

Free Relatives With *-ever*: Meaning And Use.

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1 Introduction

The semantics of so-called *free choice items* has gotten quite some attention lately, so much so that van Rooij (2006) rightly observes that “in recent years, every semanticist seems to develop his or her own pet analysis of free choice items” (before he proceeds to deliver his version thereof). I do not take this to be an indication that semanticists are slaves to fashion, but rather that many researchers think that understanding the semantic contribution of these items will lead to significant insights about the semantics of natural language.

I concur with this opinion, and so this paper presents a humble attempt to get somewhat clearer on a certain corner of the free choice landscape: The one occupied by English free relatives with **-ever**, exemplified in (1b):

- (1) a. **What Arlo is cooking** smells delicious.
- b. **Whatever Arlo is cooking** smells delicious.

The bold phrases in (1) are *free relative clauses*, which we may describe as relative clauses that do not modify a nominal head, and which typically are distributed like the type of phrase corresponding to the ‘gap’ inside the relative clause. That is, the **what**, **who** and **which** free relatives that I will be concerned with in this paper¹ are distributed like noun phrases (or determiner phrases, if you prefer those).

Semantically, (1) seems to have truth-conditions roughly equivalent to that of (2).

- (2) The thing that Arlo is cooking smells delicious.

An utterance of (1b) seems to assert the same, but signal something further: Out of context, the sentence will most likely be understood as conveying that the speaker does not know what Arlo is cooking.

An obvious question arising from such a description is: How does an utterance of (1b) signal that? Does the utterance assert, presuppose, or implicate the ignorance claim? And, given that, as we will see in Section 2, there is quite some variance in what precisely is the interpretational effect of the addition of **-ever** to a free relative in a given context, this question is accompanied by the puzzle of how the *content* of this signal is best described, ideally in a uniform way.

The same pair of questions arises, of course, with any kind of free-choice item, and ultimately, we will want to know whether the various items that have been called ‘free choice items’ can receive a uniform treatment. But what, exactly, is a free-choice item?

The term goes back to Ladusaw (1979), though the notion of *freedom of choice* goes back at least to Vendler (1967). Both applied the term with respect to what my rightfully be called the pop-star among the free-choice items (FCIs, for short): English **any**. The basic observation was this: (3a) entails (3b), but this fact does not seem to follow from any standard analysis of the terms involved:

- (3) a. You may pick any flower.
- b. For all flowers x : You may pick x .

This fact, in addition, seems to be reminiscent of a very similar inference pattern with disjunction: (4a), on one reading entails (4b):

- (4) a. You may come by plane or by boat.
- b. You may come by plane and you may come by boat.

This phenomenon of *free choice permission*, even though the historic origin of the name of the class of FCIs, is not universally a phenomenon that shows up with all free-choice items (as we will see in due course, it applies, for example, to free relatives with **-ever** only in rather special circumstances). In fact, surveying the literature on the topic, it is hard to find a single property that unifies all things that have been called ‘free choice items’. The present author will not attempt to characterize such a property, partly because he thinks

¹I set aside other free relatives, such as the ones with **how(ever)**, **when(ever)** or **where(ever)**. This is mainly to keep the discussion focused, and I see no obvious hindrance to extend the analysis developed in this paper to these FRs, as well.

that such an enterprise is futile: FCIs are, cross-linguistically, a quite heterogeneous class, and, in my view, the challenge is to explain why items with quite distinct semantic properties may have, on occasion, very similar interpretational effects, rather than finding a common core shared by all of these items.

Tentatively, I want to distinguish two kinds of free-choice items, identified, for now, only by their representative members:²

- **any**-style FCIs: English **any**, Scandinavian **wh- som helst** (Sæbø 2001), Korean **amwu-na** (Kim and Kaufmann 2006) ...
- **wh-ever**-style FCIs: English **wh-ever**, German **irgend-** indefinites (Kratzer and Shimoyama 2002), Spanish **algún** (Alonso-Ovalle and Menéndez-Benito 2008), Greek **o-dhipote** free relatives (Giannakidou and Cheng 2006) ...

The items in the first group all (i) are infelicitous in non-modal, episodic contexts³, (ii) typically support strong counterfactual inferences and/or involve a notion of scalarity and (iii) generally induce strong *domain-widening* effects, i.e. seem to be accompanied with a pragmatic instruction to include certain non-typical members in the domain of an underlying quantifier. The three properties are exemplified below.

(5) #Yesterday, John talked to any woman.

(6) Any student in Mary's class is working on NPIs.

- a. *Counterfactual implication*: It is not an accident that every student in Mary's class is working on NPIs: If more/other students were in Mary's class, they would work on NPIs, as well. (Dayal 1998)
- b. *Scalar Implication*: Every student, even the ones least interested in NPIs, are working on NPIs. (Horn 2000)
- c. *Domain-widening*: Every student in Maribel's class, even the ones just auditing, are working on NPIs. (Kadmon and Landman 1993)

The reader may utilize her imagination, or consult the given references, to see that something like the described implications in (6a-c) is available for (6) in at least some contexts. Of course, the three kinds of implications really seem to be instances of the same general phenomenon (rather than distinct possible implications), and indeed are the outcome of competing attempts to nail down the 'free-choice flavor' of **any**.

What is important here is that the items in the **wh-ever** group do not exhibit *any* of the three types of implications. They generally do **not** give rise to strong counterfactual implications (though sometimes the context may make it appear that they do⁴), do not directly involve scalarity, and, to the extent that they show effects of domain-widening, this widening is much more moderate than in the case of **any**-style FCIs⁵.

As the main focus of this paper is **-ever** free relatives (which, from now on, I will call eFRs in order to save trees and ink), I will, for the most part, not be concerned with defending the strong claims made in the preceding paragraph for any item besides eFRs, though I will provide some data suggesting that these claims

²It may be thought that this distinction coincides with the one drawn by Chierchia (2006) between 'universal' and 'existential' FCIs: Some of the items in the **any** class have the property that the morpheme carrying the FC-component (or contexts triggering the FC reading) imbue an otherwise existential item with (apparent) universal quantificational force. However, it is not clear at present whether there is any direct connection of this phenomenon to the kind of strong FC effects I describe here for the **any**-class. In the case of Korean, for example, it clearly seems to be the case that the universal force is contributed by the particle **na**, while the counterfactual/widening component is contributed by the indeterminate **amwu**, as demonstrated by the fact that **na** also can imbue the plain indeterminate **nwukwu** with universal force, without triggering strong counterfactual implications. See Kim and Kaufmann (2006) for details.

³Some of the items in the first group of FCIs, like English **any**, are fine in *negative* episodic contexts, and generally in all contexts that have been characterized as 'negative polarity item licensing contexts'. The relationship of FCIs to NPIs is striking in some languages and Chierchia (2004) suggests that this is not an accident. I will have little to say about this connection in the present paper, mostly because **wh-ever**-style FCIs do not have any obvious connection to polarity phenomena.

⁴**wh-ever** has been supposed to (sometimes) involve a counterfactual implication not dissimilar to (6a) (von Stechow 2000, Tredinnick 2005). In section 5 of this paper I will briefly comment on why I think this supposition is mistaken.

⁵Strong widening has, to my knowledge, only been claimed for **irgend-** indefinites so far. Again, see Section 5 for some reasons to doubt this characterization, this time due to Kratzer and Shimoyama (2002).

are true of the other items in the eFR class in the final section of this paper. I will also have little to say about items in the **any** class. Mentioning this class here mainly serves the purpose of clarifying that there is no claim, explicit or otherwise, that my proposed analysis of eFRs straightforwardly extends to those.

The rest of the paper is structured as follows: Section 2 contains the main empirical contribution, establishing that the semantic contribution of **-ever** is much more tightly constrained than previously thought. Section 3 develops a formal analysis capturing the informal description of Section 2 in a uniform way. The formal system developed here has some independent interest, as it brings together some off-the-shelf tools of formal semantics in a dynamic semantics framework of some generality, and contains a novel way to have the interaction of quantification and presupposition come out right. Section 4 introduces two necessary refinements of the account and shows how they can be integrated into the system of Section 3. Section 5 concludes by reexamining some of the issues touched on in this introduction, showing that the analysis developed in previous sections extends to the other FCIs in the **wh-ever** class, and argues that this extension is superior to extant analyses.

2 Towards An Analysis

This section lays out what I take to be the most relevant descriptive generalizations of the contribution of **-ever** in an eFR. To anticipate, it will be shown that this contribution is much more tightly semantically constrained than previously thought. In particular, the contribution of **-ever** is either *conversation-directed*, i.e. concerns the epistemic or bouletic states of the interlocutors or properties of their conversation, *or* it is directly regimented by the linguistic (indeed, syntactic) context. Specifically, the meaning of **-ever** does *not* involve anaphoric reference to a set of possibilities, as stipulated by, e.g. von Stechow (2000), but rather may only pick up such a set of possibilities from a quantificational operator scoping over the eFR.

2.1 Free Relatives Are Definite Descriptions

Before we delve into the question of what the semantic contribution of **-ever** is in a free relative, we need at least a working hypothesis about the semantics of free relatives without **-ever**. In the following, I will call these *plain free relatives*, or pFRs. Jacobson (1995) proposes to analyze pFRs as definite descriptions, which is intuitively adequate for occurrences like those in (7):⁶

- (7) a. I ordered what he ordered for desert.
b. I ordered the thing that he ordered for desert.

Intuitively, (7b) is a good paraphrase of (7a). As Jacobson notes, there are sentences where it seems to be more appropriate to paraphrase a pFR with a universal quantifier:

- (8) a. I read what was on the reading list.
b. I read everything that was on the reading list.

Jacobson proposes to account for this ‘quantificational variability’ by employing a lattice-based semantics for plurals along the lines independently proposed by Link (1983) and Sharvy (1980). In a Link/Sharvy

⁶There is some disagreement in the literature about whether the use of a free relative (in particular one with **-ever**) indeed presupposes (or entails) the existence of an individual satisfying the property denoted by the free relative. Horn (2000), for example, denies this. One of his examples is

- (i) Whatever beer is in the fridge is mine.

While some of my informants agree with Horn that (i) is appropriate (and true) if there is, in fact, no beer in the fridge, many others disagree. The judgement here is subtle: All informants agree that (i) is inappropriate if it is *known* that there is no beer in the fridge. The question is if an utterance of (i) leaves open the possibility that there is no beer in the fridge.

In what follows, I will simply assume that pFRs are semantically identical to definite descriptions, and that both types of free relatives presuppose existence. If it turns out that this is inadequate, some slight adjustments will have to be made to the definitions in Section 3, but these changes would not impact the analysis of the semantic contribution of **-ever** advanced there.

analysis of plurals, the domain of individuals is not taken to be a simple set, but rather an atomic join-semilattice of (possibly plural) individuals: Given two individuals a and b , there will also be a ('plural') individual $a \oplus b$ which intuitively is the plurality made up of a and b . With such a structure, we have available a 'containment' relation \sqsubseteq , such that $a \sqsubseteq a \oplus b$ and $b \sqsubseteq a \oplus b$ ⁷ and a distinguished subset *Atoms* of the the domain of individuals containing only individuals that 'contain' only themselves.

With that, definite descriptions (whether singular or plural) can be uniformly analyzed as denoting the *maximal* individual satisfying the descriptive content of the description⁸:

$$(9) \quad the_x[\phi(x)] := \text{the } i \in D \text{ such that } \phi(i) \text{ and } \forall j \in D : \phi(j) \rightarrow j \sqsubseteq i$$

Then, number morphology can be interpreted as contributing a presupposition that $the_x(\phi(x)) \in Atoms$ (for singular number morphology) and $the_x(\phi(x)) \notin Atoms$ (for plural number morphology). The result will be a neo-Russelian denotation for singular definites, while sentences with plural definite descriptions will be, issues of non-distributive predication aside, interpreted as being equivalent to universally quantified sentences.

Now, with this apparatus in place, the behavior of pFRs emerges from the system without any further assumptions: pFRs typically are not marked for number, so there will be no requirement of either atomicity or non-atomicity on the denotation of the FR, allowing the FR to refer to the unique object satisfying its descriptive content, if there is one, and to the plurality of all individuals satisfying the restrictor, if there is more than one such individual.⁹

2.2 Conversation-Oriented Uses: Ignorance, Uncertainty And Disagreement

The *sentence-internal* uses to be discussed in the next subsection only arise when an eFR is embedded under a quantifier, modal, adverb of quantification or iterative aspect, while the conversation-oriented uses are not so restricted. Thus, in order to study conversation-oriented uses, it pays to concentrate on examples of eFRs in non-modal, unquantified, episodic sentences, in order to minimize the chance of confusing the two uses with each other.

Given a non-modal, unquantified, episodic sentence, conversation-oriented implications are *mandatory*, in the sense that the eFR is infelicitous if the (extra- or intrasentential) context contradicts the conversation-oriented implications, by identifying the referent of the eFR¹⁰. Consider (10):

(10) Arlo is making Szechuan-style curry. [So,] what#ever he is cooking smells delicious!

Given the preliminary gloss given for (1b) in Section 1, repeated below, we can explain this infelicity in the following way: Given that the speaker asserts in the first sentence what Arlo is cooking, which he will do in cooperative conversation only if he knows it to be true, the implication contributed by **-ever**, viz. that the speaker does not know what Arlo is cooking, cannot be true.

(1b) Whatever Arlo is cooking smells delicious.

· *Implication*: The speaker is uncertain as to what it is that Arlo is cooking.

⁷The relation \sqsubseteq and the operator \oplus are, of course, interdefinable.

⁸For ease of exposition, I here treat definite descriptions as referring expressions (and deliberately conflate object and meta-language), while later, I will treat them as (tripartite) quantificational expressions.

⁹FRs optionally can have a nominal head, as in **what books I read last year**, though, especially with pFRs, these often sound marginal. The important fact to note is that, in these cases, the number morphology disambiguates between the uniqueness and the universal readings, just as Jacobson's analysis predicts.

¹⁰There is a kind of conversation-oriented use that seems to be immune to prior identification in discourse. (i) is an example (from von Stechow (2000)):

(i) Jim was on top of the ballot and I just voted for whoever was on top, so I voted for him.

These 'indifference' uses are, however, restricted to very special contexts, and I will return to them in Section 5. For now, I want to invite the reader to ignore their existence.

However, it is not always the speaker's uncertainty that is communicated by (and licenses) the use of an unembedded eFR. von Stechow (2000) gives the example of a guessing game, in which the speaker is known to be aware of what Arlo is cooking, but the addressee is not. In such a situation, the speaker could well use (1b) in order to give the addressee a hint.

Condoravdi (unpublished) provides a further type of example:

- (11) a. A: Jim came in first.
B: No! Josh came in first!
A: Well, whoever came in first saw what happened.
Implication: It is not resolved between the two of us who came in first.

In this case, both A and B have a certain belief (or so it seems) as to who came in first. A employs the eFR, intuitively, in order to get his second utterance accepted despite the manifest disagreement, without thereby accepting B's statement that Josh was the one who came in first.

In the glosses of the 'implication' contributed by **-ever** so far, I have spoken of 'it being not resolved', or an agent being uncertain or ignorant of, what the eFR refers to. As we will see later (in Section 4), this formulation is quite adequate; but for now, we may simplify matters somewhat by pseudo-formally equating resolvedness with constant reference: The identity of the referent of a description is *resolved* with respect to a set of possibilities W if there is some individual i such that the eFR denotes i at every $w \in W$ and an agent is *certain* about the reference of an FR if the identity of this referent is constant with respect to the set of possibilities compatible with what he believes.

With this, we can characterize the contribution of **-ever** outside of embedding environments by the following three observations:

Context-Dependence The particular implication that an unembedded eFR carries is **context-dependent** and hence, any particular implication can be **cancelled**, as illustrated for the ignorance implication in (12).

Signal of Variation An (unembedded) occurrence of an eFR conveys that the referent of the FR is not constant across a set of possibilities W .

Orientation towards the utterance situation What is conveyed by an unembedded occurrence of an eFR necessarily makes reference to features of the utterance situation, such as the speaker's or hearers' beliefs, desires, what they explicitly agree upon, and so forth.

- (12) Whoever brought the virus to the island must be dead by now. Well, I know who brought the virus, but I am not at liberty to tell you.

The observation that the contribution of *-ever* is dependent on the context of utterance is uncontroversial and has been demonstrated above, and the observation that **-ever** is a signal of variation is a preliminary simplification. The claim that unembedded occurrences of eFRs are *necessarily* conversation-oriented is a substantive empirical claim that goes against much that has been assumed in the investigation of eFRs to date. It will be defended in Section 2.4, after we have examined sentence-internal uses.

2.3 Sentence-Internal Uses: More Variation

2.3.1 Epistemic Modals And Attitude Verbs

If an eFR is embedded under one of a range of operators, for example a modal or attitude verb, it may lack any kind of conversation-oriented implication. This can be most easily seen by furnishing a context in which the participants in the conversation are in explicit agreement about the referent of the FR, so that neither their epistemic state, nor their conversational common ground can be seen as the set of possibilities with respect to which this referent varies: If conversation-oriented implications were the only possible ones, such a use should be infelicitous, just as the use of the eFR was in (10) was. But that is not what we find:

- (13) Tom won the race and John is convinced that whoever won the race will get lucky tonight.

