

Unexpected Pair-list Readings in Plural Indefinites: A New Generalization

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0. Introduction

Wh- interrogatives such as (1a), where a universal *c*-commands the *wh*- trace, yield three types of reading which can be made explicit by looking at their answers: individual (1b), functional (1c), and pair-list (1d) (e.g. Chierchia 1992; Groenendijk and Stokhof 1984).

- (1) a. Which woman does every Italian man we know love *t*?
b. Every Italian man we know loves Sophia Loren. (Individual reading)
c. Every Italian man we know loves his mother. (Functional reading)
d. Pablo loves Rosa, Gianni loves Sandra, Leo loves Lita, etc. (Pair-list)

In this paper, we re-examine the conditions under which the pair-list reading becomes available in interrogatives. First, we introduce a data set that shows that some *plural indefinites* yield pair-list readings which would be unexpected under one class of analyses which have suggested that only universals would yield such readings (e.g. Chierchia 1992). Second, we show that not all indefinites, but only a subset, yield pair-list readings; this would be unexpected from a second type of analysis (e.g. Higginbotham 1996) which suggests that any determiner in the right structural environment should yield some type of pair-list reading. Third, we provide a new generalization to better capture the data we have observed, and consider what this data may mean for an analysis of pair-list readings.

1. Pair-List Readings in *Wh*- Interrogatives

1.1. *Wh*-/Quantifier Interactions

The available readings for examples such as (1) have been a major focus in the

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syntax and semantics of questions. One phenomenon which has received much attention is that of subject/object asymmetries. The pair-list reading as in (1c) is available when the *wh*- trace is extracted from object position (see 2c), but not when extracted from subject position (see 3c) (e.g. Chierchia 1992, Aoun and Li 1993). The example in (2) is a case where object *wh*- yields a pair-list reading with *everyone*, while subject *wh*- (3) does not.

- (2) a. Who/which professor does everyone like *t*?
 b. Prof. Smith. (Individual reading)
 c. Bill likes Prof. Smith, John likes Prof. Jones, etc. (Pair-list)
- (3) a. Who/which professor *t* likes everyone?
 b. Prof. Smith. (Individual reading)
 c. *Prof. Smith likes Mary, Prof. Jones likes Bill, etc. (*Pair-list)
 (Chierchia 1992)

Chierchia (1992) sought to account for the subject/object asymmetry in (2-3) as an instance of Weak Crossover, under his functional *wh*- approach to the semantics of questions. We briefly review Chierchia (1992) below.

1.2. Chierchia's (1992) Analysis

Chierchia (1992) proposes that the pair-list reading can be accounted for as a species of the functional reading (see also Engdahl 1986, Groenendijk and Stokhof 1984, among others), as schematized in (4).

- (4) a. Example: Who does every Italian man love?
 b. which function *f* is such that every Italian *x* loves *f*(*x*)

Under this analysis, the functional reading is represented syntactically; cases where the pair-list is ruled out can be captured as a Weak Crossover violation.¹

Chierchia observes that this functional configuration does not *guarantee* the pair-list, noting that the availability of the pair-list depends in part on determiner meaning (Chierchia 1992; see also Groenendijk and Stokhof 1984). If *some* is

¹ In Chierchia's (1992) analysis, the functional reading is instantiated syntactically as involving two ingredients, functional (ia) and pronominal (ib), implemented by positing a complex trace (ic).

- (i) a. Function: {*p*: *p* is true and for some *f*, *p*= \wedge [every Italian loves *f*(*x*)]}
 b. Argument: every Italian_{*i*} man loves his_{*i*} mother
 c. *Complex trace*: [*who*_{*i*} [*every Italian*_{*j*} loves [*e*_{*j*}]]] (The function index is *i* & the argument index is *j*)

As the example in (ii) shows, subject-extracted *wh*- results in a Weak Crossover violation with respect to argument index *j*; whatever accounts for classic weak crossover violations would also rule out the pair-list.

