Topics are conditionals: A case study from exhaustification over questions

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Abstract

This paper argues in favor of Haiman's (1978) idea that conditionals and topics are analogous. The evidence comes from exhaustification over topicalized questions, which have the same semantics as conditional questions (Isaacs & Rawlins, 2008).

1 Introduction

Similarities between conditionals and topics are identified by many linguists (Haiman, 1978, 1993; Collins, 1998; Bittner, 2001; Bhatt & Pancheva, 2006; Ebert et al., 2008). Some languages use an identical morpheme to mark topics and conditionals. In Japanese, for instance, a conditional suffix *nara* is used for both conditional and topic constructions. When *nara* follows a clause as in (1-a), the clause serves as an antecedent of a conditional sentence. When *nara* attaches to a NP as in (1-b), the NP is the topic of the sentence.

(1) a. Taro-ga kuru nara, paatii-wa
Taro-nom come if party-top
tanosiku naru.
fun become
'If Taro comes, the party will be fun.'

b. Taro-nara kaeri-mas-ita.
Taro-if go.home-pol-past
'As for Taro, he went home.'

This paper offers another piece of evidence for the virtual identity of topics and conditionals. In particular, I argue that topics have the same semantics as conditional antecedents in that both serve as context-shifters. In dynamic semantics, conditionals are defined in terms of a two-step (Stalnaker, 1968; Karttunen, 1974; Heim, 1982) or three-step (Kaufmann, 2000; Isaacs & Rawlins, 2008) update procedure:

(2) $c+$ 'if P, Q' $= (c \cap P \cap Q) \cup (c \cap \overline{P})$,
where a context c and propositions P and Q are sets of possible worlds.

(3) 1. A derived context is created by updating the speech context with the antecedent of the conditional ($c \cap P$).
2. The derived context is updated with the consequent ($c \cap P \cap Q$).
3. The original context learns the effects of the second step.

To illustrate briefly, in (4-a), the initial context is assertively updated by the antecedent 'Max comes', that is, the worlds that make the proposition false are deleted. The derived context is then assertively updated by the consequent 'we'll play poker'. Finally, the worlds removed in the second step are also removed from the original context.

(4) a. If Max comes, we'll play poker.
b. There's food in the fridge, if you're hungry. (Haiman, 1978, 564)

The idea of *context-shifting* nature of conditionals might be clearer with so-called *biscuit conditionals* like (4-b). In (4-b), the antecedent 'if you're hungry' shifts the context so that the assertive update of the consequent 'There's food in the fridge' becomes relevant or optimal (Franke, 2007, 2009).

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Just like English *if*-clauses, the Japanese Topic-marking *wa* serves to shift the context. Let us take the following ambiguous English sentence which can be a sign at an airport:

(5) Dogs must be carried. (Wasow et al., 2005)

The Japanese translations of (5) are not ambiguous. The assertion of the non-*wa*-marked (6-a) could be about a general situation at an airport, thus the sentence is pragmatically implausible because it expresses a requirement that everyone at the airport has to be a dog-carrier. In contrast, the phrase *inu-wa* in (6-b) restricts the context of the assertion to cases where there is a dog, thus the sentence can be a plausible sign at the airport.

(6) a. inu-o kakae nakerebanaranai.
dog-ACC carry must
'You must carry a dog.'
b. inu-wa kakae nakerebanaranai.
dog-TOP carry must
'As for dogs, you must carry them.'≈'If there is a dog, you must carry it.'

As can be seen from the paraphrase in (6-b), the topic-marking encodes the meaning similar to the conditional antecedent.

This paper further supports the idea that topics have the same semantics as conditionals by analyzing topic-marked interrogatives. An incompatibility arises between an interrogative and the Japanese *dake-wa* 'only-TOP' construction.[1] Observe the following pair:

(7) a. John-dake-wa ki-masi-ta.
John-only-TOP come-Hon-Past.
'Only as for John, he came.'
(I don't make assertions about other individuals; only>assertion)
b. *John-dake-wa nani-o
John-only-TOP what-ACC
kai-masi-ta-ka?
buy-HON-PAST-Q
Intended: 'Only as for John, I ask: What did he buy?'
(I don't make questions about other individuals; only>question)

As a focus particle, *dake* 'only' generates a set of alternatives. When *dake* is combined with the topic *wa* , the exhausification by *dake* takes place at speech act level. Thus, the declarative construction marked with *dake-wa* as in (7-a) denotes exhaustification over assertion acts. That is, only the assertion of the prejacent proposition is executed and the rest of the alternative assertions are cancelled. In contrast, a parallel operation is not possible for interrogatives as shown in (7-b). I argue that the ungrammaticality of (7-b) is due to the violation of *Inquistive Constraint* (Isaacs & Rawlins, 2008), which dictates that any outstanding issue must be resolved before the conversation proceeds. Isaacs & Rawlins (2008) analyze conditional sentences with interrogative consequents (conditional questions) like (19) using a dynamic semantics for conditionals and a partition semantics of questions.

(8) If the party is at Emma's place, will it be fun?

Given the dynamic semantics of conditionals introduced above, a conditional question creates an issue on the derived context. If the topic-marking also creates a derived context, it also creates an issue on the derived context. In case of exhaustification, however, dues to the focus particle, alternative question acts are created and cancelled, thus many of the issues raised are abandoned, which violates Inquistive Constraint.

2 Topics as Conditionals and Exhaustification over speech acts

This section presents the data central to the current paper in detail. In particular, the *dake-wa* 'only-TOPIC' construction is incompatible with question acts. To see this, let us start with the *wa*-marked declaratives like (9).

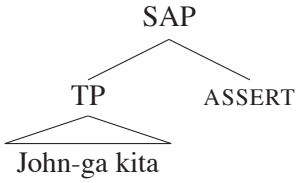
(9) John-wa kita.
John-TOP came
'John came.'

[1] Some linguists treat the use of *wa* in (7-a) as contrastive rather than topical (Kuno, 1973; Hara, 2006). I assume that the contrastive use of *wa* is obtained when there is a focus-marking on the NP to which *wa* attaches. Due to the focus particle *dake*, *John* in (7-a) is indeed focus-marked. Thus, I take *wa* in (7-a) is an instance of contrastive topic.

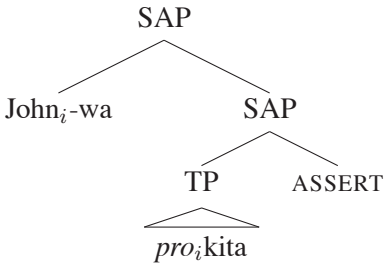
As we have seen in (6), the *wa*-phrase restricts the context for the speech act of the utterance, just like English *if*-clauses.[2] Thus, I propose that the Japanese topic-marker *wa* marks Austinian topics (Austin, 1950). That is, the topic-marked element denotes what an utterance is about.[3]

I adopt the claim by Cinque (1999); Krifka (2001); Speas & Tenny (2003); Speas (2004); Tenny (2006) that there are syntactic representations for speech acts such as ASSERT, QUEST, etc., and propose that the *wa*-phrase is base-generated at the Spec position of Speech Act Phrase (SAP). In (10-a), *John* is nominative-marked, i.e., a subject, hence it is inside a TP, which is in turn in the scope of ASSERT. In contrast, according to Austin's (1950) idea of topic, the *wa*-marked phrase takes scope over the entire speech act. In implementing this scope relation, I propose that the *wa*-marked phrase is base-generated and adjoined to the Speech Act Phrase (SAP). In the subject position of TP, there is a little *pro* co-indexed with the *wa*-marked phrase. The structure of (9) is depicted in (10-b) .

(10) a.



b.



Wa-marked declaratives can be rendered into interrogatives without any problem as in (11).[4]

(11) John-wa ki-masi-ta-ka?
John-TOP come-HON-PAST-Q
'As for John, did he come?'

[2]It is suggestive that *wa* is argued to be etymologically related to Old Japanese *ba* 'place, situation' (Martin, 1975).

[3]See also Jäger (2001), who shows that the descriptive material of the topic contributes to the restrictive clause of adverbs of quantification.

[4]Honorific forms are added in order to make the examples pragmatically more natural.

Intuitively, the topic phrase restricts the context for the subsequent question. This is similar to the function of an English *if*-clause. Isaacs & Rawlins (2008) discuss English conditional questions. The issue raised by the consequent question in (12) is relevant only in the hypothetical context created by the antecedent. The questioner is not interested in whether the party will be fun if the party is not at Emma's place.

(12) If the party is at Emma's place, will it be fun?

Put another way, the issue does not have to deal with the cases where the party is not at Emma's place. Section 3 presents how Isaacs & Rawlins (2008) implement this intuition of question at the hypothetical context.

In summary, the function of the *wa*-marked phrase is a context-shifter just like the English *if*-clause in dynamic semantics. Both items create hypothetical contexts for subsequent speech acts.

Now, consider what happens when the topic-marked phrase is further modified by the exhaustive focus particle *dake*. First, let us consider a non-*wa*-marked *dake* sentence as in (13).

(13) John-dake-ga kita.
John-only-NOM came.
'Only John came.' (Others didn't come; assertion>only)

Just like English *only*, the *dake* sentence involves a focus structure and gives rise to two entailments, 'John came' and 'Other alternative individuals didn't come'. Thus, *dake* generates a set of alternatives in the sense of Rooth (1985, 1995) and expresses that the alternative propositions are false (see also Horn, 1969):

(14) $[\![\textbf{John-dake-ga kita}]\!] = 1$ iff
a. John came; and
b. $\forall p[[p \in C \wedge p \neq \textbf{came}(j)] \rightarrow p = 0]$, where C is a contextually given set of propositions and C is the subset of the Rooth's (1992) focus value of "[John]$_F$ came", i.e., $C \in [\![\textbf{[John]}_F\textbf{kita}]\!]^f$

In other words, the exhaustification by *dake* happens at the level of the propositional content.

In (15), due to *wa*-marking on the subject, *dake* takes scope over the restriction of the assertion.

(15) John-dake-wa kita.
John-only-TOP came.
'Only as for John, he came.' (I don't make assertions about other individuals; only>assertion)

Hence, *dake* generates alternative temporary contexts, 'if we are speaking of John', 'if we are speaking of Mary', etc., and the exhaustive component of *dake* conveys that the speaker is restricting her assertion to the proposition 'John came' with the discourse topic 'John':

(16) The utterance of 'John-dake-wa kita' is felicitous iff
a. S asserts 'John came'; and
b. $\forall p[[p \in C \wedge p \neq \textbf{came}(j)] \rightarrow [S$ does not assert $p\,]]$.

In other words, the truth-condition of (15) is the same as that of *John-ga kita* and *John-wa kita*, namely 'John came'. The difference is the speaker's intention in the discourse. That is, in (15), the speaker is indicating that she is willing to make assertions only about John and the alternative speech acts about other individuals are cancelled.

We are now ready to look at the main puzzle of the current paper: The *dake-wa* construction is illicit with an interrogative, as in (17).

(17) *John-dake-wa nani-o
John-only-TOP what-ACC
kai-masi-ta-ka?
buy-HON-PAST-Q

The empirical pattern is schematically represented in (18), where d stands for a discourse individual and P stands for a predicate.

(18) a. d is the x such that [ASSERT $P(x)$]
b. ASSERT $[P(d)]$
c. d is the x such that [quest $P(x)$]
d. QUEST $[P(d)]$
e. d is the only x such that, [ASSERT $P(x)$]
f. QUEST [d is the only x such that $P(x)$]
g. *d is the only x such that [QUEST $P(x)$]
h. QUEST [d is the only x such that $P(x)$]

Given the discussion above, the ungrammaticality of (17) suggests that it is an illicit act to cancel the alternative question acts. A *wa*-marking alone shifts the current context in a minimal way, thus it is easy to query into the shifted context. However, *dake-wa*, the topicalized focus particle, creates multiple contexts and multiple issues. The exhaustification meaning of *dake* cancels alternative question acts. Thus, many of the issues raised in those contexts would remain unresolved. This would yield a defective context since an issue raised by questioning must be something assumed to be immediately resolvable. I claim that this immediacy is one of the fundamental features of questionhood.

The rest of the paper is devoted to formally motivate this asymmetry between assertions and questions. More specifically, cancelling question acts is prohibited because it would result in a violation of Isaacs and Rawlins's (2008) *Inquisitive Constraint*, which dictates that any outstanding issue must be resolved before the conversation proceeds. In order to understand this principle, the next section presents Isaacs and Rawlins's (2008) analysis on conditional questions.

3 Conditional Questions and Inquisitive Constraint

Isaacs & Rawlins (2008) analyze conditional sentences with interrogative consequents (conditional questions) like (19) using a dynamic semantics for conditionals and a partition semantics of questions.

(19) If the party is at Emma's place, will it be fun?

In analyzing conditional questions, Isaacs & Rawlins (2008) argue that questions affect the current context whereas assertions can affect the entire stack of contexts. Employing Kaufmann's (2000) temporary contexts for conditionals and stack-based account of modal subordination, Isaacs and Rawlins suggest that information conveyed by assertions can percolate down the stack while issues raised by questions cannot.

3.1 Partition Semantics for Questions

Following Hamblin and others (Hamblin, 1958, 1973; Karttunen, 1977; Kratzer & Shimoyama, 2002), Isaacs and Rawlins assume that the meaning of a question is the set of possible answers to the question. In terms of partition semantics, possible answers correspond to blocks in a partition of the set of possible worlds.[5] To implement this approach to questions in a dynamic semantics, Isaacs and Rawlins adopt Groenendijk's (1999) analysis of questions, which defines the *context set* as an equivalence relation on worlds. That is, the context set is a set of pairs of worlds specifying a relation that is symmetric, transitive, and reflexive:

(20) **Definition:** context
A context c is an equivalence relation on the set of possible worlds W. (Groenendijk, 1999)

In a standard model of assertion (Stalnaker, 1968), where the context set is a set of worlds, an assertive update removes worlds which make the assertive content false. In the current framework, the context set is a set of world-pairs, hence an assertive update amounts to deleting all pairs which contain a member which makes the assertive content false.

(21) Assertive update ($\oplus$) on contexts: For some context (set) c and clause ϕ:
$c \oplus \phi = \{\langle w_1, w_2\rangle \in c \,|\, [\![\phi]\!]^{w_1,c} = [\![\phi]\!]^{w_2,c} = 1\}$
(Isaacs and Rawlins' (2008) reformulation of Groenendijk (1999))

In contrast, a question does not remove worlds but disconnects worlds and thereby partitions the context into blocks. That is, a question ϕ? removes pairs that contain worlds, each of which resolves the question in a different way, i.e., assigns a different truth value to ϕ. If both worlds in the pair give the same answer to ϕ?, the pair is kept, i.e., the worlds are still connected.

(22) Inquisitive update ($\oslash$) on contexts: For some context (set) c and clause ϕ:
$c \oslash \phi = \{\langle w_1, w_2\rangle \in c \,|\, [\![\phi]\!]^{w_1,c} = [\![\phi]\!]^{w_2,c}\}$
(Isaacs and Rawlins' (2008) reformulation of Groenendijk (1999))

[5] By definition, the blocks in a partition of the set are mutually exclusive and collectively exhaust the set being partitioned. This property of a question becomes crucial in Section 3.3.

3.2 Stack-based Model for Conditionals

Given the dynamic view of assertive and inquisitive updates, conditionals are characterized using a three-step update procedure as introduced in (2) in Section 1.

In implementing these steps, Isaacs and Rawlins employ Kaufmann's (2000) model of temporary contexts. Let us illustrate how Isaacs and Rawlins's theory derives the meaning of (19), repeated here as (23).

(23) If the party is at Emma's place, will it be fun?

In Kaufmann's (2000) system, utterances are treated as operations over macro-contexts, where a macro-context is a stack of contexts in Kaufmann (2000) and Isaacs & Rawlins (2008):

(24) **Definition:** macro-context
a. $\langle\rangle$ is a macro-context.
b. If c is a (Stalnakerian) context and s is a macro-context, then $\langle c, s\rangle$ is a macro-context.
c. Nothing else is a macro-context.
d. If s is a macro-context, then s_n is the nth context (counting from 0 at the top) and $|s|$ is its size (excluding its final empty element).
(Isaacs & Rawlins, 2008, (43); p. 291)

Suppose that the initial input macro-context s ($= \langle c, \langle\rangle\rangle$) for some context c is defined as in (25) and that the facts of the worlds are as follows: the party is not at Emma's place in w_1, w_2, and the party is at Emma's place in w_3, w_4; the party is fun in w_1, w_3, and the party is not fun in w_2, w_4.[6] At the initial stage, the conversational agent is ignorant about these issues. That is, the agent has no pre-existing commitments about facts or issues. Reflecting this state of the context, all the worlds are connected and thereby treated as equivalent.

[6] Tense is ignored for simplicity.

(25) $s = \langle c, \langle\rangle\rangle =$

s_0:	c

$=$

s_0:	$\left\{ \begin{array}{cccc} \langle w_1,w_1\rangle & \langle w_2,w_1\rangle & \langle w_3,w_1\rangle & \langle w_4,w_1\rangle \\ \langle w_1,w_2\rangle & \langle w_2,w_2\rangle & \langle w_3,w_2\rangle & \langle w_4,w_2\rangle \\ \langle w_1,w_3\rangle & \langle w_2,w_3\rangle & \langle w_3,w_3\rangle & \langle w_4,w_3\rangle \\ \langle w_1,w_4\rangle & \langle w_2,w_4\rangle & \langle w_3,w_4\rangle & \langle w_4,w_4\rangle \end{array} \right\}$

In interpreting the antecedent of the conditional in (23), a temporary context is created by making a copy of the initial context c. More precisely, a temporary context is pushed onto the stack:

(26) **Definition:** push operator
For any macro-context s and context c:
$\mathrm{push}(s, c) =_{\mathrm{def}} \langle c, s\rangle$
(Isaacs & Rawlins, 2008, (44); p. 292)

The temporary context is assertive-updated according to (21). In a nutshell, the function of the 'if'-clause is defined as the macro-context change potential (MCCP) which creates a temporary context which is assertive-updated by the propositional content of the clause, as in (27):[7]

(27) **Definition:** MCCP of an 'if'-claus
For any macro-context s and 'if'-clause [if ϕ]:
$s+$ if $\phi =_{\mathrm{def}} \mathrm{push}(s, s_0 \oplus \phi)$
Admittance condition: 'If ϕ' is admissible in a macro-context s iff $s_0 \oplus \phi \neq \emptyset$ (adapted from Isaacs & Rawlins, 2008, (54); p. 297)

That is, all pairs which contain a member that makes the assertion false, i.e., w_1 and w_2, are removed from the temporary context, as in (28).

(28) $s' = s$+[If [the party is at Emma's place]]=

s'_0:	$\left\{ \begin{array}{cc} \langle w_3,w_3\rangle & \langle w_4,w_3\rangle \\ \langle w_3,w_4\rangle & \langle w_4,w_4\rangle \end{array} \right\}$
s'_1	c

In interpreting the question in the consequent, the derived context is partitioned into two blocks (rendering it into an inquisitive context).

(29) **Definition:** Inquisitive update on macro-contexts
For any macro-context $\langle c, s'\rangle$ where c is the top member, and s' is a stack, and clause ϕ:
$\langle c, s'\rangle$ + [Question ϕ] $=_{\mathrm{def}} \langle c \oslash \phi, s'\rangle$
(Isaacs & Rawlins, 2008, (49); p. 294)

Remember that the party is fun in w_3, and the party is not fun in w_4. Since w_3 and w_4 resolve the question in different ways, the two worlds are disconnected. In other words, the pairs that connect the two worlds are removed as in (30), and the temporary context is partitioned into two cells. The pairs which resolve the question as *yes* are in bold.

(30) $s'' = s'$+[will the party be fun?]=

s''_0:	$\left\{ \begin{array}{cc} \langle \boldsymbol{w_3, w_3}\rangle & \\ & \langle w_4,w_4\rangle \end{array} \right\}$
s''_1	c

According to Isaacs and Rawlins, a *yes*-answer is an assertive update removing all the pairs that make the assertion (answer) false in the temporary context. This assertive update by the answer affects not only the temporary context but also other members in the stack. As illustrated in (31), the update removes pairs which contain worlds where the antecedent is true and the consequent is false (w_4: the party is at Emma's place and the party is boring.).

(31) $s''' = s''$+yes=

s'''_0:	$\left\{ \begin{array}{cccc} \langle \boldsymbol{w_3, w_3}\rangle & & & \\ & & & \cancel{\langle w_4,w_4\rangle} \end{array} \right\}$
s'''_1:	$\left\{ \begin{array}{cccc} \langle w_1,w_1\rangle & \langle w_2,w_1\rangle & \langle w_3,w_1\rangle & \cancel{\langle w_4,w_1\rangle} \\ \langle w_1,w_2\rangle & \langle w_2,w_2\rangle & \langle w_3,w_3\rangle & \cancel{\langle w_4,w_2\rangle} \\ \langle w_1,w_3\rangle & \langle w_2,w_3\rangle & \langle w_3,w_3\rangle & \cancel{\langle w_4,w_3\rangle} \\ \cancel{\langle w_1,w_4\rangle} & \cancel{\langle w_2,w_4\rangle} & \cancel{\langle w_3,w_4\rangle} & \cancel{\langle w_4,w_4\rangle} \end{array} \right\}$

After the question is resolved and the temporary context is no longer inquisitive, the temporary context can be popped off the stack according to (32) as illustrated in (33).[8]

(32) **Definition:** pop operator
For any macro-context $\langle c, s'\rangle$:
$\mathrm{pop}(\langle c, s'\rangle) =_{\mathrm{def}} \langle c, s'\rangle$ if $s' = \langle\rangle$, s' otherwise
(Isaacs & Rawlins, 2008, (45); p. 292)

(33) $s'''' = \mathrm{pop}(s''')$=

s'''_0:	$\left\{ \begin{array}{ccc} \langle w_1,w_1\rangle & \langle w_2,w_1\rangle & \langle w_3,w_1\rangle \\ \langle w_1,w_2\rangle & \langle w_2,w_2\rangle & \langle w_3,w_3\rangle \\ \langle w_1,w_3\rangle & \langle w_2,w_3\rangle & \langle w_3,w_3\rangle \end{array} \right\}$

In general, derived contexts are discarded after the interpretation of *declarative* conditionals. Subsequent utterances do not refer back to the temporary contexts. In contrast, Isaacs and Rawlins propose that derived contexts are not discarded after the interpretation of *interrogative* conditionals, since the

[7] The admittance condition encodes the presupposition that the propositional content of the antecedent is possible, which is often assumed since Stalnaker (1968).

[8] The definition in (32) itself does not determine when the pop operation applies. The Inquisitive Constraint (34) bans a pop operation on a stack with an inquisitive context.

derived contexts are still inquisitive. This requirement is formulated as the *Inquisitive Constraint*:

(34) **Inquisitive Constraint**
A macro-context may not be popped if the top element is inquisitive.
(Isaacs and Rawlins' (2008) (49); p. 294)

Accordingly, information introduced by assertions percolates down the stack but issues raised by questions do not. Because this point made by Isaacs and Rawlins is particularly relevant to the current paper, I will expand on this idea in the next section.

3.3 Exclusivity and Exhaustivity in Questions

Why do issues, i.e., inquisitive contexts, not percolate down the stack? In other words, why do questions not affect the other members of the stack? According to Isaacs and Rawlins, percolating issues would result either in abandoning exhaustivity or in abandoning mutual exclusivity. Recall that issues are partitions of the context set. In mathematics, "a partition of a set S is a collection of mutually disjoint, non-empty subsets of S whose union is S" (Joshi, 1989):

(35) A set P is a partition of a set S iff:
a. $\emptyset \notin P$
b. $\bigcup P = S$ (exhaustivity)
c. $[X \in P \,\&\, Y \in P \,\&\, X \neq Y] \rightarrow X \cap Y = \emptyset$ (mutual exclusivity)

Since an issue or a set of possible answers is defined as a partition, an issue is by definition required to be collectively exhaustive and mutually exclusive.

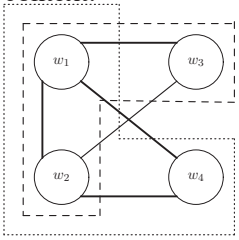
Going back to the issue raised by a conditional question, a derived context created by a conditional is a context where some of the worlds in the initial context have been removed. Hence, if an issue percolated, we would have to do something extra to the worlds which were not included in the derived context in order to maintain exhaustivity and mutual exclusivity. Pairs in s_1 which contain worlds that are not partitioned in s_1 are in blue in the table. Pairs which resolve the question as *yes* are in bold.

(36)

s_0:	$\{$ $\langle \boldsymbol{w_3}, \boldsymbol{w_3} \rangle$ $\langle w_4, w_4 \rangle$ $\}$
s_1:	$\{$ $\langle w_1, w_1 \rangle$ $\langle w_2, w_1 \rangle$ $\langle w_3, w_1 \rangle$ $\langle w_4, w_1 \rangle$ $\langle w_1, w_2 \rangle$ $\langle w_2, w_2 \rangle$ $\langle w_3, w_2 \rangle$ $\langle w_4, w_2 \rangle$ $\langle w_1, w_3 \rangle$ $\langle w_2, w_3 \rangle$ $\langle \boldsymbol{w_3}, \boldsymbol{w_3} \rangle$ $\langle w_1, w_4 \rangle$ $\langle w_2, w_4 \rangle$ $\langle w_4, w_4 \rangle$ $\}$

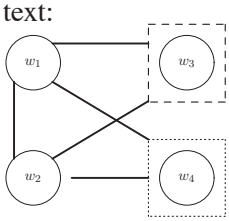
If these extra world pairs are added to both blocks of the partition specified in the derived context, then the resulting relation does not obey mutual exclusivity, as illustrated in (37).[9]

(37) Mutual exclusivity abandoned in the main context:



On the other hand, if we put those worlds in no block, as in (38), we end up abandoning exhaustivity.

(38) Exhaustivity abandoned in the main context:



Since questions must obey exhaustivity and mutual exclusivity (Hamblin, 1958; Groenendijk & Stokhof, 1997), issues cannot percolate. Questions can only partition the top-most context. Furthermore, assuming that percolation precedes the pop operation, an inquisitive (i.e., partitioned) context can never be popped without being resolved, as stated in the Inquisitive Constraint, repeated here as (39):

(39) **Inquisitive constraint**
A macro-context may not be popped if the

[9] In recent work in inquisitive semantics by Groenendijk and his colleagues (Groenendijk, 2007; Sano, 2009; Ciardelli & Roelofsen, To appear), mutual exclusivity is not treated as a principal property of questionhood. Isaacs and Rawlins also give an alternative inquisitive update operation which allows issues to percolate immediately, in which mutual exclusivity is not strictly enforced. Furthermore, according to Isaacs and Rawlins, the alternative version gives a simpler analysis for embedded conditional questions. However, even if issues percolate down the stack, the topmost context must be exclusive and exhaustive. Furthermore, the inquisitive constraint (34) must be maintained.

top element is inquisitive.
(Isaacs and Rawlins' (2008) (49); p. 294)

In short, Isaacs and Rawlins argue that only the topmost context in the stack can be partitioned, and issues raised by questions must be resolved before the context is popped.

4 Deriving the asymmetry

We are now ready to derive the asymmetry between *dake-wa* assertions and questions. The topic phrase, understood as an antecedent of a conditional, creates a temporary context. If it is further modified by *dake*, temporary contexts are multiplied.

In implementing this proposal, I introduce the notion of multi-stack, as in (40). A multi-stack is a sequence of stacks. The context can be rendered into a multi-stack by using the n-copy operator (41) when necessary, i.e., when multiple speech act updates are performed on multiple contexts. This n-copy operation can be understood as playing the role of the F-feature in Rooth (1985, 1992). Like F-feature, it generates a set of Hamblin alternatives, A. When the alternative set takes scope over a speech act operator, a multi-stack S is created ($|S| = |A|$) and each member of the alternative set creates a hypothetical context on top of each stack in S.

(40) **Definition:** multi-stack
$S := \langle s^{(0)}, s^{(1)}, s^{(2)}, ...s^{(n)} \rangle$ is a multi-stack, where $s^{(i)}$ is a macro-context and $|s^{(0)}| = ... = |s^{(n)}|$.

(41) **Definition:** n-copy operator
For any macro-context s:
n-copy$(s) =_{\text{def}} \langle s^{(0)}, ..., s^{(n-1)} \rangle$, where $s = s^{(0)} = ... = s^{(n-1)}$

Let us first consider the grammatical *dake-wa* assertion like (15), repeated here as (42).

(42) John-dake-wa kita.
John-only-TOP came.
'Only as for John, he came.'
(I don't make assertions about other individuals; only>assertion)

When the F-feature of the *dake-wa* phrase is processed, the interpreter realizes that multiple stacks will be created. In other words, a topic-marked F-feature denotes a macro-context change potential which creates a multi-stack and performs an update over the created multi-stack:

(43) **Definition:** MCCP of a 'd_0 F-wa, ACT$(P(d_0))$'
For a macro-context s and a topicalized construction [[d_0 F-wa] ACT$(P(d_0))$]:
$s+$ [[d_0 F-wa] ACT$(P(d_0))$] $=_{\text{def}}$
$\langle s^{(0)}+$[if we are talking about d_0]+ACT$(P(d_0))$,
$s^{(1)}$ + [if we are talking about d_1]+ACT$(P(d_1))\rangle$,
where $\langle s^{(0)}, s^{(1)} \rangle$ =2-copy(s)
and $d_0, d_1 \in \text{Alt}(d_0)$.

(44) $S' = s$ +[[d_0 F-wa] $P(d_0)$] =

	$s'^{(0)}$	$s'^{(1)}$
S'_0:	$\{\langle w_1,w_1\rangle \ \ \sout{\langle w_2,w_1\rangle}$ / $\sout{\langle w_1,w_2\rangle} \ \ \sout{\langle w_2,w_2\rangle}\}$	$\{\sout{\langle w_1,w_1\rangle} \ \ \sout{\langle w_2,w_1\rangle}$ / $\sout{\langle w_1,w_2\rangle} \ \langle w_2,w_2\rangle\}$
S'_1:	$\{\langle w_1,w_1\rangle \ \ \sout{\langle w_2,w_1\rangle} \ \ \langle w_3,w_1\rangle$ / $\sout{\langle w_1,w_2\rangle} \ \ \sout{\langle w_2,w_2\rangle} \ \ \sout{\langle w_3,w_2\rangle}$ / $\langle w_1,w_3\rangle \ \ \sout{\langle w_2,w_3\rangle} \ \ \langle w_3,w_3\rangle\}$	$\{\sout{\langle w_1,w_1\rangle} \ \ \sout{\langle w_2,w_1\rangle} \ \ \sout{\langle w_3,w_1\rangle}$ / $\sout{\langle w_1,w_2\rangle} \ \langle w_2,w_2\rangle \ \ \sout{\langle w_3,w_2\rangle}$ / $\sout{\langle w_1,w_3\rangle} \ \langle w_2,w_3\rangle \ \langle w_3,w_3\rangle\}$

After the percolation, i.e., the assertive update on macro-contexts, the temporary contexts are popped from the entire multi-stack. I now define MSpop, an operator which performs the pop operation on each member of the multi-stack. Since no temporary contexts are inquisitive in (44), all of them can be popped off without violating Inquisitive Constraint.

(45) **Definition:** multi-stack pop
For any multi-stack S:
MSpop$(S) =_{\text{def}}$
$\langle \text{pop}(s^{(0)}), ..., \text{pop}(s^{(n)}) \rangle$.

Now, in the current example, the topic phrase also contains the exhaustive particle *dake*; therefore, it cancels all the alternative assertion acts except for the foreground one, i.e., ASSERT('John came'). I define the cancel operator to characterize the wide-scope exhaustification of *dake-wa*:

(46) **Definition:** cancel operator
For a multi-stack S: cancel(S) is defined if $\forall s \in S.|s| = 1$.
If defined, cancel$(S) =_{\text{def}} s^{(0)}$

Crucially, this cancel operation can be executed only when there is no hypothetical context, i.e., after MSpop is executed.

Turning to the case of *dake-wa* with a question

like (47), *dake* creates multiple alternative temporary contexts that the upcoming speech act will apply to, as we saw in (42). In the current case, however, the act is a question (i.e., an inquisitive update), creating a partition over those multiple contexts, as depicted in (48).

(47) *John-dake-wa shinbun-o
John-only-TOP newspaper-ACC
kai-mashi-ta-ka?
buy-HON-PAST-Q

(48) $S' = s + [d$ F-wa] QUEST$(P(d))$]=

	$s'(0)$	$s'(1)$
S'_0:	$\{\langle w_1,w_1\rangle, \langle w_2,w_2\rangle\}$	$\{\langle w_1,w_1\rangle, \langle w_2,w_2\rangle\}$
S'_1:	$\{\langle w_1,w_1\rangle \langle w_2,w_1\rangle \langle w_3,w_1\rangle; \langle w_1,w_2\rangle \langle w_2,w_2\rangle \langle w_3,w_2\rangle; \langle w_1,w_3\rangle \langle w_2,w_3\rangle \langle w_3,w_3\rangle\}$	$\{\langle w_1,w_1\rangle \langle w_2,w_1\rangle \langle w_3,w_1\rangle; \langle w_1,w_2\rangle \langle w_2,w_2\rangle \langle w_3,w_2\rangle; \langle w_1,w_3\rangle \langle w_2,w_3\rangle \langle w_3,w_3\rangle\}$

Moreover, the exhaustive particle *dake* attempts to cancel the alternative question acts except for the foreground question, 'As for John, did he buy a newspaper?'. However, the cancel operation fails here. As defined in (46), in order to perform $\mathrm{cancel}(S)$, each member of the multi-stack S must have no temporary contexts. In turn, MSpop must have been performed beforehand. However, due to the Inquisitive Constraint, no inquisitive contexts can be popped. Since the inquisitive contexts are never resolved, and can never be popped off the stack, the discourse fails to proceed. As a result, a question modified by the *dake-wa* construction is illicit. The questioner cannot perform the act of questioning while ignoring the issues that the questioner herself raised at the same time.

5 Conclusion

Topics are analyzed as context-shifter for the subsequent updates, analogously to antecedents of conditionals in dynamic semantics. Thus, topicalized questions have an analogous semantics to conditional questions. Question acts render the hypothetical contexts created by topics or conditional antecedents into inquisitive ones. This line of analysis also correctly derives the asymmetry between assertions and questions with respect to wide-scope exhaustification. Alternative assertion acts can be cancelled, while alternative question acts cannot, since the latter would force popping of inquisitive contexts, which is prohibited by Inquisitive Constraint.

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