(13) is perfectly felicitous if *John* is uncertain who won the race. On the assumption that epistemic modals¹¹ and attitude verbs quantify over a set of possibilities (consistent with what the relevant agent believes or knows, i.e. the *modal base* in a Kratzer (1991)-style analysis of modality), we can describe this in the following way:

Observation 1: eFRs under epistemic modals and attitude verbs An eFR that occurs in the scope of an epistemic modal or attitude verb is felicitous if, and hence can be used to convey that, the referent of the FR is not constant across the set of worlds quantified over by the modal.

2.3.2 Root Modals And Attitude Verbs

We find a (superficially) quite different implication in case of eFRs embedded under a root modal or attitude verb:

- (14) a. Sue's parents have promised her to Paul. According to her own moral code, she must marry whoever her parents select for her. #That is because she is a hedonist, and Paul makes her happy.
b. Sue's parents have promised her to Paul. She wants to marry whoever her parents select for her, #because she loves Paul.

The #-marked continuations assert that what Sue must do according to her moral code, or what she wishes, depends on the identity of who her parents have selected. I take the infelicity of these continuations to show that they contradict the implication the eFR has in these cases (note that conversation-oriented uses are precluded by identifying the parent's choice in the initial sentence, so if the eFR has any kind of implication, it must be a sentence-internal one).

What is conveyed by the eFR, then, is that the obligation/wish/etc. does not depend on the identity of the referent of the FR. In Kratzer's terms, this means just that the (circumstantial) facts that fix the modal base of the modal or attitude verb do not determine the reference of the FR in the desire- or obligation-optimal worlds. Thus we can capture this implication exactly paralleling the observation for epistemic modals:

Observation 2: eFRs under root modals and attitude verbs An eFR that occurs in the scope of a root modal or attitude verb is felicitous if, and hence can be used to convey that, the referent of the FR is not constant across the set of worlds that the modal or attitude verb quantifies over.

2.3.3 Adverbs Of Quantification And Iterative Aspect

In sentences containing adverbs of quantification (for short, Q-adverbs), such as **usually** and **always**, eFRs also can occur without any conversation-oriented implications:

- (15) (In those days,) Whatever Parker wrote was always violent.

Consider two situations:

¹¹It is difficult to demonstrate the existence of an 'embedded' reading with epistemic modals because we cannot exclude conversation-directed readings by means of prior identification of the referent of the FR in the context: Such identification would result in the epistemic modal not meeting the variation requirement:

- (i) John made a tofu-burger yesterday. Since he is such a great cook, Mary must have devoured what#ever he was cooking.

The infelicity of **-ever** in (i) is consistent with the view that there are embedded uses of eFRs under epistemic modals (given appropriate assumptions about these modals), but we cannot conclusively demonstrate the existence of such readings. I will still assume that they exist, by analogy to the embedded uses under root modals discussed in the next section, though not much will depend on this assumption. However, my eventual analysis will predict such readings, unless something special is done to exclude them.

- In the relevant time span, Parker has been working on a longer piece of writing, his next novel, say, and has been revising the thing, taking out sections, rewriting others; but at all times, the draft has contained a significant amount of violence. Then (15) is adequate only if the speaker is uncertain about or otherwise unable or unwilling to resolve the identity of the FR, i.e. in this case, (15) **must** be taken to be an instance of the conversation-oriented use.
- In the relevant time span, Parker has been writing a number of things, all of which were violent. In this case, (15) is adequate even if all parties to the conversation have explicitly agreed which things Parker was writing.

A similar effect can be found by appropriately-tensed sentences not containing an adverb of quantification (the example is a variation of an example von Fintel (2000) gives):

(16) (In those days,) whatever Parker wrote was violent.

If (16) cannot be interpreted as a conversation-oriented use, the sentence **must** be interpreted as involving iterative aspect, and it must be the case that, in the relevant time span, Parker wrote more than on thing on different occasions.

We are ready for another observation:

Observation 3: Adverbs of Quantification and Iterative Aspect An eFR in a sentence carrying iterative aspect or in the scope of an adverb of quantification is felicitous if, and hence can be used to communicate that, the referent of the FR is not constant across the set of situations, times, occasions, tuples of individuals, assignments, cases, or other entity or construct that a Q-adverb and iterative aspect are taken to quantify over.

2.3.4 Individual Quantifiers

A fact that has, to my knowledge, gone unnoticed so far is that eFRs can also be licensed by a simple universal quantifier:

(17) Every test eater was randomly assigned one of the dishes. Each of them gave the highest mark to whatever he was eating.

While (17) may also have a conversation-oriented reading (implicating that the speaker does not know who got assigned what), this does not seem to be necessary for the sentence to be felicitous: Suppose Steph is throwing a dinner party for some friends, each of whom happened to be one of the test eaters for the catering company Sven works for. Steph, worrying what to serve for dinner so that everyone is pleased, asks Sven for advice. He produces a list matching testers to tested dishes, studies it closely, and hands it to Steph, uttering (17) by way of explanation. In this situation, the interlocutors are neither uncertain about who ate what, nor do they think that this information is irrelevant to the purpose of the conversation. Yet, the sentence is perfectly adequate.

Note, also, that the sentence does *not*, in any way, shape, or form, imply that each of the test eaters would have liked any other dish he might have been served instead. Such counterfactual implications have been sometimes attributed to eFRs, and I will discuss them briefly in section 5, but it should be obvious that (17) does not carry any such implication.

What licenses the use of the eFR in (17) is simply the fact that the tested dish varied from tester to tester. This is our last observation:

Observation 4: eFRs under individual quantifiers An eFR in the scope of an individual quantifier can be felicitous if, and hence be used to convey that, the referent of the eFR is not the same relative to each individual in the domain of the quantifier.

Since the referent of a definite description usually is not evaluated with respect to another individual, this variation typically comes about only if the quantifier in question binds a (covert or overt) variable in the FR.

2.4 Towards A Generalization: Context-Dependence Or Simple Composition?

We can summarize observations 1–4 in fairly succinct manner:

Contribution of sentence-internal uses An eFR under the scope of a quantificational operator, such as a modal, attitude verb, adverb of quantification or quantifier over individuals can be felicitous if, and hence be used to convey that, the referent of the FR is not the same with respect to each element of the domain of the operator.

The behavior of eFRs as it has been described so far is mostly compatible with the analysis proposed by von Fintel (2000) and elaborated by Tredinnick (2005). In a nutshell, von Fintel proposes that eFRs contain a hidden modal, with a contextually supplied modal base as in Kratzer (1991)’s analysis of modality. Then, **-ever** is taken to signal that the referent of the eFR is not constant with respect to this contextually-supplied modal base. In symbols, with N being the nominal that *wh – ever* combines with, and F a modal base:¹²

- (18) $\text{wh-ever}(w)(F)([N]) :$
- conveys: $\exists w', w'' \in F : \iota x [[N](w')(x)] \neq \iota x [[N](w'')(x)]$
 - denotes: $\iota x [[N](w)(x)]$

Most of the observations made so far are, given appropriate assumptions, compatible with this analysis: Given that a modal co-occurs with an eFR in a sentence, its modal base will be highly salient, so it is plausible to assume that **-ever** can pick up that same modal base. Similarly, the speaker’s and hearer’s doxastic and bouletic states will be salient in any discourse, explaining how conversation-oriented uses come about. If we take the term ‘modal base’ loose enough (allowing, it to be, e.g. a set of situations), we can make sense of the available sentence-internal readings under Q-adverbs and iterative aspect, as well. The only observation made so far that is incompatible with such an analysis is the absence of modal implications in case the eFR is embedded under a quantifier over individuals (in case the domain of this quantifier satisfies the variation requirement), as we saw in (17).

Putting aside the case of quantifiers over individuals for the moment, the crucial difference between the present analysis and von Fintel’s becomes clear once we make explicit a claim contained in the description of sentence-internal uses above:

Context-independence of sentence-internal uses The contribution of **-ever** in a sentence-internal use does not depend on the (extra-linguistic or extra-sentential) context.¹³

Together with the observed context-dependence of conversation-oriented uses, this entails:

- (19) An occurrence of an eFR either is conversation-oriented (i.e. concerned with the speaker or hearer’s epistemic or doxastic state), or its contribution is determined without reference to the context.

von Fintel’s analysis obviously does not predict (19). While it *allows* **-ever** to quantify over the domain of a quantificational operator that outscopes it, it does not *require* it to do so. The rest of this section is devoted to argue that my, more restricted, view is more adequate.

Given von Fintel’s analysis, we would expect an eFR to be licensed, even if a conversation-oriented use is excluded by the context, if only some modal base that meets the requirements of the eFR is salient enough. However, this does not seem to be the case, as the infelicity of **-ever** in the following short discourse demonstrates:

- (20) Raja was digging into my pork stew, oblivious to what it was. I had to tell him that what#ever he was eating was not halal.

¹²von Fintel couches his analysis in a system that allows explicit referents to worlds, and in which every predicate has an additional world argument. For the purposes of this section, I do the same.

¹³This claim will have to be refined later (in Section 3): In fact, the contribution of **-ever** always depends on the context, but not in the way von Fintel’s analysis predicts. While the domain with respect to which the reference of the eFR is unresolved is determined by the intrasentential context (on the embedded use), what counts as the reference of the eFR being resolved always depends on context. See Section 3 for details.

Here, conversation-oriented uses are excluded by the speaker identifying the dish Raja was eating in the first sentence. This sentence also establishes that Raja did not know what he was eating, thereby making Raja's epistemic state very salient and establishing that it would meet the variation requirement. Yet, the eFR in the second sentence cannot pick up this epistemic state as its modal base. On von Fintel's account, this is puzzling.¹⁴

Similarly, when an eFR is embedded under a root modal (and conversation-oriented uses are excluded), it cannot convey doxastic uncertainty of the respective agent:

- (21) Paula does not know yet that her parents have promised her to Paul, who she is hell-bent on marrying. [So,] Paula wants to marry who#ever her parents selected for her.

Given that the first sentence excludes conversation-oriented uses, and asserts that Paula is uncertain as to who her parents selected for her, we would expect that the eFR in the second sentence can pick up her epistemic state, especially as the first sentence *also* establishes that it cannot pick up her bouletic state, because in all her wish-optimal possibilities, she marries Paul. Thus, on von Fintel's account, we would expect the second sentence in (21) to have a reading like 'Paula wants to marry Paul, who, unbeknownst to her, is the guy her parents selected for her.' Such a reading, however, is simply not available for (21). Besides conversation-oriented uses (in which it conveys that the speaker is unwilling or unable to identify the referent of the FR), the sentence can only mean that Paula defers to her parents with regard to whom she wants to marry.

I conclude that it is, in general, *not* sufficient that there is a salient set of possibilities that satisfies the variation requirement imposed by *-ever* (as von Fintel's analysis predicts), but rather, as far as sentence-internal uses are concerned, that the variation requirement has to be satisfied by the domain of a quantificational operator scoping over the eFR.

2.5 The Nature Of The Implication: Assertion, Presupposition, Or What?

So far, I have spoken of eFRs 'conveying' or 'signaling' something that the corresponding pFR does not convey or signal. But how do they signal this?

von Fintel (2000), after having shown that Dayal (1997)'s claim that the ignorance implication is part of the asserted content of a sentence cannot be correct, suggests it should be analyzed as a presupposition. Condoravdi (unpublished) convincingly argues that this cannot be quite correct either. Among other things, she observes that we do not see any evidence of presupposition filtering in conversation-oriented uses: Contrast (22), which unsuccessfully tries to filter out the ignorance implication in a counterfactual conditional, with (23) which successfully does the same for the existence presupposition of a definite description:

- (22) If I did not know that Arlo is cooking curry, what#ever he is cooking would still contain garlic.
 (23) If France were a patriarchal monarchy, the king of France would be bald.

Note, however, that we find something very different with embedded occurrences of eFRs: Filtering works wonderfully in (24).

¹⁴Note that we cannot explain away the infelicity of (20) by noting that the information contributed by *-ever* would be redundant. This generally is no hindrance, as (i) shows:

- (i) John does not know yet who won the race, but he is certain that whoever won the race will get lucky tonight.
 (i) is perfectly acceptable, although the information provided by *-ever* is asserted in the first conjunct. This is a marked difference between the contribution of *-ever* and the "conventional implicatures" contributed by appositives (cf. Potts (2005), who calls this 'anti-backgrounding'):
 (ii) Lance Armstrong survived cancer. # When reporters interview Lance, a/the cancer survivor, he often talks about the disease
 (Potts 2005, p. 112, ex. 4.46)
 (ii), but not (i), feels redundant to the point of infelicity.

- (24) If John did not know that Jim came in first, he still would be convinced that whoever won the race will get lucky tonight.

So, it seems that in embedded occurrences, the signal introduced by **-ever** acts like a presupposition, while in conversation-directed uses, it does not, suggesting that the two kinds of implications have different statuses.

2.6 Summary Of The Analysis

We have seen that, in sentence-internal uses, eFRs do not seem to introduce context-dependency on their own (though their interpretation will often depend on context, to the extent that the quantificational expression they depend on has a context-dependent domain), while conversation-oriented uses typically do.

Further, we have seen that the implications of embedded uses behave presupposition-like, while those of conversation-oriented uses do not.

To complete the informal sketch of my analysis, I want to suggest that the context-dependence of conversation-oriented uses, as well as their non-presuppositional nature, can be accommodated by analyzing the observed implications as *conversational implicatures* generated on the basis of a simple, context-independent semantic meaning. This strategy has been, in essence, proposed already by Condoravdi (unpublished).

Thus I want to propose that unembedded occurrences of eFRs signal that, as far as the speaker's perspective is concerned, the reference of the FR is not resolved in the conversational common ground in the sense of Stalnaker (1978).

The observed implicatures can then be explained by noting that the following three conditions are jointly incompatible with the use of an eFR:

1. **Feasibility.** The speaker is able to commit the identity of the referent of the FR to the common ground (i.e. he has knowledge of who or what the referent is, and there are no other hindrances to share this knowledge, such as disagreement with the audience).
2. **Relevance.** The identity of the the referent of the FR is relevant to the current conversational purposes.
3. **Cooperativity.** The speaker is willing to provide his audience with any relevant information he possesses.

Given the joint incompatibility of these conditions with the meaning of a (conversation-oriented) use of an eFR, a hearer will conclude that at least one of these is false if he observes an occurrence of an eFR (which cannot be construed as sentence-internal): If he assumes the hearer to be cooperative and the identity of the referent to be relevant, he will conclude that the speaker is not *able* to identify this referent (which will, in many cases, be the case only if the speaker lacks this information, explaining ignorance implicatures). Similarly, if the hearer knows the identity to be relevant, and the speaker to be knowledgeable, he may conclude that the speaker is not fully cooperative (as in hint-type uses). Finally, the hearer may conclude that though the speaker may have the required knowledge, and is cooperative, he deems the identity of the referent *irrelevant*.

Final analysis. The use of an eFR signals that the referent of the FR is not constant across either

- (i) the domain of a quantificational operator that scopes over the eFR, or
- (ii) the set of worlds compatible with what is jointly presupposed by the interlocutors, i.e. the conversational common ground.

In the case of (ii), this typically triggers conversational implicatures to the effect that the speaker is unwilling or unable to identify the referent of the eFR.

3 Formally Speaking

3.1 A Formal Problem

There is a problem in implementing the analysis informally stated at the end of the last section in a static semantic system that translates English sentences into a language such as modal predicate logic or Montague's IL. The problem is that in the semantics of such languages an embedded operator does not have access to the domain of operators scoping over it, i.e. for a quantificational operator O in a formula

$$Ox [\phi(x)]$$

the interpretation of $\phi(x)$ cannot make reference to different values of x (in particular, in the case at hand, it cannot demand that a term in ϕ denotes distinct individuals relative to different values of x).

One way to construe the (sentence-internal) uses of eFRs is to say that they mark the referent of the FR as *quantificationally dependent* on a variable. Thus we might avail ourselves of a richer object language, in which such quantificational dependencies can be explicitly encoded. Such languages have been in fact proposed by several researchers for independent reasons. I briefly discuss two of them.

On the one hand, there is Steedman (unpublished), who interprets definites and indefinites by means of *skolem functions*. As an illustration, the two possible scopings of (25) in his system are represented as in (26):

(25) Every Englishman loves a woman.

- (26) a. $\forall x [englishman(x) \rightarrow loves(sk_{woman})]$
b. $\forall x [englishman(x) \rightarrow loves(sk_{woman}^{(x)})]$

where the skolem term sk_{woman} ends up being interpreted as a constant, while $sk_{woman}^{(x)}$ will be interpreted as a one-place skolem function (of x). That is, the form of the skolem term indicates what kind of function is used to interpret it (in particular, the skolem term dictates the arity of the function). It would be relatively straightforward to extend the system so that a skolem term can also include additional restrictions on the valuating function, e.g. demanding that it be not constant on a certain domain.

Though quite different in notation, Steedman's system is quite similar in many respects to the (family of) systems developed by Donka Farkas in a series of papers, motivated mainly by the phenomenon of *dependent indefinites* in languages such as Hungarian (Farkas 1997) and Romanian (Farkas 2002a). Dependent indefinites are indefinites which are constrained to have 'narrow scope'; thus the following Hungarian sentence (Farkas (2002b)'s (15)) is not scopally ambiguous in the way its English translation is.

- (27) Minden diák olvasott egy-egy verset
every student read.PAST a.DEPENDENT poem.ACC
'Every student read a poem.'

