# Exhaustify! Locally or Globally? Implications for Ignorance Inferences

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## 1. Introduction

This paper investigates cancelability and non-cancelability of ignorance implicatures in language. The empirical focus is on ignorance and exhaustivity implicatures associated with disjunction and indefinite expressions in Japanese and Sinhala. The parameter of non/cancelability is shown to depend on whether we scalar exhaustify below or above the assertoric operator assumed to scope over a disjunction or indefinite expression.

Sinhala and Japanese employ two particles: *-də* and *-ka* in disjunctions and indefinites in a similar fashion. In the domains of disjunction and indefinites, they both express ignorance overtly. However, it is observed that the ignorance generated by *-də* is strong (non-cancelable) while that generated by *-ka* is mild (cancelable). At the same time, Sinhala *-də* and Japanese *-ka* are positive polarity items (PPIs) in the two languages. Nevertheless, it is observed that anti-licensing for Japanese *-ka* is strictly a local phenomenon (i.e. the narrow scope interpretation can be recovered under extra-clausal negation.) while that for Sinhala *-də* is a universal phenomenon (i.e. the narrow scope interpretation can never be recovered or rescued.). Also, it can be seen that both *-də* and *-ka* induce exhaustification of domain as well as scalar alternatives. However, the scalar implicature of *-də* leads to strengthening while the scalar implicature of *-ka* does not lead to strengthening. Accounting for these empirical facts, I argue that domain and scalar exhaustification take place independently within the same clause. I show that ignorance implicatures arise as a result of exhaustification of domain alternatives (building on Nicolae 2016) as a domain implicature. I claim that non/cancelability of ignorance depends on whether we scalar exhaustify locally or globally (i.e. below or above the assertoric operator). I also argue that the non/cancelability character of ignorance is also a grammaticalized phenomenon in the two languages. In the derivations, I work with a framework in which implicatures are assumed to be grammaticalized with an implicit exhaustivity ($Exh$) operator placed in the syntactic structure (Fox (2007); Chierchia (2006); Chierchia et al. (2012); a.m.o).

The paper is organized as follows. Section two presents details about the distribution of the two particles in disjunction and indefinite constructions and shows that the semantics of the two particles are different. Then, it discusses the PPI behavior of the two particles in disjunctions and indefinites. It also presents descriptive facts about the ignorance component of the disjunction and indefinite expressions and the non/cancelability of the ignorance implicatures in the two languages. Section 3 discusses existing accounts dealing with the ignorance component in the two languages and shows some of the reasons why a novel account is required. Section 4 presents the proposal to formally account for the non/cancelability of the ignorance component in disjunctions and indefinites with the two particles in the two languages by analyzing them in terms of domain and scalar implicatures. Section 5 presents the conclusions.

## 2. Particles *-də* and *-ka* in disjunctions and indefinites

The two particles: Japanese *-ka* and Sinhala *-də* are used in disjunctions and indefinites in the two languages. The distribution facts of the two particles in the two languages are the same. However, their semantics are significantly different as explained in the following sections.

## 2.1. In disjunctions

Sinhala *-də* and Japanese *-ka* mark disjunction at constituent level combining disjuncts or alternatives as shown in (1).[1]

(1)  a.  John Giita-**də** Maala-**də** hamuun-a.       b.  John-ga   Giita-**ka** Maala-ni   atta.
      John Giita-də Maala-də met-A.           John-NOM Giita-ka Maala-DAT met
      "John met Giita or Maala." [2] (Sinhala)       "John met Giita or Maala." (Japanese)

However, the two particles instigate two different types of effects on the alternatives combined by them. As shown in (2), the particle *-də* does not allow an inclusive interpretation of the alternatives and marks a constraint akin to exclusive disjunction . And, as shown in (3), the particle *-ka* allows a conjunctive interpretation of the alternatives akin to inclusive disjunction.

(2)  a.  John Giita-**də** Maala-**də** hamuun-a.      b.  #æththətəmə, dennawəmə hamuun-a.
      "John met Giita or Maala."                 "In fact, he met both." [3]

(3)  a.  John-ga Giita-**ka** Maala-ni atta.      b.  Jituwa, kare-wa dochira mo atta.
      "John met Giita or Maala."                 "In fact, he met both." [4]

Thus, *-də* and *-ka* differ with respect to exclusivity and inclusivity constraints on the alternatives in their domains.

