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On Superiority, T-to-C Movement and Interpretation of Questions

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0. Introduction

In English, superiority violations in main clauses are judged as less severe than those in embedded clauses. In the current understanding of superiority, this contrast is surprising. Economy approach to superiority based on Minimal Link Condition of Chomsky (1995) rules out the violations in both main and embedded clauses in exactly the same way. Therefore, the main/embedded clause asymmetry is an intriguing puzzle, which I will attempt to resolve in this paper.

In this paper, I develop an account which still maintains the economy spirit of superiority (C^0 attracts the closest [+wh] feature to check its uninterpretable [+wh] feature), yet considers other syntactic and semantic processes affecting the derivation of multiple interrogatives. I specifically investigate the interaction of T-to-C movement and locality of Attract, along with the availability of pair-list and single-pair readings in different configurations of multiple interrogatives. The resulting conclusions are interesting in that they have massive predictions for other languages and other sub-areas of syntax like d-linked wh-questions, local and long-distance subject wh-questions, which are susceptible to quite straightforward testing.

The paper starts by presenting the main/embedded clause asymmetry with respect to superiority effects and evaluates the relevant data against the current theoretical notions involved in accounting for superiority, posing a puzzle for these accounts (section 1). Section 2 then examines how the presence of T-to-C movement in the matrix questions and its absence in the embedded questions affects locality restrictions of Attract F in these contexts. Even though I conclude that T-to-C movement is a crucial factor contributing to the asymmetry under investigation, it is not sufficient to the complete explanation of the facts. The next two sections focus on determining the precise contribution of the semantic properties of wh-questions to the observed contrasts in

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superiority effects: section 3 presents the logic of the semantic part of the analysis and section 4 presents some crosslinguistic evidence for the claims made in section 3 and a possible way to formalize the intended proposals. Section 5 examines the predictions of the analysis and tests them in the relevant languages: English, Icelandic, Brazilian-Portuguese and Bulgarian. I then present some findings from experimental work on multiple interrogatives in child language, which are consistent with my theoretical proposals (section 6). Section 7 summarizes the overall results and conclusions.¹

1. Matrix-embedded asymmetry in superiority effects

The phenomenon of superiority has been investigated since Chomsky (1973). The empirical generalization is that in a language like English, in a question involving more than one *wh*-phrase, it is the ‘superior’ *wh*-phrase (i.e. the one that asymmetrically c-commands other *wh*-phrases) that is fronted. For example, consider the unacceptability of (1b), where the lower *wh*-phrase is fronted over the higher one.

(1) a. Who bought what?

b. ??What did who buy t_i ?

Chomsky (1973) postulates the Superiority Condition, given in (2).

(2) No rule can involve X, Y in the structure ..X...[...Z...WYV...] where the rule applies ambiguously to Z and Y, and Z is superior to Y. The category A is superior to the category B if every major category dominating A dominates B as well but not conversely.

The Superiority condition correctly rules out (1b) where *what* undergoes movement even though *who* is superior to *what*.

In the later Minimalist analyses of superiority, the phenomenon is captured through defining the operation of Attract, responsible for the feature checking, as subject to an economy principle such as Minimal Link Condition (MLC). Chomsky (1995:311) formulates MLC as in (3).

¹ Portions of this work appeared in Grebenyova (2004a, 2004b).

(3) K attracts α only if there is no β , β closer to K than α , such that K attracts β .

β is closer to K than α if β asymmetrically c-commands α . In case of wh-interrogatives, this means that the interrogative complementizer C^0 must attract the closest wh-phrase to check its [+wh] feature. MLC correctly rules out (1b) since the object wh-phrase *what*, not the closest to C^0 , cannot be attracted by C^0 : *who* carrying a [+wh] feature asymmetrically c-commands *what* and hence intervenes.

However, there are facts that MLC alone fails to capture. Consider the following asymmetry found in main and embedded clauses in English. Superiority violations in embedded multiple questions, as in (4c), are judged by English native-speakers as more degraded than superiority violations in matrix questions, as in (4b).

- (4) a. Who bought what?
b. ??What₁ did who buy t_I ?
c. *John wonders what₁ who bought t_I .

The puzzle becomes even more intriguing when we consider the situation in other languages, such as Serbo-Croatian. The matrix-embedded contrast is even sharper in Serbo-Croatian. As is known from work of Bošković (1998, 2002), superiority effects emerge in embedded clauses in Serbo-Croatian, with the matrix clauses exhibiting no superiority effects. While (5b) is acceptable, just as (5a), showing the absence of superiority effects in main clauses, the embedded question in (6b) with the object wh-phrase fronted over the subject wh-phrase is degraded contrasting with (6a) where superiority is not violated.

- (5) a. Ko šta₁ o njemu govori t_I ?
who what about him says
'Who says what about him?'
b. Šta₁ ko o njemu govori t_I ?

(6) a. Pavle je pitao ko šta₁ o njemu govori *t*₁.
Pavle aux asked who what about him says
'Pavle asked who says what about him'

b. ??Pavle je pitao šta₁ ko o njemu govori *t*₁.

The generalization is that the degree of superiority effects increases in embedded clauses in both English and Serbo-Croatian. Crucially, MLC alone cannot distinguish between superiority violations in matrix and embedded clauses.

Bošković (2002) argues that the absence of the superiority effects in matrix contexts in Serbo-Croatian can be explained if the interrogative C^0 (and hence the strong [+wh] feature) can be inserted in covert syntax in this language. However, the analysis cannot be extended to English, since Bošković crucially treats English matrix C^0 as a PF verbal affix (given the obligatory status of inversion in English main clauses), with phonological information preventing it from being merged into the structure at LF. Besides, this would incorrectly predict a total absence of superiority effects in English main clauses. Thus, a different analysis is needed at least for the English matrix-embedded asymmetry, with the possibility of an extension to Serbo-Croatian, providing a unified account.

There is an independent asymmetry between matrix and embedded clauses that will prove to be relevant here. While subject-aux(iliary) inversion occurs in main clauses in English, it does not take place in embedded clauses, as shown in (7). (7a) is generally analyzed as involving T-to-C movement. (7b) shows that this movement is obligatory. The embedded question in (7c) and the ungrammaticality of (7d) demonstrate that this movement is not permitted in embedded questions.²

(7) a. What can John buy?

b. *What John can buy?

c. John wonders what Mary can buy.

d. *John wonders what can Mary buy.

² See Pesetsky and Torrego (2001) for an analysis challenging the assumption that T-to-C movement does not take place in embedded clauses.

We can now state a tentative generalization about the superiority contrasts under investigation in terms of T-to-C movement, as in (8).³

(8) Superiority effects increase in contexts without T-to-C movement.

How could it be that the absence of T-to-C movement in embedded clauses in English somehow contributes to the higher degree of unacceptability of superiority violations? In the next section, I will carefully consider how T-to-C movement can affect a derivation where C^0 is the attracting head.

2. T-to-C movement and the domain of Attract F

It has been previously suggested that head-movement has some effect on locality. Chomsky (1995) develops an account first proposed in Chomsky (1993) where head-movement licenses extraction of elements from otherwise non-local positions. Chomsky formulates the basic notions of domain and minimal domain of α as in (9), where α is a head or a feature, and CH is the chain (α, t) or a trivial chain α .

- (9) a. $\text{Max}(\alpha)$ is the smallest maximal projection including α .
- b. The *domain* $\delta(\text{CH})$ of CH is the set of categories included in $\text{Max}(\alpha)$ that are distinct from and do not contain α or t .
- c. The *minimal domain* $\text{Min}(\delta(\text{CH}))$ of CH is the smallest subset K of $\delta(\text{CH})$ such that for any $\gamma \in \delta(\text{CH})$, some $\beta \in K$ reflexively dominates γ .

Consider the derivation in (10). According to the Chomsky (1993) analysis, the chain $[V, t_1]$, with the head V^0 in Arg_O , extends the minimal domain of V^0 to include Arg_OP , making $\text{Spec, Agr}_O\text{P}$ and Spec, VP equidistant from the object position. Thus, V-to- Agr_O movement in (10) allows for the object to move to Spec, Agr_O over the subject occupying Spec, VP without violating minimality.

³ I will discuss the status of T-to-C movement in Serbo-Croatian in section 5. Its status combined with all the ingredients of the analysis developed here will account for another interesting contrast, namely, that even though superiority effects in embedded clauses in Serbo-Croatian (6b) contrast with their absence in the main clauses (5b), they are reported to be milder than those in English embedded clauses (4c), a contrast pointed out to me by Željko Bošković (p.c.).

(10) [TP T [AGRO_P NP₂ [Agr_O - V₁] [VP NP t₁ t₂]]]

Bobaljik and Jonas (1996) further explicate the idea of equidistance via head movement in exploring how Spec,TP positions are used by subjects in Icelandic. In (11), Agr_O-to-T movement makes the Spec,TP and Spec,Agr_O equidistant from the subject position in Spec,VP, allowing for the subject to move over the object in Spec,Agr_O.⁴

(11) [TP NP₂ [T [AGRO Agr_O-V]₁] [AGRO_P NP t₁ [VP t₂ ...]]]]

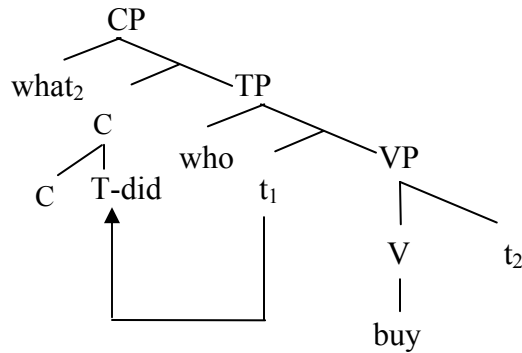
Notice that this is the notion of equidistance from the perspective of Move and therefore cannot be implemented directly in the system where Attract is the key operation underlying the movement phenomena (in the case of wh-movement we have C⁰ attracting [+wh]-feature of a wh-phrase). Chomsky (1995:299) develops somewhat similar, yet distinctly different ideas with respect to Attract. Specifically, he suggests that an element X in the minimal domain of CH with a head Y adjoined to an attracting head Z, can be ignored for the purposes of Z attracting elements into its minimal domain. It is this part of Chomsky's approach that is relevant for our purpose of understanding the interaction of T-to-C movement and Attract F, arguably affecting the degree of superiority effects in multiple wh-questions. Let us consider in detail the derivation of an example with a superiority violation in the main clause in (12), graph-theoretically represented in (13).⁵

(12) ??[CP What₂ [C-[T-did]₁] [TP who t₁ buy t₂]]

⁴ Note that Split VP Hypothesis of Koizumi (1995) and overt object shift analyses of Koizumi (1995) and Lasnik (1995) avoid the problems of object and subject raising over each other entirely due to subject originating higher than Agr_OP. Even though this renders the notion of equidistance unnecessary for the problems in question, it still allows for the possibility of finding equidistance effects in other contexts, like in the presence of T-to-C movement.

⁵ The structure is somewhat simplified here for the purposes of exposition.

(13)



Spec,TP and Spec,CP are in the same relation with respect to the chain created by T-to-C movement: they are both within the minimal domain of this chain. Recall that MLC depends on the definition of ‘closeness’. To allow for an attracting head to ignore the elements within its minimal domain, Chomsky (1995:299) defines *closer to* as follows as in (14).

(14) β is *closer to* HP (headed by H) than α if β c-commands α and is not in the minimal domain of CH (CH = (γ, t) and γ is adjoined to H).