In (27) the indefinite *egy-egy verset* ('a poem') must be interpreted as having narrow scope with respect to the universal quantifier.

In Farkas' system(s), a referential expression such as a definite or an indefinite contributes a variable and a set of *valuation constraints* for this variable, i.e. constraints on how (partial) assignments constructed in evaluating the containing expression are extended to this variable. In particular, *egy-egy* in (27) can demand that the variable it contributes be assigned a value by extending a partial assignment that previously has been extended by a quantifier, yielding a narrow-scope-only reading.

Unlike English eFRs, reduplicated determiners in Hungarian (and their equivalent in Romanian) do *not* seem to require anything over and above what classically is understood as 'narrow scope'. In particular (27) would be an adequate thing to say if, as a matter of fact, every student read the same poem. While a dependent indefinite is *compatible* with such a situation, it does not *assert* it, as a wide-scope indefinite would. In contrast, an eFR does not just require that there be a quantificational operator scoping over it, it also requires that there be two distinct referents for the FR, relative to distinct values for the quantified

variable. Thus (unless construed as a conversation-oriented use), (28) would *not* be compatible with a situation in which every student was assigned the same poem (and thus read the same poem).

(28) Every student read whatever poem he was assigned.

Thus, Farkas' dependent-variable constraint for **egy-egy** does not suffice to account for the behavior of (embedded) eFRs. Farkas (2002b) does, in her discussion of English **some**, provide a constraint that comes closer to the right thing (she calls this constraint the *unidentified variable constraint*). I defer discussion of her treatment of **some** until Section 5, where, noting that my treatment of eFRs naturally extends to a treatment of **some**, I contrast and compare the two proposals.

There is a problem with any account that takes embedded eFRs, that is 'dependent definites' as its starting point: There does not seem to be any way to extend such an analysis to cover the conversation-oriented uses¹⁵, except by stipulation.

Such stipulation may come in different varieties: One way would be to say that the quantificational dependency can be optionally 'discharged' in the common ground. Or we could simply specify the meaning of *-ever* in a disjunctive way, saying that an eFR is *either* a dependent definite *or* has a conversation-oriented use (which we characterize independently).

The latter stipulation is clearly unattractive. So is, I suggest, the former: Hypothesizing that a dependency such as the ones introduced by eFRs optionally can be satisfied by 'implicit' quantification over the common ground is nothing but a stipulation, and a quite specific one: Other operators that mark quantificational dependencies (such as Farkas' dependent definites) do *not* allow such readings (or else the dependency requirement would become vacuous). This also immediately rules out a performative-style analysis that assumes that *any* asserted sentence involves a (typically unpronounced) quantifier over possibilities in the common ground, at least if we want to treat Farkas' dependent definites and eFRs on a par.¹⁶

In the following section, I will take the opposite route: Taking conversation-oriented uses as basic, I will define an update system that models the contribution of eFRs as a requirement on the information state (understood here as the conversational common ground) relative to which a statement is evaluated. Embedded uses emerge as conditions on *local* information states. Thus we will have a uniform treatment of conversation-oriented (global) and embedded (local) uses.

3.2 An Update Semantics

This section defines an update system which will allow us to capture the contribution of eFRs in a uniform fashion. As a starting point, I take the system defined in Groenendijk, Stokhof and Veltman (1996, henceforth: GSV), with substantive modifications: The system presented here features

- quantification over possibly plural individuals (so as to enable us to capture the meanings of free relatives generally, following Jacobson's analysis referenced above),
- a general way to introduce modal quantification over arbitrary sets of worlds, enabling a Kratzer (1991)-style analysis of modality,
- a Beaver (2001)-style presupposition operator ∂ , and
- a modified version of existential quantification that is close to Heim's (1983) original version, but achieves the results of Beaver (2001)'s system with respect to the interaction of presupposition and quantification.

¹⁵There is another aspect of both Steedman's and Farkas' system that may give the reader some pause: They crucially rely on a level of logical form where the quantificational dependencies are explicitly represented. As the astute reader may suspect, this is a rather accidental feature. It is entirely possible to give a dependent-definite analysis in a system that is 'variable free' in the sense of Jacobson (1999), though some special apparatus is necessary, e.g. Barker and Shan's (2008) continuations.

¹⁶Kratzer and Shimoyama (2002) and papers following their basic approach do, indeed, stipulate a covert 'assertion' modal on top of every declarative sentence, whose existence, as far as I can see, is not independently motivated. Kratzer and Shimoyama's account faces other problems, see Section 5 of this paper.

The final system will be of some independent interest, seeing as it imports a range of classical ideas (quantification over pluralities, a Kratzer-style analysis of modals) into an update system that both matches the empirical predictions of Beaver’s system and allows us to give a unified account of eFRs.

Before delving into the specifics, I want to point out that, for present purposes, I want to conceive of the ‘information states’ updated by the dynamic formulas to be defined as *common grounds*, that is, the update clauses specify how the information that is commonly believed evolves in discourse. In contrast, GSV think of their information states as models of cognitive states of speaker or hearer: An update clause specifies how the hearer should revise his private information state upon perceiving an utterance. Utilizing a Veltman (1996)-style might operator **M**, this enables them to account for the fact that (29a) is infelicitous (with **might** read epistemically), while (29b) is not:

- (29) a. It is not raining. But it might be raining.
 $\neg p \wedge \mathbf{M}p$
 b. It might be raining. It is not.
 $\mathbf{M}p \wedge \neg p$

In their system, (29a) is inconsistent: Any information state that is updated with this sequence will lead to the inconsistent information state \emptyset . On the other hand, there are many information states which can be updated with the formula in (29b) and yield a non-empty information state.

As we will see in the following, a Veltman-style **M** operator is inadequate as an analysis of natural language modals in the system to be proposed here, and hence I will propose to treat epistemic **might** along the lines of a classical Kripkean analysis of modality. This will have the result that the sequence in (29a) will not be inconsistent: There will be plenty of information states that can be updated with the formula and yield a non-empty information state. The reason for this is that, in a system that lets (the interpretation of) natural language sentences directly manipulate the conversational common ground, conceived as a set of worlds compatible with what the interlocutors commonly presuppose, there is no reflection of the fact that, if something comes to be commonly presupposed (by virtue of an unchallenged assertion, say), it will also be commonly presupposed that each of the interlocutors believes the newly-learned fact. Ultimately, the system defined here will have to be extended to take this aspect of discourse dynamics into account, and once this is done, the infelicity of (29a) will be explained.

Thus the system defined here will be incomplete, but so is, I want to suggest, GSV’s: In their system, a formula $\mathbf{M}p$ does not denote an update at all, it is not informative, but simply a consistency test. This leaves unexplained the fact that **might**-assertions are often informative. Explaining how this can be, will, again, require a more complete model of discourse dynamics which takes the different perspectives of speaker and hearer into account, and models the change in those perspectives along with the change in the conversational common ground.

In the end, a plausible account of information dynamics in discourse will have to both represent individual information states of the interlocutors and (their view on) the common ground.¹⁷ The claim underlying my acceptance of a model of common ground dynamics which does not allow for a Veltmanian **M** operator is that the facts accounted for by the adoption of such an operator can be properly treated only once one employs such a richer model of discourse dynamics. A full defense of this view, and an formal implementation that allows for a satisfactory analysis of epistemic **might**, will have to await another occasion.

3.2.1 Preliminaries

We begin with a definition of information states¹⁸. Like GSV, we identify possible worlds with first-order interpretation functions, but, unlike GSV, we take the domain of this function to be a Link/Sharvy-style join-semilattice of individuals (including plural individuals), and add a family of accessibility relations over these functions:

¹⁷Beginnings of models that incorporate the necessary elements can be found in Gunlogson (2003) and Bruce and Farkas (2007)

¹⁸Given what has just been said, it perhaps would be more adequate to refer to ‘information states’ as ‘common grounds’ or, following Heim, ‘contexts’. I will stick with GSV’s terminology for the sake of familiarity.

Definition 1. (*Possibilities*) Given a language L , a join-semilattice $\langle D, \sqsubseteq \rangle$ (the **domain**), a set W of interpretation functions mapping the non-logical constants of L into $\bigcup_{n \in \mathbb{N}} D^n$ and a set of relations $R \subseteq \wp(W \times W)$, the set I of **possibilities based on** $\langle D, \sqsubseteq \rangle, W$ and R is the set of tuples $\langle r, g, w \rangle$ such that r is a referent system, g is a function from the range of r into D and $w \in W$.¹⁹

As in GSV, basic expressions are interpreted relative to possibilities in the obvious way: Individual constants and predicates by the world, variables by the composite of r and g . We also import GSV's definition of an information state as being a subset of s of I such that all possibilities in s have the same referent system r , as well as their notions of *descendant* and *subsistence*: A possibility j is the descendant of a possibility i if j is derived from i by introducing new discourse referents into the domain of i 's referent system. A possibility i *subsists* after an update if i has a descendant in the updated information state, and an information state subsists if all of its possibilities subsist.

We also introduce the following bit of notation: For a possibility i and $X \subseteq D : i[x|X] := \{i[x|d] \mid d \in X\}$. That is, $i[x|X]$ is an information state derived from a single possibility i by creating $|X|$ copies of i and assigning each member of X to the variable x in one of these copies.

3.2.2 First-Order Updates

With the setup from the previous section, we can state the semantic clauses for the first-order part of our language. As in Beaver (2001) (but unlike GSV) we take the interpretation of formulas to be *relations* over information states, which allows for the *partiality* of updates without necessitating numerous 'if X is defined, undefined otherwise'-clauses. However, throughout, there will always be at most one output context for a given input context, i.e. the update relation will be a *partial function*. For the sake of conciseness, I will occasionally write $s[\phi]$ in order to refer to the s' such that $s[\phi]s'$, assuming that the expression in which such a statement occurs is undefined in case there is no such s' :

Definition 2 (First-Order Updates). *Let $s, s' \subseteq I$ and ϕ, ψ formulas. Then*

$$\begin{array}{ll}
s[Rt_1, \dots, t_n]s' & : \Leftrightarrow s' = \{i \in s \mid \langle i(t_1), \dots, i(t_n) \rangle \in i(R)\} \\
s[t_1 = t_2]s' & : \Leftrightarrow s' = \{i \in s \mid i(t_1) = i(t_2)\} \\
s[\neg\phi]s' & : \Leftrightarrow s' = \{i \in s \mid i \text{ does not subsist in } s[\phi]\} \\
s[\phi \wedge \psi]s' & : \Leftrightarrow \exists s'' : s[\phi]s''[\psi]s' \\
s[\exists_x \phi]s' & : \Leftrightarrow s' = \bigcup_{i \in s} i[x|D][\phi]
\end{array}$$

The first four clauses should be unsurprising to anyone with some experience with dynamic semantics: Relation symbols can be interpreted procedurally as removing all possibilities where the relation in question does not hold, and the same goes for the interpretation of identity statements. Conjunction is relation composition, so that updating with a conjunction amounts to sequential update with both conjuncts. Finally, negation removes all those possibilities from the input state that would 'survive' (subsist) the update with the embedded formula.

The last one, the clause for the existential quantifier, is somewhat non-standard (and in fact will have to be revised shortly). Procedurally speaking, updating with an existentially quantified formula means creating a local information state for each possibility, such that every individual in D is the value of x for some possibility in the new state. Then, we update with the formula in the scope of the existential quantifier.

This is distinct from *global reassignment* as in Heim (1983)'s classic system, as well as from *local reassignment* in GSV (Beaver calls this 'slicing'). The difference can be easily appreciated by comparing Figures 1-3: All three figures display the 'preparatory' creation of local information states in the evaluation of an existentially quantified formula.

¹⁹See GSV for the definition of referent systems. All that is important here is that $g \circ r$ is a mapping from variables into the domain, i.e. an assignment function.

The idea is always the same: A set of local information states is created, then these information states get updated with the formula in the scope of the quantifier. The result of the update is the union of these updated local information states. The difference between the three approaches lies in how the local information states are defined, and the figures illustrate the difference for an information state with three worlds (w_1, w_2, w_3), over a domain of two individuals (a, b):

- In Heim's (1983) 'global reassignment', only one local state is created, in which each individual of the domain is assigned to each possibility in the input information state (Figure 1).
- In GSV/Beaver's 'slicing', a set of local information states is created, one for each individual in the domain. The local information state for an individual d will consist of all possibilities in the input state, updated so as to refer to d with the quantified variable x (Figure 2).
- In the 'vertical slicing' employed in this paper, a set of local information states is created, one for each possibility in the input state. The local information state for a possibility i will consist of $|D|$ copies of i , updated such that each individual of the domain is assigned to the quantified variable x in one of the possibilities (Figure 3).

To alleviate any fears that the non-standard definition of the existential quantifier results in a non-standard interpretation of first-order facts, we note the following:

Fact 3. Let $\models_{\text{FOL}} \subseteq (W \times G) \times L$ be the satisfaction relation of classical first-order logic and $s[\phi]s'$, where ϕ does not contain unbound variables. Then each $\langle r, g, w \rangle \in s$ will subsist in s' if and only if $\langle w, r \circ g \rangle \models_{\text{FOL}} \phi$

This assures us that the classical definitions of other connectives and the universal quantifier will give the expected results for formulas without unbound variables, so we venture on to define:

Definition 4. (*Abbreviations*)

$$\begin{aligned}\phi \vee \psi &:= \neg(\neg\phi \wedge \neg\psi) \\ \phi \rightarrow \psi &:= \neg(\phi \wedge \neg\psi) \\ \forall_x \phi &:= \neg\exists_x \neg\phi\end{aligned}$$

Considering unbound variables, we can assure ourselves that the language we have defined so far satisfies the 'donkey equivalence':

Fact 5. (*Donkey equivalence*) $[\exists_x(\phi) \rightarrow \psi] = [\forall_x(\phi \rightarrow \psi)]^{20}$

As usual, this equivalence depends on the choice of basic connectives; any other choice than \neg and \wedge would invalidate the donkey equivalence. Indeed, it can be easily seen that the first-order part of the language is wholly equivalent to that of GSV.

3.2.3 Modal Updates

The phenomena we are dealing with require a treatment of modality that, unlike GSV's Veltmanian *might* and *must* does not (exclusively) treat modals as consistency tests on the input information state. This is so because we want to provide a treatment for a host of non-veridical attitude verbs such as **believe** or **want** (and deontic *must*).

²⁰Readers familiar with GSV's paper will recall that equivalence is defined there with respect to the notion of *similarity* (rather than identity) of information states, taking into account that states that do not differ with respect to the composition $r \circ g$ at any possibility support and admit the same formulas. This complication is unnecessary here, because both \rightarrow and \forall are 'externally static', i.e., their output states are always subsets of their input states, and thus the anaphoric potential of their constituent formulas is not made available in the output information state. This will be the case throughout this paper for all quantifiers except the existential one and the definite description operator ι . Thus, the system developed here will not give an account of quantificational (or modal) subordination.

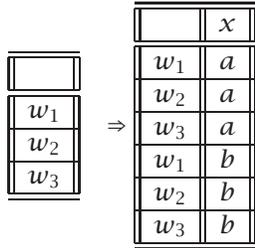


Figure 1: Heim (1990): 'Global Re-assignment'

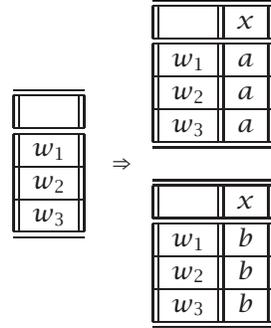


Figure 2: Beaver, GSV: 'Slicing'/'Local Re-assignment'

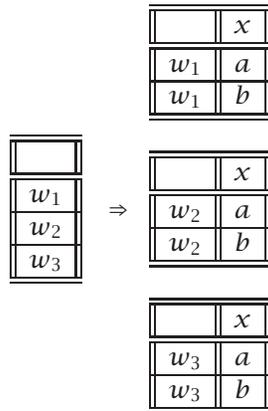


Figure 3: This paper: 'vertical slicing'

In the definition of possibilities above, we made available a set of accessibility relations between worlds²¹. We will use them now to define eliminative updates for possibility and necessity statements. First, an auxiliary notion:

Definition 6. Given a set of worlds W , referent system r and an assignment function g , the **information state given r and g based on W** , $\text{Inf}_{r,g}(W)$ is defined as $\{r\} \times \{g\} \times W = \{\langle r, g, w \rangle \mid w \in W\}$

Then, we define

Definition 7. (Possibility modals) For any $s, s' \subseteq I$ and $\phi \in L$:

$$s[\diamond_a \phi]s' \iff s' = \{\langle r, g, w \rangle \in s \mid \text{Inf}_{r,g}(\{v \in W \mid wR_a v\})[\phi] \neq \emptyset\}$$

This yields an analysis of possibility modals close to classical Kripkean semantics, with the added twist that the embedded formula inherits the anaphoric potential of its embedding context, which clearly is necessary: Witness (30a), which we can now represent as (30b):

- (30) a. A hot guy just came in. I think he might be into you.
b. $\exists x[\text{hot_guy}(x) \wedge \text{just_came_in}(x)] \wedge \diamond_s \text{into_addressee}(x)$

After the existential quantifier has been processed, all possibilities i in the resulting information state will be such that $i(x)$ is a hot guy who just came in. The subsequent update with the rest of the formula will remove all possibilities that are not such that there is an R_s -accessible world in which $i(x)$ is into the addressee.