- (ii) *who*_{*i*} *e*_{*j*} likes everyone_{*j*} (object NP has to cross *j* to bind it)

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substituted for *every* (5a), the pair-list is no longer available (5d), though the functional reading remains (5c).

- (5)
- a. Which woman do some Italian men we know like *t*?
 - b. Some/a few/several Italian men we know like Queen Elizabeth.
(Individual reading)
 - c. Some/a few/several Italian men we know like their mother-in-law.
(Functional reading)
 - d. *Pablo likes Rosa, Gianni likes Sandra, Leo likes Lita, etc.
(*Pair-list)

Chierchia (1992) observes that the determiners yielding the pair-list in this configuration are the universal quantifiers and speculates that this is so because they all provide a generator – a domain over which to map the function. In other words, they provide the answer to how to run through the values of *f* in a function. In (4), *every* provides a way to make certain the domain of the function, because it ranges over each man in the domain.

2. Pair-Lists and Indefinites: New Data, New Generalization

2.1. Plural Indefinites (e.g. *Some*) Do Yield Pair-List Readings

Our data suggests that plural indefinites such as *some*, *a few*, and *several* yield pair-list readings under *wh*-, as is shown in the examples in (6), unlike what Chierchia's (1992) generalization would predict.

- (6)
- a. Which women do some/a few/several Italian men we know like?
 - b. Some/a few/several Italian men we know like Queen Elizabeth.
(Individual reading)
 - c. Some/a few/several Italian men we know like their mother-in-law.
(Functional reading)
 - d. Pablo likes Rosa, Gianni likes Sandra, Leo likes Lita, etc. (Pair-list)

This reading was revealed when the *wh*- NP was minimally changed to its plural form (*which women* in (6) vs. *which woman* in (5)).

The data in (6) suggests that a pair-list reading is available for non-universals, counter to the previous generalization, which offered that only universals should generate the pair-list reading. Example (7) also shows, using a different predicate, *teach*, that the pair-list holds for these plural indefinites.

- (7)
- a. Which classes did some/a few/several professors teach last semester?
 - b. Bill taught syntax, John taught semantics, etc. (Pair-list)

We will discuss the requirement of plural *wh*- in more detail below (see also Dayal 1996, Hagstrom 2003, among others, for discussion of the role of plurality on readings for *wh*- interrogatives in other environments).

2.2. Not All Plural Indefinites Yield Pair-List Readings

As example (8) shows, not all plural indefinites yield the pair list reading, even under plural *wh*-. *Most* and *many* are rejected by respondents who accept a pair-list reading for *some/a few/several* (compare (7)-(8)).

- (8) a. Which classes did many/most professors teach last semester?
b. *Bill taught syntax, John taught semantics, etc. (*Pair-list)

That some plural indefinites yield the pair-list is challenging to accounts suggesting that only universals should yield pair-lists (Chierchia 1992), and also those suggesting that in principle any determiner in the right structural configuration should be a candidate for allowing some kind of pair-list reading (e.g. Higginbotham 1996).

To sum up, we have observed that plural indefinites divide into two classes with respect to whether they yield pair-list readings: indefinites such as *some*, *a few*, and *several* yield pair-lists, while indefinites like *many* and *most* do not.

2.3. New Generalization

Based on our observation of the contrasts among indefinites yielding pair-lists and those that do not (e.g. (7)-(8)), we suggest that the contrast is based on the following property of their interpretation. To calculate the truth conditions for the indefinites which yield the pair-list, one needs to *calculate an identity*; however, to interpret the indefinites not yielding the pair-list, one needs to *compare the cardinalities* of two sets. Thus, we propose the following generalization to account for the distribution of pair-list indefinites.

- (9) *Distribution of plural indefinites yielding the pair-list*
- Plural indefinites sensitive to an *absolute cardinality* (e.g. *some*, *a few*, and *several*) yield pair-list readings.
 - Plural indefinites sensitive to a *relative cardinality* (e.g. *many* and *most*) do not allow for pair-list readings.

Let us look first at the example of *some*, shown in (10).