The formulation of MLC in (17) combined with the notion of closeness as in (14) ensures that a feature within the minimal domain of a chain whose head is adjoined to the attracting head does not count as an intervener for the purposes of attracting the next feature down. A specific example of this would be exactly the one we have in (12) where a [+wh] feature is within the minimal domain of the chain (T, *t*) created by T-to-C movement, and T⁰ is adjoined to C⁰. According to (14), *who* in Spec,TP is **not** *closer to* CP headed by C⁰ than *what* is, hence C⁰ is free to attract the [+wh] feature of *what* without violating MLC.⁶

Chomsky (1995:299) metaphorically refers to the domain that can be ignored for the purposes of Attract as the “neighborhood” of the attracting head. It does seem like a

⁶ Note that in a context with T-to-C movement and three wh-phrases in the structure, attracting the lowest [+wh]-feature should not be affected by the presence of T-to-C-movement. Even if there is a prior step of head-movement to T, before T itself moves to C, it would not affect the possibility of extraction of the lowest wh-phrase since the calculation of the minimal domain of a chain is not transitive: each new chain link does not extend the minimal domain of the previous link (as assumed in Chomsky (1993) as well as in Bobaljik and Jonas (1996). For more discussion of these issues, see Section 5.2.

“neighborhood” in the sense that it is not as local as “home”, if by “home” we mean the minimal domain of the attracting head. Notice that the domain in which Spec,TP is located is not the minimal domain of C^0 (by definitions of Chomsky (1993) given in (9)), but the minimal domain of the chain whose head is adjoined to C^0 . But it is C^0 that bears the inadequacy of having to check its uninterpretable [+wh] feature. This raises a question of why C^0 would be able to ignore the elements in the minimal domain of the chain (T,t) when it attracts a certain feature.

One way to proceed in finding an answer to that question would be to examine the precise effect that an adjoined head has on the head it adjoins to. One way to view adjunction is that it splits the category hosting an adjunct into segments that exhibit some asymmetry with respect to one another. First, in this split category, only one segment dominates the adjoined element (a fact made useful in Chomsky (1986)). Second, only the higher segment of this category is subject to movement (i.e. only the whole category can move and not its segments in isolation), a phenomenon reminiscent to A-over-A.⁷ Given this asymmetry with respect to the segments of the head hosting an adjunct (in our case, head C^0), we might expect some loss of the autonomy of C^0 : it becomes impossible to calculate the minimal domain of a head if its segments are in different relation to a given element. On the other hand, the adjoined category T^0 is still in tact with respect to its segmentation, therefore C^0 piggy-backs on the minimal domain of T^0 (or rather the chain (T,t)).

Another direction would be to emphasize that a head is a bundle of features. It is plausible that head-adjunction destroys the autonomy of both heads with respect to their features, producing one complex head. It then becomes impossible to determine if it is C^0 or T^0 that attracts the [+wh] feature: perhaps, they do it as one unit and hence they share the minimal domain (the union of their former minimal domains).

We can develop the line of reasoning of Chomsky (1995) further by suggesting that the attracting head H not only *can* ignore the elements in the minimal domain of the chain CH whose head is adjoined to H, but that it *must* ignore these elements. The idea is that a head H attracts elements only from outside its minimal domain (its neighborhood)

⁷ A concrete case of extraction of a category segment would, for example, involve an auxiliary adjoined to T^0 , where extracting the lower T^0 would produce something like **Did you will like some tea?* as compared to *Would you like some tea?*

in order to bring them there (into its neighborhood). If an element is already within the neighborhood of H, like *who* with respect to C^0 in (13), it simply cannot be attracted by H since H would never even search that domain, searching only the area beyond its boundaries.⁸ More precisely, we are defining the domain of Attract, which has been considered the c-command domain of the attracting head. If this line of reasoning is correct, the domain of Attract is actually the c-command domain outside the minimal domain of the attractor.

Let us now consider the situation in embedded clauses. Since the embedded contexts in English (4c) and Serbo-Croatian (6b) do not involve T-to-C movement, the minimal domains of T^0 and C^0 are not related by any chain CH. Hence, the subject wh-phrase is not within C^0 's neighborhood. Hence, the object wh-phrase in this case cannot be attracted by C^0 (by MLC).

We can summarize the analysis we have developed up to this point. T-to-C-movement affects MLC in main clauses by extending the minimal domain of C^0 , which makes C^0 ignore the subject wh-phrase in Spec,TP position for the purposes of Attract. This results in the absence of superiority effects in this heavily restricted context, when the potential intervener is in the minimal domain of a chain whose head is adjoined to the attractor. The absence of T-to-C movement in embedded clauses, on the other hand, ensures that no wh-phrase can be attracted over another wh-phrase: the higher wh-phrase *will* count as an intervener because it is outside the minimal domain of C^0 .

At this point a question arises of why matrix questions like (12), even though better than their embedded counterparts, are still degraded to some extent. According to the analysis so far, nothing prevents C^0 from attracting the object wh-phrase in the presence of T-to-C movement. Therefore, the sentence should be fine. In the next section, I address this remaining unacceptability.

⁸ Note that being in H's neighborhood is not sufficient for the feature checking to take place. That is, *who* cannot check the uninterpretable [+wh] feature of C^0 from the position it is in (Spec,TP) even if it is within the minimal domain of C^0 . This suggests that either Spec-head configuration is required for feature checking or the locality restriction discussed here is a more general restriction applying to the operation Agree of Chomsky (2000).

3. Interpretive Superiority

Given the effect of T-to-C movement on the derivation, the degraded status of (12) cannot be a result of a locality violation, contrary to the standard accounts. Hence, it must be due to some independent factor. I will suggest that the badness of (12) derives from the semantic properties of multiple interrogatives. Specifically, my account is concerned with the licensing conditions on Single-Pair (SP) and Pair-List (PL) readings in multiple interrogatives.

Multiple interrogatives can potentially have a PL or a SP reading. A question in (16) with the PL reading is felicitous in a scenario as in (15). An expected response to such a question involves listing propositions involving ordered pairs as in (17).

(15) *PL Scenario*: John is at a formal dinner where there are diplomats and journalists. Each journalist was invited by a different diplomat. John wants to find out all the details, so he asks the host:

(16) Who invited who to the dinner?

(17) Mr. Smith invited Mr. Jones, Ms. Black invited Mr. Green, etc.

A scenario corresponding to the SP reading is given in (18). English lacks SP reading in non-d-linked wh-questions as in (16), a fact first pointed out by Wachowicz (1974). However, we can use a d-linked question, as in Pesetsky (1987), where the SP reading is available in English, (19). A felicitous response to a single-pair question is given in (20).

(18) *SP Scenario*: John knows that a very important diplomat invited a very important journalist to a private dinner. John wants to find out all the details, so he asks the caterer:

(19) Which diplomat invited which journalist to the dinner?

(20) Ms. Black invited Mr. Smith.

The distribution of PL/SP readings is subject to crosslinguistic variation, as reported by Hagstrom (1998) and Bošković (2001). As was alluded to before, the SP reading is unavailable in the English bare multiple wh-questions (21a). The same is true

of Bulgarian, as shown in (21b). However, the SP reading is freely available in Serbo-Croatian and Japanese, as can be seen in (22a) and (22b) respectively. That is, unlike the questions in (21a-b), the questions in (22a-b) are felicitous in both PL and SP scenarios.

(21) a. PL/*SP

Who invited who to the dinner?

b. PL/*SP

Koj kogo e pokanil na večeriata?

Bulgarian

who whom Aux invited to dinner

‘Who invited who to the dinner?’

(22) a. PL/SP

Ko je koga pozvao na večeru?

Serbo-Croatian

who aux whom invited to dinner

‘Who invited who to the dinner?’

b. PL/SP

Dare-ga dare-o syokuzi-ni manekimasita-ka?

Japanese

who-Nom who-Acc dinner-Dat invited-Q

‘Who invited who to the dinner?’

An interesting phenomenon can be observed in languages allowing SP readings in multiple interrogatives: fronting the lower wh-phrase over the higher wh-phrase forces the SP reading. Hagstrom (1998) discusses this phenomenon with respect to Japanese (23a) and Bošković (2001) reports that it also holds in Serbo-Croatian (23b). Bošković (2001) refers to this phenomenon *Interpretive Superiority*, meaning that, instead of complete unacceptability on any reading, only one of the two potential readings gets lost.

(23) a. *PL/SP

[Nani-o]_j dare-ga *t_j* katta no?

Japanese

what-ACC who-NOM bought Q

‘Who bought what?’

b. *PL/SP

Šta je ko kupio?

Serbo-Croatian

what is who bought

‘Who bought what?’

What happens if a similar fronting of the object wh-phrase takes place in a language where the SP reading is unavailable? It seems plausible that, if a SP reading becomes forced in a multiple interrogative in a language lacking SP readings multiple interrogatives in general, straightforward unacceptability is to be expected.⁹ For instance, let us consider our crucial example from (12), repeated below as (24).

(24) ??What₁ did who buy *t_l*?

The lower wh-phrase *what* is fronted over the higher subject wh-phrase *who*, forcing the SP reading. But as we previously demonstrated in (21), the SP reading is unavailable in English bare (non-d-linked) multiple interrogatives. I suggest that this is precisely the source of the badness of (24).¹⁰

Let us now consider embedded clauses in English. There is no asymmetry in the absence of the SP reading between main and embedded clauses: the example in (25) has only a PL reading.¹¹

(25) John wonders who bought what.

Hence, fronting the object wh-phrase over the subject wh-phrase in an embedded clause in English, as in (26) would invoke the same effect of the Interpretive Superiority as we saw occur in the main clause in (24).

(26) *John wonders what₁ who bought *t_l*.

Now, the Interpretive Superiority effect as one source of degraded status of the embedded question in (26), combined with the absence of T-to-C movement in these contexts invoking an MLS violation (as discussed in section 2), makes them overall worse than their main clauses counterparts.

⁹ I abstract away from interrogatives with d-linked wh-phrases for now, which seem to allow more flexibility with respect to the availability of SP readings cross-linguistically.

¹⁰ The semantic nature of this proposal is reminiscent to the analyses of Chierchia (1992), Hornstein (1995) and Comorovski (1996).

¹¹ The infelicitous scenario is where John wonders about the identity of exactly one individual and of exactly one item which that individual bought. Instead, the English speakers understand (25) as describing a situation where John wonders about the pairs of individuals and items they bought.

This provides the explanation for the contrasts in superiority effects under investigation. Both main and embedded clauses are subject to Interpretive Superiority (the unavailability of the SP reading in a context forcing such reading). However, in addition to that, MLC is violated in the embedded clause but not in the main clause due to the presence of T-to-C movement in the main clause in English. That is the basic logic behind my analysis. In the next section, I will explore the formal nature of the PL and SP readings and try to make the notions underlying the phenomenon of Interpretive Superiority more precise.

4. The source of Interpretive Superiority

Recall that Interpretive Superiority characterizes a situation when fronting the lower wh-phrase over the higher one results in losing the PL reading, leaving remaining only the SP reading.¹² The key to understanding the nature of Interpretive Superiority, seems to be in answering two questions: how do PL and SP readings arise (i.e., specifying the syntactic and semantic derivations that would result in the two readings in languages that allow both of these readings in bare multiple wh-questions); and why do some languages lack SP readings in questions with non-complex wh-phrases, as was demonstrated by the facts in (21)-(22) for English.

4.1. Syntax and Semantics of Pair-List and Single-Pair readings

To capture the basic nature of the PL and SP readings, I largely adopt the syntactic and semantic analysis of these readings developed by Hagstrom (1998). Unlike the semantic value of a statement, the semantic value of a question cannot be a truth value. It was proposed by Hamblin (1973) that the semantic value of a question is a set of propositions that constitute all its possible answers (semantic type $\langle pt \rangle$).¹³ For example, the denotation of the question *What book did John buy?* is represented as the following set of propositions {John bought *War and Peace*, John bought *Syntactic Structures*, etc.}.