We define necessity modals in terms of possibility modals in the standard way:²²

Definition 8. (Necessity modals) For any formula ϕ :

$$[\Box_a \phi] := [\neg \diamond_a \neg \phi] = \{\langle r, g, w \rangle \in s \mid \text{For all } i \in \text{Inf}_{r,g}(wR_a) : i \text{ subsists in } \text{Inf}_{r,g}(wR_a)[\phi]\}$$

Given that we have now imported a standard Kripkean treatment of modality that we can ask ourselves whether we should, in addition, introduce a Veltman-style *might* operator that acts as a consistency test. Let's try:

Definition 9. (Veltmanian might) For any $s, s' \subseteq I$, $\phi \in L$:

$$s[\mathbf{M}\phi]s' \iff s' = \{i \in s \mid s[\phi] \neq \emptyset\}$$

Is this a sensible definition in our current system? Not really. Consider what happens if we embed \mathbf{M} under a quantifier, as in (31b), which we may take to translate (31a):

- (31) a. There is someone who might be into you.
b. $\exists x : \mathbf{M}[\text{into_addr}(x)]$

Updating an information state s with this formula will yield the absurd state \emptyset if none of the possibilities in s feature a world w such that there is a $d \in D : d \in w(\text{into_addr})$. This arguably is what we would want: Such an information state intuitively is *incompatible* with the sentence (31a): If it is commonly known that no-one is into the addressee, (31a) cannot be true.

Trouble strikes if we consider information states that are compatible with the formula in (31b): In such a case, GSV derive the plausible result that, after updating with (31b), all $i \in s$ subsist in the resulting information state s' and all $j \in s'$ are such that there is a (possibly different) possibility in s' which features

²¹Even though we use accessibility relations here, it should be clear that the definition works equally well if the domain of modal operators is provided by other means, e.g. by the interaction of a modal base and an ordering source, in the manner of Kratzer (1991)

²²Since (in the limited system here) both kinds of modals are 'externally static', we could have equally well taken \Box as basic and defined \diamond in terms of it.

a world w such that $j(x) \in w(\text{into_addressee})$. If we understand *might* as a consistency test, this is arguably the right result.

Now, in the current system, what happens instead is that (a) every possibility in which *into_addr* is empty is removed from the information state and (b) every possibility in which *into_addr* is non-empty will be extended into $|D|$ many new possibilities, with x being assigned to *every member of the domain* at one of them. This surely is the wrong result.

I conclude that, given that we define quantifiers the way we do, \mathbf{M} is not a useful representation of natural language *might*. This does not seem to be too troubling, though, as we might as well just avail ourselves of one of the Diamond operators that are independently needed anyway and translate (31a) as

$$(32) \quad \exists x : \diamond_s[\text{into_addr}(x)]$$

3.2.4 Presuppositional Updates

The analysis of eFRs proposed in Section 3.5 will analyze the contribution of **-ever** as closely resembling the treatment of presupposition in an update semantics such as the one defined in the previous sections. This is an attractive feature of the analysis, given that we saw (in Section 2.5) that the contribution of **-ever** shows presupposition-like projection behavior when embedded.

The novel definition of existential quantification proposed in Section 3.2.1 is intended to provide the right kind of local information states to make correct predictions for eFRs embedded under quantifiers over individuals. But we have to make sure that this novel way of defining quantification combines with a standard dynamic treatment of presupposition to yield empirically adequate predictions of projection facts. In this section, we will therefore introduce Beaver’s presupposition operator and verify whether it makes the right kind of predictions about presupposition when added to the current system.

Up to now, all updates we have defined are *total* in the sense that for any information state s and any formula $[\phi]$, there is an information state s' such that $s[\phi]s'$ (and in fact, there is also at most one such state: so far, updates are *functions*). We will change this now, by introducing Beaver’s presupposition operator:

Definition 10 (Suppositional updates). *For all $s, s' \in I, \phi$ a formula not containing ∂ :*

$$s[\partial\phi]s' \iff s[\phi]s' \text{ and for all } i \in s : i \text{ subsists in } s'$$

Now, readers familiar with the history of dynamic approaches to presupposition projection may have noticed already that, as it stands, our system makes rather bad predictions about the interaction between quantifiers and presupposition. In particular, it runs into the familiar Heimian problem that (33a) (which we may want to represent as (33b)) is defined only if (presupposes that) (34) is true.

- (33) a. A fat man pushed his bicycle.
 b. $\exists x[\text{fat_man}(x) \wedge \partial[\exists y : \text{bicycle}(y) \wedge \text{has}(x, y)] \wedge \text{push}(x, y)]$

- (34) a. Every fat man has a bicycle.
 b. $\forall x[\text{fat_man}(x) \rightarrow \exists y : \text{bicycle}(y) \wedge \text{has}(x, y)]$

To see this, consider what the information state looks like after the formula in (33b) has been processed until the first conjunction: It will contain all extensions i of states in the input state such that $i(x) \in w_i(\text{fat_man})$. By the definition of ∂ , there will be an output information state for this input if and only if, for all such possibilities, the formula $\exists y : \text{bicycle}(y) \wedge \text{has}(x, y)$ is true. But that means that the presuppositional part of (33b) will have an output if and only if the input state supports (34b).

While Heim (1983) suggests that this problem can be solved by assuming the right kind of (local) *accommodation*, Beaver (1994), after an empirical review, proposes a different solution, in part because certain kinds of accommodation expected on Heim’s account do not seem to be available. Beaver’s solution consists of modifying the way a quantifier processes its restrictor and scope, by ‘slicing’ the incoming information state into subordinate information states in each of which the variable bound by the quantifier has a constant value (cf. Figure 2). This can be seen as a generalization of GSV’s definition of the existential quantifier,

discussed above. Here, I want to propose a different solution, which reproduces Beaver’s predictions about the interaction of quantification and presupposition.

First, an auxiliary notion:

Definition 11. For Ψ a class of sets closed under union and X a set, let $LS(X, \Psi)$, **the largest subset of X satisfying Ψ** , be the Y such that $Y \subseteq X \ \& \ \Psi(Y)$ & for all $Z \subseteq X$: if $\Psi(Z)$ then $Z \subseteq Y$.

This will be defined iff there is some set $Y \subseteq X$ such that $\Psi(Y)$ ²³. We could make sure that $LS(X, \Psi)$ is always defined by adding a corresponding requirement to the definition, but, instead, we will take advantage of the potential undefinedness in getting the projection facts right.

With this, the revised version of the semantics of the existential quantifier can be stated as

Definition 12 (Existential Quantifier, revised version).

$$s[\exists_x \phi]s' \iff s' = \bigcup_{i \in S} LS(i[x|D], \lambda X.X \neq \emptyset \ \& \ \exists s'' : X[\phi]s'')[\phi]$$

That is, when evaluating an existential quantifier, at each possibility, we only take those individuals into account that satisfy the presuppositions of the embedded formula, but require, on pain of undefinedness, that there be at least one such individual. This reproduces Beaver’s predictions about the interaction between quantifiers and presuppositions,²⁴ in particular, with respect to (33b), it can be shown that the update with the formula is valid on an input state s iff for all $i \in s$, there are $d, d' \in D$ such that $d \in w_i(\text{fat_man})$ and $d' \in w_i(\text{bicycle})$ and $\langle d, d' \rangle \in w_i(\text{has})$. But this just means that s supports the formula in (35):

$$(35) \quad \exists_x : \text{fat_man}(x) \wedge \exists y : \text{bicycle}(y) \wedge \text{has}(x, y)$$

Thus, the prediction is that (34a) presupposes that there is a fat man who has a bicycle (and asserts that one of the bicycle-owning fat men is pushing his bicycle), which arguably accords with intuition.

The fact that (the non-modal part of) this treatment of the existential quantifier, together with Beaver’s presupposition operator, is provably equivalent to Beaver’s system shows that ‘slicing’ is not necessary in order to have the interaction of quantification and presupposition come out right in a dynamic satisfaction semantics, a result that is of some interest in its own right.

In the present context, the most important fact is, with a Beaver (1994)-equivalent analysis of presupposition, we have an account of a considerable array of attested presupposition facts. We find the following (where, as in Beaver, \gg stands for ‘pragmatically presupposes that’):

²³ $LS(X, \Psi)$ is just the maximal element of $S = \{Y \in \wp(X) \mid \Psi(Y)\}$, ordered by set inclusion. Since Ψ is closed under union, so is S , and hence $\langle S, \subseteq \rangle$ is a join-semilattice unless empty. It directly follows that a maximal element exists unless S is empty.

²⁴We can import generalized quantification into the current system using the same technique as in the definition of the existential quantifier above: Suppose \mathbb{D} the static generalized quantifier (relation on sets) corresponding to D , then define:

$$s[D_x(\phi)(\psi)]s' : \iff s' = \left\{ i \in s \mid \mathbb{D} \left(\begin{array}{l} \{d \in D \mid i[x/d] \text{ subsists in } LS(i[x|D], \lambda X.X \neq \emptyset \ \& \ \exists s'' X[\phi]s'')[\phi]\}, \\ \{d \in D \mid i[x/d] \text{ subsists in } LS(i[x|D], \lambda X.X \neq \emptyset \ \& \ \exists s'' X[\phi][\psi]s'')[\phi][\psi]\} \end{array} \right) \right\}$$

It can be shown that the non-modal part of the system presented here, with a slight modification, is equivalent to that of Beaver (1994).

The unmodified system is slightly weaker than Beaver’s, in the following sense: If ϕ presupposes ϕ' , a formula $Qx(\phi, \psi)$ in the current system simply presupposes $\exists x : \phi(x)$. In Beaver’s system, the same formula presupposes something stronger, namely that there is a particular individual $d \in D$ of which it is presupposed that ϕ' . Thus while I only predict that **A fat man pushed his bicycle** presupposes that there are bicycle-owning fat men, Beaver predicts that the sentence presupposes that there are fat men which are commonly known to own bicycles. The definition of the quantifiers above could be complicated to reproduce Beaver’s prediction, but I refrain from doing so here, on the one hand because the issue is entirely orthogonal to our present concerns, on the other hand because I am not certain that Beaver’s stronger prediction is adequate. To my knowledge, Beaver never defends this aspect of his system(s), or draws attention to it.

Fact 13. Given four formulas such that $\phi \gg \phi'$ and $\psi \gg \psi'$:

- $$\begin{aligned} \neg\phi &\gg \phi' && \text{(i)} \\ \phi \wedge \psi &\gg \phi' \wedge \psi && \text{(ii)} \\ \phi \rightarrow \psi &\gg \phi' \wedge \psi && \text{(iii)} \\ \exists_x \phi &\gg \exists_x \phi' && \text{(iv)} \\ \forall_x \phi &\gg \forall_x \phi' && \text{(v)} \\ \Box_a \phi &\gg \Box_a \phi' && \text{(vi)} \end{aligned}$$

The first three formulas simply ensure us that fairly well-established presupposition projection facts are predicted by the system.²⁵ (iv) generalizes the preceding observation about the presuppositions of (33a). (v) needs some comment: The current theory predicts that a(n utterance of a) sentence like (36) presupposes (37):

- (36) a. Every man loves his wife.
b. $\forall_x : man(x) \rightarrow \partial[\exists_y[wife(x,y)]] \wedge loves(x,y)$
- (37) a. There is a man that has a wife.
b. $\exists_x : man(x) \wedge \exists_y : wife(x,y)$

Of course, on occasion of a sincere utterance of (36), a hearer is tempted to infer the stronger (38):

- (38) a. Every man (in the current domain of discourse) has a wife.
b. $\forall_x : man(x) \rightarrow \exists_y : wife(x,y)$

It sometimes has been assumed (e.g. by Heim (1983)) that (38) should be regarded as a presupposition of (36), and hence that a theory of presupposition projection should validate (39), rather than the formula in (v) above:

- (39) $\forall_x \phi \gg \forall_x \phi'$

Beaver (1994) convincingly demonstrates that this is empirically inadequate, and suggests that, instead, (39) should be regarded as an *entailment* of (36), and this is indeed what the current proposal predicts: As can easily be verified, any information state that supports (36b) will also support (39).

Finally, (vi) says that that the interaction of epistemic/doxastic attitude predicates accords with intuition.²⁶

²⁵While I take (i) and (ii) to be uncontroversial, (iii) is not quite as innocent: The prediction is that a conditional sentence inherits the presuppositions of its antecedent, but instead of inheriting the presuppositions of its consequent, it carries modified presuppositions, derived by conditionalizing on the antecedent. Thus, (i) will presuppose (iib), rather than (iia):

- (i) If France were a patriarchal monarchy, the king of France would be bald.
- (ii) a. There is a king of France.
b. If France were a patriarchal monarchy, there would be a king of France.

The issue of whether this prediction is adequate has been (more or less hotly) debated since at least Gazdar (1979). Beaver (2001, Ch. 9), among others, defends the predictions of a dynamic satisfaction semantics (i.e. conditionalized presuppositions for the consequents of conditionals) by outlining a pragmatic explanation of certain cases where the conditional appears to inherit the presuppositions of its consequent. Singh (to appear) takes a very different approach, based on a grammaticized notion of accommodation. Even though the latter kind of account is not as straightforwardly adopted in the framework used in this paper as the former, I do not need to take a stand on these issues here. It suffices to assume, *contra* Geurts (1996), that the semantically-mandated minimal presuppositions of a conditional are those predicted by the present theory, relegating the problem to account for the occasional appearance of stronger presuppositions to an adequate theory of accommodation, grammaticized or not.

²⁶It is well-known that this does not immediately yield the right result for 'root' attitude predicates (cf. Heim (1992)). I will ignore this problem here, it being orthogonal to the issues addressed in this paper.

Another issue I will not address is that an analysis of epistemic modals using the \diamond_r -operator predicts that epistemic modals behave exactly like attitude verbs with respect to presupposition, i.e. that they behave as 'plugs', rather than 'holes' in Karttunen's (1973) terminology. I happen to suspect this is correct, but this is not the place to motivate this view, which, as far as I know, is not shared by many.

A noteworthy point about the proposed account of presupposition projection (and Beaver’s) is that it manages to make the predictions referenced above without any appeal to ‘local accommodation’, i.e. accommodation into a local information state: The fact that (40) will presuppose (41) emerges from the system *without any appeal to accommodation*, simply by the interplay of (dynamic) modalities and presupposition:

(40) John believes the king of France is bald.

(41) John believes there is a king of France.

Thus, the only kind of accommodation that the present theory needs to assume is ‘global accommodation’, which can be regarded as a pure discourse-level phenomenon: If (40) is uttered without it being part of the common ground that (41) is true, (41) will often be assumed to be true by a cooperative listener. In this case, the *projected* presupposition is accommodated into the global information state, rather than (as in Heim’s original proposal) the *unprojected* presupposition (‘There is a king of France’) being accommodated in the local information state (John’s belief state). This is, arguably, a conceptual advantage, given that the availability of global accommodation can be easily and intuitively motivated by appeal to general principles of cooperativity, while a corresponding motivation for local accommodation is lacking.

3.3 (-ever) Free Relatives In Update Semantics

The update semantics developed in the previous section pulls together a handful of off-the-shelf tools of dynamic and static semantics. The only innovation is the definition of the quantifiers, which were shown to capture (a reasonable approximation of) projection facts about presuppositions. The system has some features that might be construed as advantages (for example, all non-suppositional updates are *distributive* and *eliminative*, the latter immediately accounting for why statements are informative²⁷, the former suggesting there is ample room for an independent notion of *content* next to *update*²⁸). There are other features that one may construe as disadvantages (e.g. the non-feasibility of a Veltmanian *might* operator), but I think, on balance, the system can be construed as at least as good as many of its predecessors²⁹.

The point of the exercise was, of course, to define a system that allows us a simple, uniform statement of the meaning of eFRs as characterized in Section 2. The system defined in the last section, combining standard techniques for the semantics of plurals, modal quantification and presupposition, has all the properties we need: As a first step, we define a (tripartite) ι -quantifier, intended to model pFRs (and Russellian definites):

Definition 14 (Definite descriptions).

$$\iota_x [\phi(x), \psi(x)] := \partial_{\square} [\exists x [\phi(x) \wedge \forall y [\phi(y) \rightarrow y \sqsubseteq x]]] \wedge \psi(x)$$

This definition assumes, for convenience, that the individual containment relation \sqsubseteq is part of the object language and construes a definite as presupposing that there is a maximal individual that satisfies the restrictor and asserts that this same individual satisfies the scope. I omit spelling out the obvious presupposition contributed by number marking (of either atomicity or non-atomicity).

Then we define

Definition 15 (eFRs, first shot).

$$s [wh\text{-}ever [\phi, \psi]] s' : \iff s [\iota_x [\phi, \psi]] s' \\ \& \exists i, j \in s' : i(x) \neq j(x)$$

²⁷This is not a given: A Veltmanian *might* is not eliminative, hence an extra story is needed to explain how it can be informative. I trade this problem for the problem of accounting for the sequence effects with epistemic modals discussed in the introduction to Section 3.

²⁸In the current system, this notion of content is not quite the good old static one, as even distributive updates in this system embody a certain DPL-style dynamicism.

²⁹Predecessors that were created by giants on whose shoulders the present author humbly stands.

