On the syntax of multiple sluicing and what it tells us about *wh*-scope taking

Klaus Abels, UCL

Veneeta Dayal, Yale University

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Abstract

Across many languages multiple sluicing obeys a clause-mate constraint. This can be understood on the empirically well-supported assumption that covert phrasal *wh*-movement is clause-bounded and subject to superiority. We provide independent evidence for syntactic structure at the ellipsis site and for locality constraints on movement operations within the ellipsis site. The fact that the distribution of multiple sluicing is substantially narrower than that of multiple *wh*-questions, on their single-pair as well as their pair-list reading, entails that there must be mechanisms for scoping in-situ *wh*-phrases that do not rely on covert phrasal *wh*-movement. We adopt the choice functional account for single-pair readings. For pair-list readings, we develop a novel functional analysis, argue for the functional basis of pair-list readings, and present a new perspective on pair-list readings of questions with quantifiers.

Keywords: syntax, locality, sluicing, ellipsis, multiple sluicing, syntax-semantics interface, *wh*-scope, covert movement, *wh*-in-situ, multiple *wh*-questions, skolem functions, questions with quantifiers

1 Introduction

Multiple sluicing across many languages obeys a clause-mate condition (CMC): all remnants of multiple sluicing must originate in the same clause. This observation requires an account with cross-linguistic validity. Our approach has three ingredients, each independently supported. (i) Multiple sluicing is a way of making covert phrasal *wh*-movement overt. (ii) Covert phrasal *wh*-movement is clause-bounded. (iii) Covert phrasal *wh*-movement is sensitive to superiority. These three ingredi-

ents together derive a substantially stronger generalization than the CMC: the remnants of multiple sluicing must originate in the highest clause within the ellipsis site. CMC-obeying examples that seem to require cyclic multiple *wh*-movement in the ellipsis site should instead be dealt with in terms of short sources (Barros, Elliott and Thoms 2014) and antecedent-sluice mismatches (D. Rudin 2019).

Clearly, if covert phrasal *wh*-movement is clause-bounded and subject to superiority, there must be additional mechanisms to interpret those *wh*-phrases that cannot reach their scope position at LF. For single pair (SP) readings we adopt Reinhart's (1998) binding-based proposal. For pair-list (PL) readings we extend Engdahl's (1986) account based on skolem functions to structures where one member of the dependency does not undergo movement to the left periphery.

Our syntactic analysis, we believe, improves on earlier work, which largely relied on language-particular properties (such as D. Takahashi's 1994 idea that Japanese *wh*-cluster formation is A-movement or Lasnik's 2014 idea that additional *wh*-phrases in English multiple sluices are extraposed) or on mistaken assumptions about the readings of multiple sluices and multiple questions (Nishigauchi 1998). They are thus inherently incapable of capturing the cross-linguistic pervasiveness of CMC.

Our semantic account builds on earlier proposals but differs in substantive ways, in conception and in execution. It differs from Dayal 1996 in recognizing the possibility of long-distance scope for *wh*-in-situ, from Dayal 2002 in allowing long-distance dependencies for PL as well as SP answers, and from Pesetsky 1987, 2000 in requiring movement-based covert scope taking to be clause-bounded, not just island sensitive. Our semantics for PL readings accords formal status to D-linking in superiority violations, bridging a gap in earlier accounts where empirical recognition of D-linking as a redeeming factor did not lead to a role for it in the explanation.

The first part of the paper deals with the syntax of sluicing. Sections 2 and 3

document the CMC and the assumptions underpinning our account of it. Section 4 defends clause-boundedness and sensitivity to superiority of covert *wh*-movement. The second part deals with the semantic implications of our findings. Section 5 argues for a choice-functional treatment of SP readings. Section 6 proposes an account for PL readings in terms of Skolem functions. Section 7 extends the approach to superiority violating questions and questions with quantifiers, cases where one member of the chain remains inside TP and where D-linking is crucial. Section 8 considers PL dependencies across clauses, posits a constraint on ∃ operators to handle trapping effects and notes a tension between trapping and the *wh*-triangle.

2 The Curious Locality of Multiple Sluicing

Sluicing is a form of clausal ellipsis (Ross 1969). Sluices have the distribution (Levin 1982; Merchant 2001; Ross 1969) and interpretation (Culicover and Jackendoff 2005; Ross 1969) of full *wh*-questions but consiste of a *wh*-phrases only: the word *what* in (1a), the phrase *which* {*one*|*car*} in (1b):

(1) a. I just did something really exciting, but I am not going to tell you what.
b. John bought a car but I don't know which {one|car}.

We adopt the following standard terminology. In (1b) (under a structural analysis like: [John bought [a car]] but I don't know [[which {one|car}] ____]) we refer to *which {one|car}* as the *remnant*. The clause providing the meaning of the elliptical question is the *antecedent*. The indefinite whose identity is queried is the *correlate*. The gap where the remainder of a non-elliptical question would come is the *ellipsis site* (E-site), and the clausal structure containing remnant and ellipsis site the *sluice*. Sluice and remnant differ in category. For theories that assume unpro-

nounced syntactic structure at the E-site, we adopt the term *presluice* (Dayal and Schwarzschild 2010) to refer to the fully pronounced version of that structure. Two plausible presluices for (1b) are: *which car he bought* and *which car it is*.

Ross (1969) not only discovered that sluices have the category, distribution, and interpretation of interrogative clauses, he also discovered three further properties of sluicing that have set the agenda for subsequent research.

First, he noted that correlate and remnant must match in a number of properties, most notably in nominal case (see Abels, 2017; Kidwai, 2018; Levin, 1982; Merchant, 2001; Molimpakis, 2019; Ross, 1969; Vicente, 2015; Wood, Barros and Sigurðsson, 2016 for discussion). This property of *case connectivity*, is often taken as compelling evidence that (i) there is an unpronounced case assigner in the E-site and (ii) that case assigner is identical to the one in the antecedent. These two assumptions lead naturally to a theory where antecedent and E-site are syntactically identical and sluicing is fed by *wh*-movement of the remnant from the E-site.

Ross's second observation is that possible sluicing remnants are canonical occupants of Spec,CP in the sense that sluicing obeys constraints on pied-piping (Abels 2019b; Alshaalan and Abels 2020 for recent discussion). This strengthens the case for a *wh*-move-and-delete theory of sluicing.

However, Ross's third point is that *wh*-movement within the E-site appears to be insensitive to syntactic islands, as shown by (2a), whose presluice under syntactic identity is the complex-NP-constraint-violating example (2b).

(2) a. They want to hire someone who speaks a Balkan language, but I don't know which (Balkan language).

b. *They want to hire someone who speaks a Balkan language, but I don't know which Balkan language they want to hire someone who speaks.

Proponents of syntactic identity face the difficulty of explaining why movement within the E-site is insensitive to island effects (see Boeckx 2008; Hornstein, Lasnik and Uriagereka 2007; Müller 2011). Culicover and Jackendoff, 2005; Ginzburg and Sag, 2000; Levin, 1982 on the other hand account for Ross's third observation by denying the existence of syntactic structure at the E-site and consequently face the problem of explaining case connectivity. The difficulties for both sides are compounded further by the fact that island insensitivity under ellipsis seems to be selective in various ways (Abels 2017, 2019a; Barros 2014; Barros, Elliott and Thoms 2014; Fox and Lasnik 2003; Griffiths and Lipták 2014; Lasnik 2001; Merchant 2008; Reinhart 1991; Winkler 2013).

A perplexing but very robust locality effect comes from the phenomenon at the center of this paper, multiple sluicing, that is, from elliptical questions with more than one *wh*-remnant.[1] The phenomenon of multiple sluicing is found in languages which otherwise have *wh*-in-situ, (3), single *wh*-fronting, (4), and multiple *wh*-fronting, (5) (see already Merchant 2001).

(3) Japanese (from Nishigauchi 1998:121 ex. 1)[2]

John-ga [dareka-ga nanika-o katta to] it-ta. Mary-wa
John-NOM someone-NOM something-ACC bought that said Mary-TOP
[dare-ga nani-o ka] siri-tagat-te iru.
who-NOM what-ACC Q know-want is
'John said someone bought something. Mary wants to know who what.'

(4) German

Jeder Student hat ein Buch gelesen, aber ich weiss nicht mehr
every student has a book read, but I know no longer

welcher welches.

which.M.SG.NOM which.N.SG.ACC

'Every student read a book, but I can't remember which student which book.'

(5) Slovenian (from Marušič and Žaucer 2013:419 ex. 3a)

Vid je rekel, da je Rok predstavil nekomu nekoga, pa ne vem

Vid AUX said that AUX Rok introduce one.DAT one.ACC, but not know

komu koga.

who.DAT who.ACC

'Vid said that Rok introduced someone to someone, but I don't know who to who.'

In these languages, multiple sluicing obeys the following two generalizations:

(6) a. Clause-mate condition on multiple sluicing (CMC): All remnants in multiple sluicing must originate in the same (finite) clause.

b. The clause in which the remnants originate may be inside of an island.

Examples (3)–(5) are acceptable and all obey the CMC, (6a). The following German examples show that multiple sluices may not violate the CMC, (7a), but that the remnants may originate in a clause inside an island, (7b).

(7) a. Fatal CMC violation:

*Vor jedem Vorfall hat ein Student behauptet, dass Maria mit

before each incident had a student claimed that Maria with

einem Professor geredet hatte, aber ich weiss nicht welcher Student
a professor talked had but I know not which student
mit welchem Professor
with which professor
'Before each incident a student claimed that Maria had talked with a professor, but I don't know which student with which professor.'

b. Unproblematic violation of the complex NP constraint:
Ich kenne einen Lehrer, der jedem Kind ein Geschenk gegeben
I know a teacher who every.DAT child a.ACC present given
hat, aber ich weiss nicht genau welchem Kind welches Geschenk.
has but I know not exactly which.DAT child which.ACC present.
'I know a teacher who gave a present to each child, but I can't remember which present to which child.'

The CMC is the main syntactic fact to be treated in this paper. It holds across a very broad range of languages. We have already shown that it applies to German, but the same is true for Japanese (D. Takahashi, 1994:285–287; Nishigauchi, 1998; Abe, 2015:chapter 6, and below), Slovenian (Marušič and Žaucer 2013). It also holds in Dutch (A. Neeleman, p.c.), English (Lasnik 2014), Brazilian Portuguese (Rodrigues, Nevins and Vicente 2009), Spanish (Rodrigues, Nevins and Vicente 2009), Italian (E. Callegari, p.c., who argues in Callegari 2015 that Italian does allow multiple questions, contra Calabrese 1984, but only in embedded contexts), Lithuanian (Adliene 2014), Bangla (Bhattacharya and Simpson 2012), Hindi, Greek (E. Molimpakis, A. Vergou, C. Vlachos, p.c.), Czech (J. Kaspar, I. Kucerova, P. Caha, p.c.), Norwegian (Ø. Nilsen, p.c.), Polish (D. Grabska, M. Dedan, p.c.), Russian (N. Slioussar, p.c.), Kîîtharaka (P. Muriungi, p.c.), Bulgarian (A. Koumbarou,

p.c.), Hungarian (K. Szendrői, B. Szendrői, p.c.), and Turkish (S. Şener, p.c.).

A few caveats are in order. Lasnik, 2014 notes that in Serbo-Croatian the CMC fails to hold for just those speakers for whom it also fails to hold under regular multiple *wh*-fronting. This suggests that overt multiple *wh*-movement can overcome the restriction that gives rise to the CMC. We argue below that the CMC arises as a consequence of constraints on covert rather than overt movement, which explains Lasnik's observation. Similarly, Comorovski (1986:175 ex. 10) and C. Rudin (1988b:452 ex. 10) report that in Romanian multiple *wh*-questions, the *wh*-phrases can originate in different clauses. Indeed, Buciuleac 2019 reports that her consultants accept violations of the CMC in full multiple questions and multiple sluices to a comparable degree.[3] This line of reasoning suggests that whenever overt multiple *wh*-fronting can overcome the CMC, multiple sluicing should be able to as well.[4] Bhattacharya and Simpson 2012:194 fn. 9 ex. ii, similarly, observe that overt long movement of the correlate can overcome the CMC in Bangla, suggesting that in Bangla, this type of overt long movement feeds covert phrasal *wh*-movement. These are descriptive counterexamples but unproblematic for the theory.

More troublingly, Nishigauchi (1998:133–34 ex. 34) noticed a counterexample to the CMC in Japanese: if a quantifier in the matrix clause binds the subject in the embedded clause, resulting in the bound subject pronoun and the *wh*-phrase being clause-mates, then multiple sluicing becomes possible across clauses. Nishigauchi's counterexample to the CMC is quite systematic and we will return to it after introducing our assumptions about island amelioration. Here we note that the pattern can be reproduced in other languages including English (below), German, Hungarian (K. Szendrői, p.c.), Norwegian (Ø. Nilsen, p.c.), Italian (N. Grillo, p.c.), Czech (P. Caha, I. Kučerova, p.c.), and Turkish (S Şener, p.c.):

(8) a. *Everybody claimed that Fred had talked to some professor, but I can't remember who to which professor.

b. Everybody$_k$ claimed that they$_k$ had talked to some professor, but I can't remember who to which professor.

We are aware of only one true counterexample to the CMC: Sato (CamCoS 5, May 06 2016) claims that in Indonesian multiple sulicing, the *wh*-phrases can be separated not only by clause boundaries but even by islands and that either or both *wh*-phrases can strand prepositions. We have no insight to offer on Indonesian.

As noted above, the CMC cannot easily be reconciled with nonsyntactic approaches to sluicing. Under such accounts, single sluicing may violate island constraints, because there is no structure at the E-site. To interpret a sluice, a suitable interpretation must be found. No more, no less. For multiple sluicing, this generally produces well-formed interpretations whether or not the remnants are clausemates. (9a) is a well-formed multiple question with a PL reading. The *wh*-phrases are separated by an island. The corresponding multiple sluice, (9b), is unacceptable; it violates the CMC.

(9) Jeder dieser Philosophen wird sich ärgern, wenn wir einen bestimmten
Every these philosophers will self annoy if we one particular
Linguisten einladen, aber ich weiss nicht,
linguist invite but I know not
'Every one of these philosophers will be annoyed if we invite a particular linguist but I don't know'

a. … welcher Philosoph sich ärgern wird, wenn wir welchen Linguisten
which philosopher self anger will if we which linguist

einladen.

invite

'…which philosopher will be annoyed if we invite which linguist.'

b. *… welcher (Philosoph) welchen (Linguisten)

which philosopher which linguist

'…which (philosopher) which (linguist)'

This problem for nonsyntactic approaches is not an argument for syntactic identity accounts, however. The latter are based on the premise that, ceteris paribus, movement within the E-site is free from locality constraints. Such models therefore have little leeway to impose the CMC (or other locality conditions).

Note in this context the following example due to an anonymous reviewer:

(10) *Every guide spoke to the tourists from some country, but I'm not sure which guide from which country.

The example is deviant, presumably because the PP cannot be extracted from the object. Again, this creates problems for the idea that ellipsis repairs islands.