Hagstrom (1998) adopts this general treatment of questions for multiple wh-interrogatives with the SP reading. He then proposes that wh-interrogatives with the PL

¹² The SP reading can also be forced in the context of scope intervention effects (cf. Hornstein (1995) and Pesetsky (2000) for details).

¹³ In this notation, adopted from Hagstrom (1998), p represents a complex type $\langle st \rangle$.

reading are different in that they represent a *set* of questions (i.e. a *set of sets* of propositions: $\langle pt, t \rangle$).

On this approach, the distribution of an interrogative morpheme (Q-morpheme) is crucial. In some languages like Japanese, there is an overt morpheme representing Q, while in a language like English, we would have to assume the interrogative morpheme is phonologically null. Hagstrom assumes two different syntactic positions for the Q-morpheme in PL and SP readings. In a question with a PL reading, it merges with the lowest wh-phrase, as in (27a); and in a question with the SP reading, it merges above TP, taking scope over both wh-phrases, as in (27b).¹⁴ The Q-morpheme in both derivations moves to the interrogative C^0 , where it checks the uninterpretable [+Q] feature of C^0 .

- (27) a. $[_{CP} Q-C^0 \dots [_{TP} \dots wh1 \dots V \dots t_j -wh2 \dots]]$ *PL*
 b. $[_{CP} Q-C^0 \dots [_{QP} t_j [_{TP} \dots wh1 \dots V \dots wh2 \dots]]]$ *SP*

Hagstrom's analysis actually involves a movement step from the lower position of Q^0 in (27a) to the higher position in (27b) (the operation he calls *Q-migration*). However, as he demonstrates, the operation is island- and intervention-insensitive. Thus, for my analysis, I will assume that the two positions are not related by movement but rather are two potential structural configurations for the Q^0 to enter.

On Hagstrom's analysis, wh-phrases denote sets of individuals (type $\langle et \rangle$), first proposed by Hamblin (1973). Q-morpheme is interpreted as a quantifier over choice functions. By movement from the clause internal position to C^0 , Q-morpheme leaves behind a variable whose value ranges over generalized choice functions (type $\langle at, \alpha \rangle$), picking a member out of the set it is merged with. The major difference between the PL and SP derivations is that there is no choice function variable in the PL derivation immediately above TP, due to the Q-morpheme merged with the lower wh-phrase (*wh2*) in that derivation. This allows for the set of individuals denoted by *wh1* to propagate through the derivation, producing in the end a set of sets of propositions. However, this is not possible in the SP derivation due to the choice function variable above TP reducing

¹⁴ Hagstrom (1998) assumes some head F above TP to which the Q-morpheme merges and becomes part of TP. Without further understanding of that TP might be, I see nothing preventing us from merging the Q-morpheme directly with TP.

the set of propositions denoted by TP to a single proposition. It then becomes the input to further computation, producing in the end just a set of propositions and not a set of sets of propositions.

I will now sketch in more detail how each reading is derived compositionally.¹⁵ In the derivation of the PL reading, the choice function (t_i) takes $wh2$ (a set of individuals) as its argument returning an individual ($\langle e \rangle$). Further, the semantic result of combining the verb with its complement is a property ($\langle et \rangle$). In order to combine this property with the set represented by $wh1$, Flexible Functional Application (FFA) applies the property to every individual in that set and puts the result into a set. This is a set of propositions ($\langle pt \rangle$) that are possible answers to a question like *Who bought what?*. The movement of the Q-morpheme to C^0 evokes λ -abstraction over this set of propositions turning it into a set of propositions abstracted over choice functions ($\langle cp, t \rangle$), where c stands for a choice function.¹⁶ The complex head $[Q-C^0]$ of type $\langle cp, pt \rangle$ then applies to this set of unsaturated propositions via FFA producing a set of sets of propositions $\langle pt, t \rangle$.¹⁷ Note that the interrogative head $[Q-C^0]$ that normally turns an unsaturated proposition into a set of propositions (for example, in the denotation of single wh-questions), here, combined with a set of propositions via FFA, turns each proposition in that set into a new set of propositions and puts the result into a set, producing this way a set of sets of propositions. Each set of propositions is the denotation of a question about each individual in the set represented by $wh1$ (e.g., *Who did Mr. Smith invite?*, *Who did Ms. Black invite?*, etc.).

In the SP reading derivation, the choice function variable is not there to reduce the set represented by $wh2$ because the Q-morpheme moves from the position above both wh-phrases. As a result, the verb composes with $wh2$ returning a set of properties. Then $wh1$ is taken as an argument via FFA, giving back a set of propositions pairing each individual in the set of $wh1$ with each property ($\langle pt \rangle$). The choice function then picks one member of that set, resulting in a single proposition ($\langle p \rangle$). Via λ -abstraction, we get an unsaturated proposition ($\langle cp \rangle$). Combining it with the complex head $[Q-C^0]$ results in

¹⁵ For more explicit formal details of the two derivations, see Hagstrom (1998), 136-145.

¹⁶ Hagstrom formulates and applies ‘flexible-lambda-abstraction’ in this case.

¹⁷ Internally to $[Q-C^0]$, C^0 takes Q as an argument (cf. Hagstrom (1998) for details).

just a set of propositions and crucially not a set of sets of propositions as we saw in the PL derivation.

Hagstrom (1998) provides this semantics for languages where wh-phrases do not undergo overt movement (e.g. Japanese and Sinhala). Extending this analysis to the languages with overt wh-movement requires interpreting the variable left by wh-movement as an entity of type $\langle e \rangle$ with further λ -abstraction over individuals and interpreting the wh-phrase in the position it moved to as the last step in the compositional semantic derivation. It is then that the set of individuals denoted by the wh-phrase will propagate through the function from individuals to the set of propositions in a PL reading derivation (or to a single proposition in a SP reading derivation, producing as a result a set of sets of propositions or a set of propositions (depending on the derivation)).¹⁸

Thus, what licenses a SP reading semantically is the presence of the Q-morpheme above TP. We are now in the position to explain the crosslinguistic pattern with respect to the availability of the SP reading.

4.2. Capturing the cross-linguistic distribution of the single-pair reading

Bošković (2001a) observes that SP readings are unavailable in the multiple interrogatives where overt syntactic wh-movement (i.e. the movement of a wh-phrase to Spec,CP in order to check the uninterpretable [+wh] feature of C^0) takes place. Using Superiority effects as a diagnostic for syntactic wh-movement, Bošković identifies English, German and Bulgarian wh-questions as such contexts. On the other hand, all contexts in Japanese and main clauses in Serbo-Croatian, are treated as not involving syntactic wh-movement at all. Serbo-Croatian is argued to have covert C^0 insertion in these contexts. On this account, multiple wh-fronting is viewed as multiple instances of focus movement to a position lower than C^0 , triggered by an uninterpretable [+focus] feature on wh-phrases or

¹⁸ In the derivation with two wh-phrases inside a VP, like in a double object construction, in a language like Japanese, where the wh-phrases would remain unmoved, the question arises how the combination of an external argument (the subject) of type $\langle e \rangle$ with the set of properties $\langle et, t \rangle$ (the denotation of the VP) proceeds. I suggest that Flexible Function Application can be used here: each property in the set will be saturated by a single individual and the result will be put into a set, giving us a set of propositions (which will then be an input to further computation as described above). In a language with overt wh-movement, the issue does not even arise since the external argument will be combined with just a single property (type $\langle et \rangle$), since wh-movement leaves a variable of type $\langle e \rangle$ in the VP.

in a language like English, producing ungrammatical results of the kind in (30). The crash of the SP reading derivation would then seem to be rather a result of a Last Resort violation (i.e. a *wh*-phrase moves to Spec,CP for no reason) and not a Relativized Minimality violation. But that leaves us with (30) being acceptable under a SP reading, which is not the case.¹⁹

(30) *Did John give who what?

Of course, the covertness of the Q-morpheme movement avoids this problem in that some *wh*-phrase would always be attracted in the overt syntax in English, before Q moves in LF. But it is rather difficult to implement, given that the Q-morpheme has the relevant [+*wh*] feature needed by C⁰.

Besides these conceptual and technical problems, there are some empirical limitations of the Relativized Minimality account. Below, I present some data from Russian and Sinhala and show that Relativized Minimality is not sufficient to rule out SP readings in these languages. First, consider the facts from Russian in (31).

(31)	Kto kogo priglasil na užin? who whom invited to dinner 'Who invited who to the dinner?'	<i>PL</i> /* <i>SP</i>	Russian
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According to all of my informants and myself, only the PL reading is available in (31), the SP reading being disallowed.²⁰ SP readings are also disallowed when the object *wh*-phrase is fronted over the subject *wh*-phrase, as in (32), when this is a context where we

¹⁹ The problem might be avoided though if we assume the necessity of specification of whether a feature is to be checked in a head-head or a spec-head relation (cf. Bošković (2001b) for some empirical argumentation for the necessity of such specification).

²⁰ These facts contrast with the judgments reported by Stepanov (1998) who claims that (i) can have a SP reading. Besides the fact that none of my informants (including myself) allow the SP reading in (i), the sentence has an interfering factor in that Superiority effects emerge with *who/what* combination in Russian as shown in (ii), with all other combinations being insensitive to Superiority. This is important because Superiority effects are used as a diagnostic for syntactic *wh*-movement. Hence, I modified the questions and corresponding scenarios by using a *who/who* combination.

(i)	Kto čto kupil? who what bought	<i>'Who bought what?'</i>	Russian
(ii)	*Čto kto kupil?		

would expect an Interpretive Superiority context for a language with SP readings, as was shown for Japanese and Serbo-Croatian.²¹

- (32) Kogo kto priglasil na užin? PL/*SP Russian
whom who invited to dinner
'Who invited who to the dinner?'

In Grebenyova (to appear), I present some more facts showing that Russian lacks the SP reading. Particularly, I observe that the contexts in which we find multiple sluicing in Russian depend crucially on interpretation of multiple interrogatives in this language. Thus, the example in (33) is unacceptable in Russian.

- (33) *Kto-to priglasil kogo-to na tanec, no ja ne znaju kto kogo
someone invited someone to dance but I not know who whom
'Someone invited someone to a dance but I don't know who invited whom'

Notice that the antecedent clause forces the SP reading of the embedded multiple interrogative, the reading unavailable in Russian. A parallel example in Serbo-Croatian is fine, as reported in Stjepanović (2003). This is not surprising since Serbo-Croatian freely allows SP readings.

- (34) Neko je video nekog, ali ne znam ko koga.
somebody is seen somebody but not know who whom
'Somebody saw someone, but I don't know who whom.'

(33) can be improved as in (35). The only interpretation of the embedded multiple interrogative in this case is the so called order-reading, different from what we considered a SP reading, where the question is not about the identity of a pair of an inviter and an invitee, but rather it is a question about the direction of the event of inviting (i.e., *Maša* invited *Ivan* or *Ivan* invited *Maša*).

²¹ English d-linked wh-questions allow both PL and SP readings whether the object is fronted over the subject or not. I return to this issue in Section 5.

- (35) *Maša i Ivan pošli na večer. Kto-to iz nix priglasil drugogo na tanec, no ja ne znaju kto kogo*
 Maša and Ivan went to party. One of them invited the-other to dance but I not know who whom.
 ‘Maša and Ivan went to a party. One of them invited the other to a dance but I don’t know who invited who’

The observation is supported by the fact that wh-interrogatives questioning adjuncts do not allow multiple sluicing as shown in (36).

- (36) **Kto-to sprjatal gde-to zdes’ klad, no ja ne znaju kto gde*
 someone hid somewhere here treasure but I not know who where
 ‘Someone hid the treasure somewhere here but I don’t know who hit it and where’

The reason is that SP reading is unavailable in Russian and adjuncts do not allow order-readings in principle. That is, the order-reading is a particular property of the arguments, not adjuncts. While arguments can be switched around, an argument and an adjunct cannot. While it makes sense to wonder if Mary invited John or John invited Mary, it does not make sense to wonder if John hid the treasure under a rock or if under a rock John hid the treasure.