Note the similarity to the definition of ∂ : The definition states that updating with *wh-ever* is just the same as updating with another formula (viz., \imath), but puts additional restrictions on when this is defined. Crucially, these conditions are not put on the *input* context, but rather on the *output* context.³⁰ Thus, if a label is wanted for the condition imposed by *-ever*, it would be adequate to call it a ‘post-supposition’.

That this is the right way to go can be appreciated easily when considering certain cases of unembedded (=conversation-oriented) uses of eFRs: Consider a context in which we both know that John devoured the cake (we’ve seen him with the remainders of said cake smeared all over his face), but it is not part of the common ground who made it to the cabin first. In such a situation, it would be odd for me to utter:^{31, 32}

- (42) a. Whoever made it to the cabin first ate the cake.
 b. $wh\text{-}ever_x[made_it_to_the_cabin_first(x)][ate_the_cake(x)]$

On the current definition, the update with (42b) will be undefined for an information state that only contains possibilities in which the same individual ate the cake, seeing as the update with $\imath_x[made_it_to_the_cabin_first(x)][ate_the_cake(x)]$ will lead to an information state at which that same individual is assigned to x in all possibilities.

3.4 Predictions

3.4.1 Embedded Uses

Does the current analysis predict the facts for embedded occurrences observed in Section 2? It does:³³

Fact 16. For ϕ, ψ, χ any formulas, $s, s' \in I$:

$$\begin{aligned} \forall_x \chi \rightarrow wh\text{-}ever_{x'}[\phi, \psi] \gg \exists_x : \chi \wedge \imath_{x'}[\phi, \psi] \wedge \exists_y : \chi \wedge \imath_{y'}[\phi, \psi] \wedge x' \neq y' \\ \square_a wh\text{-}ever_x[\phi, \psi] \gg \exists y : \exists y' : y \neq y' \wedge \diamond_a[\imath_x[\phi, \psi \wedge x = y]] \wedge \diamond_a[\imath_x[\phi, \psi \wedge x = y']] \end{aligned}$$

To illustrate, recall (17), repeated in simplified form below, with an even more simplified translation, which, according to the definition above will pragmatically presuppose (44b), which we can retranslate into natural language as (44a):

- (43) a. Everyone liked whatever he was eating.
 b. $\forall_x : person(x) \rightarrow wh\text{-}ever_y[eating(x, y)][like(x, y)]$
- (44) a. There are two people who ate distinct things and liked them.
 b. $\exists_x : person(x) \wedge \imath_{x'}[eat(x, x')], [like(x, x')] \wedge \exists_y : person(y) \wedge \imath_{y'}[eat(y, y')], [like(y, y')] \wedge x' \neq y'$

³⁰The definition properly extends the expressive power of our language: There is no formula χ such that $wh\text{-}ever_x[\phi, \psi]$ is equivalent to $\imath_x[\phi, \psi] \wedge \partial\chi$, even though the latter would be ‘post-suppositional’ in a certain sense.

This is not an accident: It is a reflex of the fact that the non-presuppositional part of the language is entirely distributive. The system as presented here thus presents a, to my knowledge, novel conceptual perspective on update dynamics: While it agrees with all of its predecessors that there are natural language expressions that impose global conditions on their contexts, it disagrees with Veltman (1996) and subsequent proposals (including GSV’s and Beaver (2001)) that these global conditions can be part of the asserted content (or perhaps what Potts (2005) calls ‘at-issue’ content). This division might turn out to be too strict, but I see no obvious reason why this should be so: It might as well turn out to be correct.

I should note that this aspect of the system was discovered, not planned: It naturally arose from attempting to define an update system that features the right local information states for a uniform statement of the contribution of *-ever* and checking whether such a system still gets the presuppositional facts right. Thus this feature should be seen as a welcome side effect: To me it seems that relegating global conditions to the non-assertional part of the update system puts them into their rightful place. I consider it an open question whether this impression is correct.

³¹It may be tempting to say that what makes this sentence odd is that it signals variation (concerning the referent of *who made it to the cabin first*) which it subsequently removes, which could be taken to be pragmatically weird. Such an explanation, if at all feasible, is difficult to bring into accord with the fact, noted in Section 2, that the use of *-ever* is not infelicitous if it is not informative.

³²In the ‘translations’ I give, here and in the sequel, I consistently ignore the contribution of the *wh-* word, for the sake of expositional simplicity.

³³With $x \gg y$ again standing for: an information state s will admit x only if s supports y , which we interpret as ‘an utterance of x pragmatically presupposes the truth of y ’

Since our system validates the ‘donkey equivalence’, it immediately accounts for the behavior of eFRs in the consequent of a donkey conditional: (45a) can be represented as (45b), which by the equivalence is the same as (45c), which in turn, by the above fact, presupposes (46):

- (45) a. If a farmer saw a monkey, he gave him whatever was in his pocket.
 b. $\exists x[farmer(x)] \wedge \exists y[monkey(y) \wedge see(x, y)] \rightarrow wh-ever_z[in_pocket_of(x, z)][feed(x, y, z)]$
 c. $\forall x \forall y [farmer(x) \wedge monkey(y) \wedge sees(x, y) \rightarrow wh-ever_z[in_pocket_of(x, z)][feed(x, y, z)]]$
- (46) a. There are farmers and monkeys such that the farmers saw the monkeys and fed them what was in their pockets, which were distinct things.
 b. $\exists x : \exists y : farmer(x) \wedge monkey(y) \wedge see(x, y) \wedge \iota_z[in_pocket(z)][feed(x, y, z)]$
 $\wedge \exists x' : \exists y' : farmer(x') \wedge monkey(y') \wedge see(x', y') \wedge \iota_{z'}[in_pocket(z')][feed(x', y', z')]$
 $\wedge z' \neq z'$

With that, it should be obvious that the behavior of eFRs embedded under Q-adverbs and iterative aspect could be accounted for in various ways, either by treating both operators as unselective variable binders or by treating them as quantifiers over entities of an opportune sort (situations, times, events, occasions, world-time pairs, or whatever one fancies).

Turning to modals and attitude verbs, consider the familiar example (47a), which we can translate as (47b), which presupposes (48):³⁴

- (47) a. Paul thinks that whoever won the race will get lucky tonight.
 b. $\Box_p wh-ever_x[winner(x)][get_lucky(x)]$
- (48) a. There are two distinct people who Paul thinks might have won the race and get lucky tonight.
 b. $\exists y : \exists y' : y \neq y' \wedge \Diamond_p[\iota_x[winner(x)][get_lucky(x) \wedge x = y]] \wedge \Diamond_p[\iota_x[winner(x)][get_lucky(x) \wedge x = y']]$

We will get the same results for root modals and attitudes verbs: (49) presupposes (50) (I omit the translations, as they are exactly parallel to the ones in (47) and (48)):

- (49) Paula wants to marry whoever her parents selected for her.
 (50) There are at least two people who, if Paula’s select either of them, Paula wants to marry the respective person.

3.4.2 Conversation-Oriented Uses

Given the account of conversation-oriented uses in terms of implicatures sketched at the end of section 2, it should be obvious that the current analysis directly predicts the necessary semantic effects: Our old friend (51) pragmatically presupposes (52a) and asserts (52b):

- (51) a. Whatever Arlo is cooking smells delicious

³⁴This pragmatic presupposition may seem too strong, in that it introduces a commitment to the existence of two *actual* individuals which are such that Paul thinks that either of them might be the winner. This seems to be inadequate, as, for example, (47) would arguably be adequate if John mistakenly thought that two descriptions of possible winners refer to distinct persons (e.g. a situation in which Paul thinks that ‘the driver of the red Ferrari’ and ‘the oldest contestant’ refer to distinct people, when in fact the refer to one and the same individual).

This problem is a consequence of the fact that, as it stands, the modal part dynamic system defined in this paper is a dynamicized version of classical modal predicate logic with constant domains, and inherits most of its problems. For example, it validates the following instance of the ‘Barcan formula’ (ia) and its converse(ib) (in the sense that every information state supports the formula):

- (i) a. $\forall x[\Box P(x)] \rightarrow \Box \forall x : P(x)$
 b. $\Box \forall x[P(x)] \rightarrow \forall x : \Box P(x)$

Both the counter-intuitive consequences of the Barcan formulas, as well the problem with an overly strong presuppositional existential commitment can be mitigated by adopting Aloni (2001)’s solution in terms of ‘conceptual covers’ into the current system. Aloni’s solution will be briefly discussed in Section 4, the appropriate definitions importing her solution can be found in Appendix A.

- b. $wh\text{-}ever_x[cooks(arlo, x)][smells_delicious(x)]$
- (52) a. There are two possibilities in the common ground such that Arlo is cooking distinct things in each of them, and both smell delicious = It is not resolved between the two of us what Arlo is cooking and adding the information that Arlo is cooking something that smells delicious does not change that.
- b. The thing that Arlo is cooking smells delicious.

Noting that the pragmatic presupposition in (52a) is jointly incompatible with the assumptions that (a) what Arlo is cooking is relevant, (b) the speaker is able to commit to the common ground what Arlo is cooking, (c) the speaker is willing to commit any relevant information to the common ground if he can; a hearer will infer that one of the three conditions is not fulfilled, giving rise to the perception of indifference ((a) is not fulfilled), ignorance or disagreement ((b) is not fulfilled) or non-cooperativity ((c) is not fulfilled). These inferences clearly are expected inferences, and in many circumstances are the communicative reason for the use of *-ever*. Hence it appears appropriate to call these inferences implicatures.

In Section 2, it was also noted that embedded occurrences of eFRs can almost always have conversation-oriented effects, given an appropriate context (making it necessary to carefully control the context in the investigation of embedded uses). This can be modeled in the current system by giving *wh-ever* scope over the embedding quantifier: This fact is thus a natural consequence of the ability of definites to take fairly wide scope.³⁵

Thus the sentence (47), repeated below, in addition to the ‘narrow scope’ reading repeated in (53b), also has the ‘wide-scope’ reading in (53c).

- (53) a. Paul thinks that whoever won the race will get lucky tonight.
- b. $\Box_p wh\text{-}ever_x[winner(x)][get_lucky(x)]$
- c. $wh\text{-}ever_x[winner(x)][\Box_p get_lucky(x)]$

On this reading, the utterance of the sentence neither presupposes nor asserts anything about Paul’s beliefs about who has won. Instead it pragmatically presupposes that there are two distinct possible winners, and asserts that Paul thinks that the person who (actually) wins will get lucky tonight, but also presupposes that learning this will not determine who the winner is. Thus the sentence will be compatible with a situation in which it is known that Paul is informed about the winner, but it is not known who Paul believes is the winner.

Crucially, accounting for conversation-oriented effects in embedded contexts in this way ensures that the restrictor of the eFR (the interpretation of **wh-ever**’s complement clause) and the variation requirement ‘cannot take scope independently’: Consider the following, somewhat contrived, example:

- (54) Context: We have just learned that Bill won the race, but only because John, who reached the finishing line before him, was disqualified after the fact. We know that Paul has been informed about the winner, but not whether this happened before or after the disqualification. We witness a messenger drop off a packet full of condoms at the front desk, with a note from Paul addressed to ‘the winner’. I may quip (b), but not (a), unless I have reason to believe that Paul does not trust his information source about the winner:
- a. Paul thinks that whoever won the race will get lucky tonight.
- b. Paul thinks that whoever he thinks won the race will get lucky tonight.
- c. $wh\text{-}ever_x[\Box_p winner(x)][\Box_p get_lucky(x)]$

³⁵This can be accomplished in a number of ways: If you like quantifier raising, this will do the trick. If you are uncomfortable with the assumption of an independent level of logical form, you will be more pleased with one of the variety of surface-compositional solutions to the problem, cf. Jacobson (1999) or Barker and Shan (2008). Arguably, the current solution does not sit too well with systems which interpret all noun/determiner phrases *in situ*, yet rely on a level of logic form, such as the system in Farkas (2002b), as in a system like this, extra stipulations are needed in order to ensure the variation requirement and descriptive content are evaluated in compatible scopal positions.

On the current account, if (54a) would be appropriate in the described context, the eFR would have to take scope *under* the belief modal, while the variation requirement would be met by the conversational common ground (i.e. *outside* of the scope of the belief modal). On the present account, this is directly excluded, as we derive conversation-oriented effects only by letting the eFR take wide scope.

This fact may seem to be a trivial consequence of the way we characterized the meaning of eFRs in Section 2, but it is necessary to check whether a formal analysis reproduces this consequence. Indeed, when I compare the present account to Farkas (2002b)'s treatment of English destressed **some** (or '**sm**'), this point will be highly relevant.

3.4.3 Possibility Modals: Permitting Freedom Of Choice.

The astute reader may have noticed that all examples of eFRs embedded under modals were utilizing necessity modals, i.e. universal quantifiers over possibilities. This was intentional, as the data in case of possibility modals is somewhat subtle, and also because these occurrences provide a good test bed for our analysis. Consider the following examples:

- (55) a. You may pick whatever flower you want (to pick).
 b. $\diamond_o wh\text{-}ever_x [flower_addr_wants(x)] [pick(x, addr)]$
- (56) a. You may pick whatever flower blooms first.
 b. $\diamond_o wh\text{-}ever_x [flower(x) \wedge blooms_first(x)] [pick(x, addr)]$

Both sentences have implications that are very similar to the ones under necessity modals: The sentences indicate that the permission does not depend on the identity of the referent of the eFR. Does the presented analysis capture this fact?

This is where the post-suppositional analysis, motivated independently above, really shines: Consider what would happen if the supposition contributed by **-ever** would be a garden-variety presupposition, i.e. a variation condition on the input context: (55) would be predicted to merely presuppose that the (circumstantial) facts that fix the domain of the modal do not determine which flower the addressee wants to pick. But that would be compatible with the permission being about a specific flower, i.e. with the addressee picking the same flower (if any) in all of the obligation-optimal worlds. For sure, this flower would not be the flower the addressee wants to pick in all those worlds, but, unlike a necessity modal, a possibility modal only requires that there be only *one* world that satisfies the embedded formula. Thus, if **-ever** would contribute a *presupposition*, (55) would be true if there is *one* obligation-optimal world in which the addressee picks the flower he wants.

The post-suppositional analysis, by contrast, does require something stronger: Namely that there be *multiple* worlds in which the addressee picks distinct flowers which, at the respective worlds, are the flowers he wants to pick. Further, in Section 4, we will see that it is plausible that the content of the post-supposition is slightly stronger than assumed so far: Instead of simply requiring variation in reference in the post-context, we will require that a set of contextually specified sub-concepts of the eFR are compatible with the output context. In the case of (55), we then predict that for every such sub-concept, there is an accessible world at which the addressee picks a flower falling under this sub-concept. As the sub-concepts will be required to exhaustively cover the domain of the FR, this goes some way to explain the impression of *free choice permission* in the case of (55) (though not in (56), which seems appropriate).

3.4.4 Plural eFRs

The current account has a problem accounting for an observation most clearly formulated by Condoravdi (unpublished), though one might construe some of Dayal's (1997)'s remarks in a similar vein: "Modal implications can disappear with plural free choice free relatives."

A relevant example of Condoravdi's is

- (57) I already returned whatever books you lent me.

The analysis presented above does not predict that this sentence can be used without conversation-directed effects (if read episodically), because I am not entirely convinced (nor am I convinced of the opposite) that the sentence really is appropriate if there has been only one lending and returning event and all participants in the conversation are in explicit agreement about which books were lent. However, we have to assume such a context to ensure that (57) is neither an instance of what I have called conversation-oriented uses, nor an embedded use. More investigation is necessary, so I content myself here with noting that, if Condoravdi's observation holds, we can account for such easily by weakening the condition imposed by **wh-ever** slightly, and define:

Definition 17 (eFRs, modified version allowing for implication-less plural eFRs).

$$s [wh\text{-}ever [\phi, \psi]] s' : \iff s [\lambda_x [\phi, \psi]] s' \\ \& \exists i, j \in s' : \exists d \in D : d \neq i(x) \& d \sqsubseteq j(x)$$

With this, the requirement imposed by *-ever* becomes vacuous if there is a possibility in the input information state at which the eFR refers to a plural entity (which will be ensured in the case of (57) by the plural number marking on **books**), as then this possibility can serve both as witness for *i* and *j* in the definition.

In the sequel, I will, for the sake of simplicity, work with the initial definition.

3.5 Summary

In this section, I introduced an update semantics that allows for the representation of plural individuals as well as a classical analysis of modals, and showed that the contribution of **-ever** can be stated in such a system in a uniform way closely paralleling a Heim/Beaver-style analysis of presupposition. Like presuppositions under such an analysis, the update of a sentence containing an eFR will lead to undefinedness if the condition **-ever** imposes is not fulfilled, requiring (global) accommodation. Thus, if it is not yet part of the common ground that Paul is uncertain as to who won the race on an occasion of utterance of (58), I assume that this problem can be as easily overcome as the problem of interpreting (59) in a context in which it has not yet been established that Paul thinks that France has a present king:

(58) Paul thinks that whoever won the race will get lucky tonight.

(59) Paul thinks that the king of France will get lucky tonight.

In both cases, interpretation will succeed effortlessly if the conversational context is *compatible* with the presupposition of the sentence (in which case accommodation will be possible by simply restricting the input context to the possibilities satisfying the presupposition), but will fail (on pain of infelicity) if the presupposition (that Paul is uncertain who won and that Paul thinks France has a king, respectively) is incompatible with the common ground, thus explaining the cases of infelicity demonstrated in Section 2.

