A direct interpretation approach to English multiple sluicing constructions

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Abstract

This paper[†] investigates multiple sluicing constructions, wherein two *wh*-phrases alone form a complete multiple *wh*-interrogative clause. Analyses of multiple sluicing generally fall into two broad categories: deletion-based approaches (Abels & Dayal 2023, Lasnik 2014, Merchant 2001, Nishigauchi 1998) proposing an underlying syntactic structure that is elided and a direct interpretation approach (Park 2009) which posits that fragment phrases are generated "as is," with their interpretation supplied by the discourse.

By examining key syntactic phenomena, particularly island insensitivity, exceptions to clause-mateness, and sluicing without overt antecedents, this study argues that the direct interpretation approach more effectively captures the empirical data than deletion-based alternatives. Building on Ginzburg and Sag's (2000) HPSG approach to single sluicing, we analyze multiple sluicing by employing the concept of Question Under Disucssion (QUD) with two quantifiers. Through this approach, we demonstrate how the meaning of multiple sluicing can be derived from the discourse context, even in the absence of explicit linguistic antecedents. Furthermore, we show how it can effectively account for the three key syntactic phenomena mentioned above, to which deletion-based approaches struggle to provide a uniform account.

1 Introduction

A single sluicing construction is an elliptical phenomenon where a single *wh*-phrase serves as a unary *wh*-interrogative clause, as shown in (1). Here, the *wh*-phrase *what* functions to convey the meaning of *what Ben wanted to ask*.

(1) Ben wanted to ask something. I wonder *what*. (Merchant 2001: 41)

Similarly, a multiple sluicing construction is an elliptical phenomenon where two *wh*-phrases constitute a multiple *wh*-interrogative clause, as in (2).[1] Here, the multiple sluice *who whom* is interpreted as equivalent to *who kicked whom*.

(2) I saw that one girl kicked a boy, but I don't know *who whom*. (Bolinger 1978: 109)

[†]We thank the anonymous reviewers and the audience of the HPSG conference for their helpful comments and suggestions. All the remaining errors are ours.

[1]Admittedly, multiple sluicing is a marked construction in English and its acceptability is subject to cross-linguistic variation. Adopting the view of Cortés Rodríguez (2026), we assume that its marginality in English can be attributed to the lack of cues such as case markers and non-omittable prepositions that would facilitate the processing of the multiple *wh*-dependencies. This may also explain why the acceptability of multiple sluicing increases substantially when the second *wh*-phrase is a PP in English, as will be shown in Section 2 and Section 4.

There are broadly two possible approaches to a sluicing construction, a deletion-based approach and a direct interpretation approach. A deletion-based approach (Abels & Dayal 2023, Lasnik 2014, Merchant 2001, Nishigauchi 1998) assumes that the two *wh*-phrases are moved to the clause-initial or final position, and the remaining TP is then deleted. The problem is that English does not permit multiple *wh*-fronting. Therefore, different mechanisms such as extraposition or exceptional covert *wh*-phrase movement had to be introduced to allow the second *wh*-phrase to survive the TP ellipsis.

On the other hand, a direct interpretation approach (e.g., Park 2009) assumes that a multiple sluicing construction is generated directly from two *wh*-phrases without a deleted or unpronounced syntactic structure. In this approach, the key issue is how the form-meaning mismatch can be resolved without positing an elided syntactic structure. In Park (2009), a multiple sluicing construction is assumed to draw its predicate meaning from its linguistic antecedent in the discourse record. However, it has limitations in accounting for cases without a linguistic antecedent or cases where the semantic structure of a multiple sluice and that of its linguistic antecedent do not match.

In this paper, we advocate a direct interpretation approach that exploits the notion of Question Under Discussion (QUD). By comparing it with a couple of representative deletion-based approaches, we show how it is more favorable in dealing with some key data of multiple sluicing constructions: exceptions to the so-called "clause-mate condition," cases without linguistic antecedents, and examples involving island insensitivity. Then, drawing on Ginzburg & Sag (2000)'s HPSG approach to single sluicing, we provide an HPSG analysis of multiple sluicing. Specifically, we show how the Question Under Discussion triggered in the discourse context can provide the backbone to the meaning of multiple sluicing constructions without solely resorting to the parallelism with the linguisitc antecedents.

