Whether-questions and *ever*-free relatives

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Abstract

Know whether sentences and *ever*-free relatives have not been discussed in connection with each other, but they have similar contextual acceptability conditions. This work offers an explanation of these similarities based on well-established pragmatic principles. These constructions are proposed to evoke equally informative alternatives with stronger presuppositions, and when such alternatives are salient, the use of a *know whether* sentence or a sentence containing an *ever*-free relative requires the presuppositions of all of its alternatives not to be satisfied, a consequence of Heim's (1991) Maximize Presupposition. This gives rise to an ignorance requirement for unembedded occurrences of these constructions and other types of requirements for embedded occurrences as a result of how their presuppositions project. Although the implications of *ever*-free relatives are typically analyzed as a grammatical component of their meaning, this work argues that a pragmatic explanation provides better empirical coverage.

1 Introduction

1.1 Ignorance requirements

There are many previously undiscussed similarities between *whether*-questions embedded by factive predicates like *know* and *ever*-free relatives, particularly in the contextual constraints on their use. In certain discourses, a *know whether* sentence is unacceptable when the answer to the *whether*-question is common knowledge. (1), based on Eckardt 2007: 448, shows this.

(1) A: We can't meet on Monday because there will be a talk
  B: Ok, should I tell Elsie?
  A: No need, Elsie knows {??whether, that} there will be a talk

Likewise, in certain discourses, an *ever*-free relative (hence, EFR) is unacceptable when the identity of the EFR's referent is common knowledge. This property has been characterized as an ignorance requirement on the part of the speaker, illustrated by EFRs' incompatibility with appositives specifying the identity of the EFR's referent, as in (2a) from Dayal 1997: 109 (also Elliott 1971: 82). In this respect, EFRs differ from free relatives without *ever* and *the*-definites as in (2b-c), which are compatible with such appositives.

(2) a. Whatever Mary is cooking (*namely, ratatouille) uses onions
  b. What Mary is cooking (namely, ratatouille) uses onions
  c. The dish Mary is cooking (namely, ratatouille) uses onions

von Fintel 2000: 29 shows that speaker-ignorance is not always an accurate characterization of the contribution of *ever*, given the acceptability of examples like (3) in contexts where the speaker knows exactly what they are cooking and is teasing the addressee.

(3) There's a lot of garlic in whatever (it is that) I am cooking

EFRs are also felicitous in discourses like (4) where each interlocutor is opinionated about the identity of the EFR's referent but they disagree (inspired by Heller & Wolter 2011: 177).

(4) *Context: Mary and Bill are each baking a pie, but they momentarily left the room. A and B enter and see two covered pies, one on the left and one on the right.*
  A: The pie that Bill is baking is the one on the left
  B: No, it's the one on the right
  A: Well, Bill is a vegan, so whatever pie he is baking is vegan

The unifying contextual condition for these types of examples is a lack of common knowledge. This is confirmed by the unacceptability of EFRs in contexts where the interlocutors agree on the identity of the EFR's referent, as in (5). Here, EFRs contrast with plain *the*-definites, though a basic pronoun is best, perhaps because it obviates repeating the NP.

(5)   *Context: Mary and Bill are each baking a pie, but they momentarily left the room. A and B enter and see two covered pies, one on the left and one on the right.*
      A: The pie that Bill is baking is the one on the left
      B: #Right, and whatever pie he is baking is vegan
      B': ?Right, and the pie he is baking is vegan
      B'': Right, and it's vegan

Note that some speakers may accept the EFR in B's response, with an implication that B doesn't know what type of pie Bill is baking (not that he doesn't know which of the two covered pies he is baking). This observation will be explained in the proposal.

In the rest of this work, when 'ignorance' requirements are discussed, the ignorance referred to is a lack of common knowledge. The same point can be made about *know whether*. Minimally changing Eckardt's original example so that the answer to the *whether*-question is not common knowledge makes the *know whether* sentence uncontroversially acceptable, as in (6). Further, Paillé & Schwarz 2018: 7 discuss acceptable uses of *know whether* sentences in contexts where the speaker knows the answer but the addressee does not, as in (7).

(6)   A: Can we meet on Monday, or will there be a talk?
      B: Ask Elsie. She knows whether there will be a talk

(7)   Game show host: Aisha knows whether Ben is Canadian, and so do I. Now I want *you* to find out whether he is.

Finally, in contexts of disagreement like (8), the *know whether* sentence is acceptable. Taken together, these facts imply that the relevant factor conditioning unacceptability in the original discourse is the fact that the answer is common knowledge.

(8)   A: Let's meet on Monday since there won't be a talk.
      B: No, we can't meet then. There actually is a talk.
      A: You're wrong, just ask Elsie. She knows whether there will be a talk.

For the answer to a *whether*-question to be common knowledge is a fairly intuitive notion; it means that the interlocutors believe the proposition that is the true answer to the question (and believe that their interlocutors believe it as well). On the other hand, it's less

clear what it means for the identity of an EFR's referent to be known, and accordingly, what it means for the use of an EFR to require the identity of its referent *not* to be known. The various positions taken in the literature will be discussed in Section 3; following Condoravdi 2008, 2015, it will be shown that ignorance amounts to a requirement that no member of a set of properties be known to hold of the referent of the EFR.

1.2 Lack of ignorance

The similarities between the constructions extend beyond ignorance. (9) is an EFR-example from von Fintel 2000: 32, whose salient reading is not ignorance, given the unlikelihood that the speaker doesn't know what tool he or she grabbed. Lack of ignorance is confirmed by compatibility with an appositive. Following von Fintel, this will be called an *indifference reading* of the EFR and will be discussed further in Section 3.

(9)   I grabbed whatever tool was handy, namely, this hammer

Know whether-sentences and EFRs also have non-ignorance readings when they appear in the scope of *every*, with binding into the question or EFR. A speaker may felicitously utter such a sentence when the question's answer or the identity of the EFR's referent is common knowledge, so long as the question's answer or the identity of the EFR's referent varies across the domain of *every*. This is shown for *know whether* sentences by (10a-b). The answer to the *whether*-question is known in both (10a-b), but only in (10a), where the answer varies across the set of boys, is the use of the *know whether* sentence felicitous.

(10)   a. *Context: John, Bill, and Al are the boys. John and Bill get picked up after school, and Al walks home alone. Someone asks if they need to be reminded of this...*
           No need, every boy knows whether he will be picked up after school
        b. *Context: John, Bill, and Al are the boys, and they all get picked up after school. Someone asks if they need to be reminded of this...*
           No need, every boy knows {??whether, that} he will be picked up after school

Similarly, the identity of the EFR's referent is known in both (11a-b), but only in (11a), where the EFR's referent varies across professors, is the use of the EFR-sentence felicitous[1].

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[1](11a-b) have been called 'functional' answers to the question in the preceding context (Engdahl 1986 and many others). The idea is that the extension of the definite *whatever conference she first attended* is not an individual but rather an $\langle e, e \rangle$-function whose domain is those professors that attended a first conference and which returns for any x in its domain the unique first conference x attended. Under this view, the puzzle is that there is an unexpected constraint on the function: it cannot map every entity in its domain to the same conference. Here, it will be assumed that the definite has only an individual-type, and the observation will be explained without recourse to constraints on functional denotations.

(11) a. *Context: Mary, Sue, and Elsie are the professors. Conference A was Mary's first conference, Conference B was Sue's first conference, and Conference C was Elsie's first conference. Someone asks what conference every professor most enjoyed.*
Every professor most enjoyed whatever conference she first attended
  b. *Context: Mary, Sue, and Elsie are the professors, and Conference A was their first conference. Someone asks what conference every professor most enjoyed.*
Every professor most enjoyed {??whatever, the} conference she first attended

Naturally-occurring examples of *know whether* sentences in the scope of *every* are relatively hard to find, but the contrast between (10a-b) seems clear. On the other hand, some naturally-occurring examples of EFRs in the scope of *every* with binding are given in (12). Such examples were first discussed in Lauer 2009: 8 (*W* means found online).

(12) a. It was pleasing to see the boys' developed cricket skills. With the pool of players (16 at any given match), giving everybody an opportunity to bat and bowl was always a challenge. We managed to get it right by the last game against Rondebosch where every boy contributed in whatever role he was asked to perform.*W*
  b. I picked up sandwiches for a few of my coworkers as well, and everybody loved whatever they ordered.*W*

While (12a) can be understood to imply a kind of indifference (i.e. every boy contributed, regardless of the role he was given) or less plausibly that the author is unaware of what role some or every boy was asked to perform, it certainly doesn't have to be understood that way. It can be understood to mean just that the boys were asked to perform different roles. (12b) is the same; it doesn't necessarily imply that the author is unaware of what their co-workers ordered or that the coworkers would have liked anything else they could have ordered. (12b) can be understood to mean just that the coworkers ordered different things.

1.3   Summary of proposal

Beginning with *know whether*, it is proposed that *know whether* sentences evoke alternative sentences containing declarative clauses in the place of the embedded question. These declaratives denote the possible answers to the *whether*-question. Because of the factivity of *know* when it embeds a declarative clause, each alternative presupposes the truth of the possible answer it embeds and contributes the new information that the subject knows this true answer. In contrast, the *know whether* sentence carries a logically weaker presupposition, which is the disjunction of the question's possible answers (cf. Dayal 1996), but it contributes

the same new information – that the subject knows the true answer, whichever it happens to be. Heim 1991 (described in Sauerland 2008) proposes a principle called Maximize Presupposition (hence, MP) that forbids the use of a presuppositionally weak alternative if its presuppositionally stronger and equally informative alternative can be used instead. This work claims that when a *know whether* sentence is used, MP requires the presuppositions of its alternatives to not be satisified, resulting in the ignorance implication. When the answer to the *whether-question* is common knowledge, the presuppositions of an alternative with an embedded declarative are satisfied and the presuppositionally weaker *know whether* sentence is unacceptable. Embedding under quantifiers with binding into the question affects the way presuppositions project, resulting in different ways of satisfying MP (e.g. with variation across the domain of the quantifier).

The analysis is then extended to EFRs. EFRs are Linkian definites, carrying presuppositions of the existence of a maximal entity (Jacobson 1995). For example, *Whatever pie Bill is baking is vegan* presupposes the existence of a maximal, singular pie that Bill is baking. Inspired by Condoravdi 2015 and the literature on *ever* as an NPI (Krifka 1995, Chierchia 2013, a.o.), it is proposed that *ever* denotes a contextually-determined property and evokes alternatives which denote a partition on *ever*'s value. As a definite, the EFR is presuppositionally weak, presupposing that the maximal entity has the general *ever*-property. However, it denotes the same entity as its alternatives, which presuppose that the maximal entity has some more specific alternative property. MP is relevant again, making an utterance of an EFR acceptable only if no alternative property is known to hold of the EFR's referent. Embedding under quantifiers with binding into the EFR affects the way presuppositions project, resulting in different ways of satisfying MP, hence different readings[2].

The main empirical contribution of this work is to identify the similarities in the constructions' implications. The explanation of these similarities aims as much as possible to draw on existing, independently motivated proposals about the syntax-semantics of *know whether* sentences and EFRs, together with well-established pragmatic principles. Thus, the theoretical component of this work is conservative, requiring nothing unusual to be assumed about the structure and denotation of *know whether* sentences (a slight modification is required for EFRs). The main theoretical argument, appearing in Section 3, is that a pragmatic account of the implications of EFRs is superior to a grammatical account.

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[2]The terms 'ignorance requirements' and 'ignorance readings' are used interchangeably (same with 'lack of ignorance requirements' and 'non-ignorance readings'). According to the analysis, these expressions have contextual acceptability requirements, but the EFR literature tends to talk about different readings of EFRs so the term will be used here as well. Readings, in the sense of implications of an utterance, can be derived from contextual requirements; the implications of an utterance, derived from its requirements, are the features that compliant contexts share i.e. the propositions that their common grounds have in common.

2 *Know whether*

2.1 Data

(13) is the discourse based on Eckardt 2007: 448, repeated from above.

(13)   A: We can't meet on Monday because there will be a talk
        B: Ok, should I tell Elsie?
        A: No need, Elsie knows {??whether, that} there will be a talk

How reliably do speakers reject *know whether* in (13)? According to Eckardt, '. . . informants who are confronted with discourse like in [(13)] usually show a strong dispreference for the pattern even to the claim that [(13)] is grammatically ill-formed. Upon closer reflection, they react by saying that an embedded *that*-clause would be the preferred option in this context.' Many speakers who were consulted reacted in this way, and the '??' in (13) represents their judgment. Interestingly, however, not all speakers have the same initial reaction. Some reported that the *know whether* sentence is fine, with comments that its use reports on Elsie having a general awareness of 'what is going on'. Although (14) produced a stronger reaction of unacceptability among many speakers, ultimately, there was again a minority of speakers who accepted *know whether* as a report of general awareness.

(14)   *Context: We are hiding from Elsie in a closet during a game of hide-and-seek, and I
        sneeze. Elsie immediately turns around and starts walking towards the closet.*
        Oh no, Elsie knows {??whether, that, ∅} we're in here!

The issue of variable judgments will be taken up again in the analysis. For now, the more common judgment of a contrast will be discussed, since it turns out to be the interesting one. It isn't explained by the basic meanings of the sentences, as usually characterized. *Know whether* sentences are commonly analyzed as meaning that the subject knows whichever answer to the question is true, as in (15) (e.g. Karttunen 1977).

(15)   Elsie knows whether there will be a talk
        Asserts: If there will be a talk, Elsie knows that there will be a talk, and if there
        won't be a talk, Elsie knows that there won't be a talk

In a context where it's known which answer to the *whether*-question is true, the assertive content of *know whether* and *know that*, with an embedded clause corresponding to the true answer, is the same. The assertion of (15) reduces to *Elsie knows that there will be a talk* when it's known that there will be a talk, by modus ponens. Therefore, on the basis of the

basic meanings of the sentences, it is surprising that a speaker would reject *know whether* but accept *know that*, given their contextual equivalence.

Knowledge of the answer to the *whether*-question is what conditions the judgment of unacceptability, as shown in the introduction. Thus, the first observation that this work aims to explain is that many speakers report an acceptability contrast between *know whether* and *know that*, conditioned by whether the answer to the question is common knowledge, and this contrast does not follow from the basic meanings of the sentences as usually characterized.

But as mentioned above, *know whether* sentences do not always require ignorance – for example, when *know whether* appears in the scope of a quantifier such as *every*. Likewise, *know whether* in the scope of *always* may be acceptable when the answer to the *whether*-question is known, so long as the answer varies across the situations quantified over by *always*. The answer is known in both (16a-b), but only (16a), which has variation, is acceptable.