4 Two Complications

In this section, I present and address two empirical inadequacies of the analysis presented so far. Both are consequences of the preliminary simplification made at the beginning of Section 2: The equation of resolvedness with constant reference. Indeed, we will see that the appropriate notion of 'resolvedness' is context-dependent, thus belying the claim advanced in Section 2 that the interpretation of eFRs in embedded contexts does not depend on context. Taking the facts discussed in the present section into account, the claim has to be refined: The interpretation of eFRs under embedding does not depend on context in the way von Stechow suggests (i.e. by featuring a covert, context-dependent modal), but in another way, more similar to the way the meaning of knowing-wh constructions depends on context.

To a certain extent, the issues addressed in this section are orthogonal to the main point of this paper: That accounting for certain kinds of (apparently) modal implications of (certain) free-choice items, can be achieved by assuming very simple meanings for them, and let standard notions of formal semantics and

appropriate pragmatic inferences do the work. However, if this argument is to be convincing, we have to convince ourselves that such an account is workable in view of the full range of the data.

4.1 When Two Individuals Are Not Enough: Condoravdi's Problem And Her Solution

Condoravdi (unpublished) raises a problem for any account that equates the unresolvedness signaled by an eFR with non-constant reference. The problem can be easily appreciated with respect to our initial example, repeated below as part of (60): All we need to do is furnish a conversational context in which the participants are in explicit agreement that Arlo is cooking a particular dish:

- (60) A: Arlo is cooking ratatouille.
B: Yes, that is right.
A: [So,] What#ever he is cooking is vegetarian.

An analysis of eFRs should be able to predict the infelicity of *-ever* in this situation. As it stands, however, the analysis developed in the previous section does not do the job: Suppose in the given context, it is still unresolved whether Arlo is cooking the kind of ratatouille that contains more onions than tomatoes, or the kind that contains more tomatoes than onions. In this situation, the variation requirement as formulated in Section 3 will be satisfied, hence *-ever* should be felicitous. But it is not. In the described situation, one would have to say:

- (61) Whatever ratatouille he is cooking is vegetarian.

Does that mean that the use of *-ever* is infelicitous, if the property denoted by the free relative is not the most specific one? No:

- (62) Arlo is cooking something vegetarian. Whatever he is cooking smells delicious.

In (62), even though something is known about what Arlo is cooking, the eFR is fine. We do not have to utter the mouthful (62) in order to make the same statement.

- (63) Whatever vegetarian dish Arlo is cooking smells delicious.

We may suspect that the problem is one of ontology: While **ratatouille** denotes a 'sub-kind' of dish (in the relevant sense), the same is not true for **vegetarian dish**. However, pushing semantic problems into the ontological realm should always make one suspicious: Having the ontology perform magic is just too easy a way out.

What's more, assuming that the ontology takes care of the problem does not account for the context-sensitivity of the phenomenon: (64) can be felicitous in a situation in which it is known that the thing in Josh's bag is a tool; if, and only if, the different kinds of tools it could be (a hammer, a screwdriver, an English wrench) are relevant to the current conversational purposes:

- (64) Maybe we can use whatever is in Josh's bag to pry open the lock.

Thus, it seems that what makes (60) so irrevocably bad is that it is hard to come up with a context in which the difference between kinds of ratatouille are relevant.

It seems that we need a way to let in the right kind of context-sensitivity. Ontology is not really sensitive to context, but conceptualization arguably is: Condoravdi suggests that we can derive a set of alternative properties from an (extrinsically given, context-dependent) concept hierarchy. How this is done exactly does not need to concern us here (though see Condoravdi's paper for details). All that matters is that, with every eFR denoting a property P and a set of worlds w , we will get a set of alternative properties $Alt_w(P)$, with the following properties: (i) every $P' \in Alt_w(P)$ will be a *sub-property* of P , i.e. for all x at all worlds $w \in W : P'_w(x) \Rightarrow P_w(x)$ and (ii) the members of $Alt_w(P)$ will be pairwise incompatible, i.e., for no two $P', P'' \in Alt_w(P)$: there is a world w and an individual x such that $P'_w(x)$ and $P''_w(x)$ at any w . If P is the

property combining with (singular) *wh-ever*, the definiteness presupposition will ensure, together with (ii), that exactly one of the the members of $Alt_W(P)$ is instantiated at any $w \in W$.

In this way, Condoravdi can account for the previous examples in the following way: Assuming that an eFR signals not only non-constant reference, but rather that all properties in $Alt_W(P)$ are instantiated at some world in the common ground (and $Alt_W(P)$ is non-trivial, i.e., not a singleton) (60) is bad, because it is hard to find a context in which the difference between different kinds of ratatouille is plausibly relevant. Yet, all sub-concepts of **thing Arlo is cooking** are asserted by the first sentence to be sub-concepts of **ratatouille Arlo is cooking**. But then, relative to an individuation scheme that does not distinguish different kinds of ratatouille, the set $Alt_W(P)$ will be trivial.

Assuming that the notion of alternative properties is lifted to relations over information states (equivalently, dynamic formulas denoting such relations), we can incorporate Condoravdi's solution in the following way:

Definition 18 (eFRs, Condoravdi-style).

$$s [wh-ever_C [\phi, \psi]] s' : \Leftrightarrow s [\iota_x [\phi, \psi]] s' \\ \& \forall \phi' \in Alt_s(\phi) : s'[\phi'] \neq \emptyset$$

With this modification, Condoravdi's account and the account presented here become so similar (or can be made to be³⁶) that they become empirically indistinguishable. Indeed, from a certain point of view, with the above modification, my account can be seen as a way to implement Condoravdi's account in a way that allows for a unified statement of the contribution of *-ever*, while hers relies on stipulating two distinct kinds of 'discharge' to get embedded and conversation-oriented readings, which correspond to the satisfaction of the requirement in a local vs. the global information state in the current system).

The behavior that was captured by the analysis in the previous section³⁷ will arise as a special case, namely if the set of alternative properties are *constant individual concepts*, i.e. properties that each are instantiated by the same individual in all possibilities in the information state. In this case, the requirement that the alternative set be non-trivial will directly translate into the variation requirement of the previous section.

4.2 The Context-Dependency Of Identification: An Aloni (2001)-style Solution.

Heller and Wolter (2008) raise another issue for the formulation of an adequate variation requirement: Given a set of possible referents (i.e. assuming that the granularity problem raised by Condoravdi is solved), what precisely, counts as identification? They provide the following descriptive generalization³⁸:

What counts as indeterminacy? The entity satisfying an *-ever* FR is indeterminate if it cannot be identified.

- Naming an entity counts as identification (Case 1).
- Applying a nominal category counts as identification (Case 2)
- Applying a verbal or adjectival predicate does not count as identification (Case 3).
- Being in a position to use a demonstrative pronoun does not count as identification (Case 4)!

Now, we already saw a counter-example to the claim that 'applying a nominal category' counts as identification in the relevant sense: The felicity of (64) in a context in which it is commonly known that the thing

³⁶Condoravdi allows a certain kind of 'discharge' for her alternatives which produces counterfactual 'indifference' implications that the current approach does not generate: As I discuss in Section 5, I find it highly implausible to assume such counterfactual implications are directly contributed by the meaning of *-ever*. As Condoravdi points out (p.c.), if my view on this point turns out to be right, she can easily account for this, by effectively dropping a parameter from her analysis, simplifying her account.

³⁷Specifically, the revised version of Definition 17.

³⁸I cite from the handout accompanying their talk.

in Josh's bag is a tool (but, crucially, not which kind of tool, with differences between tools being relevant) demonstrates that the variation requirement of an eFR can very well be satisfied if the speaker is able to provide a (basic-level) common noun that applies to the referent of the eFR.

Here are two counterexamples to the claim that 'naming counts as identification':

- (65) [Having heard that some dude named John just talked trash about my best friend.]
I am going to beat up whoever (this) John is / is John.
- (66) [Approaching the area where the catering company is setting up, addressing the closest person.]
I have to talk to whoever is in charge. His name is Frank Miller.

Arguably, (66) *also* is a counterexample to the claim that being able to point someone out (using a demonstrative pronoun) does not, generally, count as identification in the relevant sense: The eFR is licit here because, even though I know the name of the person I am looking for, the sense in which I am ignorant about who that person is is precisely that I am not able to figure out which of the people in front of me it is.

Thus we see that Heller & Wolter's descriptive generalization does not hold, but the authors are wrong in a very illuminating way: It *is* true that the variation requirement of eFRs is not only sensitive to how we *individuate* concepts (as in Condoravdi's problem), but also as to how we *identify* individuals that fall under the respective concept, i.e. how we pick them out. However, in contrast to what Heller & Wolter suppose, it is not fixed once and for all which methods of picking out individuals count as identification; rather, this is a matter of context-dependency. But how can this context-dependency be modeled?

The problem is a familiar one: One instantiation of it can be found in **wh**-questions: In some contexts, (68a) will count as a resolving answer to (67), in others, (68b) will, but not in the same context.

- (67) Who is the President of the United States?
- (68) a. [In a civics class] Barrack Obama.
b. [At a masked ball at the White House] The guy over there. [points]

The problem extends to embedded questions: At the masked ball, 'John knows who the president is' will not be judged true in virtue of John knowing that the President's name is Obama. Conversely, being able to pick Obama out from a crowd will not be the (only) sense in which a civics teacher will want her students to know how the President is.

A very similar problem arises with belief reports, and, here, it is old enough so that there is a classic scenario:

There is a certain man in a brown hat whom Ralph has glimpsed several times under questionable circumstances on which we need not enter here; suffice it to say that Ralph suspects he is a spy. Also there is a gray-haired man, vaguely known to Ralph as rather a pillar of the community, whom Ralph is not aware of having seen except once at the beach. Now Ralph does not know it, but the men are one and the same.

(Quine 1956, p. 179)

Let us conform to Quine's practice of naming the man in question 'Ortcutt' (but assume that Ralph has never heard the name). Under these circumstances, which of the following sentences is true?

- (69) Ralph thinks that Ortcutt is a spy.
(70) Ralph does not think that Ortcutt is a spy.

It seems that the right answer is 'it depends'. But on what? It depends on how we identify or think of Ortcutt. If we think of him as the guy in the hat, (69) is true and (70) is false. If instead we think of Ortcutt as the guy on the beach, the reverse is true. Note that this is not an instance of what has been come to be known as the *de re/de dicto* distinction: Ralph has never heard the name 'Ortcutt', so he probably neither believes nor disbelieves the proposition expressed by **Ortcutt is a spy**, yet, it seems that both (69) and (70)

can rightfully be called true, but not because Ralph has incoherent beliefs: He is just under-informed, that is all.

Now, luckily for us, a common solution has been proposed for both kinds of problem (among a host of others) in Aloni (2001), and her solution can easily solve the problems for eFRs, too.

The first (more technical) move Aloni makes is to replace quantification over individuals with quantification over *individual concepts*, i.e. functions from worlds to individuals. The second move is to get at the notion of a *contextual perspective*, she restricts this quantification to contextually supplied sets of such concepts. But not just any sets, but sets with rather special properties:

Definition 19 (Conceptual Covers, Aloni (2001)). *Given a set of worlds W and a domain of individuals D , a conceptual cover CC based on $\langle W, D \rangle$ is a set functions $W \rightarrow D$ such that*

$$\forall w \in W : \forall d \in D : \exists! c \in CC : c(w) = d$$

Thus a set of concepts ‘covers’ a domain if every individual in this domain is picked out by exactly one of the concepts at any world. It is easy to check that any such cover has a number of nice properties, for example, its cardinality is the same as that of the domain it covers.

Before we move on to the case of eFRs, it is helpful to quickly recap how this solves the Orcutt problem (for details see Aloni (2001, Chapter 2)): Relative to a cover that includes the concept λw [the guy in the hat in w], (69) is true and (70) is false. Conversely, relative to a cover that includes the concept λw [the guy on the beach in w], (70) is true, but (69) is false. Further, the two can never be true under the *same* cover (contextual perspective): This is so because a set that includes both the concepts just mentioned will *not* qualify as a conceptual cover, as, in the actual world, both pick out the same individual.

We can make conceptual covers do the same work for us, in the following way³⁹

Definition 20 (eFRs, Aloni-style). *Given a conceptual cover CC ,*

$$s \left[\text{wh-ever}_A^{CC} [\phi, \psi] \right] s' : \iff s [\iota_x [\phi, \psi]] s' \\ \& \neg \exists c \in CC : \forall i \in s' : i(x) = c(w_i)$$

Thus, under this definition, *-ever* requires that the referent of the FR does not co-vary with any of the concepts in the contextually given cover CC . This gives us exactly what we want, for if there would be a concept in CC such that the eFR denotes the value of that concept in all worlds in the information state, this would mean that the referent is *identified* with respect to this cover.

As an example, reconsider (65), repeated below as (71a), which we can represent as (71b) (assuming we have a future modal \Box_{gt}).

- (71) a. I am going to beat up whoever (this) John is.
b. $\text{wh-ever}_x [x = \text{john}] [\Box_{gt} \text{beat}(sp, x)]$

This sentence *cannot* be felicitous relative to a ‘naming cover’ CC_n , because after updating with (71b), x will refer to the individual named *john* in all possibilities, i.e. the referent of x will co-vary with the concept $\lambda w [w(\text{john})]$:

$$CC_n = \{ \lambda w [w(\text{john})], \lambda w [w(\text{mary})], \dots \}$$

but it can be felicitous relative to a ‘deictic cover’ CC_d , provided that the input information state does not resolve whether the guy over here is John or the guy over there is John, etc.:

$$CC_d = \{ \lambda w [\text{the guy over here in } w], \lambda w [\text{the guy over there in } w] \dots \}$$

Finally, we observe that our previous analysis arises as a special case of the Aloni-style analysis, namely if the contextually supplied cover is the ‘rigid cover’:

³⁹It may seem like importing the apparatus of conceptual covers into our current system seems like overkill, and maybe it is (see the discussion in the next subsection). Note, however, that something like this is needed independently to solve the Orcutt puzzle in our present system, as well as the problem posed by the system validating the Barcan formula, as discussed in n. 32. This can be done easily by redefining quantification so that it makes use of a cover-parameter. See Appendix A for the relevant definitions.

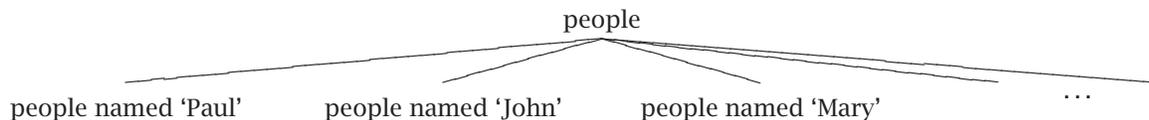


Figure 4: A (partial) naming hierarchy

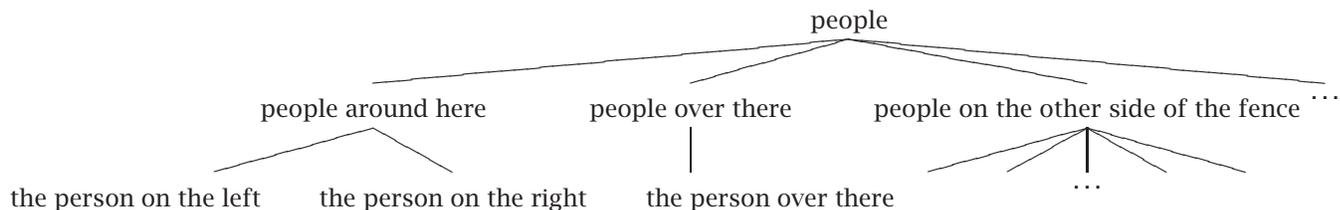


Figure 5: A (partial) deictic hierarchy

Fact 21. Let $C_{rig} = \{\lambda w [d] \mid d \in D\}$. Then
 $s [wh-ever_A^{C_{rig}} [\phi, \psi]] s' \iff s [wh-ever [\phi, \psi]] s'$

4.3 Two Birds With One Stone?

In the last two subsections, I introduced two modifications to the analysis presented in Section 3, addressing two related, though distinct issues: Condoravdi’s problem is a problem of *individuation* (‘Do *cooking ratatouille with more onions* and *cooking ratatouille with more tomatoes* count as cooking the same, or different things?’), while the problem raised by Heller & Wolter (and addressed by the use of Aloni-style covers) is one of *identification* (‘If I know the name of a person, does that mean I can identify the person, in the relevant sense?’).

Two questions naturally arise: (i) given that the two problems were given distinct solutions, are the two solutions compatible? and (ii) given that the solutions seem formally very similar, can we give a unified solution to both problems?

That the two solutions are formally very close can be easily seen: Any conceptual cover will contain only pair-wise incompatible, maximally specific concepts, i.e. conceptual cover can be construed to be the ‘bottom layer’ of a particular concept hierarchy: For an illustration, consider the two hierarchies in Figure 4 and Figure 5: For each hierarchy, the set of concepts decorating the leaf nodes (which is what is collected in Condoravdi’s alternative sets) is a conceptual cover. Thus we can characterize conceptual covers as the bottom layers of certain conceptual hierarchies, namely those hierarchies at which the leaves are *individual concepts*, i.e. concepts that are true of at most one individual at any world.⁴⁰

This just means that, as far as identification in eFRs is concerned, we can just use the definition of *wh-ever_C* to solve both Condoravdi’s problem of individuation and Heller/Wolter/Aloni’s problem of identification, by assuming that the contextually-specified concept hierarchies not only vary in *grain-size* of the distinctions at the bottom layer, but also in the way they cut up the domain into smallest pieces, an assumption that Condoravdi (unpublished, and p.c.) makes anyway.