Instead of assuming that ellipsis repairs islands, we follow the island evasion proposal from Barros, Elliott and Thoms 2014 (see also Abels, 2017, 2019a; Baker and Brame, 1972; Barros, 2014; Merchant, 2001), which is based on the assumption that there is syntactic structure at the E-site, but the identity condition on ellipsis is semantic, along the lines of Merchant's (2001) E-givenness. Roughly, E-givenness demands that modulo the effects of movement from the E-site and the effects of focus, the E-site must entail and be entailed by the antecedent.[5] Island violations can then be evaded by choosing an appropriate paraphrase as the presluice. Thus,

the presluice for (2a) is not the ungrammatical (2b) but one of (11).[6]

(11) Possible presluices for (2a):

a. …which Balkan language they should speak.

b. …which Balkan language it is.

Similarly for the multiple sluicing examples above where the remnants originate inside of an island. We suggest that the presluice for (7b) is (12).

(12) … welchem Kind er welches Geschenk gegeben hat
which.DAT child he which.ACC present given has
'…which present he gave to which child'

The island evasion approach assumes that constraints on movement are operative at the E-site, an assumption that will play a crucial role in our account of the CMC, while allowing island insensitivity when a suitable paraphrase of the antecedent is available as presluice.

We will invoke nonidentical paraphrases in the E-site for two additional kinds of cases. We hinted above that the CMC will be reduced to the clause-boundedness of covert phrasal movement. This will entail that even in bridge contexts the two *wh*-phrases have to originate in the highest clause of the presluice. Thus, for an example like the following (from Lasnik 2014:12 ex. 58), we follow Lasnik (2014) and Park (2014) in postulating a short source along the lines of (14a) instead of the long source in (14b), which would require cyclic covert movement of *which girl*.

(13) Fred thinks that a certain boy talked to a certain girl.
I wish I could remember which boy to which girl.

(14) Lasnik 2014:12 ex. 60

a. I wish I could remember which boy talked to which girl.

b. I wish I could remember which boy Fred thinks talked to which girl.

Of course, paraphrasing in the E-site must be constrained (Abels 2019a). We tentatively adopt D. Rudin's 2019 approach here in addition to E-givenness. Rudin proposes that the thematic kernel of a clause is subject to syntactic identity under ellipsis. His proposal ensures that in the general case violations of the clausemate condition have no licit paraphrase in the E-site since that paraphrase can be identical neither to the thematic kernel of the higher clause nor to that of the lower clause.[7]

Finally, we also invoke nonidentical paraphrases in the E-site – at least as one option – for Nishigauchi's counterexample ((8b) above, repeated below as (15a)). Notice that since the embedded subject is bound by the matrix quantifier, a short presluice along the lines of (15b) becomes available in addition to the fully isomorphic presluice (15c), which would require successive cyclic movement of the embedded *wh*-phrase. This is possible, because the two *wh*-phrases are coarguments within the lower clause and thus comply with D. Rudin's 2019 identity condition.[8]

(15) a. Everybody$_k$ claimed that they$_k$ had talked to some professor, but I can't remember who to which professor.

b. …but I can't remember who had (purportedly) talked to which professor

c. …but I can't remember who$_k$ claimed that they$_k$ had talked to which professor

We thank a reviewer for offering the following example to demonstrate that the

short source (16a) is indeed available and produces the required reading unlike the full source (16b). The long parse in (16b) is ruled out presumably because the semantics of the E-site is incongruent to the semantics of the antecedent.[9]

(16) Everyone claimed that their mother had talked to some professor, but I can't remember whose mother to which professor.

a. …whose mother (purportedly) had talked to which professor

b. …whose mother everyone claimed had talked to which professor.

Another straightforward argument for the availability of short sources comes from Turkish examples like (17) (Ince 2012:262 ex. 44), whose crucial properties replicate in a PL setting with singular *which*-phrases (S. Şener, p.c.).

(17) Ahmet biri-nin biryer-e git-tiğ-i-ni söyle-di-∅,
Ahmet-NOM one-GEN one.place-DAT go-COMP-POSS.3SG-ACC tell-PST-3SG
ama kim-∅ nere-ye hatırla-mı-yor-um.
but who-NOM where-DAT remember-NEG-PROG-1SG
'Ahmet said that someone went somewhere, but I don't remember who where.'

Turkish embedded clauses, due to their nominalized nature, feature subjects in the genitive. This is illustrated in the antecedent in (17). The *wh*-subject in the multiple sluice, however, may and indeed must surface in the nominative, characteristic of matrix subjects. Thus Turkish furnishes direct evidence that the short source is not only available but that it is the only viable source.[10]

This section introduced the phenomenon of multiple sluicing and its two most important, cross-linguistically stable properties: CMC and island insensitivity. We

adopted the island evasion approach to explain (apparent) island insensitivity. The next section addresses the CMC.

3 The Account of the CMC

We are positing the presence of syntactic structure subject to normal constraints at the E-site. We account for the existence of multiple sluicing and for the CMC by further assuming that (i) movement of additional *wh*-phrases represents a normal syntactic movement operation and (ii) movement of additional *wh*-phrases is clause-bounded. It will turn out that this movement also has to obey superiority. In other words, we postulate a clause-bounded movement operation affecting additional *wh*-phrases. We will refer to this movement as covert phrasal *wh*-movement. In the following paragraphs, we give substance to our account of the CMC.

Before deriving the CMC on multiple sluicing, we need to address the question of how multiple sluicing is possible in the first place. The assumptions we have introduced so far lead us to assuming the following schematic structure for grammatical instances of multiple sluicing, where wh_1 and wh_2 originate in the same clause.

Wh_1 has undergone overt *wh*-movement. English being a single *wh*-fronting language, the movement of wh_2 – when and if it happens – is usually covert. Covert *wh*-movement targets a position in the left periphery outside of the E-site. Overt movement is marked by a solid arrow below; covert movement by a dashed arrow.

(18) [Wh$_1$ [Wh$_2$ [$_{\text{E-site}}$ …Wh$_1$ […Wh$_2$…]]]]

If movement of wh_2 is usually covert, how can it become overt under sluicing? Under a single cycle model of syntax with a copy or multidominance view of phrasal movement, this is straightforward: A chain pronunciation algorithm makes sure

that for overt movement the highest copy will be pronounced and for covert movement — the lowest available one (see Gärtner 2002). We assume that the early minimalist distinction between strong and weak features is representationally realized so that Gärtner's algorithm simply states: In any chain, pronounce the highest strong position; failing that, pronounce the lowest weak position. Treating ellipsis as PF nonpronunciation, realising an element covertly moved out of the E-site becomes the expected outcome; this is the lowest copy that remains after ellipsis.[11] Indeed, Johnson 2001 suggests that pseudogapping is VP ellipsis fed by scrambling, an operation which is usually covert in English (though see Lasnik 2005 for a very different approach). Popular though this general line of thinking is (see Gribanova and Manetta 2016; Manetta 2013; Ortega-Santos, Yoshida and Nakao 2014; Park 2014; Richards 1997, 2001), it predicts that covert movement can become overt in many more cases than it actually does. For example, we would expect QR out of an elided VP to become overt and that VP ellipsis, like sluicing, should lead to high pronunciation of in-situ *wh*-phrases. Both expectations are thwarted.

While high pronunciation of covert movement under ellipsis is expected in a single-cycle model, we need to avoid overgeneration. The interaction of *wh*-movement with sluicing on the one hand and with VP ellipsis on the other hand, (19a vs. b), shows that high pronunciation is not licensed by an inherent property[12] of the moving element alone, otherwise *wh*-chains should be realized high both under VP ellipsis and under sluicing. Exceptionally high pronunciation seems to be quite a limited phenomenon, possibly restricted to chains whose head occupies the specifier of the ellipsis licensor and is attracted by it.

(19) a. Every student talked to some professor, but I don't know which student to which professor.

b. *Every student talked to some professor, but I don't know which student to which professor did.[13]

We have no further insight into which covert movements can or cannot become overt under ellipsis and under what further conditions. On our view, movement of additional *wh*-phrases in multiple sluicing is neither PF movement (cf. Weir 2014 for fragments) nor exceptional overt movement (cf. Shen 2018 for fragments), but covert phrasal movement made overt by ellipsis. The effect of high pronunciation under ellipsis, though the default expectation for all movement chains under a single cycle model of syntax, may be restricted to chains whose head occupies a specifier position of the ellipsis licensor. We now turn to CMC and multiple sluicing.

Structure (20) represents two derivations for a multiple sluice violating CMC (where CP signifies the boundary of a tensed clause). Both derivations are straightforwardly ruled out. By assumption covert phrasal *wh*-movement is clause-bounded. Yet, both derivations violate clause-boundedness either in the form of successive cyclic movement or in the form of long one-fell-swoop movement.

(20) a. [Wh_1 [Wh_2 [$_{\text{E-site}}$ …Wh_1 …[$_{\text{CP}}$ …Wh_2 …]]]]

*long covert *wh*-movement

b. [Wh_1 [Wh_2 [$_{\text{E-site}}$ …Wh_1 …[$_{\text{CP}}$ Wh_2 […Wh_2 …]]]]]

*cyclic covert *wh*-movement

The more challenging structure to rule out is the one in (21). Here, overt *wh*-movement has been cyclic and covert *wh*-movement short.

(21) [Wh_2 [Wh_1 [$_{\text{E-site}}$ …Wh_1 …[$_{\text{CP}}$ Wh_2 […Wh_2 …]]]]]

Nothing so far rules out structure (21). Indeed, as far as we know, all recent work on the CMC has overlooked the necessity to rule out (21). For example, Lasnik (2014) attempts to capture the CMC simply by assuming that movement of the second *wh*-phrase is clause-bounded. Specifically, he treats movement of the second *wh*-phrase as extraposition, subject to clause-boundedness (right roof constraint). While he thus manages to correctly capture that the analogues of (20) are ungrammatical, he fails to address derivations analogous to (21). That is, Lasnik's theory incorrectly predicts that (22a)-(22b) are well-formed on the analysis in (22c):

(22) a. ?*In each instance, Fred said to someone that Sally bought a book, but I don't know which book to whom.

b. *In each instance, Fred said that Sally bought a book, but I don't know which book to whom.

c. …which book <Fred said t_{PP} [$_{CP}$ that Sally bought t_{DP}]> to whom

The same trouble affects Ortega-Santos, Yoshida and Nakao's (2014:78–79) attempt at deriving the CMC on *wh*-stripping and Park's (2014) approach to CMCs in ellipsis with multiple remnants more generally.[14] Imposing clause-boundedness on the second movement operation is not sufficient to account for the CMC.

Two main properties distinguish the licit (21) from the illicit (18): overt *wh*-movement is cyclic in (21) and short in (18); in (18), covert *wh*-movement crosses the trace of overt *wh*-movement, while the opposite holds in (21). Successive cyclic overt *wh*-movement must, of course, be allowed. But the crossing of one *wh*-phrase over another in (21) creates the configuration of a superiority violation. We conjecture that it is this configuration which is responsible for the ill-formedness of (21). To rule out (21), we adopt the following additional constraint from Pesetsky 2000:

(23) The in-situ *wh*-phrase in superiority violating questions does not undergo covert phrasal *wh*-movement.

Pesetsky's constraint is a crucial conceptual addition to accounts like Lasnik's, Ortega-Santos, Yoshida and Nakao's, and Park's, as it regulates the interaction between movements rather than just imposing a locality constraint on the second movement. A simple locality constraint that fails to target movement interactions is too weak to rule out (21) and thus too weak to capture the CMC.

Not all languages obey superiority equally in nonelliptical multiple questions (see e.g. Featherston 2005a,b on German versus English). One might wonder, then, if superiority is the right constraint to capture the cross-linguistic prevalence of the CMC. While there is substantial variation in the acceptability of examples like (24a), with two *wh*-phrases originating in the same clause, the judgements are quite stable cross-linguistically for *wh*-phrases not originating as clause mates, (24b).

(24) a. *Who did who see?

b. *Who does who believe that John saw?

As noted, there is variation on (24a) with English disallowing it but German, Spanish (Bošković 1997:243 ex. 23–24), and Dutch (Bošković 1997:247 fn. 28, crediting M. den Dikken) allowing it – though our Dutch informants do report a degradation in examples like (24a). There is much less variation concerning (24b): neither English, nor German (Bošković 1997; Büring and Hartmann 1994; Grewendorf 2001), nor Spanish (Bošković 1997:243 ex. 23–24), nor Dutch (Bošković 1997:247 fn. 28, crediting M. den Dikken) allow it. The German pattern is illustrated here:

(25) Grewendorf 2001:112 ex. 29

a. *Wen$_i$ glaubt wer, dass Hans t$_i$ gesehen hat?
who believes who that Hans seen has

b. Wer glaubt, dass Hans wen gesehen hat?
who believes that Hans who seen has
'Who believes that Hans has seen who?'

Structure (21), which we intend to target with (23), is the cross-linguistically stable case of superiority, (24b).[15]

To be concrete, we will assume following Pesetsky, 2000 that *wh*-movement is subject to attract closest. As a consequence, the highest *wh*-phrase moves first. Further *wh*-phrases, if they move (covertly in languages like English, overtly in multiple *wh*-fronting languages), tuck in below the first *wh*-phrase. This set of assumptions derives that all *wh*-movement must obey superiority. Exceptions to superiority are derived by first scrambling the D-linked *wh*-phrase past the superior one and then *wh*-moving the scrambled phrase in accordance with attract closest. Under the well-founded assumption that so-called A-scrambling is clause-bounded and feeds *wh*-movement (while A'-scrambling is not clause-bounded and does not feed *wh*-movement, see Wiltschko, 1998 for the original proposal and Abels, 2015 for a recent overview and references), we have an immediate explanation for the asymmetry between short distance and long distance superiority. Given the discourse driven nature of scrambling, this also allows us to understand why superiority violations require D-linking: only those *wh*-phrases that are D-linked are allowed to scramble (see section 6 for further discussion). In English scrambling is, of course, usually not realized overtly while in German it is. Under the single cycle model of syntax assumed here, this means that the head of a scrambling chain in English is

in a weak position while in German it is in a strong position. As a result, the consequence of scrambling becomes visible in English only if scrambling feeds a further movement step whose chain is headed by a strong position. *Wh*-movement provides just the right derivational context. We thus reformulate (23) as (26), completing our derivation of the CMC on multiple sluicing:[16]

(26) No *wh*-phrase that has been crossed by covert[17] scrambling may undergo *wh*-movement.

We have given an account of the CMC that crucially relies on additional *wh*-phrases undergoing clause-bounded movement sensitive to superiority. We have called this movement covert *wh*-movement. One justification for the claim that this is *wh*-movement comes from the fact that the landing site of the movement shares a landing site above C and outside of the E-site (TP) with overt *wh*-movement.

However, as stressed by an anonymous reviewer, a range of ellipsis phenomena with multiple remnants share the CMC with multiple sluicing. Gapping, pseudo-gapping, and mutltiple fragments all have been analyzed as elliptical structures and all are subject to the CMC. This might suggest that there is a kind of movement (ellipsis enabling movement) which is clause-bounded and subject to superiority and which enables ellipsis with multiple fragments. This movement could then be overt but would make the later application of ellipsis obligatory.

While our account of multiple sluicing does not capture the generalization across ellipses with multiple remnants directly, postulating an ellipsis-specific movement process is theoretically disfavored compared to the reductive strategy of capturing the CMC in terms of independently necessary and characterizable processes. Section 4 provides independent evidence that covert *wh*-movement has the properties

that give rise to the CMC: clause-boundedness and superiority. Since *wh*-scope taking more generally does not share these properties, sections 5–8 are animated by the distinction between (covert) *wh*-movement and *wh*-scope taking.