2 Key Properties of Multiple Sluicing Constructions

In this section, we discuss the key properties of multiple sluicing constructions. To begin with, as mentioned above, a multiple sluicing construction is a clausal ellipsis where two *wh*-phrases serve as a multiple *wh*-interrogative clause. That is, the multiple sluicing construction in (3) is semantically equivalent to (4).

(3) A: Some student is reported to have quarreled with a famous professor.
B: *Which student with which professor?* (Ginzburg & Sag 2000: 301)

(4) Which student is reported to have quarreled with which famous professor?

Like regular *wh*-clauses, it can not only serve as a stand-alone construction as shown in (3) above, but also as an embedded clause as in (5) below.

(5) Some student is reported to have quarreled with a famous professor, but I don't know *which student with which professor*.

The fact that multiple sluicing constructions are not impossible even in a single *wh*-fronting language such as English can be perplexing to those advocating the idea that a sluice results from a *wh*-movement followed by a TP deletion, which is exemplified in (6) below. This is because, in this line of analysis, they would have to assume a multiple *wh*-fronting as in (7) in the case of multiple sluicing constructions, which is of course illicit in English.

(6) John likes someone, but I don't know who_i [TP ~~John likes t_i~~.]

(7) ?Someone talked about something, but I can't remember who_i *about* $what_j$ [TP ~~t_i talked t_j~~]

Therefore, different suggestions have been made to deal with this issue, such as repair via ellipsis (Merchant 2001, Abels & Dayal 2023) or rightward focus movement (Nishigauchi 1998, Lasnik 2014). More discussion on this will be elaborated in Section 3.

Second, the linear order of the two *wh*-remnants must match that of their correlates. The shuffling of the two *wh*-remnants is disallowed, as shown in the contrast in (8).

(8) a. Everyone brought something (different) to the potluck, but I couldn't tell you *who what*. (Merchant 2001: 112)
b. *Everyone brought something (different) to the potluck, but I couldn't tell you *what who*.

Third, multiple sluicing constructions are insensitive to island constraints. Island constraints refer to some syntactic constraints on movement, which is generally assumed by transformational approaches (Ross 1967). Certain syntactic structures such as complex NPs, adjuncts, or *wh*-clauses prohibit extraction of a constituent inside them. Ross (1969) was the first to point out that single sluices exhibit island insensitivity. For instance, in (9) below, *who* is extracted out of a complex NP island under the assumption that sluicing results from a TP deletion following the *wh*-movement. The fact that (9) is grammatical indicates that single sluices are not subject to the island constraint.

(9) I believe the claim that he bit someone, but they don't know who_i [TP ~~I believe~~ [CNP-island ~~the claim that he bit t_i~~]]. (Ross 1969: 277)

Similarly, multiple sluicies are not subject to island constraints as well. In (10) below, the two *wh*-remnants originate from a *wh*-island. Again, when

assuming that the multiple sluicing construction results from extraction of the two *wh*-phrases out of the *wh*-clause, the derivation of (10) must involve an island violation. The fact that (10) is allowed means that multiple sluicing constructions are also island-insensitive.

(10) Ben got mad when every student talked to some teacher, but he just couldn't remember *which student to which teacher*. (Cortés Rodríguez 2024: 53)

Fourth, as can be seen in the contrast between (11a) and (11b), it seems that the two *wh*-remnants of multiple sluicing may not be separated by a tensed clause boundary. As such, quite a few previous works on this construction posited a syntactic restriction that the two *wh*-remnants must be clause-mates within a finite clause (Nishigauchi 1998, Lasnik 2014, Abels & Dayal 2023).

