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Legitimate termination of nonlocal features in HPSG

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Abstract

This paper reviews the treatment of wh-question facts offered by Lappin and Johnson 1996, and suggests that their account of certain island phenomena should be adapted by assuming that certain phrase structures license binding of inherited features. In Japanese, Lappin and Johnson's INHER|LQUE feature appears to be dependent on INHER|QUE in order to terminate with a functional C head's TO-BIND|QUE. For certain languages, C's TO-BIND|LQUE feature must be null if TO-BIND|QUE is null. In the spirit of Sag 1996 and Pollard and Yoo 1996, the facts can be handled by saying that TO-BIND|LQUE is licensed on a wh-clause (*wh-cl*). As a *wh-cl* requires TO-BIND|QUE, the dependence of the less robust INHER|LQUE on INHER|QUE is thus explained.

1. Introduction

In earlier versions of the Head-Driven Phrase Structure (HPSG) framework, inheritance of nonlocal features is terminated in accordance with the Nonlocal Feature Principle (NFP).

1. NONLOCAL FEATURE PRINCIPLE (Pollard and Sag 1994, page 164)
For each nonlocal feature, the INHERITED value on the mother is the union of the inherited values on the daughters minus the TO-BIND value on the head daughter.

The Head-Filler Rule stipulates that a TO-BIND|SLASH value appears on the head daughter, thereby terminating INHER|SLASH. Adjectives like *easy*, which occur in *tough*-constructions, carry a TO-BIND|SLASH feature which allows the INHER|SLASH feature on its complement VP[inf] to be terminated at the AP level. Similarly, INHER|REL carried on to a relativizer phrase (RP) will be terminated legitimately as the RP modifies a nominal head which bears a TO-BIND|REL feature structure-shared with the INHER|REL feature on the RP.

In line with this, Lappin and Johnson 1996a&b proposes that INHER|QUE is terminated by a wh-complementizer which carries TO-BIND|QUE. Languages like Chinese and Japanese -- in which wh-phrases normally appear *in situ* -- have a wh-complementizer which subcategorizes for S[fin] with a non-empty INHER|QUE structure-shared with the TO-BIND|QUE on the C head.

1a. SUBCAT <S[fin,INHER|QUE: X]>
 b. NONLOCAL|TO-BIND|QUE: Y
 c. Condition: Y is a subset of X

In 1, we have structure-sharing between the INHER|QUE value inherited onto the complement S and the TO-BIND|QUE value on the C head.

The Japanese Q-particle *ka* is a candidate as a phonologically non-invisible complementizer. In the Government & Binding framework (GB), for example, *ka* was assumed to head a CP (in line with the 'extended' projection principle), with raising to spec of this structure.

2. Bill-wa John-ga nani-o katta ka shiritagatte-imasu yo
   Bill-top J-nom what-acc bought Q want-to-know emphatic dec particle
   "Bill wants to know what John bought!"
   *"What does Bill want to know if John bought?"

In 2 the *wh*-expression may only take narrow scope because of the presence of *ka* at that level and the forced declarative interpretation at the matrix clause. Therefore, the specifications given in 1 are unproblematic.

3. Kimi-wa John-ga nani-o katta ka shiritagatte-imasu ka
   you-top J-nom what-acc bought Q want-to-know Q
   "Do you want to know what John bought?"
   "What do you want to know if John bought?"

In 3, the presence of the Q-particle *ka* forces an interpretation as a question for the clause at which it appears but does not require a wh-expression to take scope there. The functional head *ka*, then, optionally carries TO-BIND|QUE:Y, where Y is a subset of X inherited by complement S[INHER|QUE:X].

4a. SUBCAT <S[(INHER|QUE: X)|>
 b. (NONLOCAL|TO-BIND|QUE: Y)
 c. Condition: Y is a subset of X

In 4, assuming optional TO-BIND|QUE values on the functional C head correctly predicts the interpretive possibilities for examples like 3. Thus, Lappin and Johnson's 1996 treatment -- together with the assumption that TO-BIND|QUE features on functional heads may be optionally null -- promises to explain the full range of facts relating to interpretation of wh-expressions.

2. Subjacency in Japanese

Certain constructions in Japanese provide puzzling evidence that there is some syntactic constraint on covert movement operations.

