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  3. $O^-_C (\Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)))$ }   by Min_S

{ 1. $\Diamond_w \; \exists w'' \exists 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  2. $\Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  3. $\forall D \; \Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$ }   by def. of O^-_C

$(O^-_C (\|can[G \text{ marry a doctor whatever}]\|))^{ALT} =$

$[[\; \forall D \; \Diamond_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  $\forall D \; \Box_w \; \exists w'' \exists ! 1 x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)) \;]]$

Step 5

$\|\text{can [G marry a doctor whatever]}\|_S \supseteq$

{ 1. $\Diamond_w \exists w''\exists 1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  2. $\Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  3. $\forall D \ \Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  4. $O_C (\forall D \ \Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)))$ }   by SC_S

{ 1. $\Diamond_w \exists w''\exists 1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  2. $\Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  3. $\forall D \ \Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$,

  4. $\forall D \ \Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$

   $\wedge \neg \ \forall D \ \Box_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$ }   by def. of O_C

$(O_C (\|\text{can [G marry a doctor whatever]}\|_S))^{ALT} =$
$\{ \ \Diamond_w \exists w''\exists 1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x)) \ \}$

Here is the definition of the σ-operator in its two forms:

(113) a. $\|\sigma \ \phi\| = \cap \|\phi\|_S$

   a′. $\|\sigma \ \phi\|_S^{ALT} = \{ \ \|\sigma \ \phi\|_S \ \}$

   b. $\|\boldsymbol{\sigma} \ \phi\| = \cap \|\phi\|_S$, if $\cap \|\phi\|_S \subset \|\phi\|$; undefined, otherwise

   b′. $\|\boldsymbol{\sigma} \ \phi\|_S^{ALT} = \{ \ \|\boldsymbol{\sigma} \ \phi\|_S \ \}$

Example

$\|\sigma \text{ can [G marry a doctor whatever]}\| = \cap \|\text{can [G marry a doctor whatever]}\|_S =$
$\Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$
$\wedge \ \forall D \ \Diamond_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$
$\wedge \neg \ \forall D \ \Box_w \exists w''\exists !1x \in D_{w''}(doctor_{w''}(x) \wedge marry_{w'}(G, x))$

$\|\sigma \text{ can [G marry a doctor whatever]}\|_S^{ALT}$ is the singleton of the above meaning.

Here is the definition of functional application:

(114) *Functional application*

$$\text{FA}_S. \ \|[\alpha \ \beta]\|_S \supseteq \begin{cases} \|\alpha\|_S(\|\beta\|_S), \text{ if } \beta \text{ is not DE} \\ \|\alpha\|_S(\|\beta\|) \cup \{ \ Op_{C1} \ (\|\alpha\|(\|\beta\|)), \ \ldots, Op_{Cn} \ (\|\alpha\|(\|\beta\|)) \ \}, \\ \text{where } C1 = \|\alpha\|(\|\beta\|_S^{ALT}) \text{ and } C_{i+1} = (Op_{Ci} \ (\|\alpha\|(\|\beta\|)))^{ALT}, \\ \text{otherwise} \end{cases}$$

The part of definition (114) that pertains to non-DE functions should be self-explanatory. Insofar as non-DE functions are concerned, the idea is that we compute enriched meanings, freely applying enrichments with the initial value of C set to $\|\alpha\|(\|\beta\|_S^{ALT})$ until the set of alternatives becomes a singleton (at which point, no form of enrichment can apply). The enrichments have to be applied by generalizing the relevant operation to the types that end in t (on the model of what Rooth (1985) does for *only*).

$$\text{FA}_{ALT}. \ \|\beta\|_S(\|\gamma\|_S)^{ALT} = \begin{cases} \|\beta\|_S^{ALT}(\|\gamma\|_S^{ALT}), \text{ if } \|\beta\| \text{ is not DE and } \|\gamma\|_S \text{ is not a singleton} \\ \|\beta\|_S^{ALT}(\|\gamma\|), \text{ otherwise} \end{cases}$$

Example 1

uno studente qualsiasi

a   student   whatever

$\|a_{[+\sigma]}$ student whatever$_{[+\sigma]}\|_S$ = $\|a_{[+\sigma]}\|_S(\|$whatever$\|_S$ ($\|$student$_{[+\sigma]}\|_S$))

$\supseteq \{ \lambda Q \lambda w \exists w' \exists x \ x \in D_{w'} \ [$student$_{w'}(x) \wedge 1(x) \wedge Q_w(x)] \}$

$\supseteq \{$ 1 student in D $\}$ abbreviation, by FA$_S$ (non-DE)

$\|$uno studente qualsiasi$_{[+\sigma]}\|^{ALT}$ =

[[1 student in D,   2 students in D,   3 students in D, . . .

   1 student in D$'$,   2 students in D$'$,   3 students in D$'$, . . .

   1 student in D$''$,   2 students in D$''$, 3 students in D$''$, . . .]]   by FA$_{ALT}$ (non-DE)

The rows are scales; the columns are D-variants.