(16) a. *Context: On the first two Mondays of this month, there was a talk at the depart-*
        ment, and on the other two Mondays, there wasn't. Mary had to tell Elsie when
        there would be a talk, but Elsie read the schedule for herself.
        Elsie always knew whether there would be a talk (when Mary came to tell her)
      b. *Context: Every Monday this month, there was a talk at the department. Mary had*
        to tell Elsie when there would be a talk, but Elsie read the schedule for herself.
        Elsie always knew {??whether, that} there would be a talk (when Mary came to tell her)

This contrast also cannot be attributed to a difference in the basic meanings of the sentences under standard views about *know whether* and the quantifiers.

2.2   Assumed denotations for *know whether*, *every*, and *always*

This section provides a more explicit statement of the meanings of *know whether* sentences. First, *know* is given the factive, proposition-selecting denotation in (17) (Hintikka 1969)[3].

(17) $[\![\text{know}]\!]^{g,c} = \lambda s . \lambda p_{st} . \lambda x_e : p(s) = 1 . \forall s'[s' \in \text{Dox}(x,s) \rightarrow p(s')]$
      where $\text{Dox}(x,s)$ is the set of situations compatible with what x believes in s

Next, inspired by Karttunen 1977, a question is taken to denote a function from situations to sets of true answers, which are themselves sets of situations. For example, the question

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[3]Expressions are interpreted relative to an assignment g and a context c. For exposition, an extensional system is assumed where situation arguments are supplied by situation variables in the LF (e.g. Percus 2000, von Fintel & Heim 2010). Following Heim & Kratzer 1998, '$\lambda\alpha : \phi.\gamma$' is read as the smallest function that maps any α such that ϕ to γ (or to true iff γ, whichever makes sense). This work will talk interchangeably between functions (whose type ends in t) and the sets such functions characterize.

whether there will be a talk denotes the function in (18) ('that there will be a talk' is a meta-language abbreviation for the set of situations in which there will be a talk).

(18) $[\![$whether there will be a talk$]\!]^{g,c} = \lambda s$. $\{p_{st} : (p = $ 'that there will be a talk' $\vee p = $ 'that there won't be a talk') $\wedge p(s) = 1\}$

There exist many views on how (18) is compositionally derived and how it combines with *know*. For the sake of explicitness, one proposal, inspired by Guerzoni & Sharvit 2014 and Dayal 1996, will be provided, though it will be shown that the puzzle and its eventual solution are independent of the assumptions about question LFs. The puzzle arises under any theory that assigns the *know whether* sentence its standard meaning. Here, (18) is taken to be derived from the elliptical disjunctive LF[4] in (20) (see also Larson 1985, Han & Romero 2004, Biezma & Rawlins 2012, a.o.) and the morpheme meanings in (19a-c).

(19)   a. $[\![\text{or}_4]\!]^{g,c} = \lambda p_{st}.\ \lambda q_{st}$. λs . $g(4)(s) = 1 \wedge (g(4) = p \vee g(4) = q)$
                                                                            (after Rooth & Partee 1982)

        b. $[\![?]\!]^{g,c} = \lambda q_{st}.\ \lambda p_{st}.\ p = q$ (Karttunen 1977)

        c. $[\![\text{whether}]\!]^{g,c} = \lambda Q_{\langle st,\langle st,t\rangle\rangle}.\ \lambda s.\ \{p_{st} : \exists r_{st}[Q(r)(p) = 1 \wedge p(s) = 1]\}$
                                                                            ((Guerzoni & Sharvit 2014))

(20)
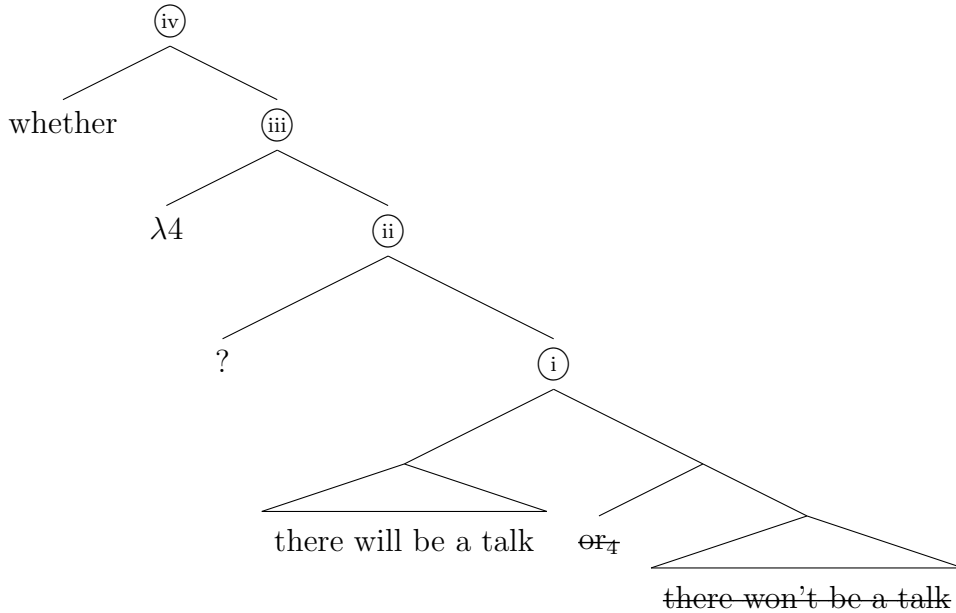
        a. $[\![\text{ⓘ}]\!]^{g,c} = \lambda s.\ g(4)(s) = 1 \wedge (g(4) = $ 'that there will be a talk' $\vee g(4) = $ 'that there won't be a talk')

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[4]λ-binders are interpreted by the rule of Predicate Abstraction (Heim & Kratzer 1998).

b. $[\![ⓘ]\!]^{g,c} = \lambda p_{st}. \; p =[\![ⓘ]\!]^{g,c}$

c. $[\![ⓘ]\!]^{g,c} = \lambda q_{st}. \; \lambda p_{st}. \; p = [\lambda s. \; q(s) = 1 \wedge (q =\text{'that there will be a talk'} \vee q = \text{'that there won't be a talk'})]$

d. $[\![ⓘ]\!]^{g,c} = \lambda s \; . \; \{p_{st} : \exists r[p =\lambda s \; . \; r(s) = 1 \wedge (r =\text{'that there will be a talk'} \vee r =\text{'that there won't be a talk'}) \wedge p(s) = 1]\}$

e. Equivalently: $[\![ⓘ]\!]^{g,c} = \lambda s \; . \; \{p_{st} : (p = \text{'that there will be a talk'} \vee p = \text{'that there won't be a talk'}) \wedge p(s) = 1\}$

Or_4 combines with the two disjuncts to return the proposition in (20a). This is taken as the input to the ?-morpheme, which returns the $\langle st, t \rangle$-function in (20b). Abstraction takes place above this node, resulting in the relation between propositions ($\langle st, \langle st, t \rangle \rangle$) in (20c). 'That there will be a talk' stands in this relation to itself, and 'That there won't be a talk' stands in this relation to itself, and no other proposition stands in this relation to any other proposition. Finally, this relation between propositions is the input to the function denoted by *whether*, which returns the question's desired meaning, the intension of the set of propositions that stand in the (20c)-relation to some proposition and are true.

In order for *know*, which requires a proposition, to combine with the question, the ANS-operator in (21) is assumed (cf. Dayal 1996, abstracting away from maximality). This operator combines with a situation s and a question-intension and returns the conjunction of all the question's true answers in s, so long as there is an answer (else, undefined).

(21) $[\![\text{ANS}]\!]^{g,c} = \lambda s \; . \; \lambda Q_{\langle s, \langle st,t \rangle \rangle} : Q(s) \neq \varnothing \; . \; \lambda s' \; . \; s' \in \bigcap Q(s)$

Putting these assumptions together, (22) is the LF and interpretation of *Elsie knows whether there will be a talk* (the disjunctive question LF is abbreviated). s_0 denotes an arbitrary situation in the context set supplied by c (abbreviated CS); for any context c, the CS of c is the set of situations compatible with the mutual beliefs of the interlocutors in c (cf. Stalnaker 1978). What Elsie is required to believe depends on what answer is true in s_0, so the assertion is a conjunction of implications.

(22)   Elsie knows whether there will be a talk

    a. LF: Elsie knows-s_0 ANS-s_0 whether there will be a talk

    b. Presupposes: There will be a talk or there won't be a talk

    c. Asserts: Elsie believes the true answer to whether there will be a talk

The relatively trivial presupposition is (22b) comes from ANS. Importantly, this basic meaning cannot explain the contrast between *whether* and *that* in (23). The *whether* sentence's

presuppositions are satisfied, and its truth is contingent on the same thing as 'Elsie knows that there will be a talk', namely, Elsie's beliefs.

(23)   A: We can't meet on Monday because there will be a talk
       B: Ok, should I tell Elsie?
       A: No need, Elsie knows {??whether, that} there will be a talk

Next, the assumptions about quantificational examples are presented. Universally quantified statements with *every* and *always*, as in (24)-(25), are commonly held to carry universal presuppositions (Heim 1983, more recently Chemla 2009, a.o.). Here, *always* is assumed to denote a universal that quantifies over situations in the extension of its contextually determined silent restrictor argument, C (cf. von Fintel 1994). This work remains agnostic as to how the general presuppositional and truth conditional statements in (25a-b) arise.

(24)   Every nation cherishes its king
       Presupposes: Every nation has exactly one king

(25)   Elsie always attends the talk
       Presupposes: In every relevant situation, there is exactly one talk

(26)   a. $[\![[[\text{every } \phi_{et}] \ \psi_{et}]]\!]^{g,c}$ is defined only if $\{x : [\![\phi]\!]^{g,c}(x) = 1\} \subseteq \text{Dom}([\![\psi]\!]^{g,c})$. When defined, $= 1$ iff $\{x : [\![\phi]\!]^{g,c}(x) = 1\} \subseteq \{x : [\![\psi]\!]^{g,c}(x) = 1\}$
       b. $[\![[[\text{always } C_{st}] \ \psi_{st}]]\!]^{g,c}$ is defined only if $\{s : [\![C]\!]^{g,c}(s) = 1\} \subseteq \text{Dom}([\![\psi]\!]^{g,c})$. When defined, $= 1$ iff $\{s : [\![C]\!]^{g,c}(s) = 1\} \subseteq \{s : [\![\psi]\!]^{g,c}(s) = 1\}$

By putting together the assumptions about universal quantifiers and *know whether*, it is evident that the basic meanings of the sentences under discussion do not explain the acceptability contrast between *know whether* and *know that* in contexts like (27) either.

(27)   *Context: John, Bill, and Al are the boys, and they all get picked up after school by their parents. Someone asks if the boys need to be reminded of this.*
       No need, every boy knows {??whether, that} he will be picked up after school
       a. LF: every boy-s_0 [$\lambda 1$ [t_1 knows-s_0 Ans-s_0 whether he$_1$ will be picked up after school]]
       b. Presupposes: Every boy is either picked up or not picked up
       c. Asserts: Every boy is such that if he will be picked up, he knows that he will be picked up, and if he won't be picked up, he knows that he won't be picked up

From the universal presupposition of *every* and the presupposition that the question has an answer in s_0 (contributed by Ans), the sentence as a whole presupposes that for every boy,

there is an answer to the *whether*-question in s_0, that is, that every boy is either picked up or not. The assertive content has it that every boy knows the answer to the *whether*-question. What this answer is depends both on the facts in s_0 and on which boy is under consideration. In other words, the conjunction of conditionals is evaluated for every boy. Since the context provides that every boy is picked up, the assertive content reduces to that of the declarative embedding sentence *every boy knows that he will be picked up*, by modus ponens. Given that the two sentences are contextually-equivalent, the contrast between *whether* and *that* can't be attributed to a difference in their basic meanings.

The contrast between *whether* and *that* in the situation-quantificational example in (28) is puzzling by the same reasoning.

(28)　*Context: Every Monday this month, there was a talk at the department. Mary had to tell Elsie when there would be a talk, but Elsie read the weekly schedule for herself.* Elsie always knew {??whether, that} there would be a talk (when Mary came to tell her)

　　　a. LF: always C-s_0 [$\lambda 7$ [Elsie knew-s_7 ANS-s_7 whether there would be a talk]]

　　　b. Presupposes: In every relevant situation (e.g. meeting between Elsie and Mary), there would be a talk or there wouldn't be a talk

　　　c. Asserts: In every relevant situation, if there would be a talk, Elsie knew that there would be a talk, and if there wouldn't, Elsie knew that there wouldn't

2.3 Maximize Presupposition and alternatives

Eckardt 2007 proposes that *know whether* in the discourse about Elsie is unacceptable because its use is suboptimal compared to the use of formally simpler alternatives containing embedded declaratives. In Grice's (1975) terms, the use of *know whether* violates the Maxim of Manner. This work also attributes unacceptability to comparison with alternatives, but instead of *know whether* being suboptimal because of its form, it's claimed to be suboptimal because of its meaning, namely, its presuppositions.No empirical argument in favor of this analytical choice is offered, but a well-established theory of unacceptability based on weak presuppositions already exists, whereas violations of Manner are less understood.

Heim 1991 proposes that a principle called Maximize Presupposition (MP), distinct from Grice's Maxims, explains contrasts like (29)-(30).

(29)　A: Have a great day
　　　B: Thanks. I'll probably go swimming since {#a, the} sun is shining

(30)　A: There's only one bed in here
　　　B: Yes, and {#a, the} bed is lumpy

The existence and uniqueness presuppositions of *the* are satisfied, either because of established world knowledge or the preceding discourse, and the indefinite article is unacceptable. Heim rejects the possibility that its unacceptability is due to under-informativity i.e. violation of Grice's Maxim of Quantity. The reason is that, on the assumption that the existence and uniqueness implications of *the* are presuppositional (i.e. not part of the new information contributed by a definite description), then the choice between *a* and *the* does not affect the informativity of B's sentences in (29)-(30). Heim concludes that there is a general preference to use presuppositionally stronger sentences, when they are usable.

The preference has also been invoked to explain so-called 'antipresuppositions' (Percus 2006), which are inferences generated by the use of presuppositionally weak alternatives that the presuppositions of presuppositionally stronger alternatives are false, as in (31).