## 2.2. In indefinites

The two particles are also used attached to indeterminate pronouns (IDPs) such as *kaawə-* "who" *monəwa-* "what" and they are used in indefinite constructions in the form of wh-indefinites.

(4)  a.  John kaawə-**də** hamuun-a.      b.  John-ga   dare-**ka**(-ni) atta.
      John who-də    met-A               John-NOM who-ka-DAT met
      " John met someone." (Sinhala)        " John met someone." (Japanese)

As I will show later, the two types of constraints of the particles *-də* and *-ka* are in effect even in the domain of indefinites.

As we will see in the next section, the two particles *-də* and *-ka* also behave as positive polarity items (PPIs) in the two languages.

## 2.3. Particles -də and -ka as PPIs

Neither disjunctions nor indefinites formed with the particles *-ka* and *-də* can be interpreted under clause-mate (immediate scope of) negation. Thus, they are PPIs. The core properties of PPIs are: anti-licensing; locality of anti-licensing and rescuing (Szabolcsi, 2004; Spector, 2014).

***Anti-licensing:*** This means that PPIs can not be interpreted (anti-licensed) under the immediate scope of local (non-embedded) sentential negation. Thus, only a wide scope interpretation of a disjunction or indefinite with respect to negation is available.

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[1]  The particles *-ka* and *-də* are used to mark disjunction only at the constituent level. Sinhala has the disjunction marker *næthnam* similar to 'if not' in English that is used to mark disjunction at sentence level (See Weerasooriya (2017a) for a discussion with more details.

[2]  The disjunction construction with the particle *-də* sounds odd without a clause similar to 'I don't know who/what/which one' attached at the end of it, it is not ungrammatical though. This will be taken up later in detail. Also, in a declarative sentence, the verb is marked with the morpheme *-a* in Sinhala, as seen in the example here. In a focus or question construction, the verb is marked with the morpheme *-e*. See Ananda (2011) for a detailed account of the use of the two morphemes in the two types of constructions.

[3]  *-də*...*-də* disjunction is the exclusive disjunction in Sinhala, while ***-hari*...*-hari*** is the inclusive counterpart of that. See Weerasooriya (2017a) for a discussion of the difference between the two types of disjunction particles.

[4]  The simple disjunction *-ka* is the inclusive disjunction in Japanese, while the complex disjunction *-ka*...*-ka* is the exclusive counterpart of that.

**Rescuing:** This means that PPIs can well receive a narrow scope interpretation in the scope of an even number of downward entailing (DWE) operators.

**Locality of Anti-licensing:** This means that the narrow scope interpretation can be recovered in the scope of an extra-clausal negation.

Spector (2014) shows that anti-licensing of French *ou* is local, as the narrow scope interpretation can be recovered with extra-clausal negation or rescued with another negation. Following this, he argues that *ou* is a very mild PPI. At the same time, for *soit-soit*, he shows that the in-situ interpretation for disjunction can not be recovered with extra-clausal negation, thus locality of anti-licensing does not to hold for *soit-soit*. However, he shows that it can be rescued with another negation or a DWE operator. Thus, he argues that *soit-soit* is a strong PPI as its narrow scope interpretation can not be recovered under extra clausal negation.

As seen in (5), neither the Sinhala *-də* disjunction nor the *-də* indefinite is licensed (thus, anti-licensed) under clause-mate negation.

(5)    a.    John Gita-**də** Mala-**də** dækk-e næ.
                John Gita-də Mala-də saw-E  not
                "John did not see Gita or he did not see Mala." -də(or) > not
                (This would be true in a context where John saw exactly one of Giita or Maala, but the speaker is not sure which one he did not see. Thus, not > -də(or) (i.e. John did not see any of them.) is ruled out.)
    b.    John kaaw-**də** dækk-e næ.
                John who-də  saw-E  not
                "John did not see somebody." Somebody(-də) > not
                (This would be true in a context where there is one particular person and John did not see that person, and the speaker does not know who that person is. Thus, not > Somebody(-də) (i.e. John did not see anybody.) is ruled out.)

Thus, Sinhala *-də* is a PPI as also discussed in Weerasooriya (2017a). As shown in (6), disjunctions and indefinites with the particle *-ka* also can not be interpreted under clause-mate negation.