(11) a. A student met with some professor, but I don't know *which student with which professor*. (Barros & Frank 2023: 651)
b. *Some student said that Sally met with some professor, but I don't know *which student with which professor*. (*ibid.*)

However, there are several data that debunk the existence of such condition. For example, Barros & Frank (2023) report several occasions where multiple sluicing across a tensed clause boundary is grammatical. For instance, if the first correlate is co-referential with the pronoun occupying the embedded subject position as in (12) or if the embedded subject is an expletive as in (13), multiple sluicing across a tensed clause-boundary is possible.

(12) $\text{Everybody}_{\text{k}}$ claimed that $\textit{they}_{k}$ had talked to some professor, but I can't remember *who to which professor*.

(13) Some student claimed that *there* was a problem with some professor, but I can't recall *which student with which professor*.

Fifth, while the category of the correlates must match that of the associated remnants, only the first *wh*-remnant allows P-stranding. P-stranding refers to the fronting of a prepositional object while leaving the preposition in its original place. Therefore, in (14), the preposition of the first *wh*-remnant can be optionally omitted. On the other hand, the preposition of the second *wh*-remnant cannot be omitted.

(14) Peter talked about something to somebody, but I can't remember (about) what *(to) whom. (Rodrigues et al. 2009: 180)

Sixth, in some cases, a multiple sluicing construction does not have an antecedent clause, as shown in examples below. Rather, the sentence providing the clue to its meaning follows it. This data is particularly noteworthy because

a deletion-based approach crucially depends on the existence of a salient antecedent clause preceding the multiple sluice, as will be shown in Section 3.

(15) I don't know *who with who*, but I'm sure everybody will get hooked up with someone. (Merchant 2006: 286)

(16) I don't know *who with who*, but I'm sure everybody will dance with somebody. (Romero 1997: 197)

Finally, the type of the embedding verbs in the antecedent clause seems to affect the grammaticality of multiple sluicing constructions according to Lasnik (2014). In (17) below, when the embedding verb is *deny* or *doubt*, the acceptability of the following multiple sluicing cosntruction drops significantly.

(17) A: Fred *denied/doubted* that a certain boy talked to a certain girl.
B: ???I wish I could remember *which boy to what girl*. (Lasnik 2014: 13)

So far, some of the key properties of this construction have been presented, which will be crucial in the discussion of which approach fits the broader data better. In the following section, we show how two representative deletion-based approaches and the existing direct interpretation approaches are insufficient to accommodate the full range of properties of this construction shown above.

3 Previous Analyses

3.1 Lasnik (2014)

Lasnik (2014) accounts for multiple sluicing constructions in a way analogous to gapping. That is, while the first *wh*-phrase undergoes a regular *wh*-movement, the second *wh*-phrase is extraposed, landing in a position higher than TP. Then, TP ellipsis occurs, yielding the surface form. For instance, (18a) below is derived from (18b).

(18) a. ?One of the students spoke to one of the professors, but I don't know *which to which*. (Lasnik 2014: 4)
b. . . . , but I don't know [which]$_i$ [TP ~~t_i spoke t_j~~] [to which]$_j$

One implicit assumption here is that the E-site[2] is syntactically identical to the antecedent clause. An issue challenging this approach concerns the Right Roof Constraint (RRC) (Ross 1967). The RRC is a condition on rightward movement, which prohibits the long-distance extraposition across a clause boundary. This posits a problem in cases like (19) below.

[2]The term E-site refers to the syntactic structure that is the target of ellipsis.

(19) Fred thinks a certain boy talked to a certain girl. I wish I could remember *which boy to what girl*. (Barros 2014: 12)

To derive the multiple sluice in (19), Lasnik would have to assume a derivation in (20), where the second *wh*-phrase, *to what girl*, has to be extraposed all the way across a finite CP boundary to the matrix CP, which is in violation of the RRC.