- (10) *Some A are B* is true if and only if $|A \cap B| = n$ where n is a (possibly vague) absolute number.

To see that this is the case, consider for example that *Some students are tired* is true if and only if there is some (possibly vague) number of students who are tired.

The same holds for *a few*. *A few students are tired* is true if and only if there is some (possibly vague) number of students who are tired. Thus we treat *a few* like *some*.

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- (11) *A few A are B* is true if and only if $|A \cap B| = n$ where n is a (possibly vague) absolute number.

The same also holds for *several*. For example, *Several students are tired* is true if and only if there is some (possibly vague) number of students who are tired. Thus, we represent *several* like *some* and *a few*, as follows.

- (12) *Several A are B* is true if and only if $|A \cap B| = n$ where n is a (possibly vague) absolute number.

Thus, we observe that for *some*, *a few*, and *several*, one must check a value; the interpretation of *some*-type indefinites relies on the cardinality of the intersection of two sets.

However, for *most/many*, one must *compare* the cardinality of two sets.

- (13) *Most A are B* is true if and only if $|A \cap B| > |A \cap \bar{B}|$

That is, the cardinality of the set of A's that are B's must be bigger than the cardinality of the set of A's that are not B's. Consider, for example, that *Most students are tired* is true if and only if the number of students who are tired is greater than the number of students who are not tired.² Thus, an indefinite like *most* yields the result of a comparison.

Next, let us consider the case of *many*. *Many* is similar to *most*, as follows.

- (14) *Many A are B* is true if and only if $|A \cap B| > |A \cap \bar{B}|_C$ (where C is a contextually determined threshold).

In other words, the actual cardinality of the set of A's that are B's must be bigger than the "expected" or "standard" cardinality of the very same set (see Partee 1989 for some discussion on approaches to *many*.) For example, *Many protesters are outside the building* is true if and only if the number of protesters outside is greater than the standard or expected number of protesters outside the building. One might have the intuition that *many* behaves like *some/several* here, but note that our judgments change depending on the number of protesters outside other nearby buildings; 20 may be *many* or not *many*. Further, it is presumably hard for most of us to judge a sentence like *Many giant squid attacked sharks today* even if told the absolute number of giant squid that attacked sharks today, because we cannot make the relevant comparison. Now, note that we could judge *Some/a few/several giant squid attacked sharks today* relative to the same context.

² We do not address aspects of interpretation that will not affect this proposal, e.g. what aspect of meaning *most* carries in addition to its truth-conditional requirement for the comparison of the intersection of two sets to be larger than its complement.

2.4. Further Predictions

If the generalization in (9) is on the right track, we should be able to predict the pair-list behavior of additional indefinites along the same lines. Let us consider some additional examples here. At a minimum, we would predict that bare numerals should yield pair-lists, which is the case (example 15).

- (15) a. Which classes did two professors teach last semester?
 b. Bill taught syntax, and Mary taught neurolinguistics. (Pair-list)

This follows under our generalization, as a bare numeral such as *two* would be represented as follows.

- (16) *Two A are B* is true if and only if $|A \cap B| = 2$ (an absolute number).

Quantifiers like *more than half*, which we take to yield the result of a comparison, like *most*, should not yield pair-lists, which is also the case (example 17).

- (17) a. Which classes did more than half the professors teach last semester?
 b. *Bill taught syntax, Mary taught neurolinguistics, etc. (*Pair-list)

This is captured by our generalization, as *more than half* would be represented as follows.

- (18) *More than half the A are B* is true if and only if $|A \cap B| > |A \cap \bar{B}|$

A few, which we take to yield a vague cardinality like *some*, should yield the pair-list, but *few*, which we take to yield the result of a comparison, should not. This is also the case, as shown in examples (19) and (20).

- (19) a. Which classes did a few professors teach last semester?
 b. Bill taught syntax, Mary taught neurolinguistics, etc. (Pair-list)
- (20) a. Which classes did few professors teach last semester?
 b. *Bill taught syntax, Mary taught neurolinguistics, etc. (*Pair-list)

Unlike *a few*, which is sensitive to a vague number, *few* is sensitive to a comparison, relative to a “standard” or “expected” threshold, like *many*, as shown in (21).