(6)    a.    John-wa aisu     ka keki-wo    tabe-nakat-ta.
                John-TOP ice cream or cake-ACC eat-neg-past
                = John did not eat ice cream or did not eat cake (Goro and Akiba 2004:3)
    b.    John-wa   nani-ka tabe-nakat-ta.
                John-TOP what    eat-neg-past
                "John did not eat something" Something(-ka) > not
                (This would be true in a context where there is one particular thing and John did not eat that thing. Thus, not > something(-ka) (i.e. John did not eat anything.) is ruled out.)

Thus, the Japanese disjunction particle *-ka* is also a PPI (following Goro & Akiba (2004)). However, the anti-licensing effects of the two particles are different. For Japanese *-ka*, the narrow scope interpretation can be derived (recovered) under extra clausal negation.

(7)    John-wa [Mary-ga  eigo    ka nihongo-wo   hanasu-to]  iwa-nakat-ta
           John-TOP Mary-NOM English or Japanese-ACC speak-Comp say-neg-past
           = John didn't say that Mary could speak English and didn't say that Mary could speak Japanese. (not > -ka(or)) (Goro and Akiba 2004:9)

This way, the anti-licensing effect of *-ka* can be re-calibrated and Japanese *-ka* is a mild PPI (following the terminology in Spector (2014)). On the other hand, the conjunctive interpretation of Sinhala *-də* can not be recovered under extra clausal negation as shown in (8).

(8)    John kiuww-e næ Mary-tə     ingrisi-**də** sinhala-**də** katha kərannə puluwan kiyala.
           John said-E   not Mary-DAT English-də Sinhala-də speak do     can       COMP
           "John didn't say that Mary could speak English or didn't say that Mary could speak Sinhala. (-də(or) > not)

It can not also be rescued under an even number of DWE operators as shown in (9).

(9)　　John Giita-**də** Maala-**də** dækk-e næ kiyala penennə næ.
　　　　John Giita-də Maala-**də** saw-E　neg COMP appear　neg
　　　　"It is unlikely that John did not see Giita or Maala." (-də (or) > not)
　　　　(This would be true in a context where it seems to the speaker that John saw exactly one of Giita
　　　　or Maala, but the speaker is not sure which one he did not see. Thus, not > -də(or) (i.e. John did
　　　　not see any of them.) is ruled out.)

Thus, the anti-licensing effect of **-də** can never be re-calibrated and Sinhala **-də** is a very strong PPI.
In section 4, I show that **-də** and **-ka** as PPIs induce exhaustification of alternatives which has significant effects on the cancellation as well as generation of ignorance implicatures.
At the same time, both disjunctions and indefinites with **-də** and **-ka** overtly express ignorance. Implications associated with the ignorance component are discussed next.

## 2.4. The ignorance component of disjunctions and indefinites with -də and -ka

Both the disjunction and indefinite expressions with the particles **-də** and **-ka** signal that the speaker lacks knowledge about who or what satisfies the existential claim made in a disjunction or indefinite. Thus, signaling lack of knowledge on the part of the speaker, such disjunctions and indefinites create an epistemic effect.

### 2.4.1. Indefinites with -də and -ka as epistemic indefinites

Both Sinhala **-də** and Japanese **-ka** indefinites are 'epistemic indefinites'. Epistemic indefinites make an existential claim and signal that the speaker cannot identify the individual that satisfies that claim (Alonso-Ovalle & Menéndez-Benito, 2017). For example, the infelicity of the question "who?" on the part of the hearer (B) as shown in (10) and (11), indicates that these indefinites overtly express ignorance.[5]

(10)　a.　A: John kaawə-**də** hamuun-a.　　　　　b.　B: *kaawə-də ?
　　　　　　John who-də　met-A　　　　　　　　　　　who-də
　　　　　　" John met someone."　　　　　　　　　　　"Who?" (Sinhala)

(11)　a.　A: John-wa kinoo　dare-**ka**-ni　atteita　　yo
　　　　　　John-TOP yesterday who-KA-DAT was.meeting PRT
　　　　　　"John was meeting with somebody yesterday."
　　　b.　B: *honto? aitsu dare-ni　atteita?
　　　　　　really　he　who-DAT was.meeting
　　　　　　"Really? Who was he meeting with?"　　　　　(Japanese) (Sudo 2010:4)

### 2.4.2. Disjunctions with -də and -ka expressing ignorance

Both **-də** and **-ka** disjunctions also overtly express ignorance. The mandatory tag clause attached at the end of a **-də** disjunction expression is also evidence for obligatory ignorance for the Sinhala disjunction as shown in (12).