5. ??Kimi-wa John-ga nani-o katta ka-dooka shiritagatte-
   imasu ka?
   you-top J-nom what-acc bought Q-yes/no want-to-know Q
   "What do you want to know whether or not John bought?"

Assuming that *ka-dooka* has a necessarily null TO-BIND|QUE feature, the only possible interpretation for 5 gives the embedded wh-expression matrix scope. Most speakers of Western Japanese dialects find this construction odd. However, informants tend to agree that there is an improvement when there is a further wh-expression in the matrix clause.

6. Dare-ga John-ga nani-o katta ka-dooka shiritagatte-imasu ka?
   who-nom J-nom what-acc bought Q-yes/no want-to-know Q
   "Who wants to know whether or not John bought what?"

Again, the assumption that Q-yes/no allows no TO-BIND|QUE feature means that the only interpretive possibility will be a multiple wh-question.

2.1 F-islands and LQUE

Lappin & Johnson account for the impossibility of interpreting wh-expressions in certain configurations by assuming that certain structures block the inheritance of certain features.

7. *Mona tsawwarat Ali istara sheno?
   Mona thought Ali bought what
   "What did Mona think Ali bought?"

While it is possible to overtly extract the wh-expression from the embedded tensed clause, as in 8, it may not remain in situ as in 7.

8. Sheno_1 tsawwarit Mona Ali istara t_1

As Lappin and Johnson point out, such facts cause serious problems for the Minimalist Program's (MP) theory of feature-checking. The MP treats wh features as interpretable. By this view, unless strong Q features of C require checking, no movement will take place. Chomsky's assumption that some other interpretive strategy than movement is involved (and that therefore unnecessary movement will give rise to an Economy violation) leaves the Iraqi Arabic cases in 7 and 8 unexplained. For one thing, if overt movement is possible in 8, then the "less costly" covert movement should also be possible.

9. *kOn Raam-ne kahaa [ki kis-ko maaregaa]
   who Ram-erg say that who will hit
   Who did Ram say will hit who?

Furthermore, 9 is ungrammatical even though there is a wh-expression in the matrix clause. If no feature-checking is required by the embedded wh-expression, there is nothing to explain these facts. It should be possible for the

presence of the wh-expression in the matrix clause to allow checking of matrix C's Q-feature, thereby allowing a multiple wh-question.

Lappin & Johnson account for these facts by assuming that S[fin] blocks the inheritance of QUE in Iraqi Arabic. This is formalized with reference to a parameterized defeasible version of the NFP.

10. For each NONLOCAL feature F, the INHERITED value of F on a mother M is the union of the INHERITED values of F on the non-F-island daughters minus the value of TO-BIND on the head daughter.

The facts in 7, 8, and 9 are successfully handled by assuming that, in Iraqi Arabic, S[fin] is a QUE island. However, this does not explain why the presence of a wh-QP *sh* in matrix clause initial position apparently allows INHER|QUE to be inherited from tensed clauses.

11. sh-tsawwarit Mona [Ali gabal meno]?
wh-QP-thought Mona Ali met who
"Who did Mona think Ali met?"

11 is explained by positing the availability of two complementizers.

12. $[_{CP[INHER|LQUE\{\}]}[_{C[TOBIND|LQUE\{1\}]}$ sh- $]][_{S[fin,INHER|LQUE\{1\}]}$ tsawwarit Mona $[_{CP[INHER|LQUE\{1\}]}[\mathbf{C[INHER|LQUE\{1\}]}^{C}]$ $[\mathbf{S[fin,INHER|QUE\{1\}]}^{Ali\ gabal}\ [_{NP[INHER|QUE\{1\}]}\ meno]]]]$
= 11

In 12, from Lappin and Johnson 1996b, a phonetically null complementizer which has the feature LQUE, unifies with the QUE feature inherited by the C's complement S. A phonetically realized wh-complementizer *sh-* carries a non-optional TO-BIND|LQUE:X feature and subcategorizes for S[INHER|LQUE:X].