- (21) *Few A are B* is true if and only if $|A \cap B| < |A \cap \bar{B}|_C$ (where *C* is a contextually determined threshold).

Thus, we claim that the indefinites sensitive to absolute cardinality and those involving comparison behave as different classes with respect to their pair-list behavior, as captured by the generalization in (9) above. As we mention briefly in

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Section 3.3 below, our generalization also predicts the indefinites which yield paired readings in specificational sentences (Romero 2002).

2.5. Some Alternative Generalizations That Do Not Account for this Data

In this section, we show that our generalization cannot be reduced to other distinctions which have been previously discussed for indefinites, such as the strong/weak distinction, or to sensitivity to increasingly large quantities on a pragmatic scale.

Strong/weak distinction. The strong/weak distinction has been used to capture properties such as the behavior of the universal quantifier and indefinites in environments such as English *there*-constructions (Milsark 1977; see also Barwise and Cooper 1981 for more discussion of the strong/weak distinction). However, the strong/weak distinction shows a lack of parallelism with the distribution of pair-list yielding plural indefinites. First, *most* patterns with *every* and other universals as a strong quantifier (see (22) below).

- (22) a. *There is every deer in the garden. (Strong)
b. *There are most deer in the garden. (Strong)

In contrast, *most* and *every* pattern as opposites in their pair-list behavior (23).

- (23) a. Which book did every student read?
b. John read *Ulysses*, Bill read *Finnegan's Wake*, etc. (Pair-list)
c. Which book did most students read?
d. *John read *Ulysses*, Bill read *Finnegan's Wake*, etc. (*Pair-list)

This suggests that what underlies the pair-list behavior of the plural indefinites constitutes a separate phenomenon from their strong/weak properties (Gary Milsark, p.c.) Second, *most* and *many* pattern as opposites with respect to the strong/weak distinction, but pattern alike with respect to their pair-list behavior ((24)-(25) below).

- (24) a. *There are most deer in the garden. (Strong)
b. There are many deer in the garden. (Weak)
- (25) a. Which books did most students read? (*Pair-list)
b. Which books did many students read? (*Pair-list)

Thus, it would not be possible to account for the pair-list behavior of plural indefinites using the strong/weak distinction.

Pragmatic Scale. One might also consider whether the distinction among indefinites which do or do not yield the pair-list can be captured by a pragmatic scale. One might suspect, for example, that indefinites calling for “large samples” are less felicitous. A possible scale may be something like: *some/a*

few < *several* < *many* < *most*. However, that approach is fatally flawed, since items all over the scale map differently with respect to their pair-list behavior. Both *few* and *a few* are at one end of the scale, but they show opposite pair-list behavior. *More than one-tenth*, a small fraction, does not yield the pair-list, and neither does *more than nine-tenths*, a large majority; further, pair-lists arise for both very small (*a few*) and very large cardinalities (e.g. *one thousand*; think of those analyzing a standardized test asking, *Which answers to #18 did 1,000 students record?*). Thus, the pragmatic scale cannot capture the pair-list behavior of plural indefinites.

3. Possible Directions for Analysis of the Pair-List for Plural Indefinites

3.1. Pair-Lists for Plural Indefinites and Plural Definites

In the previous sections, we saw that some plural indefinites yield pair-list readings under *wh*-, as does the universal quantifier, in apparent contrast to the speculation in Chierchia (1992) that only universals would generate pair-lists. Further, we offered a new generalization to account for the indefinites which do or do not yield the pair-list. In the next sections, we consider what kind of analysis might best capture the pair-list for indefinites and its sensitivity to determiner meaning. We begin by considering a treatment of pair-list readings for indefinites similar to Dayal's (1996) analysis of plural definites.

