

SINGLE-PAIR VERSUS MULTIPLE-
PAIR ANSWERS: *WH-IN-SITU*
AND SCOPE

Veneeta Dayal
Rutgers University

1 The Diagnostic of Paired Answers

It is a well-accepted generalization that *wh*-in-situ can take unbounded scope. This squib examines the diagnostic of paired answers on which this generalization is based and argues that a more refined understanding of the diagnostic leads to a reassessment of the claims about *wh*-in-situ and scope.

Consider the possibility of question-answer pairs like the following:

- (1) a. Which philosopher likes which linguist?
b. Professor Smith likes Professor Brown and Professor King likes Professor Matthew.
- (2) a. Which student knows where Mary bought which book?
b. John knows where Mary bought *Aspects* and Bill knows where she bought *Barriers*.
- (3) a. Which linguist will be offended if we invite which philosopher?
b. Professor Smith will be offended if we invite Professor Brown.

Multiple interrogatives like (1a) readily admit paired answers like (1b). That answers to (2a) and (3a) also pair values for two *wh*-expressions instead of one has therefore been taken as evidence that two *wh*s have matrix scope. In the case of (2a) the *wh*-in-situ thought to have wide scope is inside a *wh*-complement; in the case of (3a) it is inside an adjunct. *Wh*-in-situ, it would appear, can take scope across clause boundaries, in violation of Subjacency.

The ability of *wh*-in-situ to take wide scope has been explained in a number of ways: by taking Subjacency to be inapplicable at LF (Huang 1982), by unselective binding of D-linked *wh*-expressions (Pesetsky 1987), and by existential closure involving a choice function interpretation for *wh*-in-situ (Reinhart 1998). A point that has escaped theoretical attention is that paired answers to multiple questions are not always of the same form. While (1a) and (2a) support multiple-pair answers, (3a) admits only a single-pair answer. (4) is considered an awkward, if not unacceptable, response to (3a).

- (4) #/*Professor Smith will be offended if we invite Professor Brown, and Professor King will be offended if we invite Professor Matthew.

This fact is quite puzzling under all the above-mentioned approaches. This is particularly true since the *wh*-expression at issue is of the form *which N*. Such expressions are typically characterized as D-linked and thought to be able to take wide scope across islands.¹ The resistance

Thanks to Roger Schwarzschild and two anonymous reviewers for helpful comments.

¹ I assume that monomorphemic *wh*-expressions like *who/what* may be interpreted as *which individual/object*. I use *which N* in the text since it high-

of (3a) to multiple-pair answers thus shows that the correlation between paired answers and scope needs to be examined more closely. Let us begin with simple questions like (1a).

2 List Answers to Simple Multiple Interrogatives

Multiple-pair answers to simple interrogatives have been explained by moving the *wh*-in-situ to specifier position at LF and positing a semantic operation that composes the two. My account in Dayal 1996 is as follows:

- (5) a. Which philosopher likes which linguist?
 b. [which linguist_j [which philosopher_i [t_i likes t_j]]]
 c. $\lambda p \exists f_{(e,e)} [\text{Dom}(f) = \text{philosopher} \ \& \ \text{Range}(f) = \text{linguist} \ \& \ p = \cap \lambda p' \exists x [p' = x \text{ likes } f(x)]]$
 d. {a likes b and c likes d, a and c both like b, a and c both like d, a likes d, and c likes b}
 e. $\text{Ans}(Q) = \cup p [\sim p \ \& \ p \in Q \ \& \ \forall p' \in Q [\sim p' \rightarrow p \subseteq p']]$