(31)   I met all of my cousins

        Antipresupposes: speaker has more than two cousins

By assumption, *all* competes with *both*, and the latter presupposes the existence of exactly two entities in the denotation of its restrictor. From the perspective of a hearer who takes the speaker comply with MP, since the speaker chose to use the presuppositionally weaker alternative, the hearer can infer that the presuppositionally stronger alternatives were not usable (see Chemla 2008, Rouillard & Schwarz 2017 for how a hearer often infers something stronger: that the stronger presuppositions of the alternatives are actually false).

Percus 2006 proposes that to calculate antipresuppositions, speakers employ scales of lexical items that have the same syntactic distribution and whose members differ in the strength of the presuppositions they trigger. In contrast, following Katzir 2007 on scalar implicature calculation, this work assumes a structural definition of presuppositional alternatives, as argued for by Rouillard & Schwarz 2017. This is due to the fact that the alternative structures considered here differ with respect to whole constituents rather than just lexical items. MP is defined in (32).

(32)   **Maximize Presupposition (MP)**

        For any expressions ϕ, ψ, context c (i.e. tuple of at least an alternatives function ALT_c, context set CS, and speaker), and assignment g:

        a. If $\phi \in \text{ALT}_c(\psi)$, $([\![\phi]\!]^{g,c} \cap CS) = ([\![\psi]\!]^{g,c} \cap CS)$, $\text{DOM}[\![\phi]\!]^{g,c} \subset \text{DOM}[\![\psi]\!]^{g,c}$, and $CS \subseteq \text{DOM}[\![\phi]\!]^{g,c}$, the speaker must use ϕ

        b. $\text{ALT}_c(\psi) = \{\phi : \phi$ is salient in c and can be derived from ψ by a finite series of deletions, contractions, and replacements of constituents in ψ with constituents of the same category taken from the lexicon$\}$ (cf. Katzir 2007: 679)

A declarative denoting an answer can be an alternative to a *whether*-question, given disjunctive LFs, since it can be derived from the question by deletion of Ans, *or*, the other disjunct, and the morphemes involved in deriving a question. The meaning of the declarative resulting from these deletions can be taken directly as an argument of *know*.

This means that *Elsie knows that there will be a talk* and *Elsie knows that there won't be a talk* can be alternatives to *Elsie knows whether there will be a talk*. Given the assumptions about basic meaning, the factive presuppositions contributed by *know* in the declarative alternatives asymmetrically entail the presupposition contributed by Ans in the *whether* alternative. However, in any situation in which a declarative alternative's presuppositions are satisfied, it is just as informative as the *whether* alternative. The alternatives are Strawson-equivalent, in von Fintel's (1999) terms; whenever defined, both sentences' truth is contingent on the same thing, namely, Elsie's beliefs. MP is relevant in determining which alternative a speaker may utter. If the speaker utters the *whether* sentence in a context where the answer is known and the *that* sentence counts as an alternative, the speaker violates MP and the use of *know whether* is expected to be infelicitous. This is the source of the unacceptability of *know whether* in Eckardt's discourse.

Every boy knows that he will be picked up and *Every boy knows that he won't be picked up* can be alternatives to *Every boy knows whether he will be picked up*. Once again, the presuppositions of the *that* alternatives asymmetrically entail the presuppositions of the *whether* alternative, as in (33). Recall that presuppositions project universally under *every*.

(33)   a. Every boy knows that he will be picked up
          Presupposes: every boy will be picked up
       b. Every boy knows that he won't be picked up
          Presupposes: every boy won't be picked up
       c. Every boy knows whether he will be picked up
          Presupposes: For every boy x, either x will be picked up or x won't be picked up

But in any context satisfying (33a-b)'s presuppositions, uttering (33c) is as informative as (33a-b). If the speaker utters (33c) in a context where the presupposition of, e.g., (33a) is in the common ground, MP is violated and the use of (33c) is expected to be infelicitous. This is proposed to be the source of the unacceptability of *whether* in (34).

(34)   *Context: John, Bill, and Al are the boys, and they all get picked up after school by their parents. Someone asks if the boys need to be reminded of this.*
       No need, every boy knows {??whether, that} he will be picked up after school

If (33a-b) are alternatives to (33c) and the speaker intends to use (33c), then the context set cannot entail the presuppositions of (33a-b). Two types of contexts sets meet this constraint: i) a context set in which it is unsettled for at least one boy whether he will be picked up, and ii) a context set in which it is settled for at least two boys x, y that x will be picked up and that y won't. Thus, MP may be satisfied, even when the answer for every boy is known, so long as the answer varies across boys.

2.4   Discussion: Question LFs and alternatives

Assuming disjunctive questions LFs and a structural definition of alternatives allows for competition between *whether*-questions and declaratives, affording an MP-based explanation of *know whether* sentences' contextual requirements. The aim of this section is to show that an MP-based analysis is compatible with other views on questions LFs and the nature of alternatives. The proposal does not depend on the particular assumptions made here (and conversely, it does not provide an argument in favor of any of the assumptions).

Other question LFs for *whether*-questions might allow for this competition as well and therefore also afford an MP-based analysis. (35a) is a simplified *whether*-question LF that is meant to be representative of non-disjunctive proposals (requiring a different meaning for *whether*). The relevant difference is that the question 'nucleus' (i.e. underlying declarative) corresponds to only one of the question's possible answers.

(35)   a.

whether'
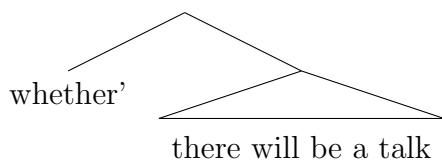
there will be a talk
      b. $[\![\text{whether'}]\!]^{g,c} = \lambda q_{st}. \ \lambda s. \ \{p_{st} : (p = q \lor p = \neg q) \land p(s) = 1\}$

If negation is a possible replacement for *whether'* or for a silent constituent in the question nucleus itself, then declaratives corresponding to both possible answers could still count as alternatives to (35) (recall that alternatives have to be derivable by deletions or replacements of subconstituents with elements of the same category). Thus, disjunctive question LFs are not necessary to maintain an MP-based explanation; however, they unequivocally allow for the relevant comparison among alternatives, relying only on deletion, not replacement. Katzir 2007 emphasizes that his proposal for the source of alternatives guarantees that individual disjuncts compete with a declarative disjunction, as required to produce the scalar implicatures of disjunctions. The same holds for *whether*-questions. For independent motivation for disjunctive *whether*-question LFs, see Guerzoni & Sharvit 2014 on the distribution

of weak NPIs and Abenina-Adar & Sharvit 2018 on the distribution of *even*-NPIs.

Alternatively, the assumptions about the source of alternatives could be modified. Some (e.g. Buccola et al. 2018) have proposed that alternatives to an utterance are conceptual, perhaps bearing little (if any) formal relation to an utterance. With respect to questions, it has been proposed (e.g. Klinedinst & Rothschild 2011, Mayr 2017) that their alternatives are inherently computed on the basis of their possible answers. Thus, an MP-based analysis could be maintained, even if the definition of ALT is challenged.

2.5 Discussion: Variable judgments

Going off the basic meanings assigned to *know whether* and *know that*, it's expected for a speaker to perceive no contrast in a context where the *whether*-question's answer is known; while most speakers do perceive a contrast, a minority does not. One way to explain speaker variation is to say that the pragmatic mechanisms accounting for unacceptability are not obligatorily employed. This could be attributed to the context-sensitivity of alternative sets.

The definition of alternatives used in MP is repeated in (36). It relies on a vague notion of contextual salience, along with a structural constraint that alternatives must meet.

(36)   For any context c and expression ψ:
        $\text{ALT}_c(\psi) = \{\phi : \phi$ is salient in c and can be derived from ψ by a finite series of deletions, contractions, and replacements of constituents in ψ with constituents of the same category taken from the lexicon$\}$

The structure of a *whether*-question makes *know that* sentences potential alternatives (so long as they are salient) but many other structures satisfy the structural condition as well. If *Elsie knows whether there will be a talk* is uttered and the set of salient alternatives is constituted differently from what was assumed above, MP may not rule out the use of *know whether*, thus explaining variable judgments. For example, if the salient alternative is *Mary knows whether there will be a talk*, MP does not dictate whether the Elsie-sentence is acceptable (irrespective of the answer being in the common ground). There is no equally informative alternative with stronger presuppositions, so MP isn't relevant.

The determination of sets of alternatives has been discussed in connection to scalar implicatures (Horn 1972, Matsumoto 1995, Katzir 2007, a.o.). One robust finding is that the generation of scalar inferences is dependent on what question in a discourse an utterance is felt to be addressing (Van Kuppevelt 1996, Roberts 2012/1996). For example, Van Kuppevelt 1996 finds that a scalar inference is generated when it provides a stronger answer to the current question under discussion (though he expressed the finding differently). (37a-b)

illustrate this. The 'exactly'-interpretation is obligatorily generated in (37a) since the implicature constitutes part of the answer to the current question under discussion, but it is cancellable in (37b), where the implicature is irrelevant to the current question.

(37)   a. A: How many patients did Dr. X treat?
         B: She treated five patients (??in fact, she treated eight)
       b. A: Every doctor who treated at least five patients will receive an ice cream sandwich. Will Dr. X receive an ice cream sandwich?
         B: Yes, she treated five patients (in fact, she treated eight)

Suppose assertions in a discourse are interpreted relative to explicit or implicit questions, whose role is to determine ALT_c by picking out a salient subset from the set of structures meeting ALT's formal requirement. If MP-alternatives are determined in this way, then a prediction of the analysis is that the robustness of the contrast between *whether* and *that* is correlated with the extent to which a declarative-containing alternative constitutes an answer to the question under discussion. The preliminary judgments in (38)-(39) suggest that this is correct. In (38), the *that* alternative constitutes a semantic answer to the preceding question and is universally preferred by speakers over *whether*. In contrast, neither the *whether*- nor *that*-alternative constitutes an answer in (39), and both tend to be judged acceptable[5]. Although *Mary knows whether we're hiding in here* in (39) has weaker presuppositions than the answers, it is not necessarily contextually equivalent, hence compatible with MP.

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[5]A's question in (38) (with contextual restriction) denotes i. and A's question in (39) denotes ii. 'Flight' = 'Bill knows that my flight has been cancelled', 'Tuesday' = 'Bill knows that I won't arrive until Tuesday'.

i. $\lambda s .\{p : (p = $ 'not flight $\wedge$ not Tuesday' $\vee p = $ 'not flight $\wedge$ Tuesday' $\vee p = $ 'flight $\wedge$ not Tuesday' $\vee p = $ 'flight $\wedge$ Tuesday') $\wedge p(s) = 1\}$

ii. $\lambda s . \{p_{st} : (p = $ 'that someone knows that we're hiding in here' $\vee p = $ 'that no one knows that we're hiding in here') $\wedge p(s) = 1\}$

(38)   A: Bill was supposed to pick me up from the airport. Unfortunately, my flight has
       been cancelled and I won't arrive until Tuesday. How much of this does Bill know?
       B: He knows {#whether, that} your flight has been cancelled, but not that you won't
       arrive until Tuesday. I'll let him know.

(39)   A: Does anyone know that we're hiding in here?
       B: Mary knows {whether, that} we're hiding in here, but she won't tell anyone

One interpretation of these judgments, together with the previously mentioned variable
judgments about *know whether*, is that speakers may differ in what alternatives they have
in mind. For some, the task of judging the difference between *know whether* and *know that*
in the Elsie-context is enough to enforce the comparison among alternatives that makes
know whether violate MP, but not for others. They may judge the *know whether* sentence
acceptable, in that case.

2.6   Discussion: Other questions and predicates

Eckardt 2007: 448 observes that constituent questions embedded under *know* don't produce
similar judgments, as shown by the acceptability of *know who* in (40).

(40)   A: We have received responses to all of the invitations to our party. Tom, Sue, and
       Linda will come, and John and Bill will not.
       B: Ok, should I tell Elsie?
       A: No need, Elsie already knows who will come to the party

There is nothing marked about A's final utterance. While it would need to be worked out
more fully, one possible explanation is that the declaratives simply do not meet the formal
condition required to be alternatives to constituent questions. This is left for future work.

     More predicates than just *know* embed *whether*-questions. Lahiri's (2002) classifica-
tion of embedding predicates is given in (41).

(41)	Rogative predicates	e.g. *wonder, ask, depend on, investigate*
	Responsive predicates (veridical)	e.g. *know, remember, discover, be surprised*
	Responsive predicates (non-veridical)	e.g. *agree on, be certain about*

     Rogative predicates embed only questions (e.g. *John wonders whether...* vs. **John
wonders that...*), whereas responsive predicates can embed both. Veridical, responsive pred-
icates express a relation to the true answer to an embedded question, whereas non-veridical
responsive predicates express a relation to a possible answer to an embedded question. To

illustrate, *John knows who came to the party* implies his beliefs about who came are true, whereas *John and Mary agree on who came to the party* does not.

The proposal above explained judgments about *know whether*, but it turns out that speakers have similar judgments when *know* is replaced with other veridical responsive predicates that are factive when they embed declaratives e.g. *heard, discovered*.

(42)   a. A: We can't meet on Monday because there will be a talk
   B: Ok, should I tell Elsie?
   A: No need, Elsie heard {??whether, that} there will be a talk at the meeting
  b. A: We can't meet on Monday because there will be a talk
   B: Ok, should I tell Elsie?
   A: No need, Elsie discovered {??whether, that} there will be a talk at the meeting

These judgments could be explained along the same lines as *know whether*: the *whether*-sentences in (42a-b) can evoke equally informative, presuppositionally stronger alternatives with declaratives, and if these are salient in the evaluation if (42a-b), then the use of *whether* violates MP. In contrast, it appears that *whether*-questions are fine under rogative predicates regardless of whether the answer is known or not, as shown in (43).

(43)   A: We can't meet on Monday because there will be a talk
  B: Ok, should I tell Elsie?
  A: Please do, Elsie is wondering whether there will be a talk

This is expected based on the analysis above, since rogative predicates cannot embed declaratives to being with, let alone be factive with a declarative. Thus, there are no equally informative alternatives with stronger presuppositions that are relevant for MP.

Finally, the acceptability of non-veridical predicates with embedded *whether*-questions does not seem in any way to depend on what is known. This is shown in (44), where *agree on whether* is acceptable despite the true answer to the question being common knowledge. The context is intended to make a *agree on whether*-statement plausibly assertable.

(44)   A: The ball is hidden in Box 1
  B: Right. We can't tell whether the experimental subjects think it's in Box 1 or not, but one thing is clear: they agree on whether it's in Box 1

MP is only relevant for contextually-equivalent alternatives whose presuppositions are ordered by asymmetric entailment. (45a-c) do not fit this profile.