Assuming that the logic here is sound, one might wonder about the theoretical merits of endowing covert and overt *wh*-movement with different properties. After all, Pesetsky 1987 rightly criticized Huang 1982 for positing such an asymmetry. The point is well taken, but the weight of the evidence regarding covert *wh*-movement reviewed in section 4 suggests that a distinction between overt and covert movement is necessary on empirical grounds.

We are then faced instead with a learnability question: How can the clause-boundedness of covert movement and the distinction between overt and covert movement be acquired? We conjecture that clause-boundedness is the default and is given up by learners only in the face of triggering experience. For overt movement, clear evidence is readily available in the form of long-distance filler-gap dependencies, but for covert movement there is no clear evidence and the parameter retains its default setting. Indeed, Yamane (2003) found that Japanese beginning learners of English who had been exposed only to short distance *wh*-movement in English failed to generalize the movement strategy to long-distance *wh*-movement and instead spontaneously produced *wh*-scope marking structures; this finding supports the view that clause-boundedness is the default and cyclic movement the marked parameter setting. If this conjecture is correct, then the clause-boundedness of various multiple ellipses may find a unified explanation after all.

4 On the Properties of Covert *Wh*-movement

In the previous section we relied crucially on the following two properties of covert *wh*-movement: covert *wh*-movement is (i) subject to superiority and (ii) is clause-bounded. Here we summarize independent evidence that (i) and (ii) hold.

4.1 On Superiority

Pesetsky 2000 was the first to point out that that covert phrasal *wh*-movement is subject to superiority. He offers two pieces of evidence: Antecedent Contained Deletion (ACD) and intervention effects.

Regarding the first, he shows that an in-situ *wh*-phrase may license ACD only if it is not in a superiority violating configuration. The *wh*-phrase in situ in (27a) has not been crossed by overt *wh*-movement and it can license ACD.

(27) Pesetsky 2000:30

a. I need to know which girl ____ ordered [which boy that Mary (also) did Δ] to congratulate Sarah.

b. I need to know for which girl x and for which boy y such that Mary ordered y to congratulate Sarah], x also ordered y to congratulate Sarah. [i.e., I need to know the girl-boy pairs such that both the girl and Mary ordered the boy to congratulate Sarah]

In (28a) by contrast, the in-situ *wh*-phrase has been crossed by overt *wh*-movement; it cannot license ACD, which makes the example overall unacceptable.

(28) Pesetsky 2000:31

a. *I need to know which girl Sue ordered [which boy that Mary (also) did

Δ] to congratulate _____.

b. I need to know for which girl x and [which boy y such that Mary ordered y to congratulate x], Sue also ordered y to congratulate x. [i.e., I need to know the girl-boy pairs such that both Sue and Mary ordered the boy to congratulate the girl]

Pesetsky explains this pattern as follows: There are several paths to an appropriate question interpretation. The first relies on covert phrasal movement of the the entire in-situ *wh*-phrase. This movement is subject to superiority and therefore fails when the *wh*-phrase has been crossed. Phrasal movement licensing ACD is thus possible in (27a) but impossible in (28a). This explains the contrast. The second path to PL interpretations, according to him, relies on feature movement. Feature movement is not subject to superiority but it cannot license ACD.[18]

Pesetsky's second argument for covert phrasal *wh*-movement's sensitivity to superiority rests on intervention effects. While it is still not clear what exactly intervention effects diagnose (see Beck 1996, 2006; Grohmann 2006; Kotek 2014; Mathieu 2002; Mayr 2014; Pesetsky 2000; Tomioka 2007), Pesetsky suggests that they again track the phrasal vs. featural movement distinction. He observes that in superiority obeying configurations like (29a)–(29c) both SP and PL interpretations are accessible but in superiority violating ones like (29d)–(29f), the PL reading disappears in case there is an intervener along the path between the crossed *wh*-phrase and its scope: (29f). This leads to the claim that *wh*-phrases are subject to intervention in case three things come together: The *wh*-phrase is in situ, has been crossed by overt *wh*-movement, and needs to support a PL interpretation.

(29) Based on Pesetsky 2000:60

Superiority obeying configuration (no crossing)

a.	Which person read which book?	SP | PL
b.	Which person did not read which book?	SP | PL
c.	Which person didn't read which book?	SP | PL

Superiority violating configuration (crossing)

d.	Which book did which person read?	SP | PL
e.	Which book did which person not read?	SP | PL
f.	Which book didn't which person read?	SP | *PL

The pattern is explained again by assuming that there are two paths to PL readings. As the first relies on covert phrasal movement subject to superiority, it is possible when the in-situ phrase has not been crossed overtly, (29a–c), but fails when the in-situ *wh*-phrase has been crossed overtly, (29d–f). Feature movement is not subject to superiority but it is subject to intervention. This explains why a PL reading is blocked in (29f), where both superiority and intervention act together.

These are the two arguments Pesetsky gives for the view that covert phrasal movement is subject to superiority.

4.2 On Clause-Boundedness

Extending the ACD diagnostic, we can ask whether the capacity of an in situ *wh*-phrases to license ACD is clause-bounded. Baltin (1987:583), based on the judgment that (30) can mean (30a) but not (30b), claimed that it is. Baltin took these data as problematic for the idea that ACD is licensed under LF movement on the further assumption that *wh*-phrases may or must move to their scope position at LF. We agree. (30) suggests that covert phrasal *wh*-movement cannot reach the

matrix CP. Culicover and Rochemont (1990:44 ex. 53) and Elliott (2015) independently reach the same conclusion.

(30) Who thought that Fred read how many of the books that Bill did?

a. Who thought that Fred read how many of the books that Bill read?

b. Who thought that Fred read how many of the books that Bill thought that he had read?

K. Syrett (p.c.) suggests that unambiguous examples are a better test.

(31) Which of these boys is surprised that Mary likes which teacher that Sally also {does | is} Δ?

Does forces embedded ACD resolution (Δ=like t); *is* forces long construal (Δ=surprised that Mary likes t). The speakers we asked found the version with *is* ungrammatical, in line with Baltin's, Culicover & Rochemont's, and Elliott's judgments.

However, Cecchetto 2004; Fox 2002; Wilder 1997; Wurmbrand 2018 discussing the question of whether QR, a different covert movement operation, which should have a similar profile to covert wh-movement given the learnability considerations above, is clause-bounded, conclude that it is not on the basis of examples like *John said that you were on every committee that Bill did <say you were on>* (Wilder 1997:435). As pointed out by an anonymous reviewer, similar examples can be constructed for multiple *wh*-questions: *Which linguist thinks that I'm on which committee that you also do?* The example is at worst mildly deviant.

Even though, these examples show that the movement operation that licenses ACD is not literally clause-bounded, Wilder (1997:435) offers the following to show that the object quantifier, while it can end up in the matrix clause, cannot take

scope over the matrix subject: *Someone said that you were on every committee that Bill did <say you were on>*, which lacks the $*\forall > \exists$ reading.

We would like to thank the reviewer for pointing out the importance of Wilder's observation for our account. Even if covert *wh*-movement can escape into the matrix clause, it may still (like QR) be unable to pass the matrix subject and thus be unable to reach the matrix Spec,CP. This is all our account needs to go through.[19]

A second argument for clause-boundedness of covert *wh*-movement comes from trapped lists (see Cheng and Demirdache 2010; Raţiu 2011). To understand trapped lists, we need to consider questions with at least three *wh*-phrases. Triple questions can be answered by lists of triples, by single triples, but also by partial lists in which a single individual is paired with a list of the other two terms. This last option is illustrated by the three answers in (32).

(32) Which parent gave which child which toy?

a. Anna gave Ken a train, Leo a car, and Martin a kite.

b. Anna gave Ken a train, Bill gave Ken a car, and Charles gave Ken a kite.

c. Anna gave Ken a train, Bill gave Leo a train, and Charles gave Martin a train.

Cheng and Demirdache, 2010 discuss an observation due to Raţiu 2011: Only clause-mate *wh*-phrases can form a pair in such an individual+PL structure, though they may be separated from the fixed individual even by an island boundary. This is schematized in (33), where only wh_2 and wh_3 can form a list to the exclusion of wh_1. List formation is 'trapped' inside the CP/island, (33). The claim is illustrated in (34) with a triple question where one *wh*-phrase is in the main clause and two

are embedded in a finite CP. Of the three answers listed, only (34a) is available:

(33) [wh_1 …[$_{\{\text{CP}|\text{island}\}}$ …wh_2 …wh_3] …]

(34) Which guest$_1$ promised that he would give which toy$_2$ to which child$_3$?

a. Bill promised that he would give the plane to Sybren and the train to Amina.

b. #Bill promised that he would give the plane to Amina and Mary promised that she would give the train to Amina.

c. #Bill promised that he would give the plane to Sybren and Mary promised that she would give the plane to Amina.

Clearly, a clause-bounded mechanism of covert *wh*-movement provides an important hook into understanding this pattern (see Dayal 2016 and section 8 for discussion).

Finally we return, with some hesitation the reasons for which will become clear in sections 5.3, 6.1 and footnote 32, to intervention effects. Kotek 2014, 2016; Kotek and Erlewine 2016 observe that Pesetsky's (2000) logic implies that an intervener along the path of covert *wh*-movement in superiority obeying structures can act as a probe for the locality of covert *wh*-movement, because covert phrasal *wh*-movement is not subject to intervention. Kotek 2016 deploys this diagnostic to demonstrate that covert phrasal *wh*-movement is island sensitive (see already Pesetsky 1987). She contrasts sentences with high and low negation in structures schematically like (35). The logic is the following: If covert *wh*-movement is island sensitive, negation outside the island should block a PL interpretation even in superiority obeying structures. Negation inside the island should not have this effect. Kotek 2016 shows that covert *wh*-movement is island sensitive according to this test.

(35) a. [Wh_1 [Wh_2 [...[Wh_1 ...[...[$_{\text{island}}$ Wh_2 [...$\text{negation}_{\text{low}}$ [...Wh_2 ...]]]]]]]]

*long covert *wh*-movement

b. [Wh_1 [Wh_2 [...[Wh_1 ...[$\text{negation}_{\text{high}}$ ...[$_{\text{island}}$ Wh_2 [...Wh_2 ...]]]]]]]

*long covert *wh*-movement

One can also evaluate whether covert phrasal *wh*-movement is clause-bounded by simply replacing the island boundary in (35) with a CP in a bridge context. If covert phrasal *wh*-movement is clause-bounded, then high (non clause-mate) negation and other interveners will suppress PL readings but low (clause-mate) negation will not. The closest Kotek comes to this structure is example (36), which features a weak island created by the manner of speaking verb. In (36) and (37), the asterisk indicates the lack of a PL reading.

(36) a. *Which protester didn't shout [that we invited which politician]?

b. Which protester shouted [that we didn't invite which politician]?

Bridge contexts seem to conform to our expectations. Consider the following example in a context where there are two newspapers (say the New York Times and the Washington Post) and two candidates (Joe Biden and Bernie Sanders). The asterisk again indicates the absence of a pair list reading.

(37) a. Which newspaper reported that Obama would only support which candidate?

b. *Which newspaper only reported that Obama would support which candidate?

The fact that the PL reading is absent just in case the intervener is in the higher

clause points to the clause-boundedness of covert *wh*- movement.

We have reviewed Pesetsky's two arguments for the superiority sensitivity of covert phrasal *wh*-movement and provided three arguments for its clause-boundedness. Clause-boundedness and superiority sensitivity of covert movement were crucial in our account of the CMC on multiple sluicing. The assumptions find independent support in the interpretive asymmetries discussed throughout this section.

Note that we are not attempting to give a theoretical deduction of the posited constraints of clause-boundedness and superiority sensitivity here. It suffices for our purpose to show that these are operative constraints. In the next sections we draw out semantic consequences of these syntactic conclusions.

5 Single-pair Readings via Choice Functions

We have seen that multiple sluicing is possible in *wh*-in-situ, single *wh*-fronting and multiple *wh*-fronting languages. It is not possible across clauses or in superiority violating simple clauses. On the view that sluicing involves ellipsis of material below $C_{[+WH]}$, we conclude from these empirical generalizations that (a) sluicing requires overt or covert *wh*-movement to a position above $C_{[+WH]}$, (b) covert *wh*-movement is not only island-sensitive but also clause-bounded and (c) superiority violating structures leave at least one *wh*-phrase in a position below $C_{[+WH]}$.

Licit multiple sluicing structures, that is structures that involve overt or covert *wh*-movement, are semantically straightforward as long as a theory of SP and PL answers compatible with *wh*-movement is adopted. It is the presluices of *illicit* sluicing structures that have interesting theoretical implications, because they establish the availability of SP and PL readings, even without all *wh*-expressions moving to the same C.

This section introduces three basic scope taking mechanisms currently used to interpret multiple *wh*-questions, shows how SP readings can be derived without movement, discusses an existing non-movement proposal for such readings, and shows that it cannot be adopted for SP readings of multiple sluices. PL answers are discussed in subsequent sections.

5.1 Mechanisms for Scope Taking

There exist at present at least three distinct semantic mechanisms for *wh*-scope taking: *wh*-phrases as alternative generating expressions (Hamblin 1973), *wh*-phrases as existential generalized quantifiers (Karttunen 1977), and *wh*-phrases as existentially bound choice functions (Reinhart 1997, 1998). We illustrate the three mechanisms using (38) as our example. The solid arrow represents overt movement. The dashed line represents covert scope taking with or without (covert) movement.[20]

(38) [Which student$_1$ [<which topic>$_2$ [C$_{+wh}$ [$_{\text{TP}}$ <which student>$_1$ published on which topic$_2$]]]]

a. λp $\exists$x $\exists$y [student(x) $\wedge$ topic(y) $\wedge$ p = $\hat{}$x has published on y]

b. λp $\exists$x $\exists$f [student(x) $\wedge$ CF(f) $\wedge$ p = $\hat{}$x has published on f(topic)]

c. {$\hat{}$x has published on y: x $\in$ student $\wedge$ y $\in$ topic}

There are three syntactic positions relevant for interpretation: the innermost TP, which forms the question nucleus, C$_{+wh}$, which is the locus for the shift from declarative to interrogative meaning, and a position for fronted *wh*-phrases to its left. If *which topic* moves covertly, both *wh*-phrases can be interpreted as existential generalized quantifiers, as shown in (38a). If *which topic* is left in situ and interpreted with a choice function variable, $\exists$-bound from outside C$_{+wh}$, we get (38b), where

CF is the set of choice functions from sets of individuals to individuals <<e,t>,e>. If *wh*-expressions are treated as foci, we get (38c).