Following the account of questions with quantifiers in Engdahl 1986 and Chierchia 1993, *wh*-expressions are taken to admit an interpretation using Skolem functions. In the case of multiple-*wh* questions, a functional dependency is posited whereby the subject term sets the domain of the function, the object term sets its range, and the propositions relate individuals in the domain set to some functionally dependent entity in the range set. Crucially, each proposition in the denotation of the question is a conjunction of the atomic propositions obtained by varying the values of *x* and its dependent element *f(x)* in the question nucleus denoted by the IP. If the set of philosophers is {a,c} and the set of linguists {b,d}, the question denotes the set of four propositions in (5d), where each proposition is the graph of a function relating the domain and the range sets. The answerhood operator, defined in (5e), picks out a unique maximally true proposition from the question denotation. In the case of the multiple-*wh* questions under discussion, such a proposition will be a multiple-pair answer.²

lights the problem under discussion. For differences between the two types of *wh*-expressions having to do with number implications, see Dayal 1996.

² Although Engdahl (1986) analyzes multiple-*wh* questions using Skolem functions, she does not posit a functional dependency between *wh*-expressions. She therefore derives only atomic propositions in the question denotation. The proposal outlined here not only derives multiple-pair answers but also accounts for the shift from uniqueness in the case of questions with a single *which* phrase to many-one or one-one pairings, with an exhaustive listing for the subject term, in questions with more than one such phrase. Hornstein (1995) and Comorovski (1996) also propose a functional dependency in multiple-*wh* questions, but the propositional sets they take as question denotations are atomic. Though the intuitions driving their analyses are the same, the desired effects are not actually obtained since the relation between such question denotations and appropriate answers is left unspecified (see Dayal 1996 for relevant discussion).

While simple multiple-*wh* questions readily admit multiple-pair answers, it is worth emphasizing that they also admit single-pair answers. Consider the discourse in (6) where Speaker B is unable to identify the referents in Speaker A's statement.³

- (6) a. Speaker A: That philosopher hates that linguist.
 b. Speaker B: Which philosopher hates which linguist?
 c. Speaker A: Professor Smith hates Professor Brown.

Multiple interrogatives that seek single-pair answers, felicitous in contexts that make it clear that the identity of a unique pair of individuals is at issue, have the intonation Pope (1976) associates with what she calls REF-questions (REF-Qs). While regular questions, including multiple-*wh* questions seeking multiple-pair answers, have a falling contour, REF-Qs have a rise in pitch on the *wh*.⁴ However, REF-Qs were not systematically distinguished in the semantic literature on questions until Dayal 1996. Here I present a different account for them than in Dayal 1996.⁵

Adopting Reinhart's (1998) choice function analysis of *wh*-in-situ, we can take the LF representation of (6b) to be (7a).

- (7) a. [which philosopher; [t_i hates which linguist]]
 b. $\lambda p \exists x \exists f_{\langle (et),e \rangle} [\text{philosopher}(x) \ \& \ p = x \text{ hates } f(\text{linguist})]$
 c. {a hates b, c hates d, a hates d, c hates b}

The *wh*-in-situ does not move to operator position. Instead, a function that yields an arbitrarily chosen entity out of the set it is applied to interprets it in situ. Since the LF representation in (7a) does not have two *wh*-operators that can be composed, we get as the denotation of the question a set of simple atomic propositions. The answerhood

³ Bošković (1999), while admitting single-pair answers to simple questions with *which N*, denies their availability with monomorphemic *wh*-expressions. The following, attributed to C. L. Baker, shows this is not so. If uttered to a group of two, *Who hit who first?* could only sensibly be given a single-pair answer. The case can also be made with the following demonstration: *I know someone bought something here. Tell me. Who bought what?* It is possible that Bošković's judgments do not take into account intonational differences between regular multiple-*wh* questions and REF-Qs. Or, to the extent that monomorphemic *wh*-expressions appear to resist single-pair readings, it may be because a choice function interpretation is harder to obtain for them owing to their poor descriptive content. In any case, it is worth noting that the main argument in this squib rests, not on the availability of single-pair answers in simple questions, but on the fact that multiple-pair answers readily available in simple questions seem to be unavailable in contexts like (3a).

⁴ As Pope points out, REF-Qs are intonationally distinct from echo questions. REF-Qs have a fall at the end, while the rise is maintained in echo questions.