(20) [CP1 [which boy]$_i$ [TP ~~Fred thinks~~ [CP2 ~~t_i talked t_j~~]] [to what girl]$_j$]

To resolve such an issue, Lasnik proposes an alternative derivation for (19), where the E-site contains the truncated mono-clausal structure:

(21) ... [CP [which boy]$_i$ [TP ~~t_i talked t_j~~] [to what girl]$_j$]

This derivation is licensed under the assumption that the speaker can accommodate the propositional content *P* from *Fred thinks P*, thereby allowing the embedded content P to serve as the antecedent for the elided TP. In (21), the extraposed phrase does not cross the finite clause boundary, since it is generated in the matrix clause. Thus, it survives the TP ellipsis, while not violating the RRC. Since Lasnik posits that the structure is always mono-clausal, the fact that the two *wh*-phrases seem to be clause-mates can be naturally accounted for.

However, there are certain data that it cannot explain. To begin with, extraposition is generally assumed to target places under a TP, as noted by Lasnik himself. This is illustrated by the ungrammaticality of (22).[3] Yet, Lasnik is assuming a different pattern of extraposition for a *wh*-phrase, which may not be independently motivated.

(22) ?*I know who Mary talked to yesterday about phonology, but I don't know *who about semantics*. (Lasnik 2014: 14)

Another issue is that multiple sluicing across a tensed clause boundary is not appropriately accounted for. As stated earlier, Lasnik basically posits a solid syntactic constraint that the E-site must contain a mono-clausal structure which is syntactically isomorphic to the linguistic antecedent. Therefore, it cannot accommodate cases of multiple sluicing across a clause-boundary in (13), repeated below in (23).

(23) Some student claimed that *there* was a problem with some professor, but I can't recall *which student with which professor*.

[3]If an extraposed phrase can move to somewhere above the TP, *about semantics* should be able to survive the TP ellipsis as follows:

(i). [who]$_i$[TP ~~Mary talked to t_i t_j~~] [about semantics]$_j$

Furthermore, he cannot address certain cases of island-insensitivity, marking another limitation.

(24) A: Sally will be surprised if one of the students in her class wins a prize in some contest.
B: *Which student in which contest?*

In (24), the correlates of the two *wh*-fragments, *one of the students in her class* and *in some contest*, are inside an adjunct island. Since extraction out of an adjunct island is prohibited (Ross 1967), Lasnik would have to assume that the E-site contains a truncated mono-clausal structure that does not contain an island:

(25) [which student]$_i$ [TP ~~t_i wins a prize t_j~~] [in which contest]$_j$

However, unlike the case of (19), the derivation in (25) cannot be licensed because a conditional clause does not support accommodation. Overall, it is evident that Lasnik (2014) cannot capture the wide array of data shown in multiple sluicing constructions.

3.2 Abels & Dayal (2023)

Abels & Dayal (2023) propose another deletion-based account of multiple sluicing, deriving it from multiple *wh*-fronting. They argue that while the first *wh*-phrase undergoes overt movement, the second moves covertly, after which TP ellipsis applies. Adopting a single-cycle model with a copy or multi-dominance view of movement, they suggest that the overt realization of the covertly moved *wh*-phrase results from pronunciation of the higher copy when the lower copy is deleted (Gärtner 2002).

They argue that since covert movement is clause-bounded and subject to superiority, both *wh*-phrases can appear in the correct order within the same CP only if the E-site contains a single finite clause. That is, while departing from different assumptions, their view aligns with Lasnik (2014) in positing a mono-clausal structural constraint in the E-site.

What distinguishes it from Lasnik (2014) is the choice of an identity condition: whereas Lasnik assumes a syntactic requirement, Abels and Dayal, adopting Merchant (2001)'s E-givenness,[4] allow the E-site to differ syntactically from its antecedent as long as semantic identity is maintained.

[4]Merchant's E-givenness Condition, presented below, is a semantic identity condition on ellipsis, requiring a mutual entailment between the focus closures of the antecedent and the elided constituent.

(i) A constituent E can be deleted iff E is e-GIVEN.
(ii) An expression counts as e-GIVEN iff E has a salient antecedent A and, modulo ∃-type shifting:
  (a) A entails the Focus closure of E (F-clo(E)), and E entails F-clo(A).
  (b) F-clo(α) replaces F-marked parts of α with ∃-bound variables.