(45)   a. They agree on whether it's in Box 1

        b. They agree that it's in Box 1

        c. They agree that it's not in Box 1

For illustrative purposes, suppose that (46) is the lexical entry for *agree* with a plural subject. Note that it is not factive.

(46) $[\![\text{agree}]\!]^{g,c} = \lambda s \ . \ \lambda p_{st} \ . \ \lambda X_e \ . \ \forall x \forall s'[(x \sqsubseteq X \wedge s' \in \text{Dox}(x)(s)) \rightarrow p(s')]$

Furthermore, to model its non-veridical character as a question embedding predicate, suppose that the situation-argument of the Ans operator of a question embedded under *agree* is existentially quantified (Spector & Egré 2015). As an additional naive assumption, *on* is inserted for syntactic reasons that do not affect the meaning of the sentence. With these assumptions, *they agree on whether it's in Box 1*, with the LF in (47), has the standard meaning that there is some possible answer to *whether it's in Box 1* that they all believe.

(47)   LF: $\exists$ [$\lambda 7$ [they agree-s_0 [Ans-s_7 whether it's in Box 1]]]

        (47) is not as informative as alternatives with declaratives, by its basic meaning; it is asymmetrically entailed by alternatives with declaratives. If *they agree that it's in Box 1* is true, that entails that there is some possible answer to the *whether*-question that they all believe. But even if in some context it is contextually-equivalent to some alternative with a declarative, it is still not presuppositionally weaker, given that *agree* is non-factive. Thus, its use is not regulated by MP and the account above does not predict the acceptability of *agree whether* to be affected by what is common knowledge (Grice's Maxim of Quantity is relevant, given the asymmetric entailment relation between a *that*- and a *whether*-alternative).

3   *Ever*-free relatives

In this section, the analysis is extended to EFRs. EFRs are definites that evoke alternative definites that denote the same entity but carry stronger presuppositions. This assumption about the meaning of EFRs and their alternatives, along with MP and presupposition projection under quantifiers, explains EFRs' various readings.

3.1   Data

(48a-c) are three examples of EFRs. An EFR may have a singular NP 'head' like (48a), a plural NP head like (48b), or no overt head at all like (48c).

(48)   a. Whatever pie Bill is baking is vegan   Singular
        b. Bill returned whatever tools he had borrowed   Plural
        c. Whoever was in here last left the light on   Headless

EFRs are definites, carrying a presupposition of the existence of a maximal entity in the denotation of the restrictor (e.g. Jacobson 1995, based on Sharvy 1980, Link 1983). (49) is a piece of evidence in support of this view, provided by Dayal 1995: 201. EFRs pattern like plural definites rather than universal quantifiers in forbidding the continuation in (49) (i.e. EFRs exhibit homogeneity – Fodor 1970, Löbner 1985, a.o.).

(49)   a. John didn't like everything Sue ordered but he liked some of the things she ordered
        b.*John didn't like what(ever) Sue ordered but he liked some of the things she ordered
        c.*John didn't like the things Sue ordered but he liked some of the things she ordered

Another piece of evidence is that EFRs with a singular head pattern with *the* rather than *every* in contexts that do not satisfy uniqueness, as in (50).

(50)   Bill is baking five pies, and {every, #whatever, #the} pie he is baking is vegan

3.1.1   Ignorance readings

At least five distinct readings have been identified for English EFRs, which will be discussed in turn. The literature on EFRs centers around *ignorance readings*, in which the use of an EFR signals ignorance about the identity of the EFR's referent, as in (51).

(51)   Whatever pie Bill is baking is vegan

Different views are found in the literature on what sort of ignorance is conveyed. One possibility is that (51) conveys uncertainty regarding what entity the EFR denotes. As observed by Heller 2005, Condoravdi 2008, and Heller & Wolter 2011, however, this empirical generalization is challenged by the unexpected felicity of EFRs in contexts where the interlocutors can identify the EFR's referent with an individual-denoting expression like *that pie* in (52).

(52)   A (pointing): Bill is baking that pie.
        B: I see. Well, Bill is a vegan, so whatever pie he is baking is vegan

(52) suggests that the ignorance conveyed is not about which entity the EFR refers to, since A and B can point to it. Discourses will be presented to uncover what type of ignorance the use of an EFR conveys. First off, (53a) is judged infelicitous out-of-the-blue. The problem

seems to be that in the same breath, the speaker has used the EFR *whatever pie Bill is baking* but also provided that Bill is baking a cherry pie. If the speaker only provides that Bill is baking a pie (53b) or uses a different definite (53c), then the utterance sounds fine.

(53)   a.*Bill is baking a cherry pie, and whatever pie he is baking is vegan

        b. Bill is baking a pie, and whatever pie he is baking is vegan

        c. Bill is baking a cherry pie, and {?the pie he is baking, it} is vegan

This judgment suggests a promising (but incorrect) empirical generalization: the use of an EFR like *whatever NP* is felicitous only if the common ground does not entail that the EFR's referent belongs to a linguistically definable subset of the denotation of *NP*. Another way of expressing this idea is that the ignorance conveyed is with respect to any more specific properties – nothing more is known about the pie Bill is baking, other than that it is a pie that Bill is baking. After the first part of the utterance in (53a), the common ground entails that the pie Bill is baking is a cherry pie, making the use of an EFR a violation of this hypothesized condition. This hypothesis is consistent with the fact that (53b) is acceptable.

    This empirical generalization is challenged by (54); the use of the same EFR is in fact felicitous, despite it being known that Bill is baking a cherry pie.

(54)   *Context: Mary and Bill each baked a cherry pie and then left. A and B enter and see two covered pies, one on the left and one on the right.*
        A: Both of these are cherry pies
        B: Right, but Bill is a vegan, so whatever pie he is baking is vegan

The felicity of the EFR shows that there is no general ban on using EFRs when their referents are known to have more specific properties that those denoted by the NP. This raises the question of what the difference between (54) and (53a) is.

    The implicit question of whether the pie is on the left or on the right seems to play a role in making the EFR felicitous in (54). The context supplies a salient 'unknown', licensing the use of the EFR. Conversely, the salience of the *cherry pie*-property ascription and the absence of any unknowns seems to play a role in making the EFR infelicitous in (53a). What about (55), in which the pie can be pointed to but *whatever pie Bill is baking* is acceptable?

(55)   A (pointing): Bill is baking that pie.
        B: I see. Well, Bill is a vegan, so whatever pie he is baking is vegan

The acceptability of B's utterance depends on how willing one is to assume that there is something unknown about the pie. Many speakers consulted report that in using an EFR, B

implies that she does not know the pie's flavor. Accordingly, (55) contrasts with the odder (56) in which the pie is pointed to and its flavor is provided; presumably this is because it's harder to think of what could remain unknown about the pie.

(56)   A (pointing): Bill is baking that cherry pie.
       B: ?I see. Well, Bill is a vegan, so whatever pie he is baking is vegan

Nonetheless, there are some far-fetched scenarios in which B's utterance could still be acceptable e.g. if A and B know that Bill's cherry pies are sometimes made with wheat flour and sometimes made with corn flour, but they're not sure about the current cherry pie. The empirical generalization is that an EFR on an ignorance reading is acceptable only if no member of a set of contextually salient properties is known to hold of the EFR's referent, as claimed by Condoravdi 2008, 2015.

3.1.2   Individual-variation readings

While many non-ignorance readings have been identified in the literature, the first to be discussed here arises when an EFR occurs in the scope of *every*, a universal individual quantifier, with binding into the EFR. As observed by Lauer 2009: 8, examples like (57) may be uttered in contexts where there is no uncertainty regarding what conference every professor first attended, relative to the salient alternative properties.

(57)   *Context: Mary, Sue, and Elsie are the professors. Conference A was Mary's first conference, Conference B was Sue's first conference, and Conference C was Elsie's first conference. Someone asks what conference every professor most enjoyed.*
       Every professor most enjoyed whatever conference she first attended

In such contexts, (57) carries implications of a different sort; the use of an EFR implies that the professors attended different conferences. Thus, when the EFR's identity is known and for every professor, it denotes the same conference, the EFR is unacceptable, shown in (58). Such sentences will be said to have an *individual-variation reading*.

(58)   *Context: Mary, Sue, and Elsie are the professors, and Conference A was their first conference. Someone asks what conference every professor most enjoyed.*
       Every professor most enjoyed {#whatever, the} conference she first attended

3.1.3 Generalizing readings

The third reading recognized in the literature has many names, including *free choice*, *universal*, *quantificational*, and *generalizing*. (59a) is from Dayal 1997: 110, (59b) is from von Fintel 2000: 36, and (59c) is from Condoravdi 2008: 3. This work uses the term *generalizing*.

(59)   a. Whatever Mary cooks uses onions
        b. There is a lot of violence in whatever Parker writes
        c. Whatever exit you take will get you onto MLK Blvd

There is an intuition that the EFR could be paraphrased with free-choice *any* or universal *every*. Faced with such examples, some have assumed that EFRs have varying force, either definite or universal. This work follows Dayal 1997 and Tredinnick 2005, who argue that the definite view can be maintained by considering the interaction between definiteness and a property unifying (59a-c): quantification over situations. (59a-b) involve quantification over generic situations, and (59c) involves quantification over future situations.

Generalizing readings require situational binding in addition to quantification over situations (Šimík 2018). For instance, depending on whether *this past Monday* is included in (60), different readings are made salient.

(60)   Bill was always infatuated with whoever he went on a date with (this past Monday)

Without *this past Monday*, (60) tends to receive the generalizing reading under which it says that in every relevant situation s, Bill was infatuated in s with the person he went on a date with in s, with the implication that it was different people across situations. In contrast, with *this past Monday*, the date tends to be understood to be independent of the infatuation situations and the sentence does not have a generalizing reading. It conveys only ignorance about who Bill went on a date with this past Monday.

That generalizing readings do not convey ignorance is illustrated by (61), in which the EFR is felicitous despite there being no uncertainty about who the EFR refers to.

(61)   *Context: Sue, the manager, was very cheerful this week. Bill and Mary, her employees, noticed this by the way she was acting in the mornings. Some days this week, Bill arrived first and some days, Sue arrived first, but either way ...*
        Sue always cheerfully greeted whoever arrived first

But the sentence has different implications on its generalizing reading, namely, that different people arrived first across the situations quantified over i.e. days of the week. Hence, when it's known that the same person arrived first every day, the EFR is unacceptable.

(62) *Context: Sue, the manager, was very cheerful this week. Bill and Mary, her employ-*
      ees, noticed this by the way she was acting in the mornings. Bill arrived first every
      day this week and, . . .
      #Sue always cheerfully greeted whoever arrived first

Indeed, this seems to be the reason that such sentences are perceived to be generalizing; they
require truth in every situation quantified over, irrespective of the EFR's extension in each
situation, with the implication that the EFR's extension varies across situations. The same
readings are present in examples with *will*, which quantifies over future situations (cf. Copley
2009). (63), the example due Condoravdi, has a generalizing reading, implying that in every
future situation s, the exit you take in s gets you onto MLK Blvd, with the implication that
across future situations you take different exits.

(63) Whatever exit you take will get you onto MLK Blvd

The availability of the generalizing reading depends on situational binding. If the tense of the
predicate in the EFR's restrictor is changed so that the situation described is independent of
the future situations quantified over, the sentence has only an ignorance reading, as in (64).

(64) Whatever exit you took will get you onto MLK Blvd

The generalizing reading implies that different exits are taken across future situations (i.e.
that what exit you will take is not settled). If (63) is uttered in a context in which you take
the same exit in every future situation, as in (65), the EFR is unacceptable.

(65) *Context: On your way to my house, you will see signs for exits one and two. You*
      will take exit two, and. . .
      #Whatever exit you take will get you onto MLK Blvd (from there, turn left)
      cf. The exit you take will get you onto MLK Blvd (from there, turn left)

Summing up, generalizing readings require universal quantification over situations, with
binding of the situation-argument relative to which the EFR is evaluated; they carry impli-
cations that the EFR's referent varies across situations.

3.1.4   Indifference readings

The fourth reading of EFRs is called the *indifference reading*. Identified in von Fintel 2000,
this reading is present in (66). That (66) does not imply ignorance is shown by the felicity
of the EFR, despite there being no uncertainty about its referent.

(66)   *Context: The hammer was in the toolbox, and the screwdriver was on the shelf. Sue*
        was assembling the bed in a rush and the toolbox was closer, so...
        Sue grabbed whatever tool was in the toolbox

Instead of conveying ignorance, such examples seem to attribute indifference to the agent regarding the identity of EFR's referent. Thus, when the identity of the tool is known and the subject is not indifferent, as in (67), the EFR is infelicitous.

(67)   *Context: The hammer was in the toolbox, and the screwdriver was on the shelf. Sue*
        was assembling the bed carefully and the next step called for a hammer, so...
        Sue grabbed {#whatever tool, the tool that} was in the toolbox

Condoravdi (2015: 217) observes that the indifference reading is '...more restricted and arises when the [EFR] is an argument of an action-denoting predicate implying that the agent in principle has a choice as to who or what' (see also Rawlins 2015 on the teleological nature of indifference readings). For example, a non-agentive predicate like *liked* contrasts with *grabbed* in that it makes available only an ignorance reading and is incompatible with an *as-it-happened* appositive specifying the EFR's referent.

(68)   a. Sue grabbed whatever tool was in the toolbox (this hammer, as it happened)
        b. Sue liked whatever tool was in the toolbox (*this hammer, as it happened)

3.1.5   Diverse-subpart readings

Finally, unembedded EFRs with a plural head have a *diverse-subpart reading*. (69) is an example from Condoravdi 2015: 218, whose non-ignorance reading is illustrated by compatibility with a conjunctive appositive exhaustively specifying the EFR's referent.

(69)   The thieves grabbed whatever small objects they could reach through the holes they
        opened – figurines, vases, and lamps

The discourse in (70), where the referent of the EFR has been identified with definite expressions but the EFR is nonetheless felicitous, makes the same point.

(70)   A: They borrowed my hammer and my screwdriver
        B: Right, but whatever tools they borrowed have been returned

However, speakers perceive a slight contrast between the discourse in (70) and the one in (71), in which the individual tools making up the plural EFR's referent are not saliently distinct.

For this reason, it's called a *diverse-subpart* reading. The plural EFR carries an implication that the subparts making up its referent differ with respect to some salient properties.