Regarding the corresponding identification-problems with respect to modals and questions discussed by Aloni, I will not spell out how Condoravdi’s, more general, solution can be formally implemented to solve these problems as well. That this would be a fruitful enterprise can be easily seen by considering that *knowing-what* questions show the same dependency on the contextually relevant grain-size as eFRs: (72)

⁴⁰This is assuming that any concept hierarchy completely covers the domain of individuals, i.e. that every individual will fall under at least one of the leaf-concepts, since concepts on the same level are assumed to be pairwise incompatible, this means that every individual will fall under exactly one leaf-concept.

will often be judged true if John knows that Arlo is cooking ratatouille, but is not aware which specific sub-type thereof. Aloni's account cannot address this problem, but a suitable implementation of Condoravdi's solution could.

(72) John knows what Arlo is cooking.

A promising way to further spell out the dependence of grain-size and identification on context, and an alternative way to solve the problem in the current analysis is suggested by the work of van Rooij (2003), who shows that, in the case of questions, both problems can be solved by relativizing the interpretation of questions to *decision problems* the questioner faces. How exactly such a solution could be made to work for other phenomena such as modals under quantifiers and eFRs needs to be spelled out, but there does not seem to be any obvious hindrance to either deriving Condoravdi-style concept hierarchies from decision problems or relativizing the interpretation of the relevant items directly to decision problems.⁴¹

5 Loose Ends, And A Conclusion

5.1 Post-Suppositions For The Whole Family (Of -ever-like FCIs)

This section shows how the post-suppositional analysis of eFRs developed in Sections 3 and 4 directly accounts for a range of free-choice items in a number of languages, thus lending some support to the claim advanced in the introduction of this paper that these form a natural class. Along the way, I will discuss some other accounts of these items, thus situating the current analysis in the intellectual landscape surrounding the study of free-choice, and argue that the present account compares favorably to extant analyses.

5.1.1 Spanish *algún*

Consider the following Spanish example (from Alonso-Ovalle and Menéndez-Benito (2008), henceforth: AM):

(73) María se casó con algún estudiante del departamento de lingüística.
María SE married with ALGÚN student of department of linguistics.
'María married a Linguistics student'

along with AM's description of the implication that (73) has, in contradistinction to the same sentence with **un** ('a/some') in place of **algún**:

In a possible world semantics, the ignorance component of sentences like [(73)] can be modeled by saying that **algún** imposes a constraint on the set of worlds compatible with what the speaker believes, namely that María didn't marry the same Linguistics student in all those worlds. When **algún** is in the scope of an intensional operator, it imposes the same type of constraint on the worlds that the operator quantifies over.

Alonso-Ovalle and Menéndez-Benito (2008)

This surely sounds a lot like our description of eFRs. In particular, it suggests that **algún** can have an analysis exactly parallel to the one hypothesized for eFRs:

⁴¹The latter may seem especially promising in a dynamic setup such as the current one, as both Michael Franke (p.c.) and I independently have recently started to explore the idea of letting the possibilities in an information state include decision problems, thus allowing *uncertainty* about what the underlying decision problems of the conversants are. The obvious benefit of such a view is that it allows us to construe certain kinds of utterance modifiers (e.g. appositives, modal particles, relevance conditionals) as *clues* towards the decision problem that a certain utterance is supposed to address, thus giving some formal content to the intuitive notion in which these modifiers indicate 'how the content is to be taken'. See Franke (2007) for a semiformal exploration of these ideas for the case of relevance conditionals.

Definition 22 (Spanish **algún** as a post-suppositional operator). *Let $s, s' \in I, \phi, \psi \in L$, then:*

$$s[\text{algun}_x[\phi][\psi]]s' : \iff s[\exists_x[\phi \wedge \psi]]s \\ \& \exists i, j \in s' : i(x) \neq j(x)$$

The only difference to the initial definition of eFRs in Section 3 is that the \neg -operator in the ‘asserted’ part is replaced with an existential quantifier. The post-supposition will have the same kinds of interpretational effects we encountered before: When not embedded, it will mark the fact that restrictor and scope of the sentence do not conspire to single out a unique individual, triggering implicatures of ignorance, irrelevance, or, as the case may be, non-cooperativity. In an embedded context, **algún** will impose the familiar variation requirement on the domain of the embedding operator, yielding the correct results in embedding under modals. Whether **algún** also can contribute a variation requirement on the domain of an adverb of quantification and individual quantifiers, as the analysis predicts, needs further investigation: AM do not make a claim either way.⁴²

How does the post-suppositional analysis compare to AM’s? AM take **algún** to be a simple indefinite, with the added requirement that a contextually given *domain-selection function* f select a non-singleton domain (thus ruling out ‘specific’ readings). Then, they invoke pragmatic reasoning of the same kind invoked by Kratzer and Shimoyama (2002) in order to derive the interpretational effects (both for embedded uses as well as unembedded uses, in contrast with the present proposal, which only derives the interpretational effects of *unembedded* uses, i.e. conversation-directed effects, as implicatures). We will see in the next subsection that the pragmatic reasoning envisaged by Kratzer and Shimoyama is not quite up to perform this job. Consequently, AM’s account in terms of the same reasoning has similar problems that the current analysis avoids.

5.1.2 German **irgend-**

Kratzer and Shimoyama (2002) (KS) develop an account of German **irgend-** indefinites that relies on the notion of *domain widening*, much like the influential account of English **any** advanced by Kadmon and Landman (1993). Thus they suppose that the meaning of **irgend-** consists in a pragmatic instruction to extend the domain of the indefinite it combines with, so as to include individuals that otherwise might have been ignored. This may seem plausible, given occurrences like the following, where the **irgend-** indefinite occurs under the scope of a deontic modal:

- (74) Maria muss irgendeinen Arzt heiraten.
 Maria must IRGEND-one doctor marry.
 Maria has to marry a doctor.

(74) has two readings: On one, the wide-scope reading, it says that there is a specific doctor that Maria has to marry, while indicating, in the by now familiar manner, that the speaker does not know or care which doctor it is. On the other, narrow scope, reading, the sentence appears to convey that every doctor was a permitted marriage option. KS: “**Irgendein**, unlike simple **ein**, induces maximal widening of the domain, as Kadmon and Landman have observed for English **any**. In our example, there has to be a propositional alternative ‘Mary marry x ’ for each and every man x .”

There is ample reason, however, to think that **irgend-**, if it directly contributes domain-widening at all, does not induce *maximal* domain-widening. Thus consider the behavior of **irgend-** under epistemic modals, which KS do not address in any detail. The following is the translation of one of AM’s Spanish examples, with **irgendein** in place of **algún**:

- (75) Juan muss in irgendeinem Raum in diesem Haus sein.
 Juan must in IRGEND-one room in this house be.
 ‘Juan must be in some room in this house.’

⁴²Tania Ros-Esponda (p.c.) confirms that, indeed, the readings of **algún** under quantifiers over individuals and adverbs of quantification predicted by my analysis seem to be available.

With respect to the Spanish version of (75), AM write:

If *algún* were a Free Choice indefinite, we would expect the sentence in (5) to convey that Juan may be in any of the rooms of the house (for every room r there should be some world compatible with the evidence of the speaker in which Juan is in r . That is, the speaker should be completely ignorant as to which room Juan is in.) To see that this is not the case, consider the scenario below:

- (76) SCENARIO: HIDE AND SEEK. María, Juan, and Pedro are playing hide-and-seek. Juan is hiding. Pedro believes that Juan is not hiding in the garden or in the barn: he is sure that Juan is inside the house. Furthermore, Pedro is sure that Juan is not in the bathroom or in the kitchen. As far as he knows, Juan could be in any of the other rooms in the house.

From their observation that the Spanish version of (75) would be a felicitous utterance, AM conclude that Spanish *algún* is not a 'free-choice indefinite', i.e. not of the *irgend*-kind.

This conclusion is premature: The German (75) would be perfectly fine in the described scenario. Indeed, (77) is a rather typical use of *irgend*- under an epistemic modal:

- (77) [After having turned large parts of the room upside-down.]
a. Mein Schlüssel muss irgendwo in diesem Raum sein!
My key must IRGEND-where in this room be
'My key must be somewhere in this room!'

(77), being uttered in the middle of a frantic search operation, clearly does not require or entail that any location in the room in question is a live epistemic option: A large number of places has already been unsuccessfully searched.

The observation holds more generally: Neither (75), nor (78) or (79) require that every room in the house is a live possibility.

- (78) Juan ist in irgendeinem Raum in diesem Haus.
Juan is in IRGEND-one room in this house
'Juan is in some room of this house.'
- (79) Juan könnte in irgendeinem Raum in diesem Haus sein.
Juan could in IRGEND-one room in this house be
'Juan could be in some room in this house.'

(79) also shows a striking difference with English *any* in this respect: (80), arguably, is only felicitous (true?) if *every* room is a live option.⁴³

- (80) Juan could be in any room in this house.

I conclude that German *irgend*- indefinites are much more similar to Spanish *algún* than the reading of KS's paper may suggest⁴⁴, and that *irgend*-, like *algún*, does induce only rather weak domain-widening, if any⁴⁵. Thus I propose to analyze *irgend*- in pretty much the same fashion as suggested for *algún* above:⁴⁶

⁴³There is a further difference between (79) and (80). The latter, but not the former, strongly suggests that Juan indeed must be in one of the rooms in the house, while the former only mentions this as a possibility. I leave it to an analysis of *any* to explain this difference.

⁴⁴There is one obvious difference between the two: *algún* may also be used to indicate that the speaker is uncertain as to *how many* individuals satisfy the scopal property (see AM for details), which is not possible for *irgendein*. I suspect that this difference is due to the fact that *irgend*- indefinites carry (typically, but not always, singular) number marking, while *algún* does not.

⁴⁵Hence the title of AM's paper 'Minimal Domain-Widening'.

⁴⁶It is possible that *irgend*- and *algún* still differ in that the former is sensitive to alternatives computed along a contextually given dimension, as suggested by Condoravdi for eFRs, while the latter only demands lack of identification, i.e. it might be that the perceived widening is more minimal with *algún* than with *irgend*-, which could be captured by adopting the modifications proposed in Section 4 for *irgend*-, but not for *algún*. Alonso-Ovalle and Menéndez-Benito (2004)'s discussion also suggests that *algún* may be less sensitive to variation in contextually relevant means of identification à la Aloni. This issue needs more investigation.

Definition 23 (Irgend- indefinites). Let $s, s' \in I, \phi, \psi \in L, Q$ an existential quantifier, then:

$$s[\textit{irgend-}Q_x[\phi][\psi]]s' : \Leftrightarrow s[Q_x[\phi \wedge \psi]]s \\ \& \exists i, j \in s' : i(x) \neq j(x)$$

Again, the question arises how this compares to KS's analysis. As indicated above, to derive the whole set of perceived implications, KS rely on conversational implicatures generated on the basis of the observation that the speaker used a domain-widener (**irgend-** in their analysis), not only to derive the ignorance/indifference readings (as the current account proposes), but also to derive the effects in embedded uses. There are, however, some problems with their sketch of how these implicatures arise. This is not the place for a detailed discussion of these issues, but see Aloni and van Rooij (2007) for some relevant discussion. One crucial issue I want to mention here is that, problematically, domain-widening does not really figure in KS's implicature-computation: The same reasoning they outline for **irgend-** indefinites applies to plain indefinites. This, of course, is rather unfortunate, if these implicatures are to capture the effect of the addition of **irgend-**.⁴⁷

However this problem is solved, the solution must take care of the fact that modal implications can be completely absent in non-episodic sentences and sentences involving universal quantifiers, a prediction that the post-suppositional analysis in Definition 23 give us for free:

- (81) (Jedes mal) Wenn Maria etwas vom Abendessen übrig hat, gibt sie es irgendeinem Nachbarn.
every time when Mari something of dinner left has, gives she it IRGEND-one neighbor.
'When Maria has leftovers from dinner, she gives them to some neighbor or other.'
- (82) Jedes Mädchen hat irgendeinen Jungen zur Party eingeladen.
every girl has IRGEND-one boy to the party invited.
'Every girl invited some boy or other to the party.'

(81) has two readings: On one, Maria gives her leftovers to the same neighbor every time, with the speaker indicating that he does know, or care to say, who this neighbor is. On the other reading, Maria gives her leftovers to different neighbors on different occasions, with no implication of ignorance or indifference present. Similarly, (82) simply conveys that different girls invited different boys (or, alternatively, if they all invited the same guy, that the speaker is uncertain or does not care who this boy is). Given the results in Section 3, it should be clear that this is predicted by the current analysis.

The fact that the current analysis treats the implications of embedded occurrences and non-embedded occurrences in a non-uniform manner (by analyzing only the latter as conversational implicatures, while treating the implications in embedded uses as direct reflexes of the (suppositional) lexical meaning of **irgend-**) also directly accounts for the fact that **irgend-**'s implication behaves presupposition-like under embedding, but not in root clauses:

- (83) Hans weiß, dass Maria irgendein Buch gekauft hat.
Hans knows that Maria IRGEND-one book bought has
'Hans knows that Maria bought some book.'
- (84) Wenn Hans nicht wüsste, dass Maria *Barriers* gekauft hat, so wüsste er doch, dass sie irgendein Buch gekauft hat.
If Hans not knew that Maria *Barriers* bought has, so knew he still that she IRGEND-one book bought has.
'If Hans did not know that Maria bought *Barriers*, he still would know that she bought some book or other.'

⁴⁷There is a way to save KS's analysis in this respect, by assuming that the addition of **irgend-** has strong effects on the set of propositional alternatives used in the calculation of Q-implicatures. The same route is taken in Aloni & van Rooij's paper. This solution, however, leads to some serious conceptual problems that will be briefly discussed in the final section of this paper.

- (85) Wenn ich nicht wüsste, dass Maria *Barriers* gekauft hat, so hätte sie doch #irgendein Buch gekauft.
 If I not know that Maria Barriers bought has, so had she still IRGEND-one book bought.
 'If I did not know that Maria bought *Barriers*, she still would have bought some book or other.'

(83) has a reading on which it conveys that Hans knows that Maria bought a book, but does not know which one. (84), on the other hand, carries no such implication, in fact the antecedent arguably implicates the opposite, i.e. that Hans does know what she in fact bought, the ignorance implication is filtered out. The same does not happen with (85), hence **irgend-** is infelicitous as the speaker just has identified what Maria bought.

Thus the current analysis does a rather good job in accounting for the behavior of **irgend-** indefinites, while KS's solution has some shortcomings. The current section glossed over some details in the analysis of **irgend-**, to be addressed at another occasion. Among those is the behavior of **irgend-** in downward-entailing contexts. KS claim that **irgend-**'s contribution vanishes in these contexts, which they take to be a good argument to derive its free-choice implications as implicatures⁴⁸.

- (86) Niemand hat irgendwen verprügelt.
 No-one has IRGEND-one beat-up.
 'No one beat up anyone.'

For now, I want to leave it as an open question whether (86) does not, indeed, have free-choice implications. What *is* clear is that (86) does not mean that no-one beat up someone about whose identity the speaker does not care or know. But *that* only shows that the free-choice implication is not part of the asserted content, which the current analysis predicts. I do want to note that (86), to me, seems infelicitous in a context in which the parties to the conversation are in agreement that there was at most one beating which involved two specific people, a (weak) prediction that the current account is able to accommodate.

5.1.3 English some

This section argues that some of the interpretational effects⁴⁹ of English **some** (in particular in its unstressed version **sm**) can be fruitfully analyzed as involving an eFR-like post-supposition.

Farkas (2002b), and the end of descriptive review of the facts, ends up with the following characterization for (singular) **some** (see her paper for motivating examples): **Sm** contributes a variable that is marked as being *unidentified*, where

A variable is unidentified in a context iff the values it is assigned in various possibilities in that context are not necessarily the same. A variable may be unidentified either because there is not enough information in the current context to identify it or because it is unidentifiable in principle. The former situation obtains either because the speaker does not possess the required information to identify the variable or because she judges it irrelevant to the purposes of the conversation to provide it. A variable is unidentifiable in principle if it has narrow scope relative to dispositionals, certain modals or conditionals.

⁴⁸Kratzer (2005) goes so far as to state, somewhat puzzlingly, that disappearance in downward-entailing contexts is "the most reliable test for diagnosing conversational implicatures".

⁴⁹Others will be ignored. For example, I will not address the apparent positive-polarity nature of **some**, which seems to be more of a preference for outscoping negation than a hard grammatical constraint, in particular **some** in the immediate scope of negation is typically fine in downward entailing contexts Szabolcsi (2004). I will also ignore the fact that **some** cannot be 'unselectively bound':

- (i) Some seagull eats fish.
- (ii) Usually, some Dutch guy is tall.

(i) cannot be read generically, and (ii) cannot be taken to mean 'Most Dutch guys are tall.' Similar restrictions apply to German **irgend-** indefinites. KS suggest a syntactic explanation for these facts.