However, multiple sluicing is perfectly permitted in multiple questions with PL reading, as in (37), for the PL reading is readily available in Russian.

- (37) *Každyj priglasil kogo-to na tanec, no ja ne znaju kto kogo*
 everyone invited someone to dance but I not know who whom
 ‘Everyone invited someone to a dance but I don’t know who invited who’

Thus multiple sluicing seems to provide a new diagnostic for the availability of certain readings in multiple questions across languages. It is important to note that the restriction on interpretation is not the only factor capable of ruling out the possibility of multiple sluicing. In other languages, other factors might be involved (e.g., lack of multiple wh-fronting in certain languages).

Russian is a language that does not involve syntactic wh-movement to Spec,CP, as argued extensively in Stepanov (1998), and Bošković (2002). Rather, on these analyses, Russian C⁰ has a weak [+wh] feature and all the wh-phrases are fronted as

instances of focus movement to some position lower than C^0 (cf. Stepanov (1998) for more discussion of where precisely this position might be located). Thus, the question arises: why is the SP reading unavailable in Russian if there is no wh-movement to Spec,CP in this language?

Željko Bošković (p.c.) suggests that in Russian, unlike in Serbo-Croatian, the base-position of Q-morpheme in a SP reading structure might be lower than the target position of the focus movement of wh-phrases. In that case, fronted wh-phrases will still cross the Q-morpheme on their way up. However, if that is on the right track, it can no longer be a [+wh] feature that is involved in the Relativized Minimality violation since wh-phrases in Russian do not front in order to check the uninterpretable [+wh] feature of C^0 but rather to check the [+focus] feature. Thus, it is not clear why the Q-morpheme would intervene.

Even if this problem presented by Russian is somehow resolved, the approach based on Relativized Minimality cannot be a solution for another language lacking SP readings, namely, Sinhala. Hagstrom (1998) observes that a configuration that forces the SP reading in Japanese (scrambling the lower wh-phrase over the higher one) shown in (38) makes a parallel question in Sinhala ungrammatical (39). Thus, Hagstrom concludes that Sinhala does not allow SP readings.

(38) [_{CP} [_{TP} [Nani-o t_Q]_j John-ga dare-ni t_j ageta] no]? *SP/??PL* Japanese
 what-ACC John-NOM who-DAT gave Q
 ‘What did John give to who?’

(39) *_{[CP} [_{TP} Mokak də Chitra kaate duunne kiyəla dannəwa] də]? Sinhala
 what Q Chitra who-DAT gave-E that know Q
 ‘Do you know what Chitra gave to whom?’
 (Hagstrom 1998: Kumara Henadeerage, p.c.)

Since Sinhala is a wh-in-situ language, Relativized Minimality cannot be the explanation for why the SP reading is not available here. Wh-phrases do not move and therefore cannot produce Relativized Minimality violation. So what is then responsible for the lack of SP readings in Sinhala?

In Grebenyova (2004a), I propose an alternative analysis by suggesting that the distinction between the languages allowing and disallowing SP reading lies in the crucial

differences between lexical properties of the Q-morpheme itself. A given language allows SP readings or not, depending on whether it has a particular Q-morpheme as part of its lexicon. Recall the two different structures for the PL and SP readings from Hagstrom (1998).

- (40) a. $[_{CP} Q_j-C^0 \dots [_{TP} \dots wh1 \dots V \dots wh2 t_j \dots]]$ *PL*
 b. $[_{CP} Q_j-C^0 \dots [_{QP} t_j [_{TP} \dots wh1 \dots V \dots wh2 \dots]]]$ *SP*

Semantically, we concluded that what licenses a SP reading is the presence of the Q-morpheme (or more precisely, its choice function variable) above TP. It is needed there to reduce the set of propositions it combines with to a single proposition. Now, if a language lacks a Q-morpheme that can be merged with TP, it would not have the option of licensing the SP reading. That is my view of the situations in Russian and Sinhala. The Q-morpheme in these languages is lexically specified such that it only selects the wh-phrase and never TP. Hence, these languages do not exhibit any presence of the SP reading.

Some supporting evidence for this analysis comes from Serbo-Croatian multiple wh-questions with a question particle *li*. I will assume that *li* is the Q-morpheme in Serbo-Croatian, a counterpart of *ka* in Japanese. *Li* is primarily used in Yes/No questions in Serbo-Croatian. When used in wh-questions, it adds some emphatic force to a question. This additional semantic property of *li* should not prevent us from analyzing it as a legitimate Q-morpheme, for such “fusion” of functional and lexical semantic material is a common property of Slavic languages (e.g. aspectual prefixes often carry additional lexical meaning along with grammatical information).

Recall that Serbo-Croatian is a language allowing both PL and SP readings in multiple interrogatives. However, whenever *li* is used in a multiple wh-question in Serbo-Croatian, it forces the SP reading as shown in (41-42).

- (41) Ko li koga pozva na večeru? *SP/??PL*
 who Q whom invited to dinner
 ‘Who (on earth) invited who to the dinner?’

predicts that SP readings emerge later than PL readings in Japanese and Serbo-Croatian speaking children.

4.3. Formalizing Interpretive Superiority

Considering these arguments for the absence of the SP readings in certain languages being due to the selectional properties of the Q-morpheme, we can now examine the precise nature of Interpretive Superiority. Recall that Interpretive Superiority characterizes the loss of a PL reading in contexts where the lower wh-phrase is fronted over the higher wh-phrase, as in Serbo-Croatian and Japanese. There must be something going wrong in the derivation of the PL reading when the lower wh-phrase is fronted. Let us consider (44), which demonstrates abstractly what happens in such PL derivation.

$$(44) \text{ [}_{CP} \text{ wh}_2 \text{ Q}_i\text{-C}^0 \text{ ... [}_{TP} \text{ ... wh}_1 \text{ ... V ... } t_i \text{ } t_j \text{]]} \quad PL$$

The choice-function variable left by Q-movement needs a set to apply to as in (27a). However, if the object wh-phrase moves to the front, the Q-morpheme is left without a set to apply to.²³ Hence, one cannot derive the PL reading in the context of object wh-fronting. In languages with the SP Q-morpheme, if the PL derivation is unavailable, an alternative derivation is available: the SP reading derivation with the Q-morpheme originating above TP. The Q-morpheme in this derivation will not be affected by object fronting since it is merged higher in the structure and takes a different set as its argument: a set of propositions denoted by TP.

Let us now consider languages that if do not have the option of generating the structure with the Q-morpheme above TP, like English and Bulgarian. In these languages, we would expect the result of fronting the lower wh-phrase to be simply unacceptable, since the alternative SP reading derivation is unavailable for these languages.

The degraded status of an English matrix question in (4b), repeated below in (45a), is then the result of being faced with the SP-forcing context, yet not having the Q-morpheme needed for the SP reading derivation. Recall that T-to-C movement ‘obviates’ MLC in (45a) in the specific way described in Section 2. Thus, the only source of

²³ I assume that the wh-phrases are interpreted in their surface positions, as in Hagstrom (1998) and contra Bošković (2001a).

unacceptability here is Interpretive Superiority arising due to the unavailability of the SP reading derivation. It is interesting that what seemed like an ordinary syntactic superiority violation is in fact a result of semantic inadequacy and not syntactic, contrary to purely syntactic accounts and on a par with the accounts of Chierchia (1992), Hornstein (1995) and Comorovski (1996).

(45) a. ??What_i did who buy t_i ?

b. *John wonders what_i who bought t_i

As for the superiority effects in embedded questions in English as in (4c), repeated here as (45b), the lack of the Q-morpheme that would allow for a SP reading is true of the embedded clauses as well, so that is a factor contributing to the ungrammaticality there. However, there is an additional factor involved in embedded clauses that is not there in the main clauses, namely, the absence of T-to-C movement, which prevents C⁰ from attracting the lower wh-phrase over the higher one (a standard minimality effect). Hence, the contrast in the degree of superiority effects between the main and embedded clauses follows naturally.

5. Implications and consequences

The analysis has a number of specific empirical predictions cross-linguistically and provides new directions for reanalysis of certain related phenomena, like the absence of T-to-C movement in subject questions and the absence of superiority effects in d-linked multiple wh-questions.

5.1 Cross-linguistic predictions

One straightforward prediction of the analysis is that in a language where T-to-C movement takes place in both main and embedded clauses and SP readings are available in bare multiple questions (hence, the Q-morpheme can be merged above TP), we should not expect to find any superiority effects in either main or embedded questions. The precise example of such a situation is Icelandic, where there is V2 phenomenon (i.e. verb movement to C⁰ via T⁰) in matrix and embedded clauses. In addition, Icelandic allows SP readings in multiple questions: the questions in (46a) and (47a) are felicitous on the SP

reading of their respective main and embedded questions. As expected, there are no Superiority effects in either main (46b) or embedded clauses (47b).²⁴

(46) a. *PL/SP*

Hver bauð hverjum í veisluna?
 who invited whom in the-dinner
 ‘Who invited who to the dinner?’

Icelandic

b. *?PL/SP*

Hverjum bauð hver í veisluna?
 whom invited who in the-dinner

(47) a. *PL/SP*

Jón veit ekki hver bauð hverjum í veisluna.
 John knows not who invited whom in the-dinner
 ‘John does not know who invited who to the dinner.’

b. *?PL/SP*

Jón veit ekki hverjum bauð hver í veisluna.
 John knows not whom invited who in the-dinner

The mirror image of the Icelandic facts are the facts from Brazilian-Portuguese, where there is no T-to-C movement in either matrix or embedded clauses and the language does not allow SP readings in bare multiple questions. (48b) shows the lack of T-to-C movement in a question without an auxiliary and (48d) and (48e) shows the same with the presence of an auxiliary.

(48) a. O quê (que) o Diogo comprou?

the-what that the-Diogo bought
 ‘What did Diogo buy?’

Brazilian-Portuguese

b. *O quê comprou o Diogo?

c. O quê (que) o Diogo vai comprar?

the-what that the Diogo will buy
 ‘What will Diogo buy?’

d. *O quê (que) vai o Diogo comprar?

the-what that will the Diogo buy

²⁴ The PL reading is harder to get in (46b) and (47b), although is possible. SP reading seems to be the preferred reading in these questions.

- e. *O quê (que) vai comprar o Diogo?
 the-what that will buy the Diogo

More extensive arguments for the absence of T-to-C movement in Brazilian-Portuguese can be found in Silva (2001). An explanation for the historical loss of T-to-C movement in this language is proposed in Pires (2004), based on clitic placement.

The questions in (49a) and (49c) only allow PL readings, and are bad on SP readings of their respective main and embedded questions. Given these facts, my analysis predicts that the superiority effects are equally strong in Brazilian-Portuguese in both main and embedded clauses. The prediction is borne out: (49b) and (49d) are equally unacceptable.

(49) a. PL/*SP

Quem (que) comprou o quê.
 who that bought the-what
 ‘Who bought what?’

- b. *O quê (que) quem comprou?
 the-what (that) who bought
 ‘What did who buy?’

c. PL/*SP

Max (me) perguntou quem (que) comprou o quê?
 Max to-me asked who (that) bought the-what
 ‘Max asked me who bought what?’

- d. *Max (me) perguntou o quê (que) quem comprou?
 Max to-me asked the-what (that) who bought
 ‘Max asked me who bought what?’