⁵ In Dayal 1996 I took such questions to involve two simple existential quantifiers, also yielding atomic propositional sets. While the results are the same for simple questions, the choice function analysis works better for the long-distance examples under discussion.

operator in (5e), when applied to such question denotations, necessarily yields single-pair answers.⁶

3 Paired Answers across Islands

Let us return now to the data in section 1 and see why multiple-pair answers do not obtain for (3a). As we have seen, multiple-pair answers crucially require the common noun inside the *wh*-in-situ to take scope outside IP, leaving a functional trace inside the question nucleus. If we assume that the scope of *wh*-in-situ is constrained by Subjacency, the *wh*-in-situ cannot move to the matrix specifier. It is therefore unable to fix the value for the range of the function, and its trace cannot be functionally bound by the matrix *wh*. This, then, correctly accounts for the absence of multiple-pair answers to (3a) and other questions involving *wh*-in-situ inside islands, such as (8a–b).

- (8) a. Which student read the book that which professor wrote?
 b. Which student got a headache after she read which book?

The only possibility for interpreting such questions is via Reinhart's (1998) choice function approach. As shown in (9), this necessarily yields a set of atomic propositions as the denotation of the question, and the answerhood operator picks one of them in a given context.

- (9) a. [which linguist_i [t_i will be offended if we invite which philosopher]]
 b. $\lambda p \exists x \exists f_{\langle(e,t)\rangle} [\text{linguist}(x) \ \& \ p = x \text{ will be offended if we invite } f(\text{philosopher})]$
 c. {a will be offended if we invite b, c will be offended if we invite d, a will be offended if we invite d, c will be offended if we invite b}

4 The *Wh* Triangle and Multiple-Pair Answers

Since we are taking Subjacency to be relevant in assigning scope to the *wh*-in-situ, blocking functional dependencies from holding across islands, the status of (2a) needs to be clarified. (2a) can, of course, be interpreted using choice functions, but this will yield only the single-pair answer. The goal of this section is to show how multiple-pair answers may be obtained if the *wh*-in-situ cannot take matrix scope. The key descriptive fact here is that the *wh*-in-situ occurs inside a multiple-*wh* complement. As elaborated in Dayal 1996, the multiple-pair answer can be explained as relating the matrix *wh* and the multiple-*wh* complement rather than the matrix *wh* and the embedded *wh*-in-situ.⁷

⁶ See Reinhart 1998 for arguments in favor of choosing the choice function approach over unselective binding. As far as the current point goes, unselective binding—or *wh*s interpreted as wide scope existential quantifiers, for that matter—would also yield single-pair answers.

⁷ Nothing much hinges on whether we take the CP to move to the left of

- (10) a. [[where Mary bought which book]_i [which student_j [t_i knows t_j]]]
 b. $Q_i = \{\text{where Mary bought A, where Mary bought B, where Mary bought C}\}$
 c. $\lambda p \exists x \exists f_{\langle\langle s, t \rangle, e \rangle} [\text{Dom}(f) = Q_i \ \& \ \text{Range}(f) = \text{student} \ \& \ p = \cap \lambda p' \exists q \in Q_i [p' = \text{know}(f(q), q)]]$

Here the embedded multiple-*wh* question is interpreted as a second-order question, which can undergo QR to take clausal scope. Semantically, it denotes the set of questions in (10b), and the full question is interpreted as a relation between the members of this set and individual students who know answers to them.⁸

This explanation turns on the possibility of a second-order interpretation for multiple-*wh* questions. One might wonder whether second-order questions are even instantiated in natural language. Independent evidence for this comes from echo questions. Consider the discourses in (11) and (12), where subscripts indicate a phonetically inaudible segment.

- (11) a. Mary bought _{a book} at the store.
 b. Mary bought WHAT at the store?
 c. Mary bought a book at the store.
- (12) a. Where did Mary buy _{the book}?
 b. Where did Mary buy WHAT?
 c. (I said) where did Mary buy the book.