By now, this characterization must sound familiar to the reader, and it suggests that a post-suppositional analysis may be appropriate to capture the meaning of **some**, along the familiar lines of **irgend-** indefinites:

Definition 24 (some). Let $s, s' \in I, \phi, \psi \in L$, then:

$$s[\text{some}_x[\phi][\psi]]s' : \Leftrightarrow s[\exists_x[\phi \wedge \psi]]s' \\ \& \exists i, j \in s' : i(x) \neq j(x)$$

This definition is too simplistic, as it would allow readings of **some** that are unattested (cf. n. 49). I assume this can be rectified by replacing \exists in the above definition by a more restrictive kind of quantifier, or deriving these restrictions as a pragmatic effect of the interplay of the post-supposition with the quantifier (preferably, of course, the latter, as this solution would non-stipulatively extend to **irgend-** indefinites).

In the case of **some**, we clearly need to make the modifications shown to be necessary for eFRs in Section 3: For one thing, the ‘non-identification’ constraint is clearly relativized to methods of identification, as shown by Alonso-Ovalle and Menéndez-Benito (2004). Condoravdi’s grain-size problem also recurs:

(87) Johann is cooking some German dish.

(87) is not felicitous if it is common knowledge that John is make *Käsespätzle*, regardless of whether it is known whether he makes the kind with onions or not.

How does the post-suppositional implementation of the analysis compare to Farkas’? Even though, in the passage quoted above, it really sounds as if the two possible ways in which a variable is unidentified are just two sides of the same coin, the implementation in Farkas (2002b) remains disjunctive: A variable is ‘unidentified’ in the relevant sense, if it co-varies with a quantifier that outscopes it, *or* if the speaker does not know what it refers to (or thinks it is irrelevant). The post-suppositional analysis keeps the general spirit of Farkas’ analysis, but implements in a different (and slightly more uniform) manner⁵⁰.

There also is further advantage the current formal implementation has over Farkas’, at least with respect to eFRs: In her system, referring expressions such as definite and indefinite noun phrases introduce *valuation constraints* that are largely independent from the descriptive content of the phrases that carry them. That means, however, that a naïve adaption of Farkas’ formal analysis to eFRs does not predict that the variation requirement is tied to the descriptive content: The two have to ‘take scope’ together. Recall (54a), repeated below:

(54a) Paul thinks that whoever won the race will get lucky tonight.

This sentence can mean that there is a certain person of who, in fact, won the race and of whom Paul thinks that he will get lucky tonight (wide-scope). Or it can mean that Paul is uncertain as to who won the race, but nonetheless thinks that the person who won will get lucky (narrow scope).

The sentence *cannot* convey, however, that Paul has a certain belief as to who won, while the speaker does not know or care who it is Paul thinks to have won (split-scope: descriptive content evaluated in situ, variation requirement satisfied globally). An analysis of eFRs in Farkas’ system would have to stipulate this constraint, while it falls out naturally from the system presented in this paper.

5.2 Not Caring Who: eFRs And Counterfactual Implications

We have seen that the post-suppositional analysis developed in Sections 3 and 4 does extends rather successfully to other items in the class of *-ever* like FCIs. Before I conclude, I want to briefly address a possible argument against the present account.

⁵⁰Farkas’ statement of the variation condition is already formulated as a *post*-condition and thus can be seen as partially anticipating the current analysis.

von Fintel (2000) claims that the implication contributed by **-ever** can be of a counterfactual kind. A relevant example is

(88) Paul just voted for whoever was on top of the ballot.

According to von Fintel, (88) can convey (89):

(89) If someone else would have been on top of the ballot, Paul would have voted for **that** person.

The present account does not straightforwardly predict such a strong counterfactual implication, and for a reason: There is no convincing evidence that these counterfactual implications, when they are perceived, are actually due to the presence of **-ever**, and there are indeed good reasons to doubt that **-ever** can directly contribute such implications. This section thus aims to establish that the non-prediction of implications like (89) is a virtue, rather than a vice, of the present account.

What would count as convincing evidence that **-ever** can contribute such a counterfactual implication? An occurrence in which we perceive a counterfactual implication with **-ever**, but not without it, and where the perceived counterfactual implication cannot be explained as the result of **-ever**'s non-counterfactual implications.

The latter condition immediately rules out a number of possible examples, where we clearly perceive counterfactual implications: An example is sentences about the future:

(90) I'll go wherever you go.

(91) I'll go where you go.

Now, (90) clearly suggests that if the addressee would go to another place than the one he actually goes, the speaker would go there as well. But this is predicted by the current analysis: Future sentences are always intensionalized. How exactly this is to be captured may be up to debate (i.e. whether we see future 'tense' as a quantifier over possible future courses of events, or as epistemic quantifiers over worlds with the same history as the actual one, or what have you), but that there is some quantification going on seems unquestionable. Then, it is clear that (90) is an instance of an embedded use, and the variation requirement will give rise to the perceived counterfactual implication: If it is not yet determined where the addressee goes, but the speaker is determined to go to the same place, then he does not care which place it is.

In general, if we want to establish the existence of counterfactual readings, we do well to look at unembedded cases, and in particular those in which the required 'indifference' is not one that can be ascribed to the speaker, as the perceived counterfactual implication *could* also be triggered by the speaker's signal that the identity is not relevant (and thus would be predicted by the current analysis). What we are out to establish here is the existence of counterfactual implications over and above the speaker-directed 'indifference'/irrelevance implications we have modeled already.

Another possible confound if we look at cases where the eFR is either embedded or the perceived implication is speaker-directed is indifference-through-ignorance uses:

(92) [After some confusion arose due to inconsistent statements about what the deadline for a specific course paper is.]

Whatever deadline is written on the syllabus is binding.

(93) Paul thinks that whoever won the race will get lucky tonight.

(92) does carry a strong indifference implication that may be described by a counterfactual, but in this case, this is clearly due to the fact that the speaker makes his announcement while signaling that he is uncertain as to what the deadline on the syllabus is. Similarly, (93) strongly suggests that Paul thinks that winning the race and getting lucky tonight are counterfactually dependent properties, but again, this is clearly due to the fact that he is asserted to have the belief he has, while not knowing who it is who won the race.

Another instance where embedded uses are not helpful in establishing the existence of counterfactual implications are cases in which the eFR occurs under non-episodic aspect (as is the case for many of the

examples Tredinnick (2005) cites as instances of the counterfactual implication):

(94) (In those days,) there was a lot of violence in whatever Parker wrote.

Again, here, any perceived counterfactual implication can easily be explained as a world-knowledge inference: Given that Parker wrote multiple things in the period in question, and whenever he wrote something, the thing he wrote was violent, we are prone to infer an explanation for this seeming regularity: Paul was a violent writer in those days. This explanation, in turn, will underwrite the counterfactual, but this is no reason to think that the counterfactual is part of the meaning of **-ever**. Similar things, *mutatis mutandis*, can be said for embeddings under individual quantifiers.

So, to recap, if we want to convince ourselves that counterfactual implications exist, we have to stay away from embedded contexts, including those with non-episodic aspect, and from cases where the counterfactual can be derived from the ignorance or indifference implicature that the current account predicts.

Further, we should stay away from sentences involving **just**, **simply** and similar scalar adverbs, because these trigger counterfactual implications even in the absence of **-ever** (95). The same is true for predicates like **grab** or **blurt** which predicate indifference of the agent to which they apply, see (96), which is a variant on one of von Stechow's examples.

(95) Paul just voted for the person on top of the ballot.

(96) Paul (just) blurted out what came to his mind first.

So, let us look at an episodic, unembedded occurrence of an eFR, where speaker-ignorance or speaker-irrelevance readings are ruled out, and where the potential counterfactual implication would be a highly plausible thing to convey. The discourse in (97) is an attempt at such a situation.

(97) Paul is a food critic who became famous by his ability to reliably evaluate the quality of a dish just by looking at it and smelling it. On a visit to his native town, he was meeting up with his old friends Mary, Jill and John, and each of them brought their signature dishes for him to try out. Unfortunately, he had caught a stomach bug and was feeling nauseous, and declined the offer. Not giving up, they begged him to try at least one of the dishes. Knowing what he is famous for, he was worried that the two friends whose dishes he would not taste might be insulted. He looked at the three standing there: Mary with her potato salad, Jill with her pan-seared tuna, and John with his Korean-style curry. Deciding that Mary was the one to get offended most easily, he tasted **what#ever Mary had brought**.

The long preceding context in (97) serves only to make plausible a situation in which the alleged counterfactual reading **he tasted what Mary had brought and if she had brought something else, he would have tasted that** is a sensible thing to say. If there would be any possibility to construe an eFR as communicating such a counterfactual, it should be possible in this context. But it is not, and as conversation-directed uses are excluded by the prior context, **-ever** becomes infelicitous.

To reiterate: If there were a way to construe an utterance containing an eFR as communicating a counterfactual (by setting contextual parameters in the right way), the final sentence in (97) should be felicitous, but it is not. This constitutes good evidence that there is no way to construe eFRs as conveying counterfactuals.

Of course, that is not to say that the *perception* that many utterances containing an eFR have counterfactual implications is mistaken: As explained in the course of pointing out which kinds of occurrences are *bad* arguments for the existence of counterfactual readings, many embedded and unembedded occurrences do license the reader to infer the truth of the corresponding counterfactual. This is what explains the intuitive plausibility of the claim that **-ever** conveys a counterfactual. But that is no reason to assume that counterfactual implications are or can be part of the *meaning* of eFRs.

The only candidates that are left for examples of genuine counterfactual implications are those involving a certain class of verbs which we may call 'verbs of intentional choice between alternatives', such as **choose**, **decide**, **vote for** and some uses of **use**, which do seem to implicate some kind of indifference when combined with an eFR, even if they are not modified with **just**:

(98) In yesterday's election John voted for whoever was on top of the ballot.

Two things are noteworthy: Firstly, it is really hard to get native speakers to read (98) as conveying anything but speaker-ignorance. Secondly, if these counterfactual indifference readings indeed exist with the predicates in question, the fact that they are confined to this narrowly defined semantic class of predicates suggests that what triggers the indifference implication in these cases is something in the lexical semantics of these predicates, rather than a property of eFRs per se. It would be possible, for example, to analyze (some uses) of these verbs as containing a hidden bouletic-like modality, which would directly explain the counterfactual implications under the current, post-suppositional account.

5.3 The Big Picture: FCIs And The Architecture Of Grammar

In the course of this paper, we have seen that a unified account of **-ever** free relatives is possible, using fairly standard tools of formal semantics, and that the presented analysis does naturally extend to a number of similar items across languages. The presented account crucially relies on certain conversational implicatures to explain the full range of the data, but does so only for 'conversation-directed' effects of eFRs, deriving embedded effects from the interaction of the lexical (suppositional) meaning of **-ever** with the embedding context.

I do think that the latter feature is a noteworthy one, and one that has some bearing on certain arguments that have recently been made concerning the nature of grammar and the proper place of pragmatic reasoning. Recently, several authors have advanced proposals to encode (certain kinds of) conversational implicatures in the grammar (ultimately, the syntax) of natural languages (Chierchia 2004, Chierchia 2006, Fox 2007), instead of deriving them 'post-grammatically', as it were, through general principles of cooperative communication. These proposals have been met with a host of counter-arguments, arguing that such a move is unnecessary (Sauerland 2004, Geurts 2009) and indeed makes false predictions (Greenhall 2008, Geurts 2009).

Interestingly, the existence of FCIs has been used as an argument in favor of the grammaticalization of implicatures (especially by Chierchia (2006)). At first glance, this is puzzling: After all, the issue raised by FCIs is an issue about conventional (or, if you will, grammatical) meaning, the question is: How does the meaning of FCIs differ from that of their non-FCI counterparts (for the cases examined here: German plain indefinites, English plain free relatives and definite descriptions, Spanish **un**)? How could an answer to *this* question conceivably bear on the question of whether certain inferences that seem to be non-grammatical in nature should be analyzed as grammatical after all?

The mystery is easily resolved if we look at some history: Recall that Kratzer and Shimoyama (2002) propose that the meaning of **irgend**-style FCIs generally involves implicatures, in embedded as well as unembedded occurrences. Recall also that their sketch of the Gricean reasoning that is involved is problematic in so far as it applies just as well to plain definites. Aloni and van Rooij (2007), noting this fact, provide an alternative derivation of the implicatures in question, not relying on domain-widening, but instead supposing that FCIs can *specify* the sets of alternatives that quantity-implicatures are calculated against (a similar move in fact could vindicate Kratzer and Shimoyama's account). Their account is formally explicit, and goes a long way to make sensible predictions, but it raises a serious conceptual problem: If we want to see the implicatures in question as properly Gricean, 'post-grammatical' inferences, how is it possible for the *conventional* meaning of **irgend**-style FCI to manipulate the alternative sets involved in calculating implicatures?

It is fairly natural, and harmless, to formulate a formal account of implicatures by invoking a set of alternative expressions that the speaker could have uttered, but did not. It is also fairly harmless to assume that this set contains a large number of alternative sentences (though relying on the assumption that it does *not* contain certain sentences is a more delicate matter). And it is even quite plausible to assume that the particular form of the uttered sentences can 'activate' certain alternative formulations by making them salient. But assuming that certain forms can *specify* these alternative sets (for example, in Aloni and van Rooij's case, specify that they should be closed under disjunction, while other items require them to be closed under conjunction) is a whole different story: For then, the employed alternative sets are no longer

arbitrary technical tools employed in the characterization of post-grammatical reasoning processes, they become *bona fide* objects that the grammar of natural languages can interface with and manipulate.

Chierchia takes this as his cue to take the existence of FCIs to lend support to the idea that implicature-computation is part of the grammatical system: For then, there is no mystery why grammatical devices have access to, and can manipulate, the alternative sets in question.

I suggest that we might want to hold the horses, step back a bit, and take the technical difficulties to derive the interpretational effects of FCIs at face value: Maybe all that these difficulties show is that these interpretational effects are not conversational implicatures. The only question, then, is how we can capture the conventional meaning of FCIs in a way that explains the interpretational effects they give rise to. This paper has presented an analysis that does just that, by analyzing the behavior of *-ever*-style FCIs as a direct reflex of the interaction of their lexical meanings with the embedding context, while analyzing conversation-directed effects as implicatures. It thus puts the respective aspects of the perceived meanings of these items where they, arguably, belong: The conventional part into the grammar, the conversational part into properly post-grammatical inference mechanisms.

The post-suppositional analysis thus shows that the existence of (*-ever*-style) FCIs is not an argument for the grammatization of Gricean reasoning: Their existence does not necessitate such a move. As such, this paper has a place among the number of publications showing that such a move is not necessary to derive things that have traditionally been thought of as implicatures (see references above), but it is complementary in that it makes the small point that such a move is not necessary to account for interpretational effects of (certain) FCIs, by arguing that these are *not* implicatures. Thus it seems that putting implicatures into the grammar turns out to be unnecessary, a welcome result given the mounting evidence that doing so leads to problematic, if not catastrophic, predictions.

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A Aloni-Style Quantification Under Conceptual Covers

In order to adopt Aloni's (2001) *quantification under conceptual covers*⁵¹, and thus solve the Ortcutt problem discussed in Section 4, we change how variables are interpreted at possibilities: So far, we have assumed (following GSV) that a variable x at a possibility $\langle r, g, w \rangle$ is interpreted by applying the composition of r and g to x :

Definition 25 (Interpretation of variables, GSV-version). *For any variable x and possibility $i = \langle r_i, g_i, w_i \rangle$*

$$i(x) = g_i(r_i(x))$$

This assumed that the composition of r and g is a map from variables to *individuals* in the domain. Instead, we now assume that the composition of r and g is a map from variables to *individual concepts*, i.e. functions from worlds to individuals, and define:

Definition 26 (Interpretation of variables, Aloni-style version). *For any variable x and possibility $i = \langle r_i, g_i, w_i \rangle$*

$$i(x) = [g_i(r_i(x))](w_i)$$

That is, we interpret a variable at a possibility by applying the individual concept selected by r and g to the world component of the possibility. The only thing left to do, then, is to adapt the definition of the existential quantifier so as to manipulate variable assignments that map variables onto concepts, rather than individuals. We do this by way of the notion of a *cc-extension* of a possibility:

Definition 27 (cc-extensions). *Given a possibility i and conceptual cover C , define:*

$$i[x|C] = \{i[x/c] \mid c \in C\}$$

With this:

Definition 28 (Existential Quantifier, conceptual cover version). *Given a conceptual cover C*

$$s[\exists_x^C \phi]_{CC} s' : \Leftrightarrow s' = \bigcup_{i \in S} LS(i[x|C], \lambda X. X \neq \emptyset \ \& \ \exists s'' : X[\phi]s'')[\phi]$$

For all non-existential formulas ϕ : $[\phi]_{CC} := [\phi]$.

⁵¹In chapter 3 of her dissertation, Aloni defines an update system with quantification under conceptual covers that is substantially different from the one defined here. Her system is mainly concerned with accommodating a Veltmanian analysis of **might** (and, in the same move, presupposition). Most of the problems for a cover-less dynamic system that she points out do not apply to the system in this paper, as it does not contain a Veltman-style *might* (and solves the presuppositional problems in a different manner). Accordingly, the introduction of conceptual covers here solely is to solve the problems for a modal predicate logic treatment of natural language language modalities (such as the Ortcutt problem), and is thus much closer to the (static) logic she defines in her Chapter 2.

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