The final denotation is the same in each case: with two students and two topics, the set has four propositions, as in (39a).The answerhood operator in (39b), from Dayal 1996, picks out the unique proposition in the set which is true at the world of evaluation. It is undefined if there is no true proposition or if there is more than one true proposition. This derives SP answers such as *Sue has published on NPI*.[21]

(39) a. { ^John has published on NPI,^John has published on FCI,
^Sue has published on NPI,^Sue has published on FCI}

b. Ans-D(Q)(w) = ιp [p $\in$ Q $\wedge$ p(w)]

Of course, multiple *wh*-questions have PL readings as well, which we will tackle in the sections to follow. For now, we simply note that sluicing, because it provides an explicit antecedent, disambiguates between the two readings. In (40a) the antecedent forces the multiple sluice in (40c) and its presluice in (40d) to have the SP reading. In (40b) the antecedent sets up a distributive context and forces the identical sluice and presluice in (40c)-(40d) to have PL readings: [22] [23]

(40) a. Some student has published on some topic, but I couldn't tell you

b. Every student has published on some topic, but I couldn't tell you

c. …which student on which topic.

d. … which student has published on which topic.

e. …[$_{CP}$ which student$_1$ [$_{CP}$ on which topic$_2$ ~~[$_{TP}$ t$_1$ has published t$_2$]~~]]

We now present our account of SP readings and then discuss an alternative account of the same facts and our reservations about it.

5.2 A Choice Functional Account of Single-Pair Readings

Local multiple *wh*-questions and multiple sluices establish the existence of covert *wh*-movement. No more. Nonlocal structures add further issues of interest.[24]

(41) Some linguist claimed that Fred had talked to some philosopher, but I can't remember

a. *…which linguist (to) which philosopher.

b. …which linguist claimed that Fred had talked to which philosopher

(42) Some linguist was upset because Harry spoke to some philosopher but Bill doesn't know

a. *…which linguist to which philosopher.

b. …which linguist was upset because Harry spoke to which philosopher.

(43) *[$_{\text{CP}}$ which linguist$_1$ [$_{\text{CP}}$ which philosopher$_2$ [C$_{+wh}$ [$_{\text{TP}}$ t$_1$ …[$_{\text{ISLAND/CP}}$ …t$_2$]]]]]

The unacceptability of (41a) and (42a) rules out an LF like (43) with both *wh*-expressions in the matrix CP; they tell us that covert phrasal *wh*-movement is clause-bounded. The grammaticality of (41b) and (42b) therefore shows that there is another scope mechanism to which the same constraints do not apply.

We adopt the choice functional account of indefinites and *wh*-phrases from Reinhart 1997, 1998 (see also Winter 1997) to account for such cases.[25] In (44a), the LF for the antecedent clause, the indefinite inside the island is interpreted with a choice function variable, existentially bound from the matrix. The SP reading of the presluice in (42b) derives from an LF like (44b) where the choice function variable on the *wh*-phrase is bound from the matrix C$_{+wh}$ by the null ∃ operator.[26] SP answers to the presluice are derived when Ans-D, given in (39b), is applied to the

set of propositions in (44b). The ungrammaticality of the sluice in (42a) is also derived; the second *wh*-phrase cannot reach the matrix CP due to clause-boundedness of covert phrasal *wh*-movement.[27] The same point can be made with SP answers across *wh*-islands in (45).

(44) a. [$_{\text{CP}}$ $\exists$**f$_2$** [$_{\text{TP}}$ Some linguist$_1$ [$_{\text{TP}}$ t$_1$ was upset [$_{\text{ISLAND}}$ because [$_{\text{TP}}$ Harry spoke to **f$_2$ (philosopher)**]]]]

b. [$_{\text{CP}}$ which linguist$_1$ [$_{\text{CP}}$ $\exists$**f$_2$** [$_{\text{TP}}$ t$_1$ was upset [$_{\text{ISLAND}}$ because [$_{\text{TP}}$ Harry spoke to **f$_2$ (philosopher)**]]]]

$\Rightarrow$ λp $\exists$x $\exists$f [CF(f) $\wedge$ linguist(x) $\wedge$ p = $^\wedge$ x was upset because Harry spoke to f(philosopher)]

(45) Some student knows what Mary said to some professor but I don't know

a. *…which student to which professor.

b. …which student knows what she said to which professor.

We emphasize that covert *wh*-movement must be clause-bounded and island sensitive (cf. example (10) above) because the idea of an island insensitive, unbounded covert *wh*-movement operation continues to have currency despite the counterarguments already in the literature (Dayal 1996; Hagstrom 1998; Nishigauchi 1990; Pesetsky 1987). For example, Cheng and Demirdache 2010 argue for adjunct islands as traps for *wh*-in-situ but nevertheless resort to island insensitive covert *wh*-movement in the face of PL answers across *wh*-islands (see section 8 for discussion). The following paradigm, due to Baker 1970, illustrates the structure in question:

(46) a. Which student knows what Mary said to which professor?

b. John knows what Mary said to which professor.

c. John knows what Mary said to Professor Smith and Sue knows what she said to Prof. Brown.

d. John knows what Mary said to Professor Smith.

The previous literature has recognized single answers like (46b), PL answers like (46c), but the SP answer in (46d) is also possible. It needs special prosody and context, as SP answers often do, but the context sentence in (45) brings it out.

SP readings across clauses, then, turn out to be revealing at two levels. One, their impossibility under multiple sluicing reinforces our argument from section 3 that covert *wh*-movement is clause-bounded and remains so under sluicing. The multiple sluicing facts thus provide a novel argument for the island sensitivity of covert wh-movement (contra Huang 1982 and much subsequent work). The CMC allows us to go further: not only is covert *wh*-movement not less restricted than overt movement, it is more restricted than overt movement in being clause-bounded (Dayal 1996).[28] At another, more general level, the acceptability of SP readings across islands in nonelliptical structures provides evidence that natural language has another scope taking mechanism for *wh*-in-situ. We take this second mechanism to rely on binding rather than movement, making it island insensitive. We have suggested that it involves binding of choice functional variables by a null $\exists$-operator, in line with Pesetsky's (1987) claim that only non-movement scope taking is immune to syntactic constraints.[29]

5.3 A Focus-based Account of Single-pair Readings

As we saw in section 5.1, it is possible to interpret *wh*-in-situ through focus semantics. In this section we consider whether focus semantics provides a viable account compatible with the multiple sluicing data. We have seen that SP readings are

available for presluice structures with one *wh*-phrase in the matrix clause and another in the embedded clause: *some student knows what Mary said to some professor but I can't remember which student knows what Mary said to which professor.* The question we are interested in probing now is whether the in-situ *wh*-phrase can be interpreted via focus semantics.

Kratzer and Shimoyama (2002) and Shimoyama (2001, 2006) predict that a SP reading of the Japanese counterpart should not be possible. According to them, the alternatives created by an indeterminate phrase can expand across clauses but must stop at the first relevant operator. The following is from Nishigauchi 1990 and suggests that Kratzer and Shimoyama's conclusion is correct. The squiggly line in the schema in (48) represents the expansion of alternatives:

(47) tanaka-kun-wa [Mary-ga doko-de nani-o kat-ta ka] sitte-imasu ka
Tanaka Mary-NOM where what-ACC bought Q knows Q
'Does Tanaka know where Mary bought what?'
Not: 'What is such that Tanaka knows where Mary bought it?'

(48) * [… [… *wh*-indefinite …ka/mo…] -ka/mo

It is not true, however, that Japanese indeterminate pronouns are always constrained in this way. Dayal 1996 provides (49) to show that long-distance PL readings are available for Japanese counterparts of Baker examples. They turn out also to allow SP readings.[30] Note that (47) and (49) pull in opposite directions and pose a problem for Kratzer and Shimoyama's position on *wh*-scope[31]

(49) dare-ga [Mary-ga doko-de nani-o kat-ta ka] sitte-imasu ka
who Mary where what bought Q know Q

'Who knows where Mary bought what?'

We can also demonstrate the problems with the focus-based approach using English. Kotek (2014) discusses intervention effects in superiority obeying vs. superiority violating multiple *wh*-questions. Following Pesetsky (2000), she takes the *wh*-in-situ to have the option of moving to C, if it respects superiorty, or be interpreted in situ. Using focus semantics to interpret in-situ *wh*-phrases and Beck 2006's account of intervention, she derives the pattern of judgments in (50), where solid lines indicate overt movement, dashed lines covert movement, and as above, squiggly arrows that the *wh*-phrase is interpreted in-situ via focus semantics.

(50) a. English superiority-obeying questions: no intervention effects

√ [$_{CP}$ wh_1 wh_2 [C [$_{TP}$ …intervener…t_1…t_2]]]

b. English superiority-violating questions: intervention effects

* [$_{CP}$ wh_2 [C [$_{TP}$ …intervener…wh_1…t_2]]]

Recall, however, that intervention effects relate to the loss of PL readings, not to ungrammaticality per se (recall Pesetsky's paradigm (29)). Kotek's account does not allow for the available SP reading of structures like (50b). The account of intervention she relies on, namely Beck 2006, is silent on the SP vs. PL distinction but the ingredients of that analysis should apply equally to both readings.[32] Kotek addresses this problem by denying the legitimacy of SP readings in superiority violating questions generally. Appealing to scope-economy (Fox 2000), she argues that PL answers to superiority-violating questions are licensed because they lead to distinct answers from those to superiority-obeying ones. SP answers, since they are

not affected by the order of *wh*-expressions, disfavour superiority-violations. She cites David Pesetksy (p.c.) for a possible counterexample, however.

(51) Context: To foster a collaborative atmosphere in our unit, every day one syntactician and one phonologist go out to lunch together, at the department's expense. You know who went out together this week, so tell me:

a. Which syntactician took which phonologist to lunch today?

b. Which phonologist did which syntactician take out to lunch today?

Kotek's suggestion is that this is an "accidental" rather than "true" SP reading but the distinction seems strained to us. We have proposed that SP readings are genuine and can be derived by interpreting the *wh*-phrase in situ through choice functions, which are impervious to locality considerations and intervention effects.

Our position, then, is that the ungrammaticality of multiple sluicing provides evidence that covert *wh*-movement is blocked in specific cases. SP readings of grammatical presluices in such cases call for a scope mechanism that does not rely on movement. We take this scope mechanism to involve binding of choice function variables, a mechanism that is known to be non local, non island-sensitive, and not subject to intervention. Note that we are not arguing against the focus-based approach *per se*. It is just that we do not see a clear way of using the focus-based approach to address the issues raised by multiple sluicing, at least not in the versions of focus semantics for questions currently on the market. It is possible, of course, that a more nimble theoretician might be able to overcome the difficulties we see.

6 Pair-list Readings via Skolem Functions

Our arguments against the focus-based approach to SP readings across clauses and in superiority violating structures do not apply to a focus-based account of PL readings. One might argue, for example, that natural language includes all (three) types of scope taking mechanisms and that the choice functional account survives when movement is blocked (as evidenced by the ungrammaticality of multiple sluicing) and when focus percolation hits a roadblock of some kind (let us say in the presence of interveners). That is, accounts such as Kotek 2014 may not be helpful for SP readings but may well be correct for PL readings. In this section we argue against this and propose an alternative approach, based on functional dependencies.

We develop our proposal for PL readings in three steps. We start in this section with cases of superiority compliant local *wh*-*wh* dependencies, those that license multiple sluicing. In section 7 we take up cases of local *wh*-*wh* dependencies that do not license multiple sluicing because of superiority violations. We also discuss ∀-*wh* dependencies, which allow PL readings but not multiple sluicing. Finally, in section 8, we apply these insights to nonlocal dependencies and probe the conditions under which they allow PL readings while disallowing multiple sluicing.

6.1 The Focus-based account of Pair-list Readings

Kotek 2014 follows the lead of Hagstrom 1998 and Fox 2012 (see also Nicolae 2013) for pair-list readings of superiority compliant structures.

(52) a. $[_{\text{CP}}$ which student$_{\text{i}}$ $[\text{C}_{+wh}$ $[_{\text{CP}}$ which topic$_{\text{k}}$ $[\text{C}_{+wh}$ $[\text{t}_{\text{i}}$ published on t_{k}]]]]]

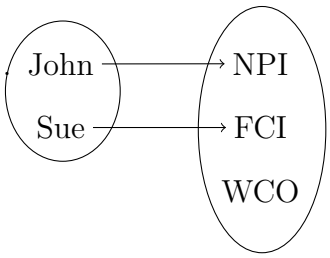
b. $\lambda\text{Q}\ \exists\text{y}\ [\text{student(y)} \wedge \text{Q} = \lambda\text{p}\ \exists\text{x}\ [\text{topic(x)} \wedge \text{p} = \hat{}\text{y published on x}]]$

c. $\left\{ \begin{array}{l} \{\text{John published on NPI, John published on FCI}\} \\ \{\text{Sue published on NPI, Sue published on FCI}\} \end{array} \right\}$

d. $\text{Ans}(\mathbb{Q})(w) = \cap \{p\text{: } \exists Q \in \mathbb{Q}\ [p = \text{Ans-D}(Q)(w)]\}$

A key aspect of this account is a split $C_{[+WH]}$ structure, where the lower C denotes a set of propositions and the higher C a set of questions. The answer to the question is the intersection of the answers derived by applying Ans-D given in (39b) to the sub-questions:*what did John publish? what did Sue publish?*. This yields answers like: *John published on NPI and Sue published on FCI*, which have the two properties identified in Dayal 1996 as critical to PL readings: domain cover and point-wise uniqueness.

(53)



Domain cover: all members of the set denoted by the fronted *wh*, the *domain set*, are paired, but not necessarily all members of the set denoted by the in-situ *wh*, the *range set*.

Point-wise Uniqueness: each member of the domain set is paired with only one member of the range set, when a singular *wh*-phrase sets the range.

Returning to Kotek's account, we focus now on superiority violating questions.

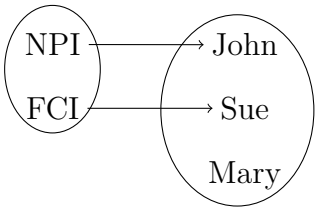
(54) a. [Which topic$_i$ [$C_{[+WH]}$ [$C_{[+WH]}$ [which student published on t_i]]]]

b. {John published on x, Sue published on x}

c. $\left\{ \begin{array}{l} \{\text{John published on NPI, Sue published on NPI}\} \\ \{\text{John published on FCI, Sue published on FCI}\} \end{array} \right\}$

The in-situ *which student* does not move covertly but is interpreted via focus semantics, yielding a set of propositions at the lower C (54b). This is tantamount to the question: *who has published on x?* When the free variable corresponding to the trace is existentially bound from the higher CP, the fronted object *wh*-phrase *which topic*, is exhaustively paired with exactly one member of the subject term. This is the desired result, capturing the observation that in superiority violating questions, the object *wh*-phrase sets the domain and the subject *wh*-phrase sets the range:

(55)



Kotek's account draws on intervention effects as support for focus semantics à la Beck 2006 but there are independent reasons to doubt its validity (see footnote 32). When combined with our own argument from the survival of SP readings, we are not persuaded that intervention effects are motivation enough for the focus-based account. We also have a general discomfort with the fact that superiority violations are known to be sensitive to discourse and yet discourse plays no role in the explanation. To be fair, the disconnect between observations about D-linking and the actual terms of the explanation also applies to other accounts. Ideally, D-linking should play the same role in the explanation as it does at the observational level. We thus believe that an alternative approach to PL readings, one that connects to discourse factors, is worth exploring and present such an alternative below.

6.2 Skolem Functions in Question Semantics

We build on the account of PL readings in Dayal 2016, in preparation, which in turn draws on the view that *wh*-epxressions can denote at the level of individuals as well as at the level of Skolem functions, functions from individuals to individuals (Chierchia 1993; Engdahl 1980, 1986; Groenendijk and Stokhof 1983). The initial justification comes from questions with quantifiers, such as (56), which allow individual answers like *on NPI* and functional answers like *His/her dissertation topic*:

(56) Which topic has every student published on?