Although the evidence is indirect, we can conclude two things on the basis of (10) and (11): that second-order questions are possible in natural language, and that they are only possible with multiple ques-

the matrix *wh*, as in (10a), or to the right, as proposed by Richards (1997) and Pesetsky (2000). Crucial for present purposes is that it move outside C^0 , or whatever position the question nucleus is formed in.

⁸ Two observations are in order here.

First, this account differs crucially from that of Kuno and Robinson (1972), who treat the list answer to examples like (2a), originally due to C. L. Baker, as a cooperative elaboration of an individual answer, on a par with list answers to questions like *Who knows where Mary bought these books?* As noted in Dayal 1996, cooperative list answers to questions involving plural definites are not possible with singular *wh*-expressions in the matrix. Questions like (2a) have singular *wh*-expressions and yet allow multiple-pair answers, indicating that a semantic account for the phenomenon is warranted.

Second, according to an anonymous reviewer, questions like (2a) also admit answers like *John knows that Mary bought Aspects in Cambridge and Bill knows that she bought Barriers in Amherst*, giving values for all three *wh*s, and answers like *John knows which book Mary bought in Cambridge and Bill knows which book she bought in Amherst*, giving values for the fronted *wh* in the embedded clause rather than the *wh*-in-situ. I believe these judgments are likely to be controversial. To the extent that they are accepted, these facts cannot be handled straightforwardly by current theories of *wh* scope, including the present one.

tions.⁹ To the extent that multiple-pair answers involving islands are restricted to embedded questions with more than one *wh*-expression, the evidence from echo questions carries weight.

The idea that there is no long-distance movement of the *wh*-in-situ in (2a) is supported by the impossibility of multiple-pair answers to questions that have a clause in the middle, as in (13).¹⁰ If the *wh*-in-situ could escape the island in CP₃, there is no reason that it should be blocked from taking matrix scope by CP₂. Since our present assumption is that LF movement of *wh*-in-situ is constrained by islands, the only way to interpret the *wh*-in-situ here is via the choice function analysis, leading to a single-pair answer.

- (13) [CP₁ Which student_i [t_i said [CP₂ that John knows [CP₃ where Mary bought which book]]]]?

The correlation between a local triangular constellation of *wh*-expressions and the possibility of multiple-pair answers is thus explained.

5 Subjacency versus Locality

We have established so far that *wh*-in-situ is interpreted either in its S-Structure position via choice functions or as an operator binding a functional trace at LF. The first option leads to single-pair answers, the second to multiple-pair answers. On the basis of the cases examined so far, we have concluded that although existential binding of choice functions is possible across islands, covert *wh*-movement is not. Further examination suggests that an even stronger conclusion may be warranted. As pointed out by an anonymous reviewer, the following questions also seem to disallow multiple-pair answers:

- (14) a. Which student doesn't believe that Mary bought which book?
 b. Which student believes that Mary didn't buy which book?
 c. Which student believes that Mary read which book?
 d. Which student said that John believes that Bill read which book?

These questions do not accord with the view that English has obligatory *wh*-fronting within the clause, but they are generally judged acceptable by native speakers. The types of answers they admit are therefore relevant to the present discussion.

⁹ Note that only one of the two *wh*s must carry echo intonation for the relevant facts to obtain. See Dayal 1996 for further details.

¹⁰ This sort of example is attributed by Mahajan (1990) to David Pesetsky. Note that such examples cannot be handled by Richards's (1997) proposals, which predict that once the "Subjacency tax" for CP₃ has been paid by *where* in (13), *which book* should be able to take matrix scope.