(12)　a.　A: John Giita-**də** Maala-**də** hamuun-a, *(mamə danne næ kaawə-də kiyəla).
　　　　　　John Giita-də Maala-də met-A,　　I　　know not who-də　COMP
　　　　　　"John met Giita or Maala (exactly one of them), I don't know who/which one."
　　　b.　B: *kaawə-də ?
　　　　　　who-də
　　　　　　"Who?"

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Also, for Japanese **-ka** disjunction, the infelicity of the question "who?" on the part of the hearer (B) shows that it induces ignorance.

(13) A: John-ga Giita-**ka** Maala-ni atta.       B: *honto? aitsu dare-ni atteita?
John-NOM Giita-ka Maala-DAT met       really he who-DAT was.meeting
"John met Giita or Maala."       "Really? Who was he meeting with?"

However, the two particles exhibit different behavior with respect to the non/cancelability of ignorance.

*2.4.3. Cancelability/non-cancelability of the ignorance component*

The ignorance in disjunctions or indefinites with the particle **-də** can never be canceled.

(14) John kaawə-**də** hamuun-a. #æththətəmə, mamə dannəwa kaawə-də kiyəla.
John who-də met-A      in fact      I      know      who-də COMP
" John met someone. In fact, I know who."

(15) John Giita-**də** Maala-**də** hamuun-a. #æththətəmə, mamə dannəwa kaawə-də kiyəla.
John Giita-də Maala-də met-A,      in fact      I      know      who-də COMP
"John met Giita or Maala. In fact, I know who/which one."

On the other hand, the ignorance in disjunctions or indefinites with the particle **-ka** can be canceled.[6]

(16) John-ga      dare-**ka**(-ni) atta. Jituwa, dare-ka sitteiru.
John-NOM who-ka-DAT met  in fact  who-ka know
" John met someone. In fact, I know who."

(17) John-ga      Giita-**ka** Maala-ni      atta. Jituwa dare-ka/dotti-ka      sitteiru.
John-NOM Giita-ka Maala-DAT met  in fact who-ka/which-ka know.
"John met Giita or Maala. In fact, I know who/which one."

Thus, the ignorance expressed by a **-də** disjunction or indefinite in Sinhala is very strong (non-cancelable). But, on the other hand, the ignorance expressed by a Japanes **-ka** disjunction or indefinite is very mild (cancelable).

Next, I explore some of the existing accounts in relation to the facts observed so far.

## 3. Existing accounts

Deriving the ignorance component of indefinites in Japanese and Sinhala has been substantially discussed before. Sudo (2010) proposes that as opposed to the Ignorance Implicure (II) approach (Kratzer & Shimoyama, 2002; Alonso-Ovalle & Menéndez-Benito, 2008, 2010), the Lack of Relevant Identification (LRI) approach (also Conceptual Cover (CC) approach) (Aloni, 2001; Aloni & Port, 2012, 2015) is able to account for the ignorance facts of Japanese *wh-ka* indeterminates. Sudo (2010) argues that Japanese *wh-ka* indefinites are concerned with the "identifiability" of the individual in question.

Bringing up evidence that shows that the ignorance component of the *wh-ka* definites disappears in both DWE and UWE contexts, which is the signature of the quantity implicature as a conversational implicature (Grice, 1989), Alonso-Ovalle & Shimoyama (2014) challenges Sudo's (2010) LRI approach to the analysis of *wh-ka* indefinites. They argue that the obviation of the ignorance component under the nuclear scope of the universal quantifier in an UWE context is expected in the II approach, but not under the LRI approach.

At the same time, arguing strongly against the LRI approach, Weerasooriya (2016) shows evidence that **-də** indefinites in Sinhala are not sensitive to different methods of identification. He also shows evidence against the II approach that the ignorance component of -də indefinites does not disappear under DWE operators. Thus, he concludes that the ignorance component of epistemic indefinites can not

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6   For example, in a context of a friend teasing another friend.

be derived exclusively by either II approach or LRI approach and we might need some other method to account for the ignorance component of **-də** indefinites in Sinhala.

Slade (2011) derives the ignorance component of Sinhala **-də** indefinites in terms of what he calls "Intensionally Unknown" indefinites.