3.2. Plural Definites (Dayal 1996)

Dayal (1996) noted that definites also yield pair-list readings under *wh*-, as in (26) below. Example (26) contains the demonstrative *these* in the same configuration which yielded the pair-list for the universal quantifier *every* (example 1) and for plural indefinites such as *some*, *a few*, and *several* (example 7).

- (26) a. Which women do these men love?
 b. Mary and Sue. (Individual reading)
 c. John loves Mary and Bill loves Sue. (Pair-list)

Plural *wh*- is needed to yield the pair-list, as the contrast between (26)-(27) shows.

- (27) a. Which woman do these men love?
 b. Mary. (Individual reading)
 c. *John loves Mary and Bill loves Sue. (*Pair-list)

Dayal (1996) proposed that the pair-list reading for plural definites could be treated as a species of individual rather than functional answer, assuming a theory of plurals allowing for plural individuals with parts, and a method for mapping among the parts of plural individuals under plural *wh*- (for Dayal, this involved cumulativeness).

- (28) a. Which women do these men love?
 b. a+b+c love d+e+f (schema showing plural individuals)

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Dayal (1996) suggests that list answers for definite plurals are allowed in cases where the list exhaustively pairs the parts of one plural individual with the parts of the other plural individual (e.g. *John and Bill and Dave love Mary and Sue and Sally*, or, *John loves Mary and Bill loves Sue and Dave loves Sally*, etc.)

3.3. Extending this Analysis to Indefinites

If the plural indefinites which are sensitive to absolute cardinality represent plural individuals, semantically similar to plural definites, then it may be possible to treat the pair-list for indefinites as a type of individual answer mapping the parts of plural individuals. The basic intuition is that the plural indefinites sensitive to an absolute cardinality (such as *some/a few/several*) would yield (a vague) *n* individuals, whose parts may be mapped to those of the plural *wh*- NP in the same way as for the *wh*- NP and the plural definite.³

If the pair-lists for plural indefinites and definites arise in a similar way, we would expect the plural indefinites to pattern like plural definites regarding the kind of pairings available. Consider the data in (29)-(30). The list answer in (29b) is allowed both for the plural indefinite and the plural definite in (29a). In contrast, such an answer (repeated as 30b) is not compatible with the universal quantifier in (30a), as discussed in Dayal (1996).

- (29) a. Which women do these/a few men love?
b. John loves Mary, Bill loves Sue, and Dave loves Sally.
- (30) a. Which women does every man love?
b. *John loves Mary, Bill loves Sue, and Dave loves Sally.

For Dayal (1996), the cumulative mapping among the parts of plural individuals is characteristic of the pair-list reading for definites. If the mapping among the parts of plural individuals for definites is governed by cumulativity, at a minimum it suggests that the requirement of plural *wh*- and also plurality on the definite or indefinite may be accounted for with respect to cumulativity, as the cumulative reading can only arise among two plurals (see the examples in (31a-b) below, from Dayal (1996); see also Scha (1981) for further discussion of the cumulative reading.)

- (31) a. The boys solved the problems. (cumulative reading)
b. The boys solved the problem. (no cumulative reading)

³ The spirit of this proposal reminds us of *specific indefinites* (e.g. Fodor and Sag 1982, Schwarzschild 2002, among others). However, the readings of these indefinites do not seem to have the flavor of specific indefinites. For example, we note a fundamental difference, which is that for questions yielding the pair-list, there is no assumption that specific individuals are being referred to, which is the direct opposite of the basic intuition for typical specific-indefinites cases like *a certain*.

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A distinct environment in which indefinites yield list-like readings constrained by plurality and cumulativity is that of specificational sentences (32). Specificational sentences, as discussed in Romero (2002), yield pair-list like readings for plural indefinites like *some*, *a few*, *several*, though not for plural indefinites like *most* and *many*.

- (32) Some/a few/several/*many/*most prices at the market are the following:
milk is \$1.99, cheese is \$2.39, etc.