Lappin and Johnson 1996a acknowledges Sag's 1996 analysis of relative clauses which dispenses with empty complementizers and the TO-BIND feature. In Sag's treatment, in which linguistic types are required to satisfy highly articulated linguistic type constraints, features are inherited through the head phrase, the presence of his QUE and REL feature being required to satisfy typing constraints on wh- and relative clauses. In contrast to Lappin and Johnson's treatment, the termination of QUE does not determine the scope of wh-expressions in Sag's treatment. Rather, the presence of QUE at a left peripheral daughter in a phrase structure in English presumably licenses the termination of wh-features (whatever we decide to call them and by whatever means they are inherited on to a higher level of structure). Although Sag does not deal with this problem, the scope of wh-expressions will presumably be determined along the lines of Pollard and Yoo's 1996 treatment of QSTOREs. I do not deal with the

problems of Pollard and Yoo's approach to quantifier scope determination here, but suggest that Lappin and Johnson's treatment of inherited features as purely "syntactic" features (rather than as necessarily stored interpretations to be unpacked eventually in the CONT feature structure) is attractive in that it promises a simpler and unified treatment of inheritance.

One obvious way to recast Lappin and Johnson's treatment in Sag's framework would be to have a type constraint preventing the INHER|QUE feature from appearing on S[fin] in Iraqi Arabic. This could be handled by saying that a finite phrase must have the VFORM *fin*, and have a null INHER|QUE value. If we then have a rule which allows INHER|QUE:X to be inherited in modified form as INHER|LQUE:X, we can handle the Iraqi Arabic facts. The *npros* in INHER|QUE:X must be inherited as INHER|LQUE:X in order to survive inheritance on to a finite phrase. Termination of INHER|LQUE is licensed at *wh-clauses* which have the non-null wh-complementizer *sh-*, as in 12. The subcategorization requirement that *sh-* takes an S[INHER|LQUE:X], where X is non-null, is retained.

It is possible, then, to dispense with complementizers as functional binders of non-local features by adopting the basic idea contained in Pollard and Yoo 1996 that scope is determined at certain target phrases at which termination of inherited features is licensed. Constraints on inheritance of features may be handled in the spirit of Sag 1996 by imposing language specific (and possibly language-universal) constraints preventing certain features from being inherited on to certain phrases. A rule of "vehicle change" allows inheritance of *npros* to proceed as elements of a different feature value with its own licensed binder.

3. The solution to the Japanese subjacency problem

The basic intuition here is that null complementizers may be dispensed with if we allow termination of non-local features (retrieval of QSTOREs in Pollard and Yoo's terms) to take place at certain target phrases which license this operation. One way to handle this would be to adapt the NFP to dispense with functional heads.

13. **New NFP.**
A phrase XP licensed as a binder for feature F inherits the INHER|F:Y features of its daughters minus its own TO-BIND|F:Z value.
Condition: Z is a subset of Y

Assume that a wh-clause in English is licensed as a binder for QUE. A constraint will determine that TO-BIND|QUE:X of a *wh-filler* clause will contain the *npro* contributed by the non-head daughter. In Iraqi Arabic, S[fin] is also licensed as a binder for QUE. As a constraint prevents inheritance of QUE onto S[fin], INHER|QUE:X on S[fin]'s daughters must appear as TO-BIND|QUE:X on mother S[fin] unless QUE is modified to LQUE. Only CP with a *sh*-head, such as 11, is licensed as a binder for LQUE in Iraqi Arabic.

The Japanese "subjacency" data can be handled by assuming that Japanese also has a rule allowing "vehicle change" of INHER|QUE to INHER|LQUE. One might suggest -- provisionally -- the rule in 14 to handle these cases.

14. **QUE to LQUE "vehicle change" rule**

If XP[INHER|QUE:X], then either XP[INHER|QUE:X] or
XP[INHER|LQUE:X]

The rule in 14 may be applied to salvage INHER|QUE in contexts in which there is illicit inheritance of the feature on to a particular structure. It allows INHER|QUE to modify to INHER|LQUE, but not vice versa. An idiosyncratic constraint applying to CP with *ka-dooka* as its C head is that it must have an empty INHER|QUE value. This is entirely in line with Sag's suggestions for explaining island phenomena, and is in the spirit of his general program of using type constraints to dispense with null complementizers. The constraint preventing INHER|QUE on *ka-dooka* CP forces "vehicle change" of INHER|QUE to INHER|LQUE in order for inheritance of the *npros* contained in INHER|QUE to proceed to successful termination at a licensed binder structure.

The "subjacency" data is then explained by assuming that only a *wh-clause* is a licensed binder for INHER|LQUE. If a *wh-clause* in Japanese must satisfy the constraint that it has a non-empty TO-BIND|QUE feature (not TO-BIND|LQUE), then the facts fall out perfectly naturally.