(18)  Sanath monəwa-də gatta.
      Sanath what-də     buy.PAST.A
      'Sanath bought something.' (Intentionally unknown)(Slade 2011, p.132)

According to Slade (2011) "intensionally-unknown" indefinites are only felicitous in contexts where the speaker lacks any means of uniquely identifying an individual who satisfies the proposition in all epistemically accessible worlds. (Slade 2011, p. 125). However, Weerasooriya (2017a) shows evidence that -də indefinites are felicitous in contexts where the speaker has direct perceptual access to the extension of the indefinite. This bears evidence for the fact that analyzing the **-də** indefinites in terms of the speaker not having any means of uniquely identifying an individual who satisfies the existential claim misses some unavoidable empirical facts in Sinhala.

Slade (2015) attempts to derive the ignorance component of Sinhala indefinites in terms of different identification methods under LRI/CC approach (Aloni, 2001; Aloni & Port, 2012, 2015). He analyses the ignorance component of indefinites as being derived from the speaker's inability to identify the individual denoted by the indefinite in a contextually relevant way. In Slade (2015), he brings forth the problems associated with applying the methods of identification: 'ostension > naming > description' to Sinhala epistemic indefinites and shows that the results are inconclusive.

Alonso-Ovalle & Shimoyama (2017) also show evidence that the ignorance component of Japanese *wh-ka* indefinites can be canceled as shown in the following example.

(19)  Mariko-wa  dare-ka  gengogaku-no  gakusei-to  kekkonshita. jitsuwa dare-ka shitteru.
      Mariko-TOP who-KA linguistics-GEN student-with married      in.fact who-Q know
      "Mariko married a linguistics student. In fact, (I) know who it is."

Alonso-Ovalle & Shimoyama (2017) discusses the properties of *wh-ka* indeterminates that can be found in common with or deviate from those of other modal indefinites.

However, none of these proposals has handled the ignorance component in the case of disjunctions. Neither do they account for the non/cancelability of the ignorance component in disjunctions and indefinites. In the next section, I propose a novel account to fill in these gaps.

## 4. The proposal

Building on Spector (2014), I argue that, being PPIs, **-də** and **-ka** induce exhaustification of alternatives. Spector (2014) argues that French *ou* and *soit-soit* as PPIs induce obligatory exhaustivity akin to exclusivity inferences as exemplified in (20).

(20)  a.  Marie ira au cinéma soit lundi soit mardi.
          Marie will go to the movies SOIT on Monday SOIT on Tuesday.
      b.  *Absolument! Et elle ira meme à la fois lundi ET mardi.
          Absolutely! She will even go on both days.

Following Spector (2014), I show that exhaustivity induced by **-də** and **-ka** at different levels (i.e. domain and scalar levels) is responsible for non/cancellation as well as generation of ignorance inferences.

Following the grammatical theory of implicatures by Chierchia et al. (2012), I assume that both the particles **-də** and **-ka** associate with an obligatory implicit exhaustivity operator, which I present as $Exh$. The idea of the grammatical approach to implicatures (cf. Chierchia (2006); Chierchia et al. (2012)) is that the computation of implicatures is done via a silent grammatical operator, which is called the *exhaustivity operator* ( abbreviated as *Exh* or *O*). This exhaustivity operator is supposed to be a silent version of $only$. In this approach, *Exh* is applied at the sentence level. Thus, in the derivations that follow here, *Exh* is responsible for generating exhaustivity inferences.

Following Alonso-Ovalle & Menéndez-Benito (2010), Meyer (2013) and Nicolae (2016), I also assume that a doxastic operator akin to a necessity epistemic modal is adjoined at the matrix level at LF. Alonso-Ovalle & Menéndez-Benito (2010) argue that application of this operator makes it possible to account for the modal variation component both with and without an overt modal. They propose the denotation in (21) for the assertoric operator.

(21)     $[[ASSERT]]^c = \lambda p. \ \lambda w. \ \forall w': \text{Epistemic}_{Speakerofc} \ [(w) \ p \ (w') \ ]$

I present this assertoric/doxastic operator as a necessity epistemic modal represented with $\square$ in the derivations.

I propose that for both **-ka** and **-də**, the ignorance implicature is derived from a common source: by exhaustifying domain alternatives (building on Nicolae (2016)) as a domain implicature. Building on Spector (2014), Nicolae (2016) argues for a link between obligatory exhaustivity and obligatory ignorance inferences. She also argues that PPI disjunctions require obligatory domain exhaustification and in UWE contexts the exhaustification of disjunction generates an epistemic inference that the speaker does not know which of the disjuncts is true, which derives the ignorance implicature as an uncertainty implicature.