The generalization which we proposed for plural indefinites in (9) also predicts the indefinites allowed in this construction. As Romero (2002) notes, these readings are also restricted to plural-plural contexts, a further similarity with the pair-list for plural indefinites as shown here, and with the pair-list for plural definites (Dayal 1996).

3.4. Plural Indefinites, Subject/Object Asymmetries, and Weak Crossover

The observations in the last section suggest that the pair-list for plural indefinites shares some properties with that of plural definites in *wh*-interrogatives, and with the paired reading for plural indefinites in specificational sentences. However, here we mention some data depending on which it may prove complicated to handle plural indefinites and plural definites in the same way.

Recall that pair-list readings involving the universal quantifier under *wh*-show subject/object asymmetries (e.g. Chierchia 1992), and that pair-list readings for plural definites under *wh*- do not (Dayal 1996). Dayal (1996) points out that plural definites under plural *wh*- yield pair-lists wherever those readings are systematically disallowed for universals. This suggests that one can test whether plural indefinites pattern like universals or like plural definites, in cases where pair-lists are blocked for universals. Let us look at the example of subject/object asymmetries briefly below.

Wh-/universal. Example (33a) with a *wh*- trace in object position should yield the pair-list, though subject-extracted *wh*- should not (33b) (e.g. Chierchia 1992).

- (33) a. Which men does every woman we know love *t*? (Pair-list)
b. Which men *t* love every woman we know? (*Pair-list)

Wh-/plural definite. Both (34a) and (34b) should yield a pair-list (Dayal 1996).

- (34) a. Which men do these women love *t*? (Pair-list)
b. Which men *t* love these women? (Pair-list)

Wh-/plural indefinite. (35a), with *wh*- trace in object position should yield the pair-list, but (35b) should pattern like (34b), not (33b), under a plural-definite style approach.

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- (35) a. Which men do some/a few/several women we know love *t*? (Pair-list)
b. Which men *t* love some/a few/several women we know? (*Pair-list)

If the judgment in (35b) is correct, it suggests that plural indefinites may be sensitive to the same syntactic requirements as universals under *wh*-.⁴ This in turn suggests that their pair-list reading is likely to be derived like that for universals, not like for plural definites.

To bring these data in line with Chierchia's (1992) *functional wh*- would require an account of why the plural definites captured by our generalization provide a generator for functional *wh*-, like universals do. For universals, the matter was straightforward, as the universal quantifier maps the *entire* domain. Intuitively, we would have to say that the graph of the function can be mapped whenever some number of individuals is available (e.g. a universal provides *all* individuals, and the plural indefinites yielding pair-lists provide a (vague) absolute number of individuals). The analysis must also account for why the pair-list for plural indefinites patterns like that for plural definites in other ways (Section 3.3). We will not speculate in this paper on how this could be implemented.

4. Conclusion

We have demonstrated that plural indefinites yield pair-list readings, counter to the generalization that the universal quantifier is required to generate a pair-list reading (Chierchia 1992). We showed this phenomenon to be partial; not all plural indefinites yield pair-lists under *wh*-. We then proposed a new generalization which captures the distribution of indefinites yielding the pair-list, focusing on the contribution of absolute and relative cardinality, and showing that it predicted the pair-list behavior for a range of indefinites. Exactly how the property of plural indefinites highlighted by our generalization results in paired readings remains an interesting puzzle. However, we hope to have offered a new generalization which captures the pair-list behavior of plural indefinites, and to have outlined some challenges for alternative analyses of these pair-list readings.

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⁴ Hornstein (1995) notes that pair-lists for subject *wh*- seem to be rescued if an additional bound pronoun is added (ii), consistent with (a version of) the WCO approach. The indefinites in (iii-iv) thus become relevant.

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|-------|--|--------------|
| (i) | Who brought every man sandwiches? | (*Pair-list) |
| (ii) | Who brought every man _i his _i sandwiches? | (Pair-list) |
| (iii) | Who brought some/a few/several men sandwiches? | (*Pair-list) |
| (iv) | Who brought some/a few/several men _i their _i sandwiches? | (Pair-list) |

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