Bulgarian is another language that is of a Brazilian-Portuguese type with respect to the superiority effects in matrix and embedded clauses, although with an interfering complication. That is, subject-aux(iliary) inversion is required in Bulgarian wh-questions. The obligatoriness of inversion in the main clauses, demonstrated in (50), was discussed in Rudin (1986), Kraskow (1990) and Rivero (1993) among others. Izvorski (1993)

reports that this phenomenon holds in Bulgarian embedded questions as well, as shown in (51).²⁵

(50) a. Koe pismo napisa deteto? Bulgarian
which letter wrote the-child
'Which letter did the child write?'

b. *Koe pismo deteto napisa?

(51) a. Tja me popita kade živee Ivan.
she me asked where lives Ivan
'She asked me where Ivan lives.'

b. *Tja me popita kade Ivan živee

The question arises if the inversion in Bulgarian is due to T-to-C movement. It is already different from English, where inversion is only in a main clause phenomenon. But that by itself is not enough to conclude that we are dealing with something different in Bulgarian. Recall the presence of T-to-C movement in the embedded clauses in Icelandic. However, there are reasons to believe that this inversion is not a result of T-to-C movement. Izvorski (1993) provides several arguments to this effect, one of which is based on the fact that adverbs can precede the verb in wh-questions in Bulgarian. (52a) is an example with an IP-adverb, and (52b) demonstrates the same with a VP-adverb.²⁶

(52) a. Za kakvo včera spomena Ivan pred Maria?
about what yesterday mentioned Ivan to Maria
'What did Ivan mention to Maria yesterday?'

b. Kakvo veče kupi Ivan?
what already bought Ivan
'What did Ivan buy already?'

²⁵ Examples in (50) and (51) are taken from Izvorski (1993).

²⁶ These facts create a problem for Bošković (1998, 2002) who takes the obligatoriness of inversion in Bulgarian (as well as in English) as an indicator that the interrogative complementizer is a PF verbal affix and hence must be adjacent to a verb in overt syntax. In English, T-to-C movement creates this adjacency. In Bulgarian, he assumes that the verb moves to T⁰ and the lower copy of the subject is pronounced (to avoid a stranded affix in PF). In (52), the adverbs clearly break the adjacency, yet the sentences are fine.

Izvorski (1993) establishes that the inversion phenomenon is not an instance of the rightward movement of the subject. She provides an example with an extra argument in the VP and shows that the subject precedes that argument, as in (53), rather than occurring sentence finally. The same point can be made in (52a).

- (53) Otkâde znae Paulina vsičko tova?
 from-where knows Paulina all this
 ‘Where does Paulina know all this from?’

Izvorski (1993) concludes that the verb moves to T^0 , while the subject remains in situ in Bulgarian. I would even suggest the possibility of the verb not moving even that high in Bulgarian, considering the example in (52b), where a VP-adverb precedes the finite verb. The claim that subjects remain in situ also raises questions of how EPP is satisfied in that case. But for our purposes, we can at least conclude with some certainty that the source of inversion in Bulgarian is not T-to-C movement.²⁷ Given that, and since the Bulgarian Q-morpheme is of the English type (i.e. Bulgarian lacks SP readings as we saw in (21b)), there predicted to be no contrast between the matrix and embedded superiority violations. The prediction is borne out.

- (54) a. *Kogo koj e pokanil na večeriata? Bulgarian
 whom who Aux invited to dinner
 ‘Who invited who to the dinner?’
 b. *Tja me popita kogo koj e pokanil na večeriata?
 she me asked whom who Aux invited to dinner
 ‘She asked me who invited who to the dinner.’

5.2 Superiority in non-subject questions

On the analysis developed here, the presence of T-to-C movement should not affect locality (MLC) in multiple questions that do not involve a wh-phrase in matrix Spec,TP. Therefore, one would expect to find an asymmetry between subject and non-subject wh-questions. That is precisely what we find in English (55a) – (55d). The matrix wh-question involving a subject in (55a) is less degraded than the matrix question

²⁷ For more discussion of the status of inversion in Bulgarian, see Izvorski (1993) and Rivero (1993).

questioning the object of a control clause in (55b) and the embedded question in (55d) questioning the objects. These have the same status as the familiar embedded question involving embedded Spec,TP in (55c).²⁸

- (55) a. ??What did who buy?
b. *What did Mary tell who to buy?
c. *Bill wonders what who bought.
d. *Bill wonders what Mary told who to buy.

5.3 Subject extraction and T-to-C movement

Recall that my analysis disallows attracting elements from inside the minimal domain of the attractor, and T-to-C movement renders Spec,TP as part of the domain of C^0 . This offers a potential answer to an old question of why questions like (56) are unacceptable in English.

- (56) *Who did leave?

The problem is often approached with an attempt to explain why T-to-C movement is not permitted in the context of subject extraction. However, on the analysis developed here, it is the subject extraction that is not permitted when T-to-C movement has applied, since the subject is now inside the minimal domain of C^0 , making C^0 search right past it. This correctly rules out (56). Now consider further paradigm in (57).

- (57) a. *Did who leave?
b. Who left?
c. Who bought what?

²⁸ To control for the degree of clausal complexity of (55a) and (55b), I tested the paradigm in (i) –(ii), where both examples involve only one clause. The 3 subjects I tested all preferred the form *who* to *whom* and freely allowed preposition stranding. The contrast seems to be in the direction we expect, although is not as clear as with the examples with two wh-phrases.

(i) ??What did who give *t* to who?
(ii) *Who did who give what to *t*?

The badness of (57a) suggests that C^0 may not be present in the structure in this case, otherwise we would expect T-to-C movement to take place. The absence of CP would then also apply to (57b) and (57c). Thus, subject wh-phrase may not be raising higher than TP in these configurations. The interrogative force must be located in T^0 in these constructions. For some related discussion, see Pesetsky (1989).

However, a question arises of why T^0 cannot attract the object wh-phrase in a single interrogative like in (58).

(58) a. * $[_{TP}$ What Mary T t bought t]?

b. * $[_{TP}$ What T $[_{VP}$ Mary bought t]]?

In the derivation in (58a), there is no room in the structure for both *Mary* and *what*, assuming there is only one Spec,TP in English. In (58b), however, one might wonder why T^0 could not attract *what* to check the [+wh] feature and satisfy the EPP requirement at the same time, assuming that Nominative Case of *Mary* can be licensed via Agree? I suggest that requirements, as opposed to features, are satisfied before the features are checked. Given that there are reasons to think that EPP is a requirement and not a strong feature (e.g., failure to satisfy EPP cannot be repaired by deletion of the offending structure unlike other strong features as discussed in the work of Lasnik (1999)), it is plausible that EPP must be satisfied before any features of the same head can be checked. This would result in *Mary* being attracted (in accordance with MLC) and further block attraction of *what* into the same Spec, TP.

The conclusion that subject wh-phrases do not move to Spec,CP in matrix questions in English has a particular implication for the analysis of matrix sluicing with the subject wh-remnant as in (59).

(59) A: Someone left.

B: Who ~~left~~?

If *who* in (59) is not in Spec,CP, how can it survive sluicing, under the analysis of sluicing as deletion of TP? I would like to suggest that the surface position of *who* is actually Spec,Agrs. This analysis can be extended to other languages where wh-phrases arguably do not move overtly all the way to CP, like in Bošković (1997, 2002)'s treatment

of Serbo-Croatian matrix clauses with the null complementizer and Stepanov (1998)'s treatment of Russian *wh*-questions in all contexts.

5.4 D-linked *wh*-questions

The account also provides an insight into why D-linked multiple questions do not exhibit Superiority effects, (60a). Importantly, D-linked *wh*-questions in English do allow SP readings. Recall that the question in (19), repeated here as (60b), is felicitous in the SP reading scenario in (18). Hence, when the d-linked object *wh*-phrase is fronted over the subject and the SP reading is forced, this reading can somehow be derived in d-linked *wh*-questions making the sentence acceptable. Remember that T-to-C movement (just like in bare multiple questions) will take care of the MLC in this case.

(60) a. Which journalist did which diplomat invite to the dinner?

b. Which diplomat invited which journalist to the dinner?

Unlike in bare interrogatives, Interpretive Superiority is not operative in d-linked *wh*-questions in English. For all of my informants, (60a), where the *wh*-object is fronted over the *wh*-subject, is still ambiguous, allowing both PL and SP readings.²⁹ My suggestion is that it has something to do with the heaviness of these complex (d-linked) *wh*-phrases. This heaviness might be forcing them to be interpreted in their base-generated positions and not in the surface positions, providing the Q-morpheme a set of individuals to combine with (i.e. the set denoted by the d-linked *wh*-phrase, namely, a set of individuals presupposed by both speakers). Hence the PL reading derivation works fine in contexts with d-linked *wh*-phrases even if the object *wh*-phrase is fronted over the subject. Some support for this conjecture comes from the fact that, in multiple *wh*-fronting languages, while bare *wh*-phrases must necessarily all front, in d-linked *wh*-questions only the one *wh*-phrase must front, the rest can remain in situ, as the paradigm from Russian in (61) demonstrates.

²⁹ Cf. Barss (2000) for a different judgment, where PL reading is not available in (60a). Even if the speakers might vary on this, we want to explain what allows the PL reading to survive in d-linked *wh*-questions of the speakers who allow it.

- (61) a. Komu čto Ivan dal?
 whom what Ivan gave
 ‘What did Ivan give to who?’
- b. *Komu Ivan dal čto?
- c. Kakomu studentu Ivan dal kakuju knigu?
 which student Ivan gave which book
 ‘Which student did Ivan give which book?’

Let us take a look at the embedded d-linked wh-questions. Assuming the analysis developed in this paper, we expect to find some superiority effects here since T-to-C movement does not take place in these contexts and therefore MLC prevents attracting the lower wh-phrase over a higher one. However, (62) does not exhibit any superiority effects.

(62) John wonders which journalist which diplomat invited to the dinner.

This fact suggests that MLC interacts differently with d-linked wh-phrases than with non-d-linked ones. How can this be? Using Chomsky (1995) notion of distance, crucially sensitive to c-command, the absence of superiority effects in d-linked wh-questions can be analyzed as a result of the [+wh] feature being embedded inside the DP, so that it does not c-command the lower wh-phrase and hence does not intervene for the purposes of Attract.³⁰

In the remaining section, I will examine the learnability issues associated with some of the proposals I have made.

6. Multiple interrogatives in child language

The proposals made in this paper have specific predictions for how multiple questions are acquired by children cross-linguistically. In this section, I examine these predictions by reporting on an experimental study with English- and Russian-speaking children.

Questions in general have been studied in child language quite extensively in works of Thornton (1990), Thornton and Crain (1994), Thornton (1995), Haegeman

³⁰ See Kitahara (1993, 1994) and Uriagereka (1999) for some related discussion.

(1995), and Guasti (2000) among many others. For example, it has been shown that the wh-parameter is set very early in children (Roeper and de Villiers (1992), Guasti (2000) among others). Also, Thornton (1990) argued that children go through a stage when they set their parameter in a way it is set for partial wh-movement in other languages. However, most of this research has been focused on wh-question with a single wh-phrase. Considerably less is known (if anything) about how children form multiple questions like *'Who hid what?'*, how early such structures emerge and whether children's knowledge of those structures shows any differences from adults. Particularly little is known about what interpretation children assign to multiple questions. Considering the proposals developed in this paper about how the syntax and semantics of multiple questions works in adult grammars and the cross-linguistic variation with respect to the availability of the SP reading in questions, it is quite interesting to explore child grammar with respect to multiple questions.