The diagram in (53) gives us individual-topic pairings but the information can also be given by naming the relation between individuals and topics.[33] The two readings of (56) are captured by extending the ontology to allow *wh*-quantifiers to range over such descriptions. We show the derivation of the individual answer first in (57). The fronted *wh*-phrase in (57) quantifies over individual topics, the universal raises TP-internally and is interpreted inside the question nucleus:

(57) $[_{CP}$ which topic$_2$ $[_{C'}$ C_{+wh} $[_{TP}$ every student$_1$ $[_{TP}$ t_1 published on t_2]]]]

$\lambda p\ \exists x\ [\text{topic}(x) \wedge p = {}^{\wedge}\ \forall y\ [\text{student}(y) \rightarrow y \text{ published-on } x]]$

$\{{}^{\wedge}\ \forall y\ [\text{student}(y) \rightarrow y \text{ published-on NPI}],\ {}^{\wedge}\ \forall y\ [\text{student}(y) \rightarrow y \text{ published-on FCI}]\}$

The same assumptions carry over to the functional answer, adjusting for quantification over <e,e> type functions. Capitalization of the variable name distinguishes Engdahl-style skolem functions from individuals to individuals and Reinhart-style choice functions from sets of individuals to individuals. *Which topic* is now interpreted as an $\exists$-quantifier over skolem functions. Instead of *topic* restricting individuals, as in (57), it restricts the range of functions in (58). Applying Ans-D to it, we

get the functional answer:

(58) [$_{CP}$ which topic$_2$ [$_{C'}$ C$_{+wh}$ [$_{TP}$ every student$_1$ [$_{TP}$ t$_1$ published on t_2^1]]]]
λp $\exists$F [$\forall$x(topic(F(x))) $\wedge$ p = $^\wedge$ $\forall$y [student(y) $\rightarrow$ y published-on F(y)]]
{$^\wedge$ $\forall$y [student(y) $\rightarrow$ y published-on y's dissertation topic],
$^\wedge$ $\forall$y [student(y) $\rightarrow$ y published-on y's qualifying paper topic]}

One other crucial aspect of the functional approach involves structural sensitivity. We adopt the syntactic proposal from Chierchia 1993, where functional *wh*-expressions leave behind functional traces. In (58), for example, the TP that forms the question nucleus has a functional trace for the object *wh*-phrase. The variable F is identified through its subscripted i-index with *which topic* but is bound by *every student* through its superscripted a-index. Chierchia makes crucial use of this syntactic relationship to explain why a functional reading is not available when the *wh*-phrase is in subject position and the quantifier in object position, as in (59a).

(59) a. Which student has published on every topic?
b. *Its chief proponent.
c. [$_{CP}$ which student$_1$ [$_{C'}$ C$_{+wh}$ [$_{TP}$ every topic$_2$ [$_{TP}$ t_1^2 published on t$_2$]]]]

For Chierchia, the a-index is pronominal, subject to the same constraints as regular pronouns. (59c) is ruled out because the binding required for the functional reading involves QR over the a-index of the functional trace, resulting in a weak crossover (WCO) configuration. Chierchia's explanation has been challenged, by Agüero-Bautista 2001, for example. We remain neutral on this point. To anticipate, our approach to this phenomenon will tap into a different aspect of meaning. What is important to note here is that functional readings are sensitive to struc-

ture, and that this sensitivity transfers over to PL readings of questions with quantifiers: (56), but not (59a), can be answered with a list of students and topics.

6.3 Deriving Pair-list Readings through Skolem Functions

Chierchia's account has been adopted for multiple *wh*-questions by Comorovski 1996; Dayal 1996, 2002; Hornstein 1995, among others, to explain the observation that the fronted *wh*-expression behaves like a universal (É. Kiss 1993). The paradigm in (60) is illustrative, given a domain with two students and two topics.

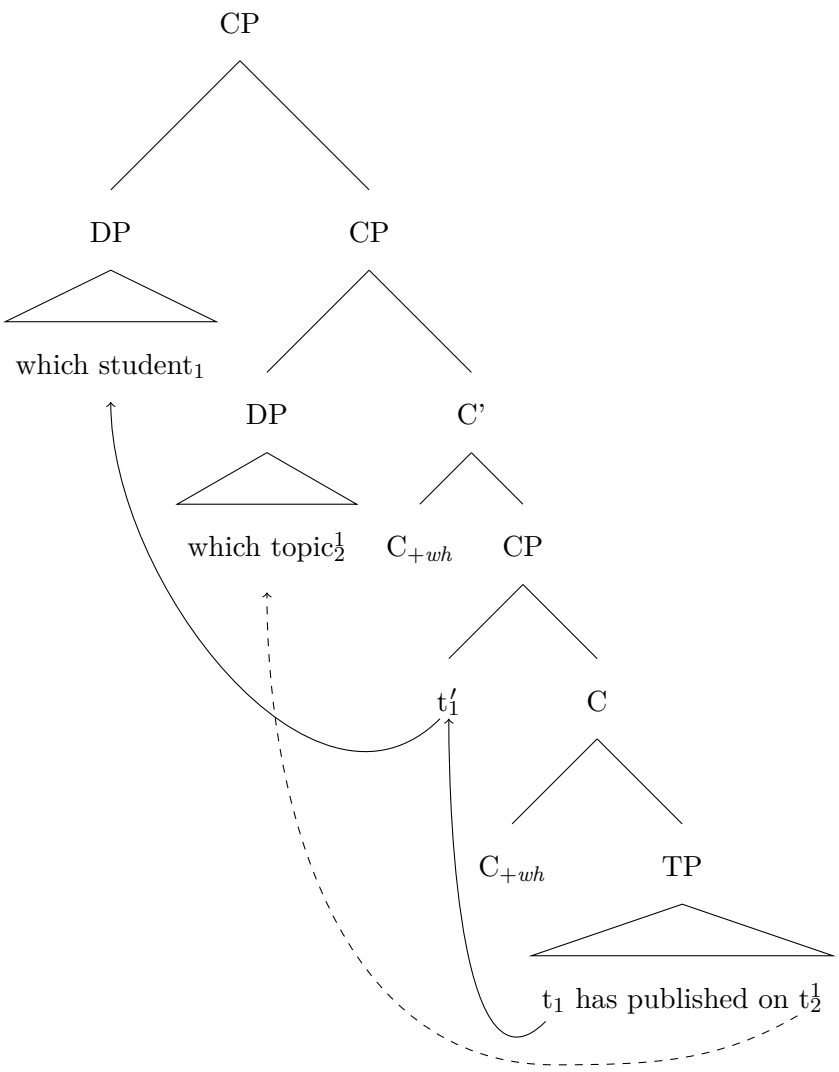
(60) a. Which student has published on which topic?
b. John and Sue have both published on NPI.
c. *John has published on NPI and FCI.

An answer like (60b), specifying for each member of the subject term the topic they have published on while leaving out a member of the object term, is fine but the opposite is not, (60c). That is, PL readings of multiple *wh*-questions show analogous subject-object asymmetries to questions with quantifiers. The appeal of adopting the functional account for multiple *wh*-questions, then, is that the locus of explanation for the asymmetry is inside the innermost TP, where questions with quantifiers and multiple *wh*-questions can have parallel structures.[34] Other accounts (e.g., May's 1985 Scope Principle) do not extend to multiple *wh*-questions, as they capitalize on the final scope positions, where *wh*-movement and QR part company.

Below is our account for a basic superiority obeying multiple *wh*-structure:

(61) a. Which student has published on which topic?

b.



c. $\lambda Q\ \exists F\ [\ \forall z[\text{topic}(F(z))] \wedge Q = \lambda p\ \exists x\ [\ \text{student}(x) \wedge p = {}^\wedge x \text{ has published on } F(x)]]$

In (61b), the structure below TP is standard but the structure above it is not. In section 6.1, we saw the iterated C$_{+wh}$ structure used for PL readings by Fox 2012; Kotek 2014; Nicolae 2013. It was also proposed in Dayal 1996 for echo questions and the *wh*-triangle. Our account differs in detail from all of these earlier accounts.

We start with the assumption that a split C structure is always available in

the syntax as long as a *wh*-phrase moves to the C domain. The overtly moved *wh*-phrase passes through the specifier positions of the two CP layers, activating both. Thus in in (61b), the fronted wh-phrase moves through the lower $C_{[+wh]}$. This lower $C_{[+wh]}$ attracts a single *wh*-phrase, necessarily the closest one, and shifts the denotation of the clause from declarative to interrogative. Next, the higher $C_{[+wh]}$ is merged. It has the power to attract multiply. In line with the derivational regime in Richards 1997, the closest *wh*-phrase (now located in the specifier of the lower CP) has to move to the specifier of the higher $C_{[+wh]}$ first because it is closest. Then, the functional *wh*-in-situ tucks in under it at LF. The order of *wh*-phrases thus follows Richards 1997, which takes its inspiration from multiple fronting languages.[35]

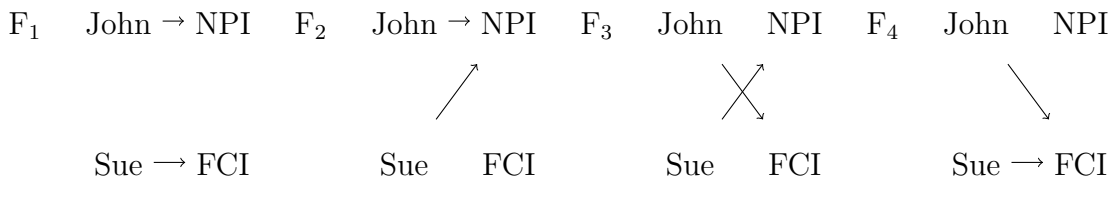
In terms of interpretation, we take the overtly fronted *wh*-phrase to be interpreted at the lower $C_{[+wh]}$. This results in the set of propositions in (62a).

(62) a. $\lambda p\ \exists x_1$ [student(x_1) $\wedge$ p = $^\wedge x_1$ has published on $F_2(x_1)$]

b. {John has published on F_2(John), Sue has published on F_2(Sue)}

To make things concrete, let us take a domain with two students and two topics. We start with four <e,e> type functions from students to topics:

(63)



The functional *wh*-phrase at the higher C level is interpreted with Engdahl's semantics for functional *wh*-phrases as ∃-quantifiers over skolem functions, as in (64). This provides a compositional route to (61c), C′ can combine with the functional

wh-element once the free functional variable inside it is abstracted over, as in (65):[36]

(64) $[\![\text{which}_{\text{FUNC}}]\!] = \lambda N\ \lambda \mathbb{F}\ \exists F\ [\ \forall z(N(F(z))) \wedge \mathbb{F}(F)]$

(65) $[\![CP]\!] = [\![\text{which}_{\text{FUNC}}\ \text{topic}]\!]([\![C']\!])$

$= \lambda \mathbb{F}\ \exists F\ [\forall z(\text{topic}(F(z))) \wedge \mathbb{F}(F)]$

$(\lambda F_2\ (Q = \lambda p\ \exists x_1\ [\text{student}(x_1) \wedge p = {}^\wedge\ x_1 \text{ has published on } F_2(x_1)]))$

$\Rightarrow \lambda Q \exists F[\forall z(\text{topic}(F(z))) \wedge$

$Q = \lambda p \exists x_1\ [\text{student}(x_1) \wedge p = {}^\wedge\ x_1 \text{ has published on } F(x_1)]]$

(66)

{john has published on F_1(john), Sue has published on F_1(sue)},	F_1: j→NPI, s→FCI
{john has published on F_2(john), Sue has published on F_2(sue)},	F_2: j→NPI, s→NPI
{john has published on F_3(john), Sue has published on F_3(sue)},	F_3: j→FCI, s→NPI
{john has published on F_4(john), Sue has published on F_4(sue)}	F_4: j→FCI, s→FCI

The answerhood operator in (67) is the familiar one but applies to a higher order set by flattening out each set of propositions inside it by intersection. The result has the key features of PL answers. Each proposition in (68) covers the domain since each cell that is intersected represents the graph of some function. Point-wise uniqueness is also satisfied. If John worked on two topics, for example, the first as well as the last proposition would be true, making Ans-D undefined.[37]

(67) $\text{Ans-D}(\mathbb{Q})(w) = \text{Ans-D}(\lambda p\ \exists Q \in \mathbb{Q}\ [p = \bigcap Q])$

(68)

- John has published on NPI and Sue has published on FCI,
- John has published on NPI and Sue has published on NPI,
- John has published on FCI and Sue has published on NPI,
- John has published on FCI and Sue has published on FCI

(69) John has published on NPI and Sue has published on FCI.

Though built up differently, the end result is the same as in Dayal 1996, 2002. Fundamental to all these accounts, however, is the fact that once the ontology is extended to include skolem functions as possible meanings for *wh*-expressions, the idea of an existential quantifier over them follows as a natural consequence.

A key difference between our account and the one in Fox 2012 relates to the role of the functional *wh*-phrase in giving bite to splitting the C. We posit that the PL readings of functional *wh*-expressions, with two indices on them, can only be realized if mapped onto a split C structure, with the lower $C_{[+wh\,]}$ interpreting the variable associated with the domain setting phrase and the higher $C_{[+wh\,]}$ interpreting the skolem function variable associated with the range-setting phrase.[38]

To return to multiple sluicing, our account predicts that ellipsis of the structure below $C_{[+wh\,]}$ will lead to a grammatical sluice. To complete the picture, we note that an analysis of the antecedent clause involving skolem functions has been independently argued for. Hintikka 1986 pointed out that it is possible for an indefinite that QRs above a universal to covary if interpreted as functionally dependent on the universal: *[$_{TP}$ some topic$_2$ [$_{TP}$ every student$_1$ [$_{TP}$ t_1 has published on t^1_2]]*.[39]

To conclude, the skolem functional account of PL readings developed here is based on structures that allow for multiple sluicing, structures where both *wh*-phrases move above C. We now turn to PL readings in structures where the unacceptability of multiple sluicing calls for an in-situ scope mechanism.

7 D-Linking and Pair-Lists without Movement

In this section we consider PL readings in two cases where multiple sluicing forces a nonmovement scope taking option for one member of a dependency. One involves *wh-wh* dependencies in superiority-violating configurations, the other a dependency

involving a quantifier. Our extension of the functional account leverages the significance of D-linking in such cases. We focus here on PL readings of local dependencies, deferring discussion of nonlocal cases where evidence from multiple sluicing also rules out movement of multiple expressions to the left periphery to section 8.