While (14a) and (14b) may arguably involve negative islands, (14c) and (14d) show that islandhood is not a necessary condition for blocking multiple-pair answers. These data can be predicted under the present approach to single- versus multiple-pair answers if covert *wh*-movement is taken to be strictly local, not just constrained by Subjacency. Since a second-order interpretation is not available to single-*wh* questions, the complement cannot enter into a functional dependency with the matrix *wh*. The only available interpretation, utilizing choice functions, results in single-pair answers.¹¹

6 Conclusions

The distinction between single-pair and multiple-pair answers has received some attention in recent literature (e.g., Hagstrom 1998, Bošković 1999, Barss 2000, Pesetsky 2000). However, to the best of my knowledge, the diagnostic has not previously been applied to long-distance cases.¹² Single-pair answers, we have seen, are generally available, while multiple-pair answers are syntactically restricted to local domains. I have argued that this is because natural language uses two different mechanisms for interpreting *wh*-expressions: as operators binding individual or functional traces and as choice functions. Since functional traces are crucial in deriving multiple-pair answers, we can conclude that the scope of *wh*-in-situ interpreted as an operator is clause bounded. Since choice functions yield single-pair answers, their availability across clause boundaries and islands shows that existential binding of *wh*-in-situ interpreted as choice functions is unbounded. This represents a more nuanced understanding of scope for *wh*-in-situ than in earlier work. For example, in Huang 1982 and work stemming from it, unbounded *wh*-movement was proposed uniformly for all *wh*-in-situ. The absence of multiple-pair answers across clause boundaries shows that unbounded scope effects are limited to existential binding of choice functions. Similarly, Reinhart (1998) has argued for choice functions and against movement for all *wh*-in-situ. The possibility of multiple-pair answers, albeit in syntactically restricted contexts, shows that local covert movement, or some close analogue of it, must be recognized in addition to choice functions. In earlier work (Dayal 1996) I interpreted all paired answers involving *wh*-in-situ locally, but that account did not take sufficient note of questions that yield single-pair answers across clause boundaries. The particular proposals made

¹¹ It may be worth noting that this yields, at least partially, the clausemate condition that has sometimes been considered a necessary condition for multiple-pair answers. In order to determine whether it is a sufficient condition for such answers, one would have to examine the effect of negation and other potential interveners in simple questions. Pesetsky (2000) discusses facts clearly relevant to this issue, which I do not go into here for reasons of space.

¹² Saddy (1991) claims a nonquantificational status for *wh*-in-situ in Bahasa Indonesia, using single-pair answers as an argument, but he did not apply the test to English *wh*-in-situ. Garrett (1996) does explore the phenomenon in English, but I became aware of this work too late to incorporate it here.

here for deriving these differences may well turn out to require revision, but that should not affect the validity of the more general point. The diagnostic of paired answers cannot be used as a simple indicator of scope.

References

- Barss, Andrew. 2000. Minimalism and asymmetric *wh*-interpretation. In *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, ed. by Roger Martin, David Michaels, and Juan Uriagereka, 31–52. Cambridge, Mass.: MIT Press.
- Bošković, Željko. 1999. On multiple feature checking: Multiple *wh*-fronting and multiple head movement. In *Working minimalism*, ed. by Samuel David Epstein and Norbert Hornstein, 159–187. Cambridge, Mass.: MIT Press.
- Chierchia, Gennaro. 1993. Questions with quantifiers. *Natural Language Semantics* 1:181–234.
- Comorovski, Ileana. 1996. *Interrogative phrases and the syntax-semantics interface*. Dordrecht: Kluwer.
- Dayal, Veneeta. 1996. *Locality in wh quantification*. Dordrecht: Kluwer.
- Engdahl, Elisabet. 1986. *Constituent questions*. Dordrecht: Reidel.
- Garrett, Edward. 1996. *Wh*-in-situ and the syntax of distributivity. In *Syntax at sunset*, ed. by Edward Garrett and Felicia Lee, 129–145. UCLA Working Papers in Syntax and Semantics 1. Los Angeles, Calif.: UCLA, Department of Linguistics.
- Hagstrom, Paul. 1998. Decomposing questions. Doctoral dissertation, MIT, Cambridge, Mass.
- Hornstein, Norbert. 1995. *Logical Form: From GB to minimalism*. Cambridge, Mass.: Blackwell.
- Huang, C.-T. James. 1982. Logical relations in Chinese and the theory of grammar. Doctoral dissertation, MIT, Cambridge, Mass.
- Kuno, Susumu, and Jane Robinson. 1972. Multiple *wh*-questions. *Linguistic Inquiry* 3:463–487.
- Mahajan, Anoop. 1990. The A/A-bar distinction and movement theory. Doctoral dissertation, MIT, Cambridge, Mass.
- Pesetsky, David. 1987. *Wh*-in-situ: Movement and unselective binding. In *The representation of (in)definiteness*, ed. by Eric Reuland and Alice ter Meulen, 98–129. Cambridge, Mass.: MIT Press.
- Pesetsky, David. 2000. *Phrasal movement and its kin*. Cambridge, Mass.: MIT Press.
- Pope, Emily. 1976. *Questions and answers in English*. The Hague: Mouton.
- Reinhart, Tanya. 1998. *Wh*-in-situ in the framework of the Minimalist Program. *Natural Language Semantics* 6:29–56.
- Richards, Norvin. 1997. What moves where when in which language? Doctoral dissertation, MIT, Cambridge, Mass.