5. ??Kimi-wa John-ga nani-o katta ka-dooka shiritagatte-
imasu ka?
you-top J-nom what-acc bought Q-yes/no want-to-know Q
"What do you want to know whether or not John bought?"

In 5, the INHER|QUE originating with the embedded wh-expression must modify to INHER|LQUE at some point in order to satisfy the constraint preventing INHER|QUE on *ka-dooka* CPs. As INHER|LQUE may not modify back to INHER|QUE, the INHER|LQUE feature may not terminate because there is no legitimate licensed binder.

6. Dare-ga John-ga nani-o katta ka-dooka shiritagatte-
imasu ka?
who-nom J-nom what-acc bought Q-yes/no want-to-know Q
"Who wants to know whether or not John bought what?"

In 6, by contrast, the "vehicle change" rule allows INHER|QUE to modify to INHER|LQUE and be inherited successfully on to the *ka-dooka* CP. The presence of a wh-expression in the matrix clause means that there will be a *wh-clause* available to act as a licensed binder for INHER|LQUE.

3.1 Advantages of this approach

The Japanese "subjacency" data repeated above has played an important role in the development of the MP. Watanabe's 1991 famous analysis assumed that there were two levels of movement, one an optional operator feature movement taking place at S-structure in order to trigger a CP[wh], the other at LF -- of the whole category -- to determine the scope of the wh-expression. This second level of movement was assumed to be free from subjacency restrictions. The approach recommended here has the advantage over Watanabe's solution that there is no need to consider different levels of movement, and therefore no need to motivate the claim that different constraints apply at those levels. Instead, we assume that language-particular constraints prevent certain features being inherited on to certain phrases, certain strategies being available to effect extraction.

A considerable body of data (Tancredi's 1990 evidence relating to *only*, for example) has seriously undermined the claim that whole categories moved at LF. In the development of the MP, the need to eradicate certain putatively unmotivated movement operations was widely accepted by linguists working in the Principles and Parameters tradition. Chomsky 1995 assumes that some other interpretive strategy like unselective binding is sufficient to determine the scope of wh-expressions. Therefore, something like Watanabe's original operator movement has been retained to handle checking of features of C[wh], but further movement is assumed to be blocked as a violation of Economy. Thus although wh-*in situ* constructions in many of the world's languages exhibit Island effects typical of movement, the MP must resort to completely unrelated mechanisms in order to account for wh-movement and wh-*in situ* constructions. In this approach, wh-*in situ* and wh-movement are both subject to constraints on inheritance -- although these may not be the same.

While Lappin and Johnson assume that *ka-dooka* CPs are F-islands for INHERIQUE, they do not resort to LQUE in order to explain the Japanese "subjacency" data. Instead, Johnson (pc) proposes an update function on feature values to the effect that the QUE value of the phrase *dare-ga* in 6 is the union of the value of its own QUE feature and the value of the QUE feature of the F-island *ka-dooka* CP.

While this approach offers a simple solution to the problem, it suffers from a number of problems. The biggest difficulty is that it means that apparently parallel island phenomena are handled in radically different ways for different languages. In Iraqi Arabic, QUE escapes islands by resort to a resumption strategy which replaces QUE with LQUE. However, this solution is rejected for the Japanese data and appeal is made to a completely different mechanism. It would clearly be advantageous to deal with the problem with recourse to the same strategy. In doing so, however, the requirement that INHERIT features are terminated by a functional category carrying TO-BIND features means that considerable optionality has to be factored into their analysis.

As already mentioned, treating *ka* as a functional TO-BIND head requires

that we let it carry this feature only optionally.

4a. SUBCAT <S|(INHER|QUE: X)|>
 b. (NONLOCAL|TO-BIND|QUE: Y)
 c. Condition: Y is a subset of X

Further, generalizing Lappin and Johnson's account of Iraqi Arabic to the Japanese data requires that *ka-dooka* optionally carries INHER|LQUE, which unifies with the INHER|QUE feature on a subcategorized S.

15. ka-dooka
a. SUBCAT <S|(INHER|QUE:X)|>
NONLOCAL|(INHER|LQUE:X)

In addition to this, it is necessary to specify that *ka* allows TO-BIND|LQUE, but only if there is also a non-null TO-BIND|QUE value. Therefore, 4 has to be modified to 16.