7.1 Pair-list Readings of Superiority Violating Questions

As noted earlier, there is at present a disconnect between observations about the crucial role of D-linking in ameliorating superiority violations and the proferred explanations. We close this gap by allowing a lower *wh*-expression to scramble over a higher *wh*-expression if it is more prominent, crucially reversing the dependency relationship. A scrambled object, for example, can thus become the domain term and the subject the functional term, matching their discourse status. In a *wh*-fronting language, Attract Closest then forces the object term to move to the C domain, (70b).[40] Recall that we follow accounts, such as Pesetsky 2000, in disallowing LF movement of the subject term once it has been scrambled across (see (26)):

(70) a. Which topic did which student publish on?

b. [CP *wh* topic$_2$ [C$_{[+WH]}$ [t$_2$ [C$_{[+WH]}$ [TP t$_2$ *wh* student$^2_1$ publish on t$_2$]]]]]

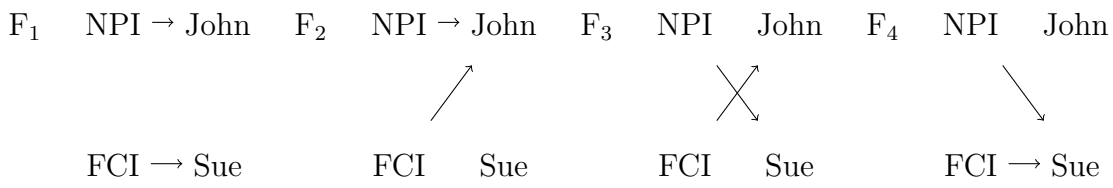
A general point first. We have admitted choice functions into our toolkit and modeled them as functions from sets of individuals to an arbitrarily chosen member of that set, an individual, type <<e, t> e>. We have also admitted into our system, in addition to individuals, abstract entities of type <e,e>, namely skolem functions. We can easily define choice functions over skolem functions, type <<<e, e>, t>, <e, e>>. We propose a generalization of the choice functional binding option available to the domain of individuals to the domain of skolem functions.

That is, if a choice function is applied to a set, be it a set of individuals or a set of skolem functions, it will pick out a member of that set, a particular individual in the first case, a particular skolem function in the second. In (71a) we flesh out the LF in (70b) by activating the null ∃ at the higher C level to bind the choice function variable over *which student*, the *wh*-in-situ that sets the range.[41]

(71) a. $[_{CP}\ \exists_1\ C_{[+WH]}\ [_{CP}\ wh\ \text{topic}_2\ C_{[+WH]}\ [_{TP}\ t_2\ wh\ \text{student}_1^2\ \text{publish on}\ t_2\ ]]]]]$

b. $\lambda Q\ \exists f_{1<<<e,e>t>,\ <e,e>>}\ [CF(f_1) \wedge Q = \lambda p\ \exists x\ [\text{topic}(x) \wedge p = \hat{}[f_1\ (\lambda F\ [\ \forall z[\text{student}(F(z))]])(x)\ \text{published-on}\ x]]]$

c. $\lambda F\ [\ \forall z[\text{student}(F(z))]] = \{F_1, F_2, F_3, F_4\}$, each F a function from topics to students:



The choice-functional interpretation of the in-situ *wh*-phrase mirrors the account for in-situ individual denoting *wh*-phrase discussed in relation to SP readings of cross-clausal presluices but unacceptable sluices in section 5.2.

(72) a. $\left\{ \begin{array}{l} \{F_1(\text{NPI})\ \text{published on NPI},\ F_1(\text{FCI})\ \text{published on FCI}\} \\ \{F_2(\text{NPI})\ \text{published on NPI},\ F_2(\text{FCI})\ \text{published on FCI}\} \\ \{F_3(\text{NPI})\ \text{published on NPI},\ F_3\ (\text{FCI})\ \text{published on FCI}\} \\ \{F_4(\text{NPI})\ \text{published on NPI},\ F_4(\text{FCI})\ \text{published on FCI}\} \end{array} \right\}$

b. $\left\{ \begin{array}{l} \{\text{John published on NPI, Sue published on FCI }\} \\ \{\text{John published on NPI, John published on FCI}\} \\ \{\text{Sue published on NPI, John published on FCI}\} \\ \{\text{Sue published on NPI, Sue published on FCI }\} \end{array} \right\}$

c. Ans-D(72b) = John published on NPI and Sue published on FCI.

In a particular case, we might get the answer in (72c) but an answer linking a single individual to both topics is also possible. This reverses the dependency seen in superiority compliant structures and matches earlier claims about Japanese scrambled questions (Dayal 1996) and English superiority violations (Kotek 2014).

To sum up, the functional approach to PL readings accounts for superiority violations by scrambling a syntactically lower but discourse-prominent *wh*-phrase to a c-commanding position. The scrambled *wh*-phrase can then function as the domain term, binding the a-index of the dependent term, which is blocked from moving to the left periphery. The functional *wh*-in-situ is then interpreted using a choice-function variable over skolem functions. Note that this extension of our account maintains the crucial connection between a split C structure and a skolem functional dependency in the nucleus. We now return to questions with quantifiers.[42]

7.2 Pair-list Readings of Questions with Quantifiers

It is well-known that not all quantifiers lend themselves to PL readings: *each N* and *every N*, for example, readily do so, while *no N* does not. In (73) we give four LFs that correspond to current approaches to PL readings with *every N*. Engdahl (1986) holds that the PL reading is simply a pragmatic spell-out of the functional reading (73a). Chierchia 1993:210 entertains the option of an absorption operation that syntactically adjoins the quantifier above C and uses its witness set to create the relevant pairings (73b). Nicolae (2013) extends the Fox-Hagstrom account of PL readings to include quantifiers (73c). Krifka 2001 treats the universal as quantifying into the speech act of questioning (73d). Of these, only (73a) straightforwardly predicts the unavailability of multiple sluicing, (74).

(73) a. [$_{CP}$ Which book$_2$ [$_{C'}$ did [every student$_1$ [$_{TP}$ read t^1_2]]]

b. [$_{CP}$ [Which book$_2$ every student$_1$] [$_{C'}$ did [$_{TP}$ t_1 read t^1_2]]

c. [$_{CP}$ Every student$_1$ [$_{CP}$ Which book$_2$ [$_{C'}$ did [$_{TP}$ t_1 read t_2]]]]

d. [$_{SAP}$ Every student$_1$ [$_{CP}$ Which book$_2$ [$_{C'}$ did [$_{TP}$ t_1 read t_2]]]]

(74) I know every student is working on a different topic but I couldn't tell you…

a. …which topic every student is working on.

b. *…on which topic every student

c. *…every student on which topic

While it is quite possible that there is no logically independent LF for PL readings, we follow the view that they are structurally distinct. There are only two additional assumptions we need to incorporate into the functional account, both of which have substantive independent motivation. One, it is possible to extract a unique witness set (W) from universal quantifiers, namely the common noun set that generates the quantifier. Two, only indefinites and *wh*-phrases can be functionally dependent terms, when universal quantifiers participate in PL readings, they do so only as domain terms (see Dayal 2016 for further discussion).

We discuss the LFs for two core cases, with the universal interpreted inside TP. The first has the universal in subject position. The fronted *wh*-phrase triggers the split C structure and the lower C existentially binds the TP internal universal, via a choice function over the witness set of students.[43] The rest follows as expected:

(75) a. Which topic is {every| each} student working on?

[$_{CP}$ which topic$_2$ [$_{CP}$ $\exists_1$ [$_{TP}$ {every|each student}$_1$ work-on t^1_2]]]

b. $\lambda Q\ \exists F_2$ [$\forall z(\text{topic}(F_2\ (z))) \wedge Q = \lambda p\ \exists f_1$ [$CF(f_1) \wedge p =$

$\hat{}f_1$ (W({every|each} student)) work-on F_2 (f_1 (W(every/each student)))]]

The binding of the a-index of the *wh*-phrase by the universal in object position in (76a) requires an additional step. The universal must scramble above the subject but this option is only available to the inherently D-linked *each N*, not to *every N*.[44] Other than scrambling, the path to a pair list reading calls for nothing further.

(76) a. Which student is working on {each |*every} topic?
[$_{CP}$ *wh* student$_1$ [$_{CP}$ $\exists_2$ [$_{TP}$ {each|*every} topic$_2$ [$_{TP}$ t^2_1 work-on t_2]]]

b. $\lambda Q\ \exists F_1\ [\forall z(\text{student}(F_1\ (z))) \wedge Q = \lambda p\ \exists f_2\ [CF(f_2) \wedge p = \hat{}F_1\ (f_2\ (W(\text{each topic}))\ \text{work-on}\ f_2\ (W(\text{each topic}))]]$

The idea that the two *wh*-expressions are not on equal footing, which we have invoked throughout, goes back to the Sorting Key Hypothesis (Kuno 1982), which anticipates the characterization of the fronted *wh*-phrase as a universal (É. Kiss 1993), and its role as the domain term in functional approaches (Comorovski 1996; Dayal 1996; Hornstein 1995). An anonymous reviewer reminds us, however, that the parallel between multiple *wh*-questions and questions with quantifiers has been challenged. Xiang 2016 points out that in a context with 100 candidates and 3 jobs, *which candidate will get which job?* allows a PL reading, but not *which job will every candidate get?* While this is true, we believe that the contrast holds for only a subset of verbs. Furthermore, the PL reading becomes available with a D-linked universal in object position: *which candidate got each job?* We leave further exploration of these facts to another ocacasion.

We conclude by highlighting a few points. One, the unacceptability of (76a) with *every N* crucially relies on the assumption that a quantifier cannot be the dependent element in a *wh*-QP chain. Two, dependency-reversals are intrinsically tied to discourse status. Three, fronting of *wh*-phrases in single fronting languages is

independent of the functional status of the *wh*-phrase. Attract Closest targets the domain setting *wh*-phrase in a *wh*-*wh* dependency but the range-setting *wh*-term in a *wh*-QP dependency. This confluence of factors gives a principled account of the availability of PL readings in cases where evidence from multiple sluicing converges with independently motivated prohibitions against moving a *wh*-phrase or a quantifier to C. So although questions with quantifiers have not so far been part of the sluicing literature, we believe they add an interesting dimension to the discussion.

8 Long-distance Pair-lists without Movement

We now extend the functional account of *wh*-dependencies to cross-clausal contexts. We lay out the implications of various options that the theory developed so far makes available. We balance this against empirical considerations, partly drawing on the literature and partly on our own fieldwork. Crucially, we separate out 2-member lists, where a long-distance nonmovement scopal account of individual *wh*-expressions is warranted, from 3-member lists which manifest *wh*-scope trapping.

8.1 Long-distance Lists with Two Members

A cross-clausal PL reading, on our account, has a split C structure at the matrix level. In single fronting languages like English there should be a *wh*-phrase at the matrix left periphery and a second phrase that it can form a functional dependency with. At least one of them must originate inside the embedded clause for the structure to count as cross-clausal. We first consider the possibility that a null ∃-operator in matrix C binds a choice functional variable over the set denoted by the *wh*-in-situ, whether that *wh*-phrase sets the domain or the range of the function.

To test these possibilities, we created contexts that favored exhaustive pairings

on one of two *wh*-phrases separated by a clause boundary either at the base or at the surface. That is, we used the context to fix which *wh*-phrase would set the domain of the function. We asked 8 native speakers to rate the acceptability of questions in such contexts on a 5 point Likert scale. We give the results and our analysis of the results before drawing conclusions. To aid readability we single-underline the domain term and double-underline the range term (as a nod to the double indexing on the dependent term) using schematic partial LF representations.

In the first context the matrix subject sets the domain of the function.

(77) There are crazy rumors going around among the security guards claiming that Mary stole a precious painting from the museum. The rumor exists in many different versions. To get an idea of how it might have spread, I would like a complete list of

a. which guard thinks (that) Mary stole which painting 8✓

b. [∃F2 which guard$_1$ [$_{CP_1}$ t$_1$ …[$_{CP_2}$ …which painting$^1_2$]]]

In (77a) the functional *wh* is c-commanded by the trace of the fronted domain setting *wh*. The judgments show that long-distance binding of the a-index of the functional *wh* is grammatical, as is long-distance binding of the i-index by the null ∃.

We next consider a context in which the domain is set by the embedded *wh*, which is fronted over the matrix *wh*, violating superiority:

(78) Three precious paintings went missing from different rooms of the museum. The museum is divided into overlapping security zones. Each guard is in charge of their own zone. Mary is a suspect, because some of the guards believe that she stole a painting from their zone. To investigate this systemati-

cally, painting by painting, I need a complete list of

a. which painting which guard thinks Mary stole 5✓, 3 *

b. [∃F1 which painting$_2$ [$_{CP_1}$ t$_2$ …which guard$^2_1$ …[$_{CP_2}$ …t$_2$]]]

Here long-distance scrambling is needed in order to bind the a-index of the functional term and we ascribe the discomfort that some speakers had with (78a) to this. We do not see any other problem with this derivation.

The context in (79) privileges the subject. The *wh*-dependency is established locally in the embedded clause, after which the *wh*-subject moves successive cyclically, splits the matrix CP and enables long-distance binding of *which painting*:

(79) Last night, a number of precious paintings were stolen from the museum. Mary has an elaborate theory according to which a number of security guards stole the paintings by individually smuggling them out of the building. To investigate Mary's theory properly, I would like a complete list of

a. which security guard Mary thinks stole which painting. 7✓, 1 ?

b. [∃F2 which guard$_1$ [$_{CP_1}$ …[$_{CP_2}$ t$_1$ …which painting$^1_2$]]]

Finally, (80a) also has two embedded *wh*-terms but the dependency involves a superiority violation. However, each piece of the scope taking mechanism is legitimate, given earlier judgments. We are forced to conclude that the discomfort some speakers feel must be with long distance movement coming after scrambling:

(80) Last night, four valuable paintings were stolen from the museum. Mary has a detailed theory according to which a number of security guards committed independent thefts. To investigate Mary's theory properly, I would like a complete list of

a. which painting Mary thinks (that) which security guard stole. 5✓, 3*/?

b. [∃F1 which painting$_2$ [$_{CP_1}$ …[$_{CP_2}$ t_2 …which guard$^2_1$ …t_2]]]

What this data set suggests is that superiorty violating structures are significantly degraded when clausal boundaries are implicated. Other than that, the results are as expected, given our proposal that the nonmovement scope mechanism uses choice functions and choice functions are insensitive to clausal boundaries.

In our survey, we also balanced the multiple *wh*-questions in each context with questions with quantifiers. We did this on the view that universal quantifiers, because of their distinct properties, could provide additional insight into our findings about *wh*-phrases. Two assumptions about universal quantifiers inform our discussion. One, quantifiers can only be domain setters, unlike *wh*-expressions which can be domain or range terms. Two, quantifiers take only local scope. The results of our survey suggest that consultants adjust the context to fit the grammatical need of quantifiers to be domain terms in *wh*-QP dependencies. We therefore represent the four cases accordingly. We give the results next to each of them and spell out some of the key conclusions that we can draw from them:

(81) a. [which guard$_1$ [t^2_1 thinks [**each painting$_2$** [Mary stole t_2]]]] 2✓6*

b. [which painting$_2$ [**each guard$_1$** [t_1 thinks [Mary stole t^1_2]]]] 7✓, 1?

c. [which guard$_1$ [Mary thinks [**each painting$_2$** [t^2_1 stole t_2]]]] 3✓; 3*

d. [which painting$_2$ [Mary thinks [**each guard$_1$** [t_1 stole t^1_2]]]] 8✓

The first striking contrast is between (81a) and (81b). The ungrammaticality of (81a) is predicted since local QR of the universal does not put it in a position to bind the a-index of the *wh*-phrase. The grammaticality of (81b) is also predicted since the quantifier c-commands the *wh*-trace in the base structure itself. The sec-

ond striking contrast is between (81a) and (81d), both cases where QR is within the embedded clause. In (81a) QR is not enough to bind the a-index of the *wh*-trace while in (81d) QR is not needed for c-command. This contrast cannot be explained on theories which crucially require getting the universal to the matrix C domain (cf. (73)). There is no reason why whatever principle could give the universal matrix scope in (81d) would not also do so in (81a). As such, these data strongly corroborate our general approach to modeling PL answers via skolem functions. Finally, (81c) does not violate any principle but was not accepted by all. This is similar to the resistance we saw to the combination of superiority violation and long-distance movement in multiple *wh*-questions in contexts (78) and (80).