6.1. Acquisition of Q-morpheme

Given the crosslinguistic analysis in Grebenyova (2004a), my experimental study is basically the study of the acquisition of the Q-morpheme. I will adopt the Minimalist view of parameter setting explicated in Chomsky (1995), where the parameters are aimed to be restricted to the items in the lexicon. This arguably increases the overall explanatory power of the theory. In our case then, a child sets the PL/SP parameter by specifying selectional features of the Q-morpheme. Recall that Q-morpheme can select either a wh-phrase or TP: Q [+wh; +/-TP].³¹ Since selecting wh-phrase is default (innately specified by UG), no parameter needs to be set for PL readings. SP reading will arise by setting Q-morpheme's value of [+/- TP] to [+TP] if a child's linguistic environment includes utterances with SP reading (i.e. the child is sensitive to the questions in SP reading scenarios and answers given to those questions), as well as morphological cues like Serbo-Croatian *li* and utterances with multiple sluicing. That is, positive evidence will be needed to obtain the SP reading. Otherwise, the parameter remains unset and perhaps later gets the negative value. We can think of this parameter as a Q-TP-parameter, since all that needs to be done by the child is to figure out whether Q can select TP or not.

³¹ In this I follow Tesan and Thornton (to appear) arguing for the overspecified parametric values.

Now, since children would have [+wh] value set from the outset, PL reading would always be available to them. SP reading should then become available once they set the parameter of Q to [+TP] (Japanese, Serbo-Croatian). English-, Russian-, Bulgarian-speaking children's Q-TP parameter will remain with [-TP] value, preventing them from assigning SP readings to multiple questions. In other words, children have the subset [+wh] value available to them at the outset and then they might expand into the superset [+TP] depending on the input.

6.2. Experimental schema

My cross-linguistic study specifically examines children's production and interpretation of multiple questions. In this section, I will present the details of the experimental design I used. The experiment consists of the elicited production and the truth-value judgment (TVJ) tasks. *Elicited production* is a good task to use because, if controlling the contexts for elicitation very precisely, the resulting production data can tell us about both: how children produce multiple questions and what interpretation they assign to those questions. In addition, to strengthen the interpretation facts, I used a TVJ task with embedded questions.

In the elicitation part, children were prompted to ask a puppet questions in PL and SP scenarios. The experimental hypothesis is that, if children have only PL reading, they would not be producing multiple questions (e.g., *Who hid what?*) in SP scenarios, but will, however, produce those in PL contexts. A TVJ task then includes embedded wh-questions (e.g. *The Kermit guessed correctly who hid what*), where the PL reading of the utterance is made false while the SP reading is made true. So we would expect negative responses from children lacking SP reading, since they would go out of their way to reject the utterance, when a potential SP reading is made true in the same context.

The general plot is as follows. Merlyn, the wizard puppet, is teaching Kermit how to do magic, particularly, how to guess about things without looking. Kermit is supposed to hide under the table with a blindfold over his eyes. The experimenter acts out a story. Then Kermit comes up from under the table (still blindfolded). The experimenter gives a lead-in, prompting a child to ask Kermit a question about the story. Merlyn demonstrates his skill first with a warm up story. The target question here is: *What did everyone buy?*

Then Kermit has his first try, with another warm up story. The target question here is *Who bought everything?*.³²

The warm up is followed by two parallel test stories. I will describe one of them. Mermaid is having a birthday party. The guests are Hockey-Player, Rabbit and Horse. They bring 3 presents: a block, a brush, and a bike. Mermaid has baked a beautiful cake. Hockey-Player suggests playing a Hide-and-guess game, where each of them is going to hide a different thing, so that Kermit would have to guess about it later. Mermaid has to go and get the pizza for the party but Horse offers to help and goes away to pick up pizza instead of Mermaid. Mermaid, Hockey-Player and Rabbit play Hide-and-guess. Hockey-Player hides the brush, Mermaid the bike and Horse the cake. Kermit comes up from under the table (still blindfolded). At the same time, Horse comes back with pizza but it is too late to hide anything, so he decides to just sit there and watch. The experimenter provides the lead-in as in (63), which is followed by child's question. The target question is in (64).

(63) *Lead-in:* We know that Horse didn't hide anything and nobody hid the block. But each of them hid a different thing. See if Kermit can tell us.

(64) Who hid what?

Thus, we used a PL context with an expected multiple interrogative. To answer such a question, Kermit tries to guess about each pair and gets only one of them right, guessing incorrectly about the other two pairs. Merlyn then says how well he thinks Kermit did on this task, using an embedded multiple interrogative, (65). This is the TVJ part of the experiment.

(65) Kermit figured out who hid what.

Since Kermit made two mistakes, the sentence is false on the PL reading; however, since he guessed about one pair correctly, Merlin's statement it is true on the SP reading. Thus, if English-speaking children lack the SP reading in these constructions (as English-

³² If a child is shy about asking questions, the child is told that Kermit is rather shy of grown-ups and only talks to children. The child is then asked to help us out with such a shy Kermit.

speaking adults do), they are expected to reply with *No*, indicating that the sentence is false.³³ They are supposed to give Merlyn a coin if he is right and a jewel if Merlyn says something that did not happen. If a child responds with *No*, we ask the child why not, expecting some elaboration on why the sentence is judged to be false.

Kermit again goes under the table and this time we try to make the story a bit easier for him. This time only one of the characters hides one thing. For example, Horse chooses to hide the block. Kermit comes back and the experimenter provides the following lead-in.

(66) *Lead-in*: We know that one of them hid one thing. See if Kermit can tell us.

This is a SP context. Thus, children lacking the SP reading, are expected not to produce a bare multiple interrogative in this case but some other type of question, of the kind that adults produce in such situation, (67).

- (67) a. Who hid something and what?
b. Who hid the block?
c. What did Horse hide?
d. Which guy hid which thing?

They might also produce a d-linked multiple question since those have a SP reading in English. However, I tried to construct scenarios in such a way as to eliminate possibility of d-linking as much as possible (e.g., mixing characters: animals, people, etc.).

6.3. Results from adult controls testing

Eight English-speaking adults participated in a pilot testing, all of whom were undergraduate students at the University of Maryland. Tables 1 and 2 present production data in the PL and SP contexts respectively.

³³ Japanese or Serbo-Croatian adults would be expected to say ‘Yes’ in the same situation at least some of the time, since for them the utterance in (63) would be truly ambiguous.

Table 1. Production of wh-questions in the PL context.

Speaker	PL Context	
	Story 1	Story 2
1	Each of the guests hid one thing. What did each of them hide?	Which guys won what thing?
2	Do you know what each person hid?	Do you know who won what?
3	Who hid what?	Who won what?
4	What did everybody else hide?	What did everybody else win?
5	What did everyone hide?	What did each person win?
6	Do you know who hid what?	Who do you think won what object?
7	Bear, can you tell us who hid what?	Kermit, who won what?
8	Which party guests hid which objects?	Three of the guests hid three objects. Which of the guests won which objects.

Table 2. Production of wh-questions in the SP context.

Speaker	SP Context	
	Story 1	Story 2
1	Which one of the guests hid something and what did they hide?	Which guy won what prize?
2	Do you know who hid something?	Who won something and what did they win?
3	Who hid which item?	Who won a prize and which prize was it?
4	Who hid something and what?	Which one won something?
5	Who hid something and what?	Who won a prize?
6	Do you know who hid which object?	Who do you think won what prize?
7	Who hid something and what?	Kermit, can you tell us which character won what?
8	Which party guest hid which objects?	Which person won something and what?

The utterances we find in this set of data can be sorted into the following three categories. Constructions that are restricted to the PL contexts are multiple questions with bare wh-phrases (e.g. *Who hid what?*) and questions involving a universal quantifier (e.g. *What did everyone hide?*).³⁴ Then there are constructions that seem to occur only in SP contexts: questions with selectively d-linked wh-phrases (e.g. *Which person hid what?*). Finally, constructions occurring in both contexts are questions with both wh-phrases being d-linked (e.g. *Which person hid which item?*) and conjoined wh-questions (e.g. *Who hid something and what did they hide?*).

³⁴ Even though I tried to eliminate those by having one of the characters (Horse) not participating in the hiding activity and one extra object remaining unhidden, the speakers still produced some utterances containing universal quantifiers.

As we can see in Table 3, adults never produce PL constructions in a SP context, which confirms that the SP readings are not permitted in simple multiple questions. There was only one instance of a SP construction being produced in the PL context. This is a selectively d-linked question produced by Speaker 6.

Table 3. Wh-constructions with respect to context.

	PL constructions	SP constructions
PL scenario	6 (38%)	1 (6%)
SP scenario	0	5 (31%)

A certain observation can be made about plurality. Adults produce questions with d-linked wh-phrases marked for plural in PL contexts and singular wh-phrases in SP contexts (Cf. Speaker 1 and Speaker 8). Also selective d-linking of the wh-phrases in a multiple question tends to be object d-linking. However, it is hard to make much of these observations at this point, given the small number of subjects.

The results from the TVJ task are given in Table 4 below, which show that English-speaking adults rejected declaratives with embedded multiple interrogatives in the context where the SP reading was made true, while the PL reading was made false. This confirms that English allows only PL readings in multiple interrogatives and not SP readings.

Table 4. TVJ task with embedded multiple wh-questions.

<i>True</i>	<i>False</i>
0 (0%)	16 (100%)

It is important to run a control testing with Japanese-speaking adults, where the results are supposed to change because Japanese does allow SP readings. I have no specific data to this effect at this time, but very informal testing of three Japanese speakers does exhibit the clear shift toward *Yes* in responses.

6.4. Children's multiple questions

Let us now turn to how children did on the same tasks. Twenty English-speaking children (age range 3;7–6;2) and twenty Russian-speaking children (age range 3;5–6;5) participated in the experiment. The data in table 5 from the English-speaking children, shows that out of 40 utterances in the PL context, 32 % are utterances that involve what we characterized as PL constructions based on the adult data: multiple questions and questions with universal quantifiers. No such constructions were produced in SP scenarios, which is a significant finding, consistent with the adult data and the claim that English lacks SP readings in bare multiple questions. The result is also crucial to establish that there is no subset-superset problem and support our working hypothesis, according to which, both English- and Russian-speaking children were expected not to produce multiple questions in SP contexts, exhibiting the absence of SP readings in their grammars.

Table 5. Wh-constructions in child English.

	PL Constructions
PL scenario	13 (32%)
SP scenario	0

The types of multiple interrogatives that adults produced in SP scenarios, namely, selectively d-linked multiple questions (e.g., *Who won what thing?*), did not show up in the child data at all. There was only one utterance by an adult of that kind, so it might not be so significant. Also note that it is not of interest to us to track the utterances that are consistent with SP readings in general (e.g. *Who won something and what did that person win*), because some of such utterances (with slight modification) are also felicitous in the PL scenarios. However, if one were interested in comparing those in the child data vs. adult data, it is certainly possible to do.

Hence, for our purposes, the most important finding is that English-speaking children, exactly like the adults, used multiple interrogatives (PL constructions) only in PL scenarios. Similar facts can also be found in the data produced by the Russian-

speaking children in Table 6. A larger number of PL constructions were used here (45%), many of which are multiple interrogatives.

Table 6. Wh-constructions in child Russian.

	PL Constructions
PL scenario	18 (45%)
SP scenario	0

Quite comparably, Russian-speaking adults have produced PL constructions in the PL scenario 50% of the time and never produced these type of constructions in the SP scenarios. The Russian adult-controls data is reported in Appendix 3.

An interesting observation can be made about Russian-speaking children's bare multiple questions: only one wh-phrase tends to be fronted (e.g., speakers 1, 2, 5 in Appendix 2). None of such utterances were produced by Russian-speaking adult controls. Considering that Russian is a multiple wh-fronting language, children's leaving some wh-phrases in-situ is quite surprising. Perhaps, even though earlier studies showed that the wh-parameter is set early, that conclusion only extends to the parameter of whether the [+wh] feature is strong or weak in a language (or whatever determines whether any wh-phrase undergoes overt fronting). The property of the attracting feature: Attract-one vs. Attract-all, as in Bošković (2002), might be acquired later, as the child data from Russian suggest.