(71)   A: They borrowed my two hammers
       B: ?Right, but whatever tools they borrowed have been returned

Five readings have been identified for EFRs, which depend on the grammatical environment that the EFR appears in. When the EFR is an argument of a non-agentive predicate, and no quantificational expressions appear in the sentence, the EFR has only the ignorance reading in (72a). Individual or situational quantifiers, with binding into the EFR, make individual-variation or generalizing readings available, as in (72b-c). When the EFR is an argument of a certain kind of agentive predicate like *grabbed*, an indifference reading is available, and when the EFR has a plural head, the EFR has a diverse-subpart reading.

(72)   a. Whatever pie Bill is baking is vegan   Ignorance
       b. Every professor most enjoyed whatever conference she first attended

                                                                        Individual variation
       c. Sue always cheerfully greeted whichever employee arrived first   Generalizing
       d. Sue grabbed whatever tool was in the toolbox   Indifference
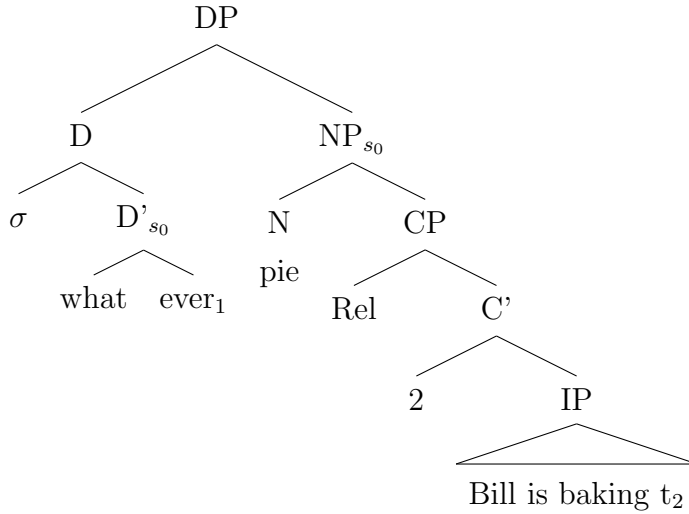   e. Whatever tools they borrowed have been returned   Diverse subpart

3.2   Proposal

EFRs have a uniform grammatical representation. Part of this grammatical representation involves ascribing to the EFR's referent a contextually-determined property, which obligatorily triggers alternative more specific properties. This property ascription is proposed to be presuppositional, inducing equally informative alternatives with more specific presuppositions. The various constructions that EFRs occur in affect the way that the EFR's presupposition projects, leading to different ways of satisfying MP (i.e. different readings).

3.2.1   Structure and denotation

EFRs are assumed to have the structure in (73), in which the WH-*ever* expression forms part of a complex null D-head, σ, encoding definiteness. WH-*ever* does not move from a clause-internal position but rather merges with an NP containing a restrictive relative clause (a 'matching' analysis of the relative clause with operator movement is assumed). *Ever*$_1$ is indexed because it receives its property-type value from the assignment function.

(73) a.

DP
├── D
│   ├── σ
│   └── D'$_{s_0}$
│   ├── what
│   └── ever$_1$
└── NP$_{s_0}$
    ├── N
    │   └── pie
    └── CP
        ├── Rel
        └── C'
            ├── 2
            └── IP
                └── Bill is baking t$_2$

b. $[\![\text{ever}_1]\!]^{g,c} = g(1)$, where $g(1) \in D_{\langle s,et \rangle}$

This diverges from the more standard view regarding plain free-relatives, which are typically thought to be composed of a definite determiner merging directly with a CP, whose denotation is derived by WH-movement to the edge of the CP (Grosu & Landman 1998, Caponigro 2003, 2004, a.o.). Two pieces of evidence support the non-canonical syntax: the first is that EFRs, unlike plain *ever*-less free relatives, occur with NP heads (e.g. *Whatever pie Bill is baking is vegan* vs. *What (*pie) Bill is baking is vegan*). The second is that English EFRs occur with the overt complementizer *that* in naturally occurring examples like (74a-c). These two facts suggest a genuine relative clause structure, at least for EFRs.

(74) a. We knew at that time that whatever dog that we adopted into our lives would be a special addition to our little family of three[W]
     b. The cover is made by me but the photo credit goes to whoever that took the photo[W]
     c. I basically read whatever book that catches my interest. With that being said though, I tend to avoid reading non-fiction...[W]

A partial derivation of (73a) is given in (75). The NP denotes the set of pies that Bill is baking in s_0, derived by intersective Predicate Modification (PM). D' is also interpreted by PM, deriving the set of individuals that are inanimate (the property contributed by *what* (cf. Caponigro 2003)) and that are in the extension of *ever*$_1$ in s_0. σ denotes the Linkian sum-formation operator but is given an extra argument, P_{et}, which is supplied by the WH-*ever* word and will be discussed shortly. The Q argument is supplied by the NP. For any $\langle e,t \rangle$-function Q, $\text{MAX}(Q) := \iota x[Q(x) \wedge \forall y[Q(y) \rightarrow y \sqsubseteq x]]$; if the NP is singular, σ requires uniqueness, and if it is plural, σ requires there to be a mereologically maximal entity in Q.

(75) a. $[\![\text{NP}]\!]^{g,c} = \lambda x_e.\ x$ is a pie in $s_0 \wedge$ Bill is baking x in s_0

  b. $[\![\text{D'}]\!]^{g,c} = \lambda x_e\ .\ x$ is inanimate in $s_0 \wedge [\![\text{ever}_1]\!]^{g,c}(s_0)(x) = 1$

  c. $[\![\sigma]\!]^{g,c} = \lambda P_{et}\ .\ \lambda Q_{et} : \exists x[x = \text{MAX}(Q) \wedge P(x)].\text{MAX}(Q)$

  d. $[\![\text{DP}]\!]^{g,c}$ is defined only if $\exists x[x = [\text{the unique pie Bill is baking in } s_0] \wedge [\![\text{ever}_1]\!]^{g,c}(s_0)(x)$
     $= 1]$. When defined, $[\![\text{DP}]\!]^{g,c} =$ the unique pie that Bill is baking in s_0

Note how the meaning of σ uses (75b), its P-argument; it is not intersected with (75a) to derive a set of entities whose maximal member is then picked out. Instead, the meaning of σ uses (75b) to make a presuppositional 'comment' on the maximal pie that Bill is baking. 'Ordinary' contextual restriction[6] is assumed to take place within NP and is not represented. This non-standard proposal for the meaning of σ will be discussed again in Section 3.5.

3.2.2 Alternatives

On an ignorance reading, an EFR conveys that there is a salient unknown regarding its referent. Condoravdi 2015 proposes to derive EFRs' ignorance implications from the contextually-determined alternatives that EFRs evoke, and the same will be done here. This work assumes that the morpheme $ever_1$ denotes a contextually-determined property that triggers alternatives whose denotations constitute a partition of $ever_1$'s denotation, as defined in (76).

(76) A set of properties $C_{\langle\langle s,et\rangle,t\rangle}$ is a partition of property $P_{\langle s,et\rangle}$ iff for any situation s:

a. $\forall Q \in C[Q(s) \subseteq P(s)]$	'more specific than P' condition
b. $\bigcup\{Q(s) : Q \in C\} = P(s)$	'Jointly exhaust P' condition
c. $\exists Q, Q' \in C[Q \neq Q']$	'Non-trivial' condition
d. $\forall Q, Q' \in C[Q(s) \cap Q'(s) = \varnothing]$	'Pairwise incompatible' condition

For example, (77b) is a partition of (77a) (assuming no pie is both a cherry pie and a rhubarb pie), and (78b) is a partition of (78a).

(77) a. $\lambda s.\lambda x.\ x$ is a cherry pie in $s \vee x$ is a rhubarb pie in s

  b. $\{\lambda s.\lambda x.\ x$ is a cherry pie in $s, \lambda s.\lambda x.\ x$ is a rhubarb pie in $s\}$

(78) a. $\lambda s.\lambda x.\ x$ is on the left in $s \vee x$ is on the right in s

  b. $\{\lambda s.\lambda x.\ x$ is on the left in $s, \lambda s.\lambda x.\ x$ is on the right in $s\}$

Next, (79) is a claim about the grammatical representation of $ever_1$, which has obvious

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[6]This would be the kind of restriction that makes an EFR like e.g. *whatever dog just barked* interpretable, despite the fact that many dogs in the universe just barked.
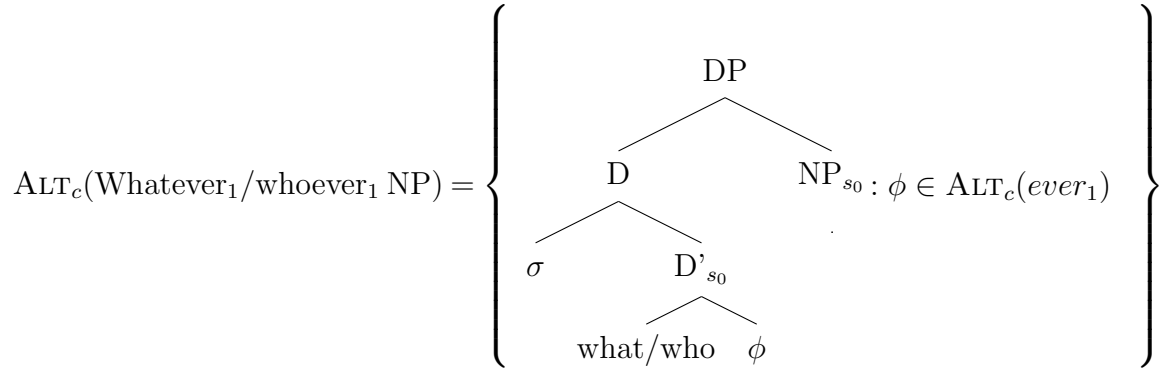
precedents in the literature on NPI-*ever*[7] (Krifka 1995, Chierchia 2013).

(79) **The meaning of *ever*$_1$**

For any context c and assignment g, $\{\llbracket\phi\rrbracket^{g,c} : \phi \in \text{ALT}_c(\text{ever}_1)\}$ is a partition of the overarching property $\llbracket\text{ever}_1\rrbracket^{g,c}$

This view on *ever*$_1$ implies that the alternatives to an utterance containing an EFR will be utterances with definites in which an alternative to *ever*$_1$ replaces *ever*$_1$ in the LF, as in (80). By assumption, if the EFR has a head, the alternative definites are pronounced with *the*, and if the EFR is headless, the alternatives are pronounced as *ever*-less free relatives (*the*$_\phi$ *pie Bill baked* vs. *what*$_\phi$ *Bill baked*). These alternative definites are interpreted as in (81).

(80) For any context c:

$$\text{ALT}_c(\text{Whatever}_1/\text{whoever}_1\,\text{NP}) = \left\{ \begin{array}{c} \text{DP} \\ \diagup \diagdown \\ \text{D} \qquad \text{NP}_{s_0} : \phi \in \text{ALT}_c(ever_1) \\ \diagup \diagdown \\ \sigma \qquad \text{D'}_{s_0} \\ \diagup \diagdown \\ \text{what/who} \quad \phi \end{array} \right\}$$

(81) For any *the*$_\phi$ *NP* $\in$(80), $\llbracket the_\phi\ NP\rrbracket^{g,c}$ is defined only if $\exists x[x = \text{MAX}(\llbracket NP\rrbracket^{g,c}(s_0))\wedge$ $\llbracket\phi\rrbracket^{g,c}(s_0)(x) = 1]$. When defined, $\llbracket the_\phi\ NP\rrbracket^{g,c} = \text{MAX}(\llbracket NP\rrbracket^{g,c}(s_0))$

Given the definition of a partition and the claim that *ever*$_1$'s alternatives partition *ever*$_1$, any alternative to an utterance with an EFR, where ϕ replaces *ever*$_1$, has a stronger presupposition than the original utterance with an EFR. Together with MP, this view of the meaning of the EFR and the meanings of its alternatives predicts the various readings observed in the preceding section.

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[7]For example, Chierchia 2013 proposes that in **John has ever been to Canada*, *ever* denotes an obligatorily exhaustified existential quantifier over times, whose domain of quantification evokes so-called subdomain alternatives (i.e. the alternative domains are a partition of the domain of *ever*, in the sense defined here). The meaning resulting from exhaustification is that there is some past time in an interval at which John was in Canada but no time in a more specific sub-interval at which he was in Canada (contradiction). The contradiction is obviated by negation.

3.2.3 Ignorance reading

Suppose (82) is uttered in a context where the assignment provides (82a) as the value of $ever_1$ and (82b) for the set of its alternatives.

(82) Whatever pie Bill is baking is vegan

    a. $\lambda s.\lambda x.$ x is a cherry pie in s $\vee$ x is a rhubarb pie in s

    b. $\{\lambda s.\lambda x.$ x is a cherry pie in s, $\lambda s.\lambda x.$ x is a rhubarb pie in $s\}$

(82) carries the presupposition in (83a) while the alternatives determined on the basis of the alternatives to $ever_1$ carry the presuppositions in (83b-c).

(83) a. Bill is baking exactly one pie, which is a cherry pie or a rhubarb pie

    b. Bill is baking exactly one pie, which is a cherry pie

    c. Bill is baking exactly one pie, which is a rhubarb pie

The EFR denotes the same entity as its alternatives, namely, the pie that Bill is baking. They differ only in what they presuppose. MP is relevant in determining whether the speaker's utterance of the EFR is acceptable. The use of the sentence is only acceptable if the presuppositions of its equivalent, presuppositionally stronger alternatives are not entailed by the context set. This amounts to a requirement that the context set not entail that the pie Bill is baking is of a particular flavor. This is satisfied in cases of speaker-ignorance, addressee-ignorance (von Fintel's teasing reading), and disagreement. It is not satisfied if the interlocutors publicly agree on what flavor the pie is.

Taking the perspective of a hearer who takes the speaker to be MP-compliant and who observes an utterance of an EFR, the utterance generates an antipresupposition that the context set meets the contextual requirements of an EFR. The use of the EFR implies that the speaker is not in a position to utter an alternative (and with an additional epistemic step, that the speaker does not believe any alternative's presupposition). On the analysis presented here, such ignorance implications of EFRs have the status of antipresuppositions.

Recall the infelicity of (84), in which a speaker provides that the pie Bill is baking is a cherry pie but refers to it using the EFR *whatever pie Bill is baking*.