However, Nicolae (2016) does not refer to the role of the scalar implicatures in the derivation of the meaning of a disjunction as a whole. Crucially, I take both domain and scalar alternatives into account and argue that the domain and scalar exhaustification take place independently within the same clause. In my account, the domain implicature is identical to semantics of the primary implicature of Sauerland (2004) and what I call the scalar implicature is identical to the secondary implicature of Sauerland (2004). However, Sauerland (2004) treats the alternatives for primary implicatures as scalar alternatives while the alternatives for the domain implicature in my account are only treated as domain alternatives.

I argue that non/cancelability of the ignorance component of meaning is relative to whether we scalar exhaustify locally or globally.[7] And, I claim that non/cancelability character of ignorance is also part of the grammaticalized meaning of disjunctions and indefinites in the two languages.

### 4.1. Sinhala disjunction with -də

For the disjuncton construction in (1-a) in Sinhala, the components of meaning we want to account for are: (1) John met one of Giita or Maala; (2) The speaker does not know who/which one; (3) The ignorance implicature can not be canceled. These components of meaning/implicatures are derived and reasoned out as follows.

(22)     a.     $\square$ [John Giita-**də** Maala-**də** hamuun-a]
         b.     Assertion: $\square$ [G $\vee$ M]
         c.     Domain Implicature: $Alt_D \ (\square \ [G \vee M]) = \{\square \ G, \ \square \ M\}$
                 $Exh_D \ [\square \ [G \vee M]] = \square \ [G \vee M] \wedge \neg \ \square \ G \wedge \neg \ \square \ M$
         d.     Scalar Implicature: $Alt_S \ (G \vee M) = \{G \wedge M\}$
                 $\square \ Exh_S \ [G \vee M] = \square \ [G \vee M] \wedge \square \ \neg \ [G \wedge M]$
         e.     Total Meaning: $\square \ [G \vee M] \wedge \square \ \neg \ [G \wedge M] \wedge \neg \ \square \ G \wedge \neg \ \square \ M$

In (22-a), we have the disjunction construction with the covert doxastic operator adjoined at the matrix level at LF. Assertion of (22-a) is represented in (22-b). The domain implicature drawn by exhaustification of domain alternatives results in the uncertainty implicature as represented in (22-c). This serves to generate the ignorance component of meaning as an uncertainty implicature, that the speaker is not sure that John met Giita and the speaker is not sure John met Maala. Crucially, the scalar exhaustification occurs only below the doxastic operator, thus locally as shown in (22-d). This serves to derive the exclusivity implicature of the disjunction and a meaning stronger than the assertion. In (22-e), derived by the union of the domain and scalar implicatures, we have the total meaning that John met exactly one of the two individuals and the speaker is not sure which one.

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[7]  I assume that the doxastic operator appears at the extreme boundary of a clause and any operations or functions below this operator are assumed to be local (or clause bound). Any operations or functions above this operator are assumed to be extra-clausal or global.

Now, we need to account for the reason for local scalar exhaustification for **-də**. I argue that the exclusivity constraint of **-də** in agreement with the exhaustivity operator forces the scalar exhaustification to happen locally. Thus, we derive the exclusivity interpretation as the scalar implicature: $\Box \neg [G \wedge M]$. This way, the local exhaustification serves to derive the enriched meaning stronger than the assertion.

Handling the non-cancelability of the ignorance induced by **-də**, inspired by Chierchia (2006), I argue that the local exhaustification serves to 'freeze' or 'lock in' the implicatures. For example, given $\Box [G \vee M] \wedge \neg \Box G \wedge \neg \Box M$, we can derive $\Diamond M \wedge \Diamond G$.[8] This rules out a situation where the speaker knows $\neg G$ or the speaker knows $\neg M$. And, when we add $\Box \neg [G \wedge M]$, this also rules out a situation where the speaker knows both $G \wedge M$ are true. Thus, all the implicatures together rule out any situation where the speaker knows any of the alternatives is true. Accordingly, the ignorance implicatures become part of the meaning and hence can no longer be 'removed' or 'recalibrated'.[9] This way, the semantic identity (i.e. the ignorance component) of the implicatures are frozen and preserved. This, I argue, prevents the ignorance component from being able to be canceled.