Notice there was also one superiority violation utterance by a Russian speaking child (speaker 13 in Appendix 2), which is consistent with the arguments made in the syntactic literature about Russian exhibiting no superiority effects. For an analysis of these facts, see Stepanov (1998).

Both English-speaking and Russian speaking children produce what I would call child-specific PL constructions, where, confronted with a PL scenario, they ask their question in a series of single questions about each individual represented by one of the wh-phrases, as in (68): 25% of English child PL utterances; 13% of Russian child utterances. (These constructions are not included in the numbers in tables 5 and 6.) Recall

that according to the formal semantics for multiple questions we adopt here, this is exactly a set of questions (i. e., a set of sets of propositions) that a multiple interrogative denotes. Especially, consider the question about Story 2 by a Russian-speaking (child 7 in appendix 2), where the set of individuals denoted by the object wh-phrase is explicitly propagated through the set of the individuals denoted by the subject wh-phrase. We do not find such linguistic behavior in adult English speakers. My tentative explanation of that is based on the observation made above that it takes longer to acquire the second part of the wh-parameter (multiple wh-fronting vs. one wh-phrase fronting). Given that, children do the best they can with single interrogatives in a multiple interrogative context. In a way, they act like Italian-speaking children (with Italian, being a language not permitting multiple interrogatives in adult grammar).

(68) What did the Mermaid hide? What did the bunny hide? And what did the hockey player hide?

(69) *Kto vyigral, princessa jabločko ili parovoz, ili tort? A lev ili tort, ili parovoz, ili jabločko, a robot jabločko ili vyigral tortik ili parovoz?*
 who won princess apple or train or cake? And lion or cake or train or
 apple and robot apple or won cake or train

Consider also children's use of quantifiers in multiple interrogatives, especially by Russian-speaking children, of the kind in (70) (39% of all PL constructions). This over-usage of quantifiers might be related somehow to children being overly sensitive to the exhaustivity, and the universal quantification aspect of the PL reading of an interrogative (i.e., the answer to a question with a PL reading is only felicitous if it includes all the pairs involved in an event). Alternatively, it could potentially have something to do with children acquiring universal quantifiers at the same time, not a trivial matter.

(70) *Kto každý čto sprjatal?*
 who everyone what hid

Finally, tables 7 – 10 present the result of the TVJ task using embedded multiple questions. It is clear that English- and Russian-speaking children tended to reject the declaratives with embedded multiple interrogatives in the context where the SP reading was made true, while the PL reading was made false. This potentially offers support for the claim that English and Russian allow only PL readings in multiple interrogatives. The control run with embedded d-linked questions, even though not showing a big contrast in the subjects starting to accept the utterance, shows a larger percentage of what I called partial answers, where a subject is undecided on *Yes* or *No*. Instead, a child gives the puppet a coin and some jewels, indicating that the puppet is partially right and partially wrong.³⁵

Table 7. TVJ task in child English (non-d-linked embedded questions).

<i>True</i>	<i>False</i>	<i>Partial</i>
3 (7.5%)	36 (90%)	1(2%)

Table 8. TVJ task in child Russian (non-d-linked embedded questions).

<i>True</i>	<i>False</i>	<i>Partial</i>
2 (5%)	32 (80%)	5(12%)

Table 9. TVJ task in child English (d-linked embedded questions).

<i>True</i>	<i>False</i>	<i>Partial</i>
1 (1%)	3 (30%)	6 (60%)

Table 10. TVJ task in child Russian (d-linked embedded questions).

<i>True</i>	<i>False</i>	<i>Partial</i>
2 (20%)	5 (50%)	3 (30%)

³⁵ It was much easier to elicit d-linked multiple questions from children than non-d-linked ones. This might be the case because d-linked wh-phrases are not subject to the Attract-1 vs. Attract-all parameter. D-linked wh-phrases, unlike their bare counterparts, do not have to front in multiple wh-fronting languages and are able to remain in situ, consistent with the Attract-1 value of the parameter, which must be a default value after the first part of the wh-parameter is set, namely, that the wh-feature is strong or weak in a language.

The results are quite preliminary at this point, due to the small number of subjects tested in a control experiment with d-linked questions. Thus, I will not be drawing any conclusions based on the findings of the TVJ task at this point and leave it for further on-going research.

Thus, the child data available at this point is consistent with the proposals developed in this paper and provides interesting insights into how children acquire the complex syntax and semantics of multiple questions.

7. Concluding remarks

To summarize, I have presented an analysis of certain contrasts in superiority effects in main vs. embedded clauses in a number of languages. As a result, we have a refined and a unified account of superiority, which considers both syntactic and semantic properties of *wh*-constructions. We can conclude that one constraint (Interpretive Superiority) is responsible for the two contexts in English questions with an additional one operating only in the main clause (T-to-C movement). On the other hand, Bulgarian and Brazilian Portuguese have two of the same conditions contributing to the unacceptability in both matrix and embedded clauses.

If this analysis is correct, it makes head-movement (as we saw with T-to-C movement) quite relevant to the syntactic processes and not merely a PF operation as it has been treated in Chomsky (2000). Of course, the reasons for the PF analysis of head-movement would then have to be reconsidered.

This analysis also puts into question the analyses suggesting that there is in fact T-to-C movement in embedded clauses in English (e.g., Pesetsky and Torrego (1991)).

Moreover, child data presented in section 6 is consistent with the overall proposals developed in this paper and even seems to show some considerable support for the analysis.

Appendix 1: English-speaking children's utterances

Elicitation:

Pair-List Context		
Speaker	Story 1	Story 2
1	What did they hided?	What did the robot took? What did the
2	What did each of them hide?	Which guests got what thing?
3	Who hid what?	Which ones had the prizes?
4	Who hid the bike? Who hid the cake? Who hid the brush?	Who won the train? Who won the cupcake? And who won the pizza?
5	What did everybody hide?	What did they have?
6	Guess who has (pause) anything. There is a bike and a block and a skateboard.	You have to guess who got (pause) anything? There was a strawberry, a train, and a cupcake.
7	What are they hiding? And what guys are hiding the stuff?	What did they get?
8	Who hided the cake, who hided the roller-skate and who hided the block?	Who won what?
9	Who hid what?	Who won the 1 st place and who won the other places?
10	Who hid what?	Which person won what thing?
11	What did each person hide?	Who won each thing and what are the things?
12	Who hid what?	Who won what?
13	What is a girl hiding, what is a dog hiding, what is the blue little boy hiding?	What did this animal win and what did the girl win and what did this metal person win?
14	Who hid the block, and who hid the rest?	Who win the car and who win the cupcake?
15	Who hid what?	Who won something? (but not satisfied when the non-PL-answer is given)?
16	Who hid what thing?	Which one got which and who got what?
17	Which one hid the bicycle, which one hid the cake and which one hid the block?	Which one got the cupcake and which one got the money and which one got the pizza?
18	What did they hide and who were the guests?	What was it that they won?
19	What did the Mermaid hide? What did the bunny hide and what did the hockey player hide?	Which character got the train, (waits) who got the money? And who got the pizza?
20	Who hid everything at the same time?	Who won all the prizes?

Single-Pair Context		
Speaker	Story 1	Story 2
1	Somebody hid something. Guess what he hid.	Guess what someone hid.
2	Which one of the guests hid something and what did he hide?	Which guest got what thing?
3	Who hid the block?	The robot won something. Can you tell us which thing he won?
4	What did the horse hide?	Can you guess what somebody got here?
5	What did the Mermaid hide?	What did the princess have?
6	What did the Mermaid hid?	Guess what the robot got?
7	What is the horse hiding?	What did the princess get?
8	What did she hide?	Who won the strawberry?
9	Which guy hid something and what was it?	Who won the prize?
10	What person hid it and what did that person hide?	Which one won the prize this time?
11	Who is it and what did that person hide?	Who won the thing and what is the thing?
12	What did somebody hide?	Who has the prize?
13	What do you think is the thing he hid?	Who is this animal that won the contest?
14	Who hid the cake?	Who won the strawberry?
15	Who... What did the horse hide?	Who got a prize?
16	Which one hid what thing?	Who got the money?
17	Which one hid something?	Which one got the money?
18	Who hid the cake?	Who was it and what was it?
19	Which character hid one thing?	Which character got one thing?
20	Which one hid the brush?	Which one got the cupcake?

TVJ Task:

Speaker	Story 1	Story 2
1	Yes	Yes
2	No	No
3	No. He only got one right.	Yes. He got the princess right. Exp: Is that guessing correctly <i>who got what?</i> Child: Yes.
4	No. He made 2 mistakes	Part right and part wrong.
5	No. Only the horse.	No. Only the robot.
6	No. He only got this guy.	No. (points out the mistakes)
7	No. Just a little. Only one.	No.
8	No.	No. He really didn't. No.
9	No. He guessed correctly about the Mermaid but not about the rest.	No. He got one right only.
10	No. He only guessed one.	No. (points out mistakes)
11	No. You got one right and 2 wrong.	No. He got one right and 2 wrong.
12	No. He didn't get 2 right.	No. He made 2 mistakes.
13	No. Only about one person.	No. Only one.

14	No. He didn't.	No. Kermit answered wrong.
15	No. – difficulty explaining	No. Because he wasn't right on everything.
16	No. He only did on one thing right.	No. Because the Kermit only got correctly the boy.
17	No. Because he was right about the Mermaid and then he made mistakes.	No. He guessed one right and the rest wrong.
18	No. He made mistakes.	No. Because look what they got. And he said...
19	No. Because he wasn't right on all of them.	No. Because you didn't guess correctly on all of them.
20	Yes. But one right and 2 wrong.	Wrong about some things.

D-linking

Elicitation

Pair-List Context		
Speaker	Story 1	Story 2
1	Which lizard took which fruit and what color lizard took what color fruit?	What color dog got which frog?
2	Which lizard took which fruit?	Which dog found which color frog? You have to find out which color frog and the color of the dogs.
3	Which lizard found which fruit?	Which dog found which frog?
4	Which lizard got which fruit?	What color dog found what color frog?
5	What color lizard took what fruit?	Which dog found which frog?

Single-Pair Context		
Speaker	Story 1	Story 2
1	Which lizard got which fruit?	Which color dog got which color frog?
2	Which lizard got the fruit and what fruit was it?	Which dog went into the forest and which color frog did he find?
3	Which lizard took which fruit?	Which dog found which frog?
4	Which lizard got a fruit and what fruit?	Which dog found a frog?
5	Which color lizard found a fruit?	What color frog did some lizard find?

TVJ Task

Speaker	Story 1	Story 2
1	In this one? No. He got one right and 2 wrong.	(thinking...) Not really. Gives some coins and some jewels.
2	Kermit only figured out one.	A little bit right and a little bit wrong.
3	Yes. He guessed about the orange one.	Maybe he is not very right, but I'll give him a coin for the white dog.
4	No. He made 2 mistakes and only got one right.	Kermit didn't say right about these (points) but got this one right.
5	He was Ok. I'll give him a coin.	(pause) Is he right? Maybe I'll give him both.