Given this, it can address how multiple sluicing can "evade" island constraints. In the German example in (26), the two correlates, *which present* and *to which child*, belong to a relative clause, extraction out of which is prohibited.

(26) Ich kenne einen Lehrer, der jedem Kind ein Geschenk gegeben hat
I know a teacher who every.DAT child a.ACC present given has
aber ich weiß nicht genau welchem Kind welches Geschenk.
but I know not exactly which.DAT child which.ACC present
'I know a teacher who gave a present to each child, but I don't know exactly which present to which child.'
(Abels & Dayal 2023: 433)

Abels & Dayal (2023) account for this data by positing a mono-clausal structure which is semantically equivalent but not syntactically isomorphic to the linguistic antecedent, as shown in (27). This way, the E-site does not contain a relative clause, thus evading the island violations.

(27) ... I don't know exactly [which present]$_i$ [to which child]$_j$ [TP ~~he gave t_i t_j~~]

However, such an account cannot resolve all cases of island insensitivity. For instance, in (24), repeated below, the two correlates belong to a conditional clause.

(28) A: Sally will be surprised if one of the students in her class wins a prize in some contest.
B: Which student in which contest?

In this case, an analysis in line with (27), given in (29) below, is not tenable here. In (28), since the antecedent clause is a conditional clause, it cannot entail the focus closure of the E-site in (30), violating Merchant's E-givenness condition (see footnote 4).

(29) [which student]$_i$ [in which contest]$_j$ [TP ~~t_i wins a prize t_j~~]

(30) F-clo of (29): ∃x ∃y [x wins a prize in y]

Abels & Dayal (2023) also face challenges as to explaining the exception cases to the clause-mate condition. Recall that Abels and Dayal require the E-site to be mono-clausal, so examples of multiple sluicing that cross a finite-clause boundary (e.g. (13)) appear problematic.[5]

[5]Cortés Rodríguez (2022) claims that Abels & Dayal (2023) can also cover multiple sluices across a tensed clause boundary by invoking the "short source" approach as below:

(i) ..., but I can't recall [which student]$_i$ [with which professor]$_j$ [TP ~~t_i had problem t_j~~].

Finally, there are cases where multiple sluicing does not follow a linguistic antecedent. For instance, in (15), repeated below in (31), the sentence providing the clue to the interpretation of the multiple sluice does not precede it, but follows it.

(31) I don't know who with who, but I'm sure everybody will get hooked up with someone.

These cases cannot be accounted for in this analysis, because Merchant (2001)'s E-givenness condition basically requires a salient antecedent. If there is no appropriate linguistic antecedent, there is no way to account for such cases.

Overall, deletion-based approaches assume that the relevant syntactic structure in the ellipsis site is derived from the syntax/ semantics of an overt antecedent. Consequently, such approaches cannot be applied when no suitable antecedent exists. Moreover, since the movement that precedes deletion, whether it is an extraposition or a covert *wh*-phrase movement, is subject to clause-boundedness constraints, the E-site must be mono-clausal. It thus follows that deletion-based accounts are unable to capture cases of multiple sluicing across a finite clause-boundary. Furthermore, certain cases regarding island-insensitivity cannot be explained in both approaches. In Lasnik (2014), the syntactic identity condition disallows evasion of island constraints. Abels & Dayal (2023), on the other hand, circumvent this issue by positing a non-isomorphic E-site structure but still fails to account for cases where the mutual entailment between the antecedent and the multiple sluicing construction cannot be satisfied.