## 4.2. Japanese disjunction with -ka

For the disjuncton construction in (1-b) in Japanese, the components of meaning/implicatures we want to account for are: (1) John met one of Giita or Maala (2) The speaker does not know who/which one. (3) The ignorance implicature can be canceled. The derivation is as follows.

(23)  a.  $\Box$ [John-ga Giita-**ka** Maala-ni atta]
  b.  Assertion: $\Box [G \vee M]$
  c.  Domain Implicature: $Alt_D (\Box [G \vee M]) = \{\Box G, \Box M\}$
    $Exh_D [\Box [G \vee M]] = \Box [G \vee M] \wedge \neg \Box G \wedge \neg \Box M$
  d.  Scalar Implicature: $Alt_S (\Box [G \vee M]) = \{\Box [G \wedge M]\}$
    $Exh_S [\Box [G \vee M]] = \Box [G \vee M] \wedge \neg \Box [G \wedge M]$
  e.  Total Meaning: $\Box [G \vee M] \wedge \neg \Box [G \wedge M] \wedge \neg \Box G \wedge \neg \Box M$

As for the derivation of Sinhala **-də** disjunction in (22), in (23-a), we have the disjunction construction with the covert doxastic operator adjoined at the matrix level at LF. Assertion of (23-a) is represented in (23-b). Even for Japanese, the domain implicature drawn by exhaustification of domain alternatives results in the uncertainty implicature as represented in (23-c). This serves to generate the ignorance component of meaning as an uncertainty implicature, that the speaker is not sure that John met Giita and the speaker is not sure John met Maala. Here, the scalar exhaustification occurs only above the doxastic operator, thus globally as shown in (23-d). Thus, we derive an inclusive interpretation of the disjunction. In (23-e), derived by the union of the domain and scalar implicatures, we have the total meaning that John could have met any of the two individuals or even both and the speaker is not sure which set of alternatives holds for the truth.

Crucially for Japanese **-ka**, the scalar exhaustification occurs only above the doxastic operator, thus globally. Accounting for the choice of **-ka** for global negation, I argue that the inclusivity character of Japanese **-ka** disjunction does not force the exhaustification to occur below the doxastic operator. Thus, scalar exhaustification functions only above the doxastic operator and we derive the scalar implicature: $\neg \Box [G \wedge M]$. Note that $\neg \Box G$ (or $\neg \Box M$) entails $\neg \Box [G \wedge M]$. Thus, the scalar implicature does not add any new information and does not lead to strengthening. This scalar implicature is also weaker than that of Sinhala **-də**.

Accounting for the cancelability of the ignorance induced by **-ka**, I argue that given $\Box [G \vee M] \wedge \neg \Box G \wedge \neg \Box M$, we can derive $\Diamond M \wedge \Diamond G$. This rules out a situation where the speaker knows $\neg G$ or the speaker knows $\neg M$, which gives us ignorance. When we add $\neg \Box [G \wedge M]$, this does not necessarily rule out a situation where both $G \wedge M$ are true. The fact that both $G \wedge M$ are possible is compatible with a reading where both $G \wedge M$ are true. I argue that this has an effect on the ignorance implicatures already

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[8]  This could be accounted for in terms of Gazdar (1979): $\neg \Box M \wedge \Box [G \vee M] \Rightarrow \Diamond G$ and vise versa.

[9]  Compare my domain implicatures with Sauerland's primary implicatures with $\kappa$ representing 'believe', my domain implicatures will look like $\neg \kappa$ G, $\neg \kappa$ M. The picture is even clearer here. So, if scalar exhaustification freezes them, they will retain their ignorance component.

derived. The idea is that the speaker can go back and recalibrate the domain (ignorance) implicatures. Thus, the domain (ignorance) implicatures are made vulnerable for cancelation.[10]

Thus, I argue that the non/cancelability behavior of the ignorance component of disjunctions and indefinites is also represented in the grammar of these languages.

### 4.3. The case of indefinites

I argue that the indefinites with the particle *-də* or *-ka* undergo the same processes parallel with their disjunction counterparts. This is tenable if we assume that the general function of indefinites is to introduce alternatives (c.f. Kratzer & Shimoyama (2002)). For Sinhala *-də*, suppose, we have three alternatives: {Giita, Maala, Siita} in the contextual domain for the indefinite in (4-a). The derivation proceeds as follows.