Appendix 2: Russian-speaking children's utterances

Elicitation:

Pair-List Context		
Speaker	Story 1	Story 2
1	<i>Kak ty dumaješ, čto sprjatali oni?</i> what you think what hid they	<i>Kto vyigral</i> (pause) <i>čego?</i> who won what
2	<i>Kto vse sprjatali čto?</i> who all hid what	<i>Kto vyigral parovozik? Kto vyigral</i> who won train who won <i>tort? Kto vyigral jabloko?</i> cake who won apple
3	<i>Kto sprjatal kakuju veš'?</i> who won what thing	<i>Kto vyigral kakije prizy, ah?</i> who won what prizes, ah
4	<i>Kakuju veš' každyj sprjatal?</i> what thing everyone hid	<i>Čto vyigrala princessa, robot i lev?</i> what won princess robot and lion
5	<i>Kto každyj sprjatal čto?</i> who each hid what	<i>Kto vse vzjal prizy kakie?</i> who all took prizes which
6	<i>Každyj sprjatal po odnoj veš'i. I</i> everyone hid per one thing. And <i>veš'i i geroev ty mozheš</i> things and characters you can <i>otgadat'?</i> guess	<i>Kto čto vyigral?</i> who what won
7	<i>Kto vsjo spjstal?</i> who everything hid	<i>Kto vyigral, princessa jabločko ili parovoz,</i> who won princess apple or train <i>ili tort? A lev ili tort, ili parovoz, ili</i> or cake? And lion or cake or train or <i>jabločko, a robot jabločko ili vyigral</i> apple and robot apple or won <i>tortik ili parovoz?</i> cake or train
8	<i>Kto každyj vsjo sprjatal?</i> what everyone all hid	<i>Čto každyj vyigral?</i> what everyone won

9	<i>Kto vsjo sprjatal?</i> who everything hid	<i>Čto každyj vyigral?</i> what everyone won
10	<i>Čto sprjatali oni?</i> what hid they	<i>Čto oni vyigrali?</i> what they won
11	<i>Kto každyj vsjo sprjatal?</i> who everyone all hid	<i>Kto vsjo vyigral?</i> who everything won
12	<i>Kto (hokeist, rusalka who hockey-player mermaid i lošadka) čto sprjatali oni?</i> and horse what hid they	<i>Čto vsjo vyigrali oni?</i> what all hid they
13	<i>Kto vse sprjatali vse veš'i</i> who all hid all things	<i>Čto kto vyigral</i> what who won
14	<i>Kto sprjatal čto-nibud'</i> who hid anything (means PL)	<i>Ty ugadaeš čto, rasnyje prizy, you will-guess what different prizes kto razobral?</i> who took
15	<i>Kto každyj čto sprjatal?</i> who everyone what hid	<i>Kto vyigral svojo každoje?</i> who won his-own each
16	<i>Kto ty dumajes' čto sprjatal?</i> who you think what hid	<i>Čto vsje vyigrali?</i> what everyone won
17	<i>Čto oni sprjatali?</i> what they hid	<i>Kto čto vyigral?</i> who what won
18	<i>Čto sprjatala rusaločka, čto sprjatal what hid mermaid what hid hokeist i čto sprjatala hockey player and want hid lošadka? horse</i>	<i>Kto kakoj priz polučil?</i> who what prize got
19	<i>Kto sprjatal čto-nibud'?</i> who hid something	<i>Čto kto-nibud' vyigral?</i> what someone won
20	<i>Čto každyj sprjatal?</i> what everyone hid	<i>Kto každyi čto vyigral?</i> what everyone what won

Single-Pair Context		
Speaker	Story 1	Story 2
1	<i>Kto spjatal zdes' čto-to?</i> who hid here something	<i>Kto zdes' vyigral tortik?</i> who here won cake
2	<i>Čto lošadka spjatala?</i> what horse hid	<i>Kto vyigral tortik?</i> who won cake
3	<i>Kto sprjatal odnu veš'?</i> who won one thing	<i>Kto vyigral odnu veš'?</i> who won one thing
4	<i>Čto sprjatala rusaločka?</i> what won mermaid	<i>Kto vyigral odnu veš'?</i> who won one thing
5	<i>Kto čto-to sprjatal?</i> who something hid	<i>Kto vyigral čto-to?</i> who won something
6	<i>Ty mozheš otgadat' etot predmet i you can guess this object and etogo geroja? this character</i>	<i>Kakoj geroj vyigral čto-to i which character won something and kakoj eto byl priz? which it was prize</i>

7	<i>Sprjatala lošadka kubik ili velosiped ili hid horse block or train or tortik? cake</i>	<i>Čto vyigrala princessa: jabločko, tort what won princess apple cake ili parovoz? or train</i>
8	<i>Kto sprjatal? who hid</i>	<i>Kto čto-to vyigral? who something won</i>
9	<i>Kto čto-to sprjatal? who something hid</i>	<i>Kto eto vyigral? who this won</i>
10	<i>Čto zdes' kto-to sprjatal? what here somebody hid</i>	<i>Kto zdes' čto-to vyigral who here something won</i>
11	<i>Kto odin sprjatal? who one hid</i>	<i>Kto vyigral odin? who won one</i>
12	<i>Kto sprjatal i čego sprjatal? who hid and what hid</i>	<i>Čto lev vyigral sebe? what lion won for-himself</i>
13	<i>Kto sprjatal velosiped? who hid bike</i>	<i>Kto zdes' čto-to vyigral who here something won</i>
14	<i>Ty ugadaješ' čto rusaločka you will-guess what mermaid sprjatala? hid</i>	<i>Kto vzjal čto-nibud'? who took something</i>
15	<i>Vot Rusaločka, čto sprjatala now mermaid what hid</i>	<i>Kto vyigral tortik? who won cake</i>
16	<i>Čto zdes' kto-to sprjatal?</i>	<i>Čto ty dumajesh čto lev vyigral? What you think what lion won</i>
17	<i>Kto teper' sprjatal? who now hid</i>	<i>Kto tam vyigral? who there won</i>
18	<i>Čto zdes' kto-to sprjatal? what here someone hid</i>	<i>Kto vyigral priz kakoj-nibid'? who won prize of-some-kind</i>
19	<i>Čto rusaločka sprjatala? what mermaid hid</i>	<i>Čto lev vyigral? What lion won</i>
20	<i>Čto kto-to sprjatal? what someone hid</i>	<i>Kakoj priz kto-to vyigral? Which prize someone hid</i>

TVJ Task: (translation only)

Speaker	Story 1	Story 2
1	No	No
2	Gives jewels (No)	Shakes head (No)
3	Points out mistakes (No)	Points out mistakes
4	Gives 1 coin and 2 jewels	Gives 1 coin and 2 jewels
5	Wrong	Wrong
6	He made mistakes (points out those)	Not exactly, only one is right.
7	Wrong	Points out mistakes.
8	Wrong	No
9	Gives jewels (No)	Points out mistakes
10	You are mistaken	You are wrong again

11	Wrong (and points out mistakes)	No and points out mistakes
12	Gives jewels (No)	No
13	Gives jewels (No)	No
14	No, he said that... points out mistakes	Not exactly, 2 mistakes.
15	Gives jewels (No)	Gives jewels (No)
16	No, not right.	Not right
17	Gives jewels (No)	No.
18	Points out mistakes	No, and points out mistakes
19	Yes	One was Ok, insists on Yes
20	Gives 1 coin and 2 jewels	Gives 1 coin and 2 jewels

D-linking

Elicitation

Pair-List Context		
Speaker	Story 1	Story 2
1	<i>Kakaja čerepaška kakoj frukt kupila?</i> which turtle which fruit bought	<i>Kakaja sobačka našla kakuju ljagušku?</i> which dog found which frog
2	<i>Kakaja čerepaška kupila kakoj frukt?</i> which turtle bought which fruit	<i>Kakaja ljaguška pošla s kakoj sobačkom?</i>
3	<i>Čto ty dymajesh čto čerepaški kupili?</i> what you think what turtles bought	<i>Čto každaja sobačka won?</i> what every dog won
4	<i>Čto čerepaški kupili, kakije frukty?</i> what turtles bought, which fruits	<i>Kakaja sobačka kakuju ljagušku našla?</i> which dog which frog found
5	<i>Kakije čerepaški kakije frukty vybrali?</i> which turtles which fruits chose	<i>Kakije sobački našli kakijx ljagušek?</i> which dogs found which frogs

Single-Pair Context		
Speaker	Story 1	Story 2
1	<i>Kakaja čerepaška kupila kakoj-to frukt?</i> which turtle bought some fruit	<i>Kakaja sobačka i kakaja ljaguška zdes' sidjat?</i> <i>are-sitting</i>
2	<i>Kakoj frukt kakaja čerepaška kupila na bazare?</i> which fruit which turtle bought at market	<i>Kakaja sobačka kakuju ljagušku našla?</i> which dog which frog found
3	<i>Kakaja čerepaška kupila kakoj-to frukt i kakoj eto frukt?</i> which turtle bought some fruit and which it-is fruit	<i>Kakaja sobačka pošla i privela kakuju ljagušku?</i> which dog went and brought which frog
4	<i>Kakaja čerepaška kupila kakoj frukt?</i> which turtle bought which fruit	<i>Kakaja sobačka našla kakuju ljagušku?</i> which dog found which frog
5	<i>Kakoj frukt kupila kakaja čerepaška?</i> which fruit bought which turtle	<i>Kogo našla sobačka i kakaja eto sobačka whom found dog and which it-is dog</i>

TVJ Task (d-linking)

Speaker	Story 1	Story 2
1	No, because he did not guess about 2 turtles.	No, wrong 2 times
2	Yes, and gives coins	Yes, and gives coins
3	On two, he is wrong	(pause) Gives 1 coin and 2 jewels
4	She guesses one (gives one coin, says she'd give more coins if guessed correctly more)	No, he made mistakes.
5	(pause) Gives 1 coin and 2 jewels	Gives 1 coin and 2 jewels

Appendix 3: Russian-speaking adult controls

Elicitation:

Pair-List Context		
Speaker	Story 1	Story 2
1	<i>Kto sprjatal kubik, kto sprjatal tort</i> who hid block who hid cake <i>a kto iz nix sprjatal velosiped?</i> and who out-of them hid bike	<i>Kto kakoj priz polučil?</i> who which prize got
2	<i>Kto kakuju sprjatal veš'?</i> who which hid thing	<i>Kto zdes' čto vyigral?</i> who here what won
3	<i>Kto že vsjo-taki čto sprjatal?</i> who in-the-end what hid	<i>Čto každyj iz nix vyigral?</i> what each of them won
4	<i>Čto každyj sprjatali?</i> what everyone hid	<i>Kto čto vyigral?</i> who what won
5	<i>Kto čto sprjatal?</i> who what hid	<i>Kto kakoj vyigral priz?</i> who which won prize
6	<i>Čto oni sprjatali?</i> what they hid	<i>Kakoj kto polučil priz?</i> which who got prize
7	<i>Kto iz nix kakuju veš' sprjatal?</i> who of them which thing hid	<i>Kto čto vyigral?</i> who what won

Single-Pair Context		
Speaker	Story 1	Story 2
1	<i>Kto sprjatal i čto sprjatal?</i> who hid and what hid	<i>Kto pobedil na sorevnovanijax i čto on vyigral?</i> who won at competition and what he won
2	<i>Kto iz zdes' naxodjaš'ixsja sprjatal veš'?</i> who out-of here present-ones hid thing	<i>Kto kakoj vyigral priz?</i> who which won prize
3	<i>Kto sprjatal tort?</i> who hid cake	<i>Kto vyigral parovoz?</i> who won train

4	<i>Kto ix nix sprjatal čto-to?</i> who out-of them hid something	<i>Kto tut vyigral čto-to i čto on</i> who here won something and what he <i>vyigral?</i> won
5	<i>Kto sprjatal velosiped?</i> who hid bike	<i>Kakoj iz geroev polučil kakoj priz?</i> which out-of characters got which prize
6	<i>Čto tut kto-to vyigral?</i> what here someone won	<i>Kakoj priz zdes' kto-to vyigral i kto</i> Which prize here someone won and who <i>ego vyigral?</i> it won
7	<i>Kto zdes' sprjatal veš'?</i> who here hid thing	<i>Kto vyigral odnu veš'?</i> who won one thing

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