Saddy, Douglas. 1991. WH scope mechanisms in Bahasa Indonesia. In *More papers on wh-movement*, ed. by Lisa L. S. Cheng and Hamida Demirdache, 183–218. MIT Working Papers in Linguistics 15. Cambridge, Mass.: MIT, Department of Linguistics and Philosophy, MITWPL.

VOWEL REDUCTION AND
REDUPLICATION IN KLAMATH
Cheryl Zoll
MIT

McCarthy and Prince (1995) propose a powerful new approach to reduplication, correspondence theory, which differs from previous approaches in its ability to enforce identity between a base and its reduplicant even after copying has taken place. Base-reduplicant (BR) correspondence makes it possible to account for ostensible cases of over- and underapplication, but in doing so predicts a wide range of cases that are apparently unattested (see McCarthy and Prince 1995 for discussion). This squib examines one prominent case of ostensible backcopying—the nonapplication of vowel reduction in intensive prefixing reduplication in Klamath (Penutian)—and demonstrates that vowel reduction failure in the intensive cannot be derived from BR faithfulness. Rather, intensive prefixation is actually a process of stem formation not subject to the same constraints as regular prefixation. This reanalysis eliminates Klamath as support for BR correspondence and makes the more general point that morphological investigation must precede any attempt to attribute the nonapplication of a phonological alternation to backcopying underapplication.

The verb in Klamath consists of a number of prefix classes, a root, and a variety of suffixes (Barker 1964, DeLancey 1991, 1999).

(1) *Overview of Klamath verb*

| | | | | | | |
|--------------|--|--------------------------|-------------|-----------|------|----------|
| DISTRIBUTIVE | CAUSATIVE, REFLEXIVE- RECIPROCAL | CAUSATIVE, TRANSITIVE | CLASSIFIERS | INTENSIVE | ROOT | SUFFIXES |
|--------------|--|--------------------------|-------------|-----------|------|----------|

Klamath prefixes trigger a well-known process of vowel reduction and syncope. Both reduplicative and nonreduplicative prefixes trigger vowel reduction in the following syllable (Barker 1963, 1964).¹ If the second syllable is closed, its vowel reduces to schwa (2a–c). In what would otherwise be an open syllable, the vowel deletes (2d–f).

I am grateful to Sharon Inkelas, Michael Kenstowicz, Sam Rosenthal, and two anonymous reviewers for their helpful comments and suggestions.

¹ This process is described in detail by Barker (1963, 1964) and discussed extensively in the linguistics literature by, among others, Kisseberth (1972), Kean (1973, 1975), White (1973), Thomas (1975), Feinstein and Vago (1981), and Clements and Keyser (1983).