(84) *Bill is baking a cherry pie, and whatever pie he is baking is vegan

Its infelicity is explained under the assumption that the property denoted by *cherry pie* is the only basis for arriving at a partition of $ever_1$ in the discourse, hence $[\lambda s.\lambda x.$ x is a cherry pie in $s]$ is the meaning of an alternative to $ever_1$. The speaker commits to the EFR's referent

having one of the alternative properties, and this information is in the context set relative to which the second conjunct containing the EFR is evaluated, resulting in an MP-violation. In contexts where there is another basis for arriving at alternative properties, like (85), the EFR is fine, even if it's known to denote a cherry pie. Presumably, the alternatives to $ever_1$ denote $[\lambda s.\lambda x.\ x$ is on the left in $s]$ and $[\lambda s.\lambda x.\ x$ is on the right in $s]$ in this context.

(85)   *Context: Mary and Bill each baked a cherry pie and then left. A and B enter and see two covered pies, one on the left and one on the right.*
       A: Both of these are cherry pies
       B: Right, but Bill is a vegan, so whatever pie he is baking is vegan

Regarding (84), one might wonder why speakers use *cherry pie* as the basis for partitioning $ever_1$ and therefore judge (84) unacceptable, instead of accommodating some other unknown about the pie (e.g. where it's located, what flour it's made of). This work does not offer an answer to this question but points out a parallel judgment with quantification in (86).

(86)   Bill is a student in my class and he has never come to one of my parties. Just yesterday, I had a party for my class and every student #(but Bill) showed up.

The determination of alternative sets resembles the determination of quantificational domains in the following sense. Although Bill in principle could be excluded from the domain quantified over by *every student* to prevent a contradiction, speakers tend to judge the sequence contradictory without the overt exceptive. Likewise, although the cherry pie property could be excluded from the set of alternatives to $ever_1$, it tends to be included, leading to infelicity. It seems that in evaluating such discourses, speakers are inclined towards what's salient, not what's consistent.

Recall that an EFR is felicitous in the demonstration dialog, repeated in (87), so long as some uncertainty regarding identity of the pie Bill is baking can be accommodated.

(87)   A (pointing): Bill is baking that pie.
       B: I see. Well, Bill is a vegan, so whatever pie he is baking is vegan

(87) differs from the cherry pie sequence, in that the default judgment is acceptability; why might that be? Phrased in terms of the theory presented here, why is a property equivalent to demonstration not among the alternatives to $ever_1$? This question will be returned to in the discussion section, when Heller & Wolter's (2011) solution to this puzzle will be evaluated.

While incompatibility with *namely*-appositives was not treated as a core fact to be explained about EFRs, it was used as a diagnostic for the availability of non-ignorance

readings. A question that awaits future work is why examples like (88) are unacceptable.

(88) Whatever pie Bill is baking (*namely, a cherry pie) is vegan
cf. The pie Bill is baking (namely, a cherry pie) is vegan

While it is a non-trivial assumption, suppose that the property ascribed to the EFR's referent by a *namely*-appositive obligatorily counts as an alternative to $ever_1$ (cf. Onea & Volodina 2011 on *namely*-appositives answering implicit specificational questions). Even granting this, MP does not guarantee that a *namely*-appositive is incompatible with an EFR. MP requires the *initial* context set to which the speaker's utterance is added not to entail certain propositions about the EFR's referent; this is compatible with them being added over the course of the utterance containing the EFR, e.g. by the appositive itself. Although it remains to be worked out, one possible explanation of the incompatibility is to consider how anti-presuppositions generated by MP typically get strengthened from conditions on common ground to inferences about the speaker's epistemic state (cf. Chemla 2008, Rouillard & Schwarz 2017). The unacceptability of *namely*-appositives could be explained by a contradiction between the speaker's utterance of the *namely*-appositive and the strengthened inference generated by MP, that the speaker's epistemic state does not entail that the EFR's referent has one of the alternative properties. This explanation awaits future work and especially a better understanding of *namely*-appositives.

3.2.4 Individual and situational quantifiers

The next reading arises when the EFR is in the scope of an individual quantifier, with binding into the EFR, as in (89). The EFR is unacceptable when it is known that every professor attended the same conference as their first.

(89) *Context: Mary, Sue, and Elsie are the professors, and Conference A was their first conference. Someone asks what conference every professor most enjoyed.*
a. Every professor most enjoyed {#whatever, the} conference she first attended
b. LF: every prof-s_0 [$\lambda 7$ [t_7 enjoyed-s_0 whatever$_1$-s_0 [conference she$_7$ first attended]-s_0]]

The constituent '[$\lambda 7$ [t_7 enjoyed-s_0 whatever$_1$-s_0 [conference she$_7$ first attended]-s_0]]' denotes a partial function whose domain contains only those individuals who attended exactly one first conference, which is in the extension of $ever_1$. *Every* requires every professor to be in the domain of this function, so (89) as a whole presupposes (90a) while the alternatives presuppose (90b-d), assuming (91a-b) as the values of $ever_1$ and alternatives.

(90) a. Every professor attended exactly one first conference, which was Conference A, Conference B, or Conference C

  b. Every professor attended exactly one first conference, which was Conference A

  c. Every professor attended exactly one first conference, which was Conference B

  d. Every professor attended exactly one first conference, which was Conference C

(91) a. $\lambda s.\ \lambda x$. x is Conference A in $s \vee x$ is Conference B in $s \vee x$ is Conference C in s

  b. $\{\lambda s.\ \lambda x$. x is Conference A in s, $\lambda s.\ \lambda x$. x is Conference B in s, $\lambda s.\ \lambda x$. x is Conference C in $s\}$

A speaker uttering the EFR-sentence complies with MP only if all of (90b-d) are not entailed by the context set. Two types of context sets meet this requirement: i) a context set in which it is unsettled which conference at least one professor attended and ii) a context set in which it is settled that at least two professors attended different conferences. The context above supplies that every professor attended Conference A, hence it does not meet this requirement.

  Taking the perspective of a hearer who takes the speaker to be MP-compliant and who observes an utterance of an EFR, the utterance generates an antipresupposition that the context set meets the contextual requirements of an EFR. Hence the EFR has a reading that implies either that it's unknown which conference every professor attended, or that the professors attended different conferences.

  The same type of explanation is given for generalizing readings. Recall that when the referent of the EFR is known, and it is the same entity across situations quantified over by *always*, (92) with an EFR is unacceptable.

(92) *Context: Sue, the manager, was very cheerful this week. Bill and Mary, her employees, noticed this by the way she was acting in the mornings. Bill arrived first every day this week and. . .*

  a.#Sue always cheerfully greeted whichever employee arrived first

  b. LF: always C-s_0 [$\lambda 7$ [Sue greeted-s_7 whichever$_1$-s_7 [employee arrived first]-s_7]]

Given universal presupposition projection under *always*, (92a) presupposes (93a), and its alternatives presuppose (93b-c), assuming (94a-b) as the values of *ever*$_1$ and of alternatives.

(93) a. In every situation, exactly one employee arrived first, and it was Bill or Mary

  b. In every situation, exactly one employee arrived first, and it was Bill

  c. In every situation, exactly one employee arrived first, and it was Mary

(94) a. λs . λx . x is Bill in $s \vee x$ is Mary in s

  b. $\{\lambda s$. λx . x is Bill in s, λs . λx . x is Mary in $s\}$

A speaker uttering the EFR sentence complies with MP only if the context set entails neither (93b) nor (93c). In the preceding example, the context supplies that in every relevant situation (e.g. every morning this past work week), Bill arrived first, hence the use of the EFR is unacceptable. The same proposal can extend to generalizing readings with *will*, assuming that in addition to whatever temporal or epistemic conditions it imposes on the set of situations it quantifies over, it has universal presuppositions like *always*. (95) is unacceptable when in every future situation, you take the same exit; in this context, its use violates MP assuming the values in (96a-b) for $ever_1$ and its alternatives.

(95)   *Context: On your way to my house, you will see signs for exits one and two. You will take exit two, and...*

   a.#Whatever exit you take will get you onto MLK Blvd
   b. LF: will C-s_0 [$\lambda 7$ [whatever$_1$-s_7 [exit you take]-s_7 gets-s_7 you onto MLK]]

(96)   a. λs . λx . x is exit one in $s \vee x$ is exit two in s
   b. $\{\lambda s$. λx . x is exit one in s, λs . λx . x is exit two in $s\}$

Finally, recall that (97) has only an ignorance reading when *this past Monday*, which tends to preclude situational binding, is included. This is because without binding, the presupposition contributed by the EFR projects globally, unaffected by *always*. Hence, the only way for MP to be satisfied is for it to be unsettled which alternative property the EFR's referent has.

(97)   Bill was always infatuated with whoever he went on a date with (this past Monday)

3.2.5   Indifference reading

The indifference reading arises when an EFR is an argument of a certain kind of agentive predicate (and there are no individual or situational quantifiers in the sentence, giving rise to the readings discussed above); the EFR conveys that the agentive subject is indifferent about the identity of the EFR's referent. When the referent of the EFR is known, and the subject of the agentive verb is known not to be indifferent, the EFR is unacceptable, (98).

(98)   *Context: The hammer was in the toolbox, and the screwdriver was on the shelf. Sue was assembling the bed carefully and the next step called for a hammer, so...*
   Sue grabbed {#whatever tool, the tool that} was in the toolbox

To explain this reading, this work adopts an idea from the literature on agentive predicates: that certain agentive predicates introduce a modal base into the grammatical representation of the sentence (Koenig & Davis 2001, Martin & Schäfer 2012, Kratzer 2013, et al. on

defeasible causatives and transfer of possession). (99) is a piece of evidence for this view from Martin & Schäfer 2012, citing Oehrle 1976. In (99a), the animate, agentive subject allows for a reading under which the uptake of the offer is non-actual, while (99b), which has an inanimate non-agentive subject, implies actual uptake.

(99)   a. L'organisateur de la course lui a offert la première place. Mais elle a refusé ce marché.
          'The organizer of the race offered her the first position, but she refused this deal.'
       b. Son excellent résultat lui a offert la première place. #Mais elle ne l'a pas prise.
          'Her excellent result offered her the first position. But she didn't take it.'

Suppose that one possible LF for *Sue grabbed whatever tool was in the toolbox* under the indifference reading is (100), where AGENT has the denotation in (101) (based on Kratzer 2013). In this LF, the EFR's situation argument s_7 is bound by the agentive modal. Event arguments (type ϵ) are represented explicitly in this example, and presuppositions are assumed to project universally from the scope of the agentive situation quantifier.

(100)
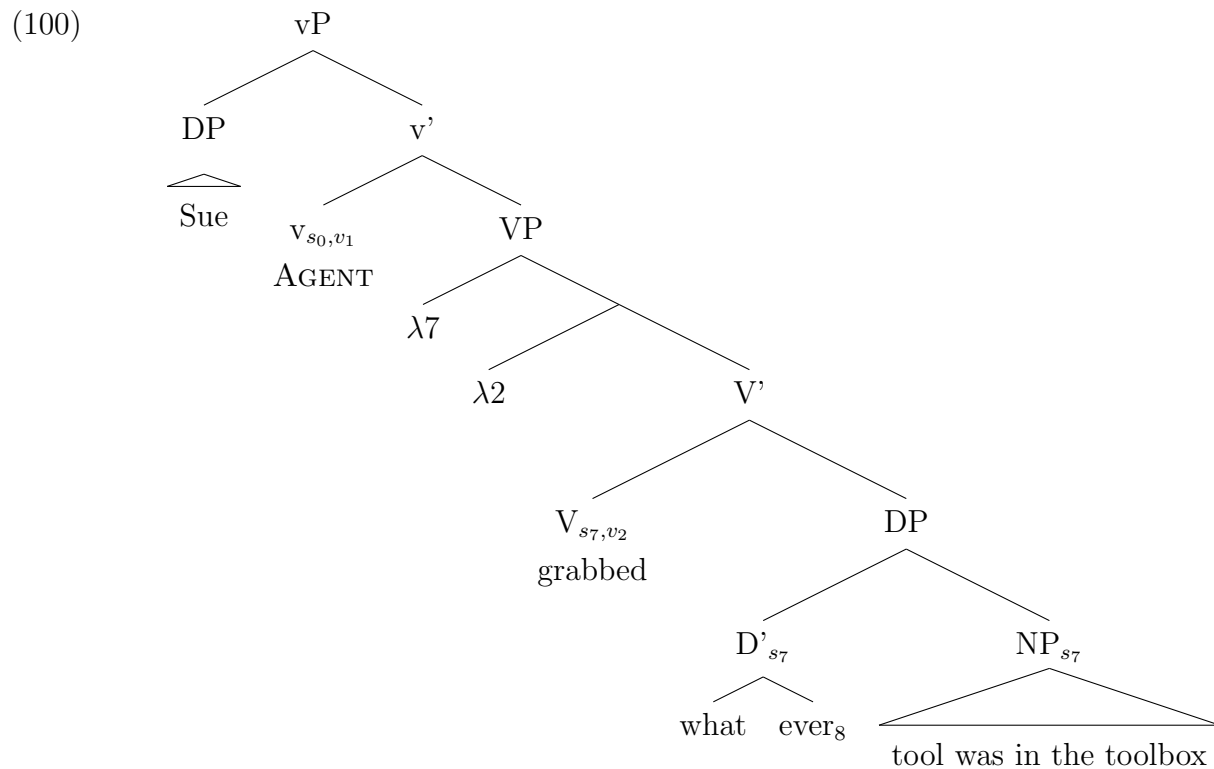
(101) $[\![\text{AGENT}]\!]^{g,c} = \lambda s \, . \, \lambda v_\epsilon \, . \, \lambda P_{\langle s, \epsilon t \rangle} \, . \, \lambda x : \forall s' \in \text{GOALS}(s,x,v) \to s' \in \text{DOM}(P) \, . \, x$ is the agent of v in s and $\forall s'[s' \in \text{GOALS}(s,x,v) \to \exists v'_\epsilon [P(s',v') \wedge \text{CAUSE}(s',v,v')]]$
        $\text{GOALS}(s,x,v)$ is the set of situations where the goals of x in s during v are realized

(100) presupposes (102a) and its alternatives presuppose (102b-c), assuming (103a-b) as the

value of *ever*$_8$ and alternatives.