3.3 Park (2009)

Park (2009), adopting Bertomeu & Kordoni (2005), provides an HPSG analysis of multiple sluicing based on the discourse record.[6] In Bertomeu & Kordoni (2005), it is assumed that fragments are not a uniform phenomenon but are licensed by different construction types. One such type is *sem-struct-res-frag-cl*, which crucially relies on the access to the structural semantic information from an antecedent utterance. The semantic structural information of recent utterances is stored in the discourse record, which is a memory buffer that keeps track of representations of recent utterances in sequence. In *sem-struct-res-frag-cl*, fragment resolution is achieved by identifying the relation of the *soa* of the recent utterance with that of the constructional

However, in this case, the structure prior to ellipsis would be *which student had a problem with which professor*. It only licenses the specific meaning where some student had a trouble with some professor. Another possible interpretation where some student is a mere reporter of some professor having a problem is rejected under such an analysis.

[6]Due to space constraints, we only provide a simplified description of Park (2009). For a detailed discussion, refer to Kim (2025).

content, allowing the fragment to reconstruct a propositional meaning without a verbal predicate.

By introducing *multi-wh-frag-cl* as a type representing multiple sluicing constructions and making it a subtype of *sem-struct-res-frag-cl*, Park (2009) applies this approach directly to multiple sluicing, with an addition of a few construction-specific constraints. The crucial point in the constraints is that the key semantic relation of the recent utterance is matched with that of the multiple sluicing construction[7]

However, this approach also faces certain limitations. First, it crucially relies on the presence of an antecedent in the discourse, making it difficult to account for exophoric multiple sluicing, where no linguistic antecedent is available. Second, because the approach derives the constructional meaning by mapping the relation of a single verbal predicate in the antecedent to multiple fragments, it encounters challenges in cases where multiple sluicing occurs across the clause boundary. It is because neither of the antecedent predicates can have the two *wh*-fragments as their arguments. Finally, since it relies purely on semantics in resolving multiple sluicing constructions, it cannot account for the syntactic features of the construction. For instance, while only the first fragment allows for the omission of preposition, this sort of syntactic pattern cannot be captured in this approach.

4 A QUD-based HPSG Analysis

In this section, we propose a more discourse-driven approach in which the interpretation of an elliptical phenomenon is guided not mainly by the structural parallelism with the antecedent, but by the retrieval of contextually salient question meanings from the discourse i.e., Question Under Discussion (QUD). QUD, discussed in Ginzburg (1994) and Roberts (1996), is a salient question meaning sequentially activated in the discourse context, which functions to constrain the felicitous flow of discourse among interlocutors. Employing such a pragmatic concept enables a more flexible account that is not necessarily constrained by the presence of a linguistic antecedent.

One possible approach is to extend AnderBois (2014)'s QUD-based analysis of single sluicing constructions to multiple sluicing constructions. However, since it is couched in a type of a deletion-based approach, it assumes that the QUD is directly calculated from the quantificational items in the linguistic antecedent. Thus, it shares many of the limitations of deletion-based analyses discussed in Section 3.[8]

[7]To be more specific, this identity is enforced by matching the RELN value of the *soa* relation in the construction's C-CONT|RELS with the RELN value of the *soa* in the RELS stored in the antecedent's DISC-REC (discourse record).

[8]See Kim (2025) for the discussion on potential challenges to an attempt to extend this particular analysis to multiple sluicing constructions.

Instead, we adopt and extend Ginzburg & Sag's (2000) single sluicing analysis (G&S henceforth) to multiple sluicing constructions. G&S offers a QUD-based account of sluicing within HPSG, employing a direct interpretation approach. Basically, it assumes that a *wh*-fragment in a single sluicing construction is generated *as is*, without transformational operations such as movement and deletion. That single fragment projects into a verbal mother and the sentential meaning of the mother is derived from the most immediate QUD (i.e., maximal QUD) in the discourse context.

To see how it works, here is a simple example:

(32) A: Some student died.
B: Who?

In G&S, which is built up upon the framework of KoS (Ginzburg 1996, Traum et al. 1999), both querying and assertion involve a question becoming the maximal QUD: when a question q is explicitly posed, that question q will become the maximal QUD. When an assertion p is uttered, a polar question $\lambda\{\}$p will become the maximal QUD. In (32) above, the MAX-QUD will be $\lambda\{\}\ prop(s,\ \langle\langle Some;\ \lambda b.\langle\