(24)  a.  $\square$ [John kaaw-**də** hamuun-a]
      b.  Assertion: $\square$ [G $\vee$ M $\vee$ S]
      c.  Domain Implicature: $Alt_D$ ($\square$ [G $\vee$ M $\vee$ S]) = {$\square$ G, $\square$ M, $\square$ S}
          $Exh_D$ [$\square$ [G $\vee$ M $\vee$ S]] = $\square$ [G $\vee$ M $\vee$ S] $\wedge \neg \square$ G $\wedge \neg \square$ M $\wedge \neg \square$ S
      d.  Scalar Implicature: $Alt_S$ (G $\vee$ M $\vee$ S) = {[G $\wedge$ M], [G $\wedge$ S], [M $\wedge$ S], [G $\wedge$ M $\wedge$ S]}
          $Exh_S$ [G $\vee$ M $\vee$ S] = [G $\vee$ M $\vee$ S] $\wedge \neg$ [G $\wedge$ M] $\wedge \neg$ [G $\wedge$ S] $\wedge \neg$ [M $\wedge$ S] $\wedge \neg$ [G$\wedge$M$\wedge$S]
      e.  Total Meaning: $\square$ [G $\vee$ M $\vee$ S] $\wedge \square \neg$ [G $\wedge$ M] $\wedge \square \neg$ [M $\wedge$ S] $\wedge \square \neg$ [G $\wedge$ M $\wedge$ S] $\wedge \neg \square$ G $\wedge \neg \square$ M $\wedge \neg \square$ S

Thus, as in the case of disjunction, owing to the local scalar exhaustification of *-də* indefinites in Sinhala, the semantic identity (ignorance component) of the implicatures are frozen and preserved.

For the indefinite with Japanese *-ka* in (4-b), I assume a derivation similar to that of its disjunction counterpart as given in (25).

(25)  a.  $\square$ [John-ga dare-**ka**(-ni) atta.]
      b.  Assertion: $\square$ [G $\vee$ M $\vee$ S]
      c.  Domain Implicature: $Alt_D$ ($\square$ [G $\vee$ M $\vee$ S]) = {$\square$ G, $\square$ M, $\square$ S}
          $Exh_D$ [$\square$ [G $\vee$ M $\vee$ S]] = $\square$ [G $\vee$ M $\vee$ S] $\wedge \neg \square$ G $\wedge \neg \square$ M $\wedge \neg \square$ S
      d.  Scalar Implicature: $Alt_S$ ($\square$ [G $\vee$ M $\vee$ S]) = {$\square$ [G $\wedge$ M] $\wedge \square$ [G $\wedge$ S] $\wedge \square$ [M $\wedge$ S] $\wedge \square$ [G $\wedge$ M $\wedge$ S]}
          $Exh_S$ [$\square$ [G $\vee$ M $\vee$ S]] = $\square$ [G $\vee$ M $\vee$ S] $\wedge \neg \square$ [G $\wedge$ M] $\wedge \neg \square$ [G $\wedge$ S] $\wedge \neg \square$ [M $\wedge$ S] $\wedge \neg \square$ [G $\wedge$ M $\wedge$ S]
      e.  Total Meaning: $\square$ [G $\vee$ M $\vee$ S] $\wedge \neg \square$ [G $\wedge$ M] $\wedge \neg \square$ [G $\wedge$ S] $\wedge \neg \square$ [M $\wedge$ S] $\wedge \neg \square$ [G $\wedge$ M $\wedge$ S] $\wedge \neg \square$ G $\wedge \neg \square$ M $\wedge \neg \square$ S

Thus, as in the case of disjunction, owing to the global scalar exhaustification, the ignorance implicatures of *-ka* indefinites in Japanese can be recalibrated and canceled.

## 5. Conclusions

This paper marks a clear distinction between domain implcatures and scalar implicatures to account for the distinctive effects they generate. It argues that domain and scalar exhaustification take place independently within the same clause. It shows that ignorance implicatures arise as a result of exhaustification of domain alternatives as a domain implicature. It proposes that non/cancelability of ignorance is relative to global/local exhaustification of the scalar alternative. It also claims that the non/cancelability behavior of the ignorance component of the disjunctions and indefinites is also a grammaticalized phenomenon in these languages.

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[10] In this paper, the focus is only on the simple disjunction *-ka* in Japanese. It remains for future work to investigate the behavior of the complex disjunction *-ka...ka* in Japanese.

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