Two points are worth highlighting. One, the approach to PL readings best able to capture the complex empirical terrain must rely on skolem functions and the restrictions that go into establishing dependencies via a-binding of the function *wh*-term by the domain term. Two, PL readings do not obey CMC per se, only those that are based on movement to the C domain, diagnosable via multiple sluicing, do.

8.2 Long-distance Lists with Three Members

When we turn to lists with more than two members, we see the CMC re-emerge under the guise of trapping effects (Raţiu 2007, 2011, Cheng and Demirdache (2010)):

(82) a. [Which guest promised [that he would give which toy to which child]]?

b. Bill the plane to Sybren and
the train to Amina

c. #Bill the plane to Amina and
Mary the train to Amina

d. #Bill the plane to Sybren and
Mary the plane to Amina

We have treated choice functions as cross-categorial: they take a set and deliver a member of that set, and applied it to sets of entities (type <e,t>) and to sets of skolem functions (type <<e,e>,t>). In fact, they can apply to any type <α, t>, including sets of propositions or sets of sets of propositions, and denote something of type α. We now posit a uniformity constraint on the binding of choice functions by null $\exists$: when a moved *wh*-expression activates the cross categorical null $\exists$, it can only activate binding over a single type of argument, be it type <e,t> or type <<e,e>,t>, but not both. The same applies to any other argument type.

We now revisit the data in (82). The fronted *which guest* may or may not trigger a split C. If it does not, we get simple long-distance binding of two choice function variables over type <e,t> arguments, *which toy* and *which child*, leading to sets like (83b). Ans-D, applied to it, yields the single triple answer (82a).

(83) a. [$\exists f_2$ $\exists f_3$ which guest$_1$ [t_1 promised […which toy$_2$ …which child$_3$]]]

$\Rightarrow$ $\lambda p\ \exists f_2\ \exists f_3\ \exists x_1$ [guest(x_1) $\wedge$ CF(f_2) $\wedge$ CF(f_3) $\wedge$

p = x_1 promised he$_1$ would give f_2 (toy) to f_3 (child)]

b. {Bill promised that he would give the train to Amina,

Bill promised that he would give the plane to Amina

Bill promised he would give the train to Sybren

Bill promised he would give the plane to Sybren …}

The functional dependency in (82b) is in the embedded clause. *Which toy* splits the embedded C, which then denotes a set of sets of propositions. The LF includes a choice functional variable over the embedded CP, which is bound from matrix C:

(84) [*Wh* guest$_1$ $\exists$**f$_4$** [t$_1$ promise [$_{\mathrm{CP}_4}$ *wh* child$_3$ [*wh* toy$_2$ [he$_1$ give t$_2$ to t$_3^2$]]]]]

$\Rightarrow$ λp $\exists$x$_1$ $\exists$f$_4$ [guest(x$_1$) CF(f$_4$) $\wedge$ p = x$_1$ promised $\cap$ f$_4$ ([[CP$_4$]])] where [[CP$_4$]] =λQ $\exists$F$_3$ [$\forall$z(child(F$_3$(z))) $\wedge$ Q = λp' $\exists$x$_2$ [toy(x$_2$) $\wedge$ p' = x$_1$ would give x$_2$ to F$_3$(x$_2$)]]

Each cell in the denotation of CP$_4$ gives the propositions based on one possible function from toys to children, illustrated in (85) with two functions.[45] The choice function f$_4$ picks one cell from [[CP$_4$]], yielding a normal question denotation with four propositions, (86). Ans-D applied to it derives the trapped PL answer (82b):

(85) $$[\![\mathrm{CP}_4]\!] = \left\{ \begin{array}{l} \{x_1 \text{ will give the train to Amina, } x_1 \text{ will give the plane to Sybren}\} \\ \{x_1 \text{ will give the plane to Amina, } x_1 \text{ will give the train to Sybren}\} \end{array} \right\}$$

(86) $$\left\{ \begin{array}{l} \text{Bill promised he will give the train to Amina and the plane to Sybren,} \\ \text{Bill promised he will give the plane to Amina and the train to Sybren,} \\ \text{Mike promised he will give the train to Amina and the plane to Sybren,} \\ \text{Mike promised he will give the plane to Amina and the train to Sybren} \end{array} \right\}$$

Let us now see how the uniformity constraint rules out the unacceptable answers in (82c) and (82d). A potential LF for (82c) has a dependency between matrix *which guest* and embedded *which toy*, excluding embedded *which child*:

(87) a. *[$\exists f_3$ $\exists F_2$ which guest$_1$ [t_1 promised [...which toy$^1_2$ ...which child$_3$]]]

b. λQ $\exists f_2$ $\exists f_3$ [$CF(f_3) \wedge CF(f_2) \wedge Q = \lambda p'$ $\exists x_1$ [guest(x_1) $\wedge$
p' = x_1 promised that x_1 will give $\mathbf{f_2}(\underline{\lambda F_2\ [\forall z(\text{toy}(F_2(z)))]}_{<<e,\,e>,\,t>})(x_1)$
to $\mathbf{f_3}(\underline{\text{child}}_{<e,\,t>})$]]

Note that the dependency between the matrix and the embedded *wh*-phrases is exactly what we saw in (77) and the long-distance binding of *which child* what we saw in (83b) and other cases in sections 5, 6 and 7. The problem, therefore, must be with combining two distinct types of long-distance binding. In (87b) the functional *wh*-in-situ (*which toy*) denotes a set of toy-valued functions (<<e,e>,t>), over which we have a choice function variable bound by the matrix $\exists$. There is also an ordinary *wh*-phrase interpreted in situ (*which child*) with a choice function over a set of individuals (<e,t>). This incurs a violation of the proposed constraint.

Let us also consider interpreting *which child* in the embedded clause itself:

(88) *[$\exists F_2$ *Wh* guest$_1$ [t_1 promised [$_{CP_4}$ *wh* child$_3$ [he would give *wh* toy$^1_2$ to t_3]]]]]

$\Rightarrow$ λQ $\exists f_2$ $\exists f_4$ [$CF(f_2) \wedge CF(f_4) \wedge Q = \lambda p'$ $\exists x_1$ [guest(x_1) $\wedge$
p' = x_1 promised $\mathbf{f_4}(\underline{[\![CP_4]\!]}_{<<s,\,t>t>})$]
where $[\![CP_4]\!] = \lambda p$ $\exists x_3$ [child(x_3) $\wedge$
p = x_1 will give $\mathbf{f_2}(\underline{\lambda F_2\ [\forall z(\text{toy}(F_2\ (z)))]}_{<<e,e>t>})$ (x_1) to x_3]

Unpacking (88), we interpret *which child* in the embedded clause, which then denotes a set of propositions. Since *promise* takes a propositional complement, individual propositions need to be pulled out of that set. That is, we need a choice function that applies to something of type <<s,t>,t>. In addition, we interpret the functional *which toy* in-situ, as in (87), and need a choice function over the set of

skolem functions of type <<e,e>,t>. This incurs a violation of the uniformity constraint. The core paradigm illustrating the phenomenon of trapping is explained.

8.3 The Wh-island Wrinkle

Cheng and Demirdache 2010 note that trapping is not observed in the familiar Baker examples, where the matrix *wh*-phrase pairs up with the embedded *wh*-in-situ, leaving the other embedded *wh*-phrases untouched. They appeal to one fell-swoop movement of the *wh*-in-situ from embedded clause to matrix Spec to account for such answers but this leads to an internal inconsistency in their account (Dayal (2016)). For if such movement is possible out of *wh*-islands, why not also from those clauses that show trapping effects? Our approach provides a way out.

The difference between (89a) and (82), we suggest, is in the selectional profile of the matrix predicates: *know*, unlike *promise*, can take indirect question complements. The uniformity constraint is not violated in a list linking *which student* and *which book* since it effectively involves only a 2-member dependency. It can be violated, even in Baker examples, when there is a third embedded *wh*-term, as in (90):

(89) a. Which student knows where Mary bought which book?

b. [$\exists F_2$ *wh* $student_1$ [t_1 knows [$where_3$ [Mary bought *wh* $book^1_2$ t_3]]]]

c. $\Rightarrow$ $\lambda Q\ \exists f_2$ [$CF(f_2) \wedge Q = \lambda p'\ \exists x_1$ [$student(x_1) \wedge$
$p' = x_1$ knows ($[\![CP_4]\!]$)]
where $[\![CP_4]\!] = \lambda p\ \exists x_3$ [$place(x_3) \wedge$
$p =$ Mary bought f_2 (λF_2 [$\forall z(book(F_2\ (z)))$]) ($x_1$) at x_3]

(90) a. Which student knows who gave which present to which teacher?

b. John knows who gave which present to Mary.

c. John knows who gave the book to Mary and the pen to Sue.

d. #John knows who gave the book to Mary and Sue knows who gave the pen to Mary.

Answer (90b) interprets two *wh*-expressions in the embedded clause, with one getting matrix scope via choice functional binding over individuals. Answer (90c) interprets one *wh*-phrase in the embedded clause, allowing the other two to form an internal dependency, which gets matrix scope via choice functional binding over skolem functions. This is a SP answer linking a student with a function from presents to teachers, a trapped PL answer analogous to (82b). Answer (90d) is a trapping violation like (82c), and is blocked by the uniformity constraint.

While this solution works well enough, there is in fact a wrinkle for all accounts that give wide scope to the embedded *wh*-in-situ, be it through covert movement or through choice functional binding. They predict that the fronted *wh*-phrase will be exhaustively paired, when in fact, it is the *wh*-in-situ that is so interpreted. Dayal 1996 and subsequent work dubs this phenomenon the *wh*-triangle. Her solution to it has three components: (i) all *wh*-expressions are interpreted locally, not just those that take scope via movement, (ii) the complement is interpreted at a higher type than usual, (iii) the complement functions as the domain term, becoming a de facto quantifier, and the fronted *wh*-phrase becomes the dependent expression.

Apart from domain-cover, then, there is another difference separating the two approaches. In the long-distance binding of the *wh*-in-situ, the depth of embedding is not relevant. The *wh*-triangle approach requires the *wh*-in-situ to be in the complement of the matrix predicate because the complement has to QR in order to c-command the a-index of the matrix *wh*-phrase. This enforces strict locality.

To re-calibrate our account for long-distance lists in terms of the *wh*-triangle

would take us too far afield and may well be premature, given the facts in section 8.1. Our goal was to show which aspects of the theory cause which effects, making it relatively easy to see how the theory would have to be modified to incorporate any new findings that future empirical studies of long-distance lists may reveal.

9 Conclusions

Sluicing is clearly an interface phenomenon and, unlike earlier studies, we have focused on both aspects of its grammer in order to tap its full potential. Comparing licit with illicit multiple sluicing structures and illicit multiple sluicing structures with the possible interpretations of their presluices has led us to conclude that:

- Sluicing can make (certain) otherwise covert phrasal movement operations overt. Specifically, sluicing can make covert phrasal *wh*-movement overt.
- Covert phrasal *wh*-movement is clause-bounded and feeds multiple sluicing. It differs from movement operations such as QR or extraposition that may also be clause-bounded but do not feed sluicing.
- Covert phrasal *wh*-movement is subject to superiority. Imposing locality constraints on the movement of the second remnant and imposing superiority as a condition on the interaction of the two movements strongly suggests that the second remnant reaches its position specifically through *wh*-movement.
- A single language can employ both a strictly local movement-based *wh*-scope mechanism and island insensitive long-distance choice-functional binding.
- PL readings need Skolem functions and a split C structure. The lower C interprets the domain term and denotes a set of propositions. The higher C

interprets the functional term and yields a set of sets of propositions. The answer is the intersection of the unique cell with only true propositions in it.

- In superiority violating structures and in questions with D-linked universal quantifiers, scrambling a discourse prominent expression over the structurally higher expression creates the configuration needed for PL readings.
- Neither SP nor PL answers are constrained by the CMC per se but embedded *wh*-expressions reveal a clause-mate dependence, where clause-mates cannot separately enter into dependency relations outside the clause.
- Choice functions are cross-categorial but a given ∃ only binds one type of choice function, trapping embedded clause-mates in their own clause.

We would be foolish to believe that ours is the last word on any of these issues. There clearly are many open empirical questions that we have flagged in the paper. On the theoretical side, two issues seem most pressing: the need for a better understanding of the mechanisms guaranteeing that covert phrasal movement is clause-bounded and subject to superiority, and the need for a full theory of *wh*-scope taking that derives intervention effects. Alas, these tasks must be left for the future.

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Klaus Abels

Department of Linguistics

UCL

k.abels@ucl.ac.uk

Veneeta Dayal

Department of Linguistics

Yale University

veneeta.dayal@yale.edu

Notes

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[1]Some examples of multiple sluicing in the literature have potential confounds. Truly convincing cases must use unambiguously singular *wh*-phrases in contexts that force a PL reading. Thus, (4) features a universally quantified correlate distributing over an existentially quantified one. Another context for PL readings is shown in (7a), where a wide scope adverbial quantifier distributes over both indefinite correlates.

By contrast, SP interpretations are compatible with (asyndetic) coordination of two single sluices: *which student ~~was reading~~ (and) which book ~~they were reading~~*. If - in a given language - a silent conjunction is possible here, we cannot conclude anything about multiple sluicing. The difficulty of distinguishing asyndetic coordination of single sluices from multiple sluicing persists in examples with plural *wh*-phrases (*which students (and) which books*) and ambiguously singular/plural *wh*-phrases (*who (and) what*) even un-

der PL readings (Dayal 2016:99–101 and references cited there). To avoid these complications unambiguous cases of multiple sluicing should always be used.

[2]Hiraiwa 2021 questions the existence of sluicing proper in Japanese. We could make the point on the basis of another *wh*-in-situ language such as Hindi or Turkish.

[3]All other multiple *wh*-fronting languages we have looked at require overtly moved multiple *wh*-phrases to be clause mates and thus do not allow us to further test the conjecture that overt violations of the CMC license violations under ellipsis. These further languages fall into two classes: those that allow multiple *wh*-phrases to move cyclically and those in which mutliple *wh*-phrases can only move to the edge of their immediate clause. The first group allows long-distance multiple fronting of clausemate *wh*-phrases and includes Lithuanian (Adliene 2014:29 ex. 138) and Bulgarian (C. Rudin 1988b:452 fn. 7, C. Rudin 1988a:8). The second more restrictive group of multiple *wh*-fronting languages includes Slovenian (Marušič and Žaucer 2013:419, 421), Russian, Polish, and Czech. The latter three do not even allow single long-distance *wh*-movement (Müller and Sternefeld 1993; Stepanov 1998 for Russian, Toman 1981:296–7, D. Grabska, p.c. for Polish and Meyer 2003, J. Kaspar, p.c. for Czech, pace Toman 1981). Our claim that Bulgarian disallows multiple *wh*-phrases from different clauses might be surprising; Richards 1997 is often taken to have shown that additional *wh*-phrases in Bulgarian are altogether unconstrained (due to the Principle of Minimal Compliance–PMC). This is an overinerpretation: the ameliorating effect of PMC alone is mild: thus, compare Richards's (47a) (p. 256) marked '*' with the ameliorated version (47c) marked '??'.