Example 2

no student with two papers

$\|$no$_{[+\sigma]}$ student with two papers$_{[+\sigma]}\|_S$

= $\{$ 1. no (student with two papers),

    2. O$_C$ (no student with two papers) $\}$ by FA$_S$ (DE)

= $\{$ 1. no (student with two papers),

    2. no (student with two papers) $\wedge$ some (student with one paper) $\}$ by def. of O$_C$

$\|$no$_{[+\sigma]}\|_S(\|$student with two papers$_{[+\sigma]}\|_S)^{ALT}$

= [[not all (students with two papers),

   few (students with two papers),

  no (students with two papers)]] by FA$_{ALT}$ (DE)

Example 3

No student with two papers has to read anything further.

$\|$no$_{[+\sigma]}$ student with two papers$_{[+\sigma]}$ has to read anything$\|_S$

= $\{$ 1. no (student with two papers)(has to read some$_D$thing),

    2. no (student with two papers)(has to read some$_D$thing) $\wedge$

      some (student with one paper)(has to read some$_D$thing),

    3. E$_C$ (no (student with two papers)(has to read some$_D$thing)) $\}$

where C = [[no (student with two papers)(has to read some$_D$thing),

         no (student with two papers)(has to read some$_{D'}$thing),

         no (student with two papers)(has to read some$_{D''}$thing), . . .]] by FA$_S$ (DE)

$\|$no$_{[+\sigma]}$ student with two papers$_{[+\sigma]}$ has to read anything$\|_S^{ALT}$

= [[not all (students with two papers)(have to read some$_D$thing),

   few (students with one paper)(have to read some$_D$thing),

  no (student with two papers)(has to read some$_D$thing)]] by FA$_{ALT}$ (DE)

$\|$no$_{[+\sigma]}$ student with two papers$_{[+\sigma]}$ has to read anything$\|_S$

= $\{$ 1. no (student with two papers)(has to read some$_D$thing),

2. no (student with two papers)(has to read some$_D$thing) $\wedge$
   some (student with one paper)(has to read some$_D$thing),

3. E_C (no (student with two papers)(has to read some$_D$thing)),

4. $O_{C'}$ (no (student with two papers)(has to read some$_D$thing)) }   by SC_S

A4 Free Choice Effects with Universal Modalities

In this section, I will show how the FC implicature comes about in the case of universal modals. I will not consider the derivation in every detail; instead, I will focus just on the relevant aspects.

Consider:

(115) Devo   sposare un dottore qualunque.
      (I) must marry   a   doctor   whatever

(116) a. *LF*
         [must [I marry a doctor whatever]]
      b. *Basic meaning*
         $\Box_w \exists w'' \exists 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))$
         $= \forall w' [R(w, w') \rightarrow \exists w'' \exists 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]$
      c. *Enriched meaning*
         $O^-_C O_{C'} (\forall w' [R(w, w') \rightarrow \exists w'' \exists 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))])$

(117) *Reductions of enriched meaning*
      a. $O^-_C \forall w' [R(w, w') \rightarrow$
         $\exists w'' \exists! 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]$ by def. of O_C
      b. $\forall D' \subset D \ \forall D'' \subseteq D - D' \ [\forall w' [R(w, w') \rightarrow$
         $\exists w'' \exists! 1x \in D'_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))] \rightarrow$
         $[\forall w' [R(w, w') \rightarrow \exists w'' \exists! 1x \in D''_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]]$

The assertion (116b) states that in every possible world, I marry a unique doctor selected from the widest domain D. The implicature states that if the assertion is true of a submaximal domain D′, it must also be true of every complementary domain. Suppose, for example, that the assertion is true of domain D1 = { a }; then it must also be true of every subset of D − { a }. But this clashes with the requirement that the doctor I marry be unique. Therefore, (117b) can only be vacuously true: it can be true only if the antecedent is false. We thus conclude that (116b) and (117b) entail (117c).

(117) c. $\neg \ \exists D' \subset D \ \forall w' [R(w, w') \rightarrow \exists w'' \exists! 1x \in D'_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]$

So, for (116a) to hold, given (117c), it must be the case that for every world there is a *distinct* member of D that I marry.

(117) d. $\forall w' [R(w, w') \rightarrow \exists w'' \exists! 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]$

This is the FC implicature.

As a referee notes, it is crucial in the above proof that (117b) be restricted to *sub*maximal domains, to the exclusion of the maximal domain D itself. Otherwise, the statement itself would constitute an antecedent to (117b) and one would derive (118).

(118) $\forall D \, \forall w' \, [R(w, w') \rightarrow \exists w'' \exists 1x \in D_{w''}(\text{doctor}_{w''}(x) \wedge \text{marry}_{w'}(I, x))]$

But (118) can only be satisfied in worlds where there is a unique doctor, a requirement that imposes exceedingly strong uniqueness conditions on the interpretation of (115).

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Department of Linguistics
Boylston Hall
Harvard University
Cambridge, Massachusetts 02138

chierch@fas.harvard.edu

Dipartimento di Psicologia
University of Milan – Bicocca
Piazza dell'Ateneo Nuovo 1
201126 Milan
Italy