(102) a. In every situation where Sue's goals are realized, there is exactly one tool in the toolbox, which is a hammer or a screwdriver

   b. In every situation where Sue's goals are realized, there is exactly one tool in the toolbox, which is a hammer

   c. In every situation where Sue's goals are realized, there is exactly one tool in the toolbox, which is a screwdriver

(103) a. λs . λx . x is a hammer in $s \vee x$ is a screwdriver in s

   b. $\{\lambda s$. λx . x is a hammer in $s, \lambda s$. λx . x is a screwdriver in $s\}$

The alternatives are as informative as the sentence containing the EFR; all of them describe an actual agentive event on the part of Sue and in all situations where the agentive event leads to Sue's intended result, her action causes the tool to be grabbed. They differ in terms of what property is presupposed to hold of the tool in Sue's goal worlds, hence MP is relevant. The use of the EFR-sentence is MP-compliant only if neither (102b) nor (102c) is entailed by the context set. Two types of context sets meet this requirement: i) a context set in which it is unsettled what tool was in the toolbox in all of Sue's goal realizing situations and ii) a context set in which it is settled, for at least two goal realizing situations s and s' that the tool is a hammer in s and a screwdriver in s'. From the perspective of a hearer who takes a speaker to be MP-compliant, the speaker's choice to utter an EFR generates the antipresupposition that (103b-c) are false. Hence, a hearer can infer that the speaker is ignorant about what type of tool was in the toolbox or that the speaker knows that Sue was indifferent about the type of the tool that was in the toolbox.

Several question remain to be answered regarding indifference. Non-actuality of uptake was given as evidence for modality in the meaning of *The presenter offered her the first place*, but *Sue grabbed whatever tool was in the toolbox* implies not just that the grabbing of the tool was actual, but also that the tool was actual. This doesn't immediately follow from the proposal above, where the extension of the EFR is determined in Sue's goal-realizing situations and where these situations do not have to be related in any way to the situation of evaluation s_0. One possible solution, to be explored in future work, is that the situations quantified over are more 'realistic' than the proposal above suggests[8].

The second question left open for future work is the divide between assertive vs.

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[8]For example, under a Kratzerian (1981, 1991, 2012) doubly-relative view of modality, the agentive modal base might be a realistic circumstantial modal base, ordered by the goals of the agent. Unless explicitly signalled that certain entities only exist in the modal base once it is ordered by the agent's goals, the entities in the modal base are assumed to exist in the unordered, circumstantial modal base, and hence are actual.

presuppositional content in indifference readings. Given the perceived readings of (104a-b) (based on von Fintel 2000: 36), it has been proposed that the indifference implication is truth conditional rather than presuppositional (see also Rawlins 2015, Condoravdi 2015).

(104)   a. Sue didn't just grab whatever tool was in the toolbox (. . . she grabbed the hammer
          on purpose)
      b. Unless Sue just grabbed whatever tool was in the toolbox, she took a long time
          to assemble the bed

Under the current analysis, there is no difference in status between the ignorance and indifference implications. Both are antipresuppositions generated by the use of a presuppositionally weak alternative. It is not yet clear if this is a fault, and this question is left for future work. Rawlins 2015 observes that many kinds of definites may give rise to indifference implications, which at times may appear to be at-issue. He provides the example in (105), which can naturally be understood to express a condition on Alfonso acting indifferently (Rawlins 2015: 275), suggesting that this question isn't particular to EFRs.

(105)   Unless Alfonso (simply) grabs the tool that is handy, we will be waiting for hours
      ⤳ Unless Alfonso makes a quick decision . . .

3.2.6 Diverse subpart reading

EFRs with a plural head need not carry any modal implications of ignorance, as shown in (106). However, speakers report a slight contrast between (107a-b), where the subparts making up the EFR's referent have salient, distinct properties in (107a) but not (107b).

(106)   The thieves grabbed whatever small objects they could reach through the holes they
      opened – figurines, vases, and lamps

(107)   a. A: They borrowed my hammer and my screwdriver
         B: Right, but whatever tools they borrowed have been returned
      b. A: They borrowed my two hammers
         B: ?Right, but whatever tools they borrowed have been returned

Plural EFRs presuppose the existence of a maximal non-atomic entity having the property denoted by the restrictor, and that the maximal entity is in the extension of $ever_1$. To comply with MP, the maximal non-atomic entity can't be known to have one of the alternative properties. Two context sets meet this requirement: i) a context set in which it is unsettled which alternative property holds of the referent and ii) a context set in which it's settled

that different alternative properties hold of the entity's subparts. The latter type of context supports the non-modal reading identified by Condoravdi 2015. Following Condoravdi, a very fine-grained partition of $ever_1$ is in principle possible (e.g. based on properties of being identical to atomic subparts of the EFR's referent). This implies that the use of a plural EFR can always be construed as MP-compliant, carrying the antipresupposition that the EFR's plural referent is simply made up of different parts, which is guaranteed by plurality. Regarding the contrast between the discourses in (107a-b), if $ever_1$ and alternatives receive the salient values in (108a-b), then B's utterance is MP-compliant only in (107a); B's utterance in (107b) could be MP compliant under different values (e.g. $\lambda s.\ \lambda x.\ x$ is hammer 1 in $s \vee x$ is hammer 2 in s).

(108) a. $\lambda s\ .\ \lambda x.\ x$ is a hammer in $s \vee x$ is a screwdriver in s
  b. $\{\lambda s\ .\ \lambda x.\ x$ is a hammer in $s, \lambda s\ .\ \lambda x.\ x$ is a screwdriver in $s\}$

3.3 Discussion: Other views on modal readings

The current subsection discusses observations about ignorance readings that this account is able to explain but that prove challenging for Dayal 1997 (and successors) and Heller & Wolter 2011. It then discusses some challenges for the account of indifference based on counterfactuality in von Fintel 2000.

Dayal 1997 offers the first formal semantic analysis of EFRs, and it primarily aims to explain ignorance and generalizing readings. According to Dayal 1997 (as recast in von Fintel 2000: 30, analysis-N), ignorance arises because EFRs carry a presupposition of non-rigid designation across a set of epistemic alternatives, as in (109).

(109) For any world w and any property $P_{\langle s,et \rangle}$:
  $[\![\text{whatever}]\!]^{g,c}(w)(F)(P)$ is defined only if $\exists w', w'' \in F[\iota x[P(w')(x)] \neq \iota x[P(w'')(x)]]$
  When defined, $[\![\text{whatever}]\!]^{g,c}(w)(F)(P) = \iota x[P(w)(x)]$
  (where F is the extension in w of a salient epistemic modal base function)

This analysis implies that the use of an EFR is felicitous only if the speaker (or relevant epistemic source) is not certain of which individual the EFR denotes. Heller 2005, Condoravdi 2008, and Heller & Wolter 2011 identify two empirical challenges for the analysis. The first is the unexpected felicity of EFRs in contexts where the speaker can identify the EFR's referent with an individual-denoting expression like the demonstrative *that* in (110).

(110) A (pointing): Bill is baking that.
  B: I see. Well, Bill is a vegan, so whatever he is baking is vegan

The second challenge is the unexpected infelicity of EFRs in contexts where an NP-property is saliently ascribed to the EFR's referent, as in (111). Such contexts are in principle compatible with the speaker being unable to identify the individual that the EFR denotes, making the EFR's non-rigidity requirement satisfiable.

(111) *Bill is baking a cherry pie, and whatever pie he is baking is vegan

Heller & Wolter 2011 aims to resolve both of these problems by proposing a different presuppositional condition on the use of an EFR. The proposal relies on different ontological assumptions about the meanings of common nouns, which will be presented in brief. They propose that EFRs presuppose uncertainty about the identity of the EFR's referent, where the linguistically-relevant notion of identity is relativized to noun meanings. On their ontological assumptions (based especially on Gupta 1980), noun meanings are not properties, as assumed here, but rather *sorts*. Sorts are intensions of sets of individual concepts that uphold three principles: the principle of application (which says that the individual concepts pick out entities with the noun-related property), the principle of identity (which tracks the entities picked out by the individual concepts across worlds), and the principle of separation (which distinguishes between individual concepts). An example common noun denotation under their assumptions is given in (112) (slight notational differences for readability).

(112) $[\![\text{statue}]\!]^{g,c}$ is the function S from worlds into sets of individual concepts (type $\langle s, \langle\langle s, e\rangle, t\rangle\rangle$) such that for any world w:

    a. $\forall i \in S(w)$: $\text{STATUE}(i(w)) = 1$ Application

    b. $\forall i \in S(w)$: $\forall w', w''$: if $i(w')$ and $i(w'')$ are defined, then $i(w')$ is
        the same statue as $i(w'')$ Identity

    c. $\forall i, i' \in S(w)$: if $i(w) = i'(w)$, then $i = i'$ Separation

According to Heller & Wolter 2011, EFRs presuppose that there is no nominal sort by which to track the EFR's identity across worlds, as in (113), where S ranges over sorts.

(113) For any world w and any properties $P_{\langle s,et\rangle}, Q_{\langle s,et\rangle}$:
    $[\![\text{whatever}]\!]^{g,c}(w)(F)(P)(Q)$ is defined only if $\forall S_{\langle s,\langle\langle s,e\rangle,t\rangle\rangle} : \exists w, w' \in F[\iota x[P(w)(x)]$
    is not the same S as $\iota x[P(w')(x)]]$.
    When defined, $[\![\text{whatever}]\!]^{g,c}(w)(F)(P)(Q) = 1$ iff $\forall w' \in F[Q(\iota x[P(w')(x)])]$

The denotation is meant to solve the two problems faced by Dayal's account based on non-rigidity. The first problem, posed by felicitous EFRs in contexts of demonstration, is solved by assuming a particular view on demonstration, inspired by Kaplan 1989. Demonstratives

denote some individual concept, provided by the assignment, whose extension is presupposed to be demonstrated and which is presupposed to belong to some sort.

(114)   For any world w, $[\![\text{that}_1]\!]^{g,c} = g(1)$, where $g(1) \in D_{\langle s,e \rangle}$, when $g(1)(w)$ is demonstrated by the speaker and $\exists S \in D_{\langle s, \langle \langle s,e \rangle, t \rangle \rangle}[g(1) \in S(w)]$, else undefined.

Demonstratives, unlike common nouns, do not denote sorts; as such, they do not provide a method of identifying their referent in the way that a common noun does. Thus, there is no problem with referring to an entity using a demonstrative and then an EFR. The EFR's ignorance requirement represented in (113) is satisfiable.

The second problem, posed by infelicitous EFRs which have been saliently ascribed a property like *cherry pie* is explained by Heller & Wolter 2011: 184 as follows: "Knowing that the sort [*cherry pie*] applies to the denotation of the FR provides a principle of identity for this entity, and there is no information in this context which guarantees that the entity will not be the same [*cherry pie*] across the possible worlds in the modal base. This violates Condition S, which requires there not to be any such identifying nominal sort."

In addition to these welcome results, the proposal is compatible with the felicity of the EFR in the discourse repeated in (115), which is inspired by one of their own that is used to motivate the switch to sorts in the meaning of EFRs.

(115)   *Context: Mary and Bill each baked a cherry pie and then left. A and B enter and see two covered pies, one on the left and one on the right.*
A: Both of these are cherry pies
B: Right, but Bill is a vegan, so whatever pie he is baking is vegan

Although the EFR's referent is known to be a cherry pie, there is still indeterminacy whether it denotes the cherry pie on the left or the cherry pie on the right. As such, the sort denoted by *cherry pie* does not provide a method of identifying the EFR's referent across the epistemic modal base, making the requirement of the EFR on their proposal satisfiable.

Two problems for their analysis will be pointed out. Arguably, it does not adequately explain the infelicity of (116), an example of the second problem for Dayal's proposal.

(116)   *Bill is baking a cherry pie, and whatever pie he is baking is vegan

Since (115) is acceptable, while the EFR is known to denote a cherry pie, it's not clear why speakers judge (116) deviant rather than recognizing that its use requires the EFR not to denote the same cherry pie across the modal base. In other words, why is the default judgment unacceptability, rather than accommodation of some uncertainty regarding the

pie's identity? (116) is explained under the current proposal by relativizing the ignorance requirement to a contextually determined set of properties.

The second point concerns the fact that speakers accept an EFR in contexts where its referent can be pointed to. Based on their proposal for the meaning of the EFR and the denotation of demonstrative *that*, a demonstrative on its own could never make an EFR infelicitous. In contrast, this work claims that EFRs are sensitive to contextually-salient properties, not sorts, implying that demonstration could make an EFR infelicitous if an alternative to *ever*$_1$ has a denotation equivalent to demonstration. While the evidence is preliminary, the contrast between (117a-b) seems to suggest that there are certain cases where EFRs (namely, *whichever*) are made unacceptable by salient demonstration.

(117)   a. A: Bill is either baking this or that
           B: I see. Well, whichever Bill is baking is vegan
        b. A: Is Bill baking this, or that?
           B: He's baking that.
           A: #I see. Well, whichever Bill is baking is vegan

(117b) suggests that a property-based requirement for ignorance, which can be violated by a demonstration-type property ascription, is more appropriate. On the other hand, this work would need to say why demonstration does not make the EFR infelicitous in the original example or in other words, why a demonstration-type property is not among the alternatives in the original example. While this seems to be related to the difference between *whatever NP* and *whichever*, this question is left for future work.

The current proposal and the proposal for indifference readings in von Fintel 2000 will be discussed. According to von Fintel 2000: 33 (final Analysis-I), EFRs have the denotation in (118), inspired by Dayal 1997. The presupposition of an EFR involves quantification over the worlds in the modal base that most closely resemble the world of evaluation but in which the restrictor of the EFR denotes a different entity; in all of these worlds, the main predication of the sentence is true.

(118)   For any world w, any modal base F_{st}, and any properties $P_{\langle s,et \rangle}, Q_{\langle s,et \rangle}$:
        $[\![$whatever$]\!]^{g,c}(w)(F)(P)(Q)$ is defined only if
        $\forall w' \in \text{MIN}_w(F \cap \{w'' : \iota x[P(w'')(x)] \neq \iota x[P(w)(x)]\}) : Q(w')(\iota x[P(w')(x)])$
        When defined, $[\![$whatever$]\!]^{g,c}(w)(F)(P)(Q) = 1$ iff $Q(w)(\iota x[P(w)(x)])$

Indifference readings arise when context supplies the extension of a counterfactual modal

base as the value for F[9]. An EFR-sentence carries the presupposition that a change to the identity of the EFR's referent would not affect the truth of the sentence. For example, *Sue grabbed whatever tool was in the toolbox* presupposes that if the tool in the toolbox had been something else, Sue would've grabbed that.

As pointed out before, indifference readings are only available with certain predicates; thus, (119) is incompatible with an appositive, unlike the original sentence with *grabbed*.

(119)   Sue liked whatever tool was in the toolbox (*this hammer, as it happened)

Without further elaboration, this does not follow from Analysis-I. For example, consider (120), which makes a counterfactual modal base salient but where the EFR is an argument to a non-agentive predicate *contains*. The EFR is unacceptable in this context.

(120)   *Context: The tool Sue bought at the store today is this hammer. She wanted a screwdriver and she would have bought one if she had had more money. When she got home, she put away the hammer where she puts all of her tools.*
         *This toolbox contains whatever tool Sue bought at the store today

Analysis-I would need to be amended to explain (120). A counterfactual modal base in which the EFR denotes something else is salient; in counterfactual worlds where Sue has more money, she buys the screwdriver. Furthermore, the predicted presupposition (that the toolbox would contain the screwdriver if Sue had bought it) is satisfied by the information that all of her tools go in the box. The unacceptability of (120) is unexpected.

On the other hand, the current analysis relates indifference readings to agentive modal bases in the grammatical representation of the sentence. In this respect, it agrees with Rawlins 2015 that indifference readings convey a type of agent-teleological modality (though he is concerned more with the way that the particles *just, simply*, as in *Sue just grabbed whatever was handy*, contribute this modality). While determining which verbs introduce this type of modality is beyond the scope of this work, the prediction of the analysis is that the availability of an indifference reading is conditioned by the choice of verb. Hence, it is not unexpected that *contain* does not support an indifference reading while *grab* does.

Rawlins 2015 also discusses indifference, especially the contribution particles like *just* and *simply*, but a thorough comparison is beyond this work. Like this work, Rawlins proposes that *ever* obligatorily evokes 'descriptive alternatives' for the entity denoted by an EFR i.e. different definite expressions that could be used to refer to it. He hypothesizes that these

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[9]Under this version of the meaning of the EFR, ignorance arises when F is epistemic; non-rigidity across F, which is what Analysis-N required, is derived by assuming that MIN is a partial function, applying only to non-empty sets, thus $F \cap \{w'' : \iota x[P(w'')(x)] \neq \iota x[P(w)(x)]\}$ has to be non-empty.

alternatives are used by covert or overt scalar particles, generating indifference inferences. In contrast, this work does not rely on covert scalar particles for the various readings of EFRs, only MP-based reasoning. Furthermore, the proposal here grammatically links indifference readings to agentive verbs that introduce modal bases. It is not clear whether the analysis he proposes would rule out indifference readings when EFRs are arguments of non-agentive verbs e.g. *contain.*

3.4   Discussion: The challenge of individual variation

Individual variation readings pose a challenge for many previous accounts: the accounts based on modal presuppositions (Dayal 1997, von Fintel 2000, Heller & Wolter 2011, Rawlins 2010), the account based on unconditionals restricting modals (Hirsch 2015, Šimík 2018), and the account based on rules for using alternatives (Condoravdi 2015). Such readings were observed by Lauer 2009, and this section will briefly compare the current proposal to his.

According to the modal presupposition account, EFRs carry a presupposition that requires variation with respect to the EFR's denotation across a contextually determined modal base; typically this is expressed as a presupposition of non-rigidity, but Heller & Wolter 2011 propose that variation relative is to sorts, and in principle, variation could be made relative to a set of partitioning properties. Different readings have been explained by assuming that the modal base across which the EFR varies can be the set of epistemically accessible situations (ignorance), the set of counterfactually accessible situations (indifference), or the set of generically accessible situations (generalizing).

The main empirical challenge faced by such accounts is the existence of non-modal readings of variation, as in (121).

(121)   Every professor most enjoyed whatever conference she first attended

As discussed above, (121) need not imply ignorance. It is felicitous in contexts in which it's settled for every professor what her first conference was, so long as the conference varies across professors. (121) also lacks an indifference reading, given the non-agentive predicate, as evidenced by its incompatibility with appositives, (122).

(122)   a. Sue most enjoyed whatever pie Bill gave her (*a cherry pie, as it happened)
         b. Sue grabbed whatever pie Bill gave her (a cherry pie, as it happened)

Furthermore, the choice of predicate and referent for the EFR make a generalizing reading implausible, as evidenced by the oddity of (123). Generally, enjoying a particular conference the most describes a state, not something that happens on multiple occasion.

(123) ?Sue always most enjoyed the first conference she attended

Variation across the set of epistemically accessible situations, the set of counterfactually accessible situations, or the set of generically accessible situations will not provide the attested reading of the example.

　　According to the unconditional account of EFRs proposed by Hirsch 2015 and extended in Šimík 2018, a sentence containing an EFR uses the property-denoting restrictor of the EFR twice: once in the conditional restrictor to a quantifier over worlds and once as the argument of a definite determiner. A sentence like *John ate whatever Mary cooked* has the LF in (124a), whose meaning is derived from the parts in (124b-e).

(124)　a. LF: Op [□ [Q whatever Mary cooked] [John ate D whatever Mary cooked]]
　　　　b. $[[$Q whatever Mary cooked$]]^{g,c} = \lambda p_{st}. \exists x[p = \lambda w.$ Mary cooked x in $w]$
　　　　c. $[$John ate D whatever Mary cooked$]^{g,c} = \lambda w.$ John ate $\iota x[$Mary cooked x in $w]$ in w
　　　　d. $[□]^{g,c} = \lambda p_{st} : F_c(w) \cap p \neq \varnothing . \lambda q_{st} . \lambda w . \forall w' \in F_c(w) \cap p : q(w') = 1$
　　　　e. $[$Op$]^{g,c} = \lambda P_{st,t}. \lambda w. \forall p \in P : p(w) = 1$

The EFR-restrictor property is used to derive a question-meaning (a Hamblin set of possible answers), which pointwise restricts a quantifier over worlds, □. □ denotes a partial function, requiring there to be epistemically accessible worlds in its restrictor. Hence, the pointwise restriction results in a presupposition of variation across $F_c(w)$; every possible answer is presupposed to be epistemically possible. The EFR-restrictor property is used again as an argument of a definite determiner, whose extension is determined in the worlds quantified over by □. Finally, Op returns the intersection of all propositions derived by pointwise composition, resulting in the truth conditions in (125).

(125)　　If the thing Mary cooked was pasta, then John ate the thing Mary cooked
　　　　∧ if the thing Mary cooked was pizza, then John ate the thing Mary cooked...

Šimík 2018 shows that the analysis can be extended to generalizing readings by having the set of propositions restrict a quantifier over situations rather than an epistemic modal. This view faces problems explaining the same data point as the modal-presupposition account, namely the individual variation reading of (126).

(126)　　Every professor most enjoyed whatever conference she first attended

As shown before, (126) does not involve quantification over situations; thus, the account based on conditional restriction of a modal does not predict any reading other than ignorance.

Condoravdi's (2015) account introduces the notion of contextually-determined alternative properties, thus avoiding the problems relating to non-rigidity. However, the alternative properties are discharged with one of two modalized rules. The first rule produces a presupposition of variation across the context set, and the second rule makes variation across a counterfactual modal base part of an EFR sentence's assertive content. Since both rules are modalized, the non-modal variation in (126) is problematic as well.

Lauer 2009 is the first to point out the individual-variation reading and the problem it poses for inherently modal accounts. He notes that the type of variation an EFR can convey is determined by what quantificational expressions scope over the EFR. Under his proposal, which is couched in a dynamic semantic framework, EFRs have grammatically encoded postsuppositions which require variation with respect to the EFR's referent in the EFR's output context. In sentences with individual quantifiers that bind into the EFR, this amounts to a requirement that the EFR denote different individuals across the domain of the quantifier. Thus, his proposal derives the same result as the current proposal for the problematic *Every professor most enjoyed whatever conference she first attended.*

Under Lauer's proposal, variation is part of the grammatical meaning of EFRs. In contrast, under the current proposal, evocation of alternatives is part of the grammatical meaning of EFRs (because of *ever*), but variation is not. It is a result of MP-based reasoning. The current account naturally explains the availability of non-modal readings with plural EFRs. MP is satisfiable without ignorance about the EFR's referent, so long as no individuating property holds of the entire maximal plural referent (hence the diverse-subpart reading). In contrast, to avoid ignorance requirements for plural EFRs, Lauer 2009: 26-27 hypothesizes that they are exempt from the requirements of singular EFRs, not predicting any implication about diverse subparts. Additionally, this work is able to provide a unified explanation for the parallel readings of *whether*-questions and EFRs without assigning *whether*-questions postsuppositional requirements. The MP-based account predicts that similar effects arise when alternative-evoking expressions are integrated into presuppositional expressions, whereas Lauer's does not predict such a correlation.

3.5   Discussion: Definites and domain restriction

Definite expressions are commonly assumed to presuppose that there is a maximal entity in the set derived by intersecting the denotation of the NP with a contextual restrictor (e.g Westerståhl 1985). Thus, an ordinary denotation for *the* is as in (127a) (where P is supplied by a C-variable in the LF), which differs crucially from the denotation of σ assumed to be part of the meaning of the silent definite head in EFRs, repeated in (127b).

(127) a. $[\![\text{the}]\!]^{g,c} = \lambda P_{et} . \lambda Q_{et} : \exists x[x = \text{Max}(Q \cap P)].\text{Max}(Q \cap P)$
    b. $[\![\sigma]\!]^{g,c} = \lambda P_{et} . \lambda Q_{et} : \exists x[x = \text{Max}(Q) \wedge P(x)].\text{Max}(Q)$

The reason that (127b) was proposed is to guarantee entailment between the presuppositions of the EFR's alternatives and the presupposition of the EFR, thus getting the MP-based analysis off the ground. MP is only relevant for expressions whose presuppositions are ordered by asymmetric entailment. If (127a) had been used instead, even by assuming that $ever_1$'s alternatives partition $ever_1$, there would be no entailment relation between the presuppositions of alternatives and the presuppositions of the EFR.

Suppose there is exactly one food item, and it's a pie. It follows that there is exactly one food item, and it's a pastry. In contrast, if there is exactly one pie (i.e. exactly one entity in the intersection of food items and pies), it does not follow there is exactly one pastry (i.e. exactly one entity in the intersection of food items and pastries); there might be one pie and then several cookies. Thus, replacing the P-arguments with subsets of P, there is entailment in the presupposition of (127b) but not (127a).

The non-canonical syntax proposed for EFRs in Section 3.2.1 is also partly motivated by the denotation assumed for the definite article. Previous accounts like Caponigro 2003, Caponigro 2004 propose that the WH-word contributes a restricting property that is intersected with the denotation of the clause, as in (128).

(128) $[_{DP} \sigma [_{CP} \text{what-}s_0 [\lambda 1 [\text{John bought-}s_0 t_1]]]]$
    $[\![\text{CP}]\!]^g = \lambda x.\ x$ is inanimate in $s_0 \wedge$ John bought x in s_0

Caponigro's proposal is incompatible with the idea that $ever_1$ contributes a presuppositional 'comment' about the maximal entity in the denotation of the clause; once *what* (or *whatever*) is intersected with the denotation of the clause, its meaning is used to determine what the maximal entity that the definite refers to is, not to comment on it.

Jacobson 1995 proposes that the WH-word ($what^J$) in free-relatives denotes a function from an $\langle e, t \rangle$-function to a singleton set containing the maximal entity that the function maps to true, as in (129). (129b) is then type-shifted to its single member.

(129) $[_{CP} \text{what}^J [\lambda 1 [\text{John bought-}s_0 t_1]]]$
    a. $[\![\text{what}^J]\!]^g = \lambda P_{et}. \{\text{Max}(P)\}$
    b. $[\![\text{CP}]\!]^g = \{\text{Max}(\lambda y.\ \text{John bought } y \text{ in } s_0)\}$

Caponigro 2003 argues against this proposal by pointing out that free-relatives do not always receive a maximal interpretation, as in existential free-relatives in Hebrew, (130). *ma le'eχol,*

'what to eat', is a free-relative, and the non-maximal reading is conditioned by the predicate.

(130) yeš li   ma   le'eχol
       exist to.me what to.eat
       'I have something to eat'

Caponigro takes examples like (130) to show that maximality is not encoded in the free-relative but contributed by the determiner/type-shifter that sometimes applies to it.

In some sense, this work's proposal for English EFR's is aligned with Jacobson's (1995) proposal for ordinary free-relatives in that the WH-word is analyzed as part of the definite determiner. However, the proposal here is restricted to EFRs, and some arguments were provided in Section 3.2.1 that EFRs have a different syntactic structure from ordinary free-relatives. Furthermore, consistent with the proposal here, even in Hebrew where certain ordinary free-relatives receive non-maximal readings, EFRs consistently receive maximal readings. Hebrew EFRs are formed with expletive negation as in (131) (Eilam 2007).

(131) ma še-Dani   lo katav hitparsem
       what that-Dani neg wrote was.published
       'Whatever Dani wrote got published' (lit. 'what Dani didn't write')

While such expressions can appear with existential verbs, as in (132), they cannot receive existential readings like the plain infinitival free-relative in (130); (132) means what is glossed below, not 'here, they dreamed of something'.

(132) po yeš lehem   ma še-lo   χalmu^W
       here exist to.them what that-neg dreamed
       'Here, they have whatever they dreamed of'

Thus, it seems that there is some independent justification for treating EFRs as involving a specialized definite determiner. That there are definite expressions that carry presuppositional 'comments' about the maximal entity they denote is a hypothesis of this analysis. It remains to be determined if independent motivation can be found that material within a definite expressions can serve a non-restricting function. Note that the idea that the denotation of the NP is intersected with a context set is compatible with the analysis presented here, so long as the denotations of the alternatives' NP-argument are also intersected with the same context set. This intersection might happen at the NP- or at the DP-level.

4   Conclusion

This work generally provided a uniform analysis for the contextual requirements of *know whether* sentences and EFRs. Both carry implications (depending on the grammatical environment they appear in) that are a consequence of their evoking equally informative alternatives with stronger presuppositions. It is worth pointing out a few of the differences in the treatments of the two constructions.

While comparison with such alternatives is, by hypothesis, part of the grammatical meaning of EFRs, *whether*-questions are only compared to declaratives denoting their possible answers if such alternatives are contextually salient. This assumption is meant to explain variable judgments with *know whether* sentences, which do not seem to be present with EFRs. Additionally, more readings were identified for EFRs than for *whether*-questions; for example, there was no corresponding indifference reading of *know whether* sentences. Under the current proposal, this can be explained with the additional assumption that agentive modal bases tend not to be part of the meaning of attitude predicates like *know, saw, discover* (though this work offers no principled reason why).

In general, this work extended MP to new empirical domains. It argued that a pragmatic analysis of EFRs provides better empirical coverage for the readings they exhibit than an analysis that encodes variation as a conventional component of EFRs' meaning.

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