[4]Manetta 2017 gives an example of a CMC violating multiple-slucie in Kashmiri, a multiple *wh*-fronting language with non clause-mate multiple *wh*-questions. However, the example has a potential confound. Kashmiri multiple questions are claimed to disallow SP readings (see Manetta 2019:ch. 5) but the example has just that reading. We therefore think that it might involve asyndetic coordination of two sluices. See fn. 1.

[5]Our proposal works equally well with pragmatically based approaches to ellipsis identity (AnderBois 2010, 2011; Barros 2014; Kroll 2018; D. Rudin 2019; Weir 2014).

[6]Unrestricted versions of Merchant's (2001) theory fail to derive case connectivity (see Lasnik 2005). For possible solutions see Abels 2017; Barros 2016; Barros and Vicente 2016; Chung 2013; Kidwai 2018; Wood, Barros and Sigurðsson 2016. Unrestricted versions also face the too-many-paraphrases problem (see Abels 2019a; Chung, Ladusaw and McCloskey 2006), which is discussed briefly below.

[7]The copula in some paraphrases from Barros, Elliott and Thoms 2014 must either be viewed as a substructure of any thematic kernel or requires special stipulation.

[8]Barros and Frank 2017b note that this approach to Nishigauchi's counterexample might still undergenerate. They give several examples, which successfully violate the CMC but lack a short source, including *Some student claimed [$_{CP}$ that there was a problem with some professor], but I can't recall which student with which professor* (p. 2 ex. 8, attributed to L. Horn). We leave further exploration of such examples for the future, noting only that for Barros and Frank 2016, 2017a,b; Grano and Lasnik 2018, Nishigauchi's counterexample is part of a larger pattern, in which the clause-boundedness of a variety of processes like QR is sometimes suspended. If, as suggested by Barros and Frank, clause-boundedness can be modulated for covert phrasal *wh*-movement in the same way that it can be modulated for QR and other movement operations, this would provide further indirect evidence in favor of our proposal of deriving multiple sluicing through covert phrasal *wh*-movement. For the sake of simplicity and pending further investigation of the issue, we continue to talk about the CMC on multiple sluicing and the clause-boundedness of covert phrasal *wh*-movement. See also footnote 19.

[9]A different reviewer presents the following context: [Every student in the class talked about one book on the reading list.] *We were able to figure out that a certain student talked about a certain book. Can you guess which student about which book?* They ask

why the question is not infelicitous on the following short source analysis, structurally analogous to (14a): *Can you guess [which student [about which book ~~[t_{DP} talked t_{PP}]~~]]*.

The common ground here establishes a multiplicity of student-book pairs, which should make the SP construal of the short presluice infelicitous while being compatible only with a long presluice. Note, however, that the nonelliptical version does not force the infelicitous reading and therefore does not argue for a long presluice. Presumably, the *wh*-phrases (both in the sluiced and in the nonelliptical version) are contextually restricted to a single student-book pair, made salient by the antecedent.

[10]The genitive-nominative mismatch is, of course, a violation of Ross's case matching generalization mentioned above. However, the example does obey Abels's 2017:13 Fit condition, designed to deal with case mismatch. Case (mis-)matching under sluicing in Turkish is discussed further in Ince 2012; Kiper 2020; Palaz 2019.

[11]We refer to the movement of additional *wh*-phrases in multiple sluicing as *covert phrasal* wh-*movement*, despite the fact that it is exceptionally overt. Covert movement is movement the head of whose chain is in a weak position.

[12]A candidate property, suggested by a reviewer and invoked for this purpose in in-situ analyses of sluicing like Abe 2015, is focus on *wh*-phrases. Another equally problematic version of this proposal would be to give up a single cycle model and to distinguish QR from *wh*-movement by locating them in different cycles.

[13]Realization of the second *wh*-phrase after the auxiliary results in pseudogapping rather than VP ellipsis. See Gengel 2013; Johnson 2001 for differences between them.

Example (19b) raises further issues, which we cannot do justice to here. A reviewer asks why (19b) cannot be completed by '…which student did.' The question semantics developed below allows two relevant derivations: one where the object *wh*-phrase remains in situ at LF and one where it moves but is pronounced low. The latter is ruled out by Max Elide or whatever else captures the generalization that ellipsis must be as large

as possible if it intersects a movement path (see Fiengo and May 1994; Fox and Lasnik 2003; Hartman 2011; Kennedy 2002; Kimura 2013; Merchant 2008; Messick and Thoms 2016; S. Takahashi and Fox 2006). We do not know what blocks the former derivation.

[14]Given that Lasnik 2014 assumes locality violations of *wh*-movement to be repaired by ellipsis, there are no constraints on the first movement as long as the second obeys the right-roof constraint. He therefore wrongly predicts the following to be to be grammatical: **In each case, the fact that some enthusiast had photographed Old Faithful proved useful to some researcher, though I couldn't tell you which enthusiast to which researcher*.

Two further points should be noted. First, Lasnik's account remains language specific; extraposition of *wh*-phrases is not available in a number of the languages treated here (German, Hindi), leaving a Lasnik style account without a source of multiple sluicing in these languages. Second, it remains unclear under Lasnik's account why ellipsis should repair locality violations for *wh*-movement but not for extraposition.

[15]A hypothetical third type of languages would violate superiority freely even in (24b) and would not bar crossed *wh*-phrases from moving. Learnability demands that there be robust triggering evidence for such a parameter setting. Plausibly, this setting would only be accessible in languages with multiple *wh*-fronting. Among the multiple *wh*-fronting languages we have investigated, we have not found this third type. It may not exist.

[16]Abels and Dayal 2017:section 2.1 suggest that multiple sluicing must obey superiority even in certain contexts where the presluices may violate superiority. However, the crucial examples Abels and Dayal 2017:ex. 20-21 are not perfect minimal pairs and it is unclear if the presluices for their example 21 really do allow superiority violations.

[17]The restriction to covert scrambling, that is scrambling landing in a weak position, captures two facts: (i) multiple *wh*-fronting languages like Russian that have overt scrambling allow superiority violations under multiple *wh*-fronting in nonelliptical clauses and in multiple sluicing (see Kotek and Barros 2018); (ii) single *wh*-fronting scrambling lan-

guages allow superiority violations under multiple sluicing.

[18]Whether in situ *wh*-phrases in superiority violating contexts can undergo any kind of covert movement and ever license ACD is discussed in Branan 2017; Fox 2002; Nissenbaum 2000, largely using prepositional dative constructions. Prepositional dative constructions may not give rise to classic superiority effects (see Featherston 2005b) nor should we expect them to (see Janke and Neeleman 2012). But even if the examples from the literature do involve superiority, pairs like **Which mission did you warn which spy that Mary also did about?* and *?Which missions did you warn which spy about that Mary also did?* (Branan 2017:example 9) show that extraposition rather than covert phrasal *wh*-movement licenses ACD here. Pesetsky's claim about covert phrasal *wh*-movement and our adaptation remains unaffected.

[19]An anonymous reviewer points out an interaction between the account of Nishigauchi's counterexample, (8), from footnote 8 and ACD. If the presence of a bound subject pronoun in the embedded clause can overcome clause-boundedness of covert *wh*-movement, we should see the following pattern (predicted ideal judgments) in ACD cases with quantifiers and with *wh*-in-situ:

(i) a. John claims that Sue is working on every project that Bill {*does | is}.

b. John_{j} claims that he_{j} is working on every project that Bill_{b} {does <claim that $\text{he}_{\{\text{b} \mid *\text{j}\}}$ is working on> | is <working on>}.

(ii) a. Which of these boys claims that Sue is working on which project that Mr Finn (also) {*does | is }?

b. Which of these boys_{b} claims that he_{b} is working on which project that $\text{Mr Finn}_{\text{f}}$ (also) {does <claim that $\text{he}_{\{\text{f} \mid *\text{b}\}}$ is working on> | is <working on>}?

Consultation with native speakers suggests that the predicted effect may exist, but is not very strong. Controlled experimental work would be necessary to clarify the facts. Such an experiment would allow us to evaluate the proposal from footnote 8 more clearly.

[20]We set aside the possibility of interpreting *wh*-expressions as lambda abstracts (George 2011; Groenendijk and Stokhof 1982, 1984) and work on *wh*-scope taking in Inquisitive Semantics (Ciardelli, Roelofsen and Theiler 2017; Groenendijk and Roelofsen 2009).

[21]Since we are focusing on singular *wh*-terms, we have simplified Ans-D. Plural *wh*-expressions require a generalization of (39b), with uniqueness calibrated to maximality and quantification ranging over plural individuals. These are standard semantic adjustments that all plural terms call for in operations involving *iota*. See Dayal 1996, 2016.

[22]The acceptability of DPs as second remnants in English varies across speakers. As our focus now is on the semantics, we abstract away from this nontrivial issue and present examples like (40c) as representative of multiple sluicing patterns generally.

[23]Movement structures were notated with copies so far. We switch to a notation with traces for readability but, formally speaking, we intend movement chains to involve copies.

[24]To reiterate, we assume that coordinate sluices (*but Bill doesn't know which linguist and which philosopher*) derive from different presluices, possibly including *which linguist and which philosopher {it was | they were}*. See footnote 1.

[25]Like Reinhart, we treat fronted *wh*-phrases as generalized quantifiers. Unlike her, we crucially allow *wh*-in-situ to be interpreted as generalized quantifiers or as choice functions. Using choice functions to interpret fronted *wh*-phrase would not affect SP readings but it would violate the uniformity constraint introduced in section 8.2 below.

[26]There are several open questions in the literature on specific indefinites, which we do not believe bear on the points under discussion here (see Heusinger 2011 for an overview).

[27]An anonymous reviewer asks why the single sluice cannot yield a multiple question interpretation. Not having an answer to this question, we leave it unaddressed here.

[28]While the claims here are in line with Dayal 2002, the discussion in section 8 will diverge in allowing PL answers, in addition to SP answers, across clauses.

[29]Pesetsky (1987) took the relevant mechanism to be unselective binding of an individual variable, which we do not adopt, for the reasons given in Reinhart 1997, 1998.

[30] The status of examples like (49) has been debated (see e.g. Watanabe 1992) but explicitly or implicitly under its PL reading. This reading falls under the umbrella of *wh*-triangle (see Dayal 2016). Here we consider the SP reading, which we have confirmed is available for (49) when prosody and context are controlled for.

[31]An astute reviewer asks why the contrast between (47) and (49) is not equally problematic for us. The issue for the focus account is why [$\exists_{1\ 3}$ [...f_1 (who) [$\exists_2$ [...f_2 (where)...f_3 (what)...] is available; the issue for us is why [$\exists_3$ [...[$\exists_2$ [...f_2 (where)...f_3 (what)...] is unavailable. The focus account faces a problem of undergeneration, the choice functional account one of overgeneration. While we do not know the exact constraint ruling out the unacceptable LF, we note that overgeneration problems are typically easier to solve without giving up basic assumptions of the theory than undergeneration problems.

[32]Beck's account of intervention has been challenged on empirical as well as theoretical grounds. As such, there are several viable alternative accounts of the phenomenon currently on the market (Grohmann 2006; Mayr 2014; Tomioka 2007, among others).

[33]Functional answers are not descriptions of PL answers because they are possible with all quantifiers, while PL answers are possible with only a subset of quantifiers.

[34]Anticipating our account, the LF for (60b) would be *[*wh student$_1$ [*wh topic$_2$ [t_1 has published on t_2^1]]]*; the LF for (60c) would be the unacceptable **[*wh student$_1$ [*wh topic$_2$ [t_1^2 has published on t_2]]]*. On accounts following Chierchia, the latter is a WCO violation. On our account , the a-index cannot be bound from A-bar positions. Binding must be mediated by scrambling, which does not target canonical A-bar positions.

[35]We are not committed to moving the *wh*-expressions exactly as in (61b). The same

results, with minor tweaks, obtain if one *wh*-phrase moves overtly to the higher CP directly and the functional, in situ *wh*-phrase moves covertly through the lower CP before tucking in below the *wh*-phrase in the higher CP. Our choice represents the most general case, as we will see in section 7, when we consider cases where one member of the dependency remains inside TP. We adopt Richards's analysis of order preservation for convenience. Other analyses (Bošković 1998; Starke 2001) may equally be assumed.

[36]A reviewer asks what would happen if the fronted *wh*-phrase were interpreted in its surface position. What we would need to get the nearly equivalent formula $\lambda Q\ \exists F_2\ [\ \forall z\ [student(z) \rightarrow topic(F_2\ (z))] \wedge\ Q = \lambda p\ \exists x_1\ [student(x_1) \wedge\ p = x_1$ *published on* $F_2\ (x_1)]]$ is a principled way to interpret the domain term twice. This is not a stretch, since there are two indices for the domain term, but we do not pursue this idea further.

[37]Dayal 1996 notes that Chierchia 1993 and Comorovski 1996 do not capture the functionality of PL answers as their questions denote sets of simple atomic propositions.

[38]The topmost CP has the same type in both accounts: sets of sets of propositions (<<<s,t>, t> ,t>) but the set of propositions at the lower CP in our account does not correspond to natural questions. Intersection and Ans-D are thus ordered differently than in (52d). This difference is orthogonal to our current concerns (see Dayal 2016).

[39]An anonymous reviewer points out that there may be reasons (see e.g. Fox 2000) to think that this particular LF might not be derivable because of scope economy.

[40]In *wh*-in-situ languages overt scrambling would be followed by covert *wh*-movement to C. Dayal 1996 notes for Japanese that scrambling leads to a reversal in the functional dependency. The same is true for Russian Grebenyova 2009, as pointed out by a reviewer. Recall the discussion in section 3 on the interactions between A-scrambling and *wh*-movement.

[41]A reviewer notes that, as expected if crossing is A-scrambling, the a-index does not give rise to WCO. However, the reviewer brings up the following WCO violation: **Which* $prize_i$ *did which teacher award* its_i *winner?* This is unexpected, since the object *wh*-phrase

must have scrambled past the subject in order to get around superiority. Thus, a full assimilation of the a-index to pronouns remains elusive. The example may suggest that scrambling ameliorates WCO effects only in languages with overt A-scrambling. A role for overtness and linear order seems plausible given that WCO is sensitive to linear order; observe that '*Which book$_i$ did [you say he chose $t_{which\ book}$] [because you saw it$_i$ on his desk]?*' does not violate WCO despite the fact that the *wh*-phrase does not c-command the pronoun in the base.

[42]An anonymous reviewer helpfully points out that our account of superiority violations could be incorporated into the Fox-Hagstrom-Kotek-Nicolae approach to PL readings. They also note, however, that it may or may not be possible to sustain a nonfunctional account for the full range of PL readings explored in sections 7.2 and 8.

[43]An anonymous reviewer asks what prevents *every NP* from being interpreted as *some NP*, using the same mechanism. On our view, the universal itself cannot introduce the binder for the choice function variable, a *wh*-phrase is needed to activate the null ∃.

[44]Kadmon and Landman (1993:378–379) invoke D-linking of *each* for NPI licensing; and Dayal 2016 the possibility of generic readings with *every* but not *each* in questions with quantifiers.

[45]The functions in such cases seem to involve only one-one pairings (see Dayal 2016:230).