16a. SUBCAT <S|(INHER|QUE: X, INHER|LQUE:Y)|>
 b. (NONLOCAL|TO-BIND|QUE: W, TO-BIND|LQUE:Z)
 c. Condition: W is a subset of W, Z is a subset of Y
 d. Condition: if W is null, Z is also null

There is considerable optionality here which is factored into functional heads in a more or less arbitrary manner in order to account for the facts. In the account suggested here, by contrast, the new NFP allows *npros* to be bound at certain licensed levels of structure, with no need to treat *ka* as a functional head. INHER|LQUE arises by the same mechanism in Japanese and Iraqi Arabic, with no need for empty complementizers. These last two points are of considerable importance given the fact that Q complementizers are actually optional in matrix clauses in Japanese.

17. Kimi-wa nani-o taberu?
 you-top what-acc eat
 "What are you going to eat?"

In 17, a perfectly natural sentence, there is no Q-particle. It is not possible to both dispense with null complementizers and retain complementizers as functional heads required to terminate INHERIT features. In the present account, by contrast, S is simply licensed as a binder for QUE in Japanese. Therefore, we have a mechanism allowing INHER|QUE to terminate without the complementizer. The full range of facts can be explained by assuming that *ka* is required on a *wh-clause* in embedded contexts to satisfy the subcategorization requirements of selecting verbs, but not required in matrix positions because INHER|QUE can terminate perfectly well without the complementizer. Positing

an invisible complementizer raises the question of why a verb like *shiritai* (want to know) may not take a clause without a complementizer.

18. a. Kimi-wa John-ga nani-o tabeta ka shiritai?
you-top J-nom what-acc ate Q want-to-know
"What do you want to know if John ate?"
"Do you want to know what John ate?"

b. *Kimi-wa John-ga nani-o tabeta shiritai?
you-top J-nom what-acc ate want-to-know

In 18a, both narrow and wide scope is possible for the embedded wh-expression, as expected given that there is no constraint blocking INHER|QUE out of *ka* CP. By contrast, 18b is completely ruled out, as expected on the assumption that *shiritai* needs a *ka* CP.

Another problem with Johnson's update function is that nothing prevents adjunct wh-expressions contributing INHER|QUE and these being inherited onto *ka-dooka* CPs and updated to extract them from the F-island. This in fact makes very wrong predictions as adjunct wh-expressions do not easily extract from interrogative clauses in Japanese at all. One may speculate that this problem can be dealt with very simply by assuming that interrogative clauses are subject to the constraint that any INHER|QUE they carry must have the head feature *noun*. This requires that *npros* would contain head feature information, but such a solution would not seem to be beyond the theory, and would be in line with Sag's 1996 suggestions regarding weak islands for SLASH. This would, in fact, solve the problem for Johnson's update function. Interestingly, however, accepting that constraints apply to block certain kinds of INHERIT features on certain kinds of structures weakens the case for F-islands as stated in Lappin and Johnson's version of the NFP.

10. For each NONLOCAL feature F, the INHERITED value of F on a mother M is the union of the INHERITED values of F on the non-F-island daughters minus the value of TO-BIND on the head daughter.

If Lappin and Johnson need to resort to type constraints to block inheritance of certain features in any case, it would be desirable to reduce all inheritance constraints to the same mechanism. There is no obvious way that the block on extraction of adjunct *npros* out of interrogative clauses can be handled through recourse to F-islands. By contrast, type constraints can be made to straightforwardly handle all the island effects dealt with here. As the suggestions offered here make reference to type constraints rather than F-islands, there is good reason to prefer this as a general approach. Furthermore, dispensing with the unmotivated update function simplifies things considerably and is therefore to be preferred.

Conclusion

The treatment of Relative Clauses in Sag 1996 suggests that imposing highly articlulated constraints on linguistic types will allow us to dispense with invisible categories. Pollard and Yoo's 1996 approach to quantifiers suggests how "nonlocal" features can be terminated without recourse to (often invisible) functional heads. Lappin and Johnson's 1996 account of island phenomena in a variety of languages is extremely suggestive of how the presence of wh-expressions *in situ* may give rise to ungrammaticality. The suggestions made above can be viewed as a synthesis of these three approaches. Islands may be handled in general as constraints preventing features from appearing at certain levels of structure, with no need for F-islands. Eradicating functional complementizers as terminators of nonlocal features solves the problem of optionality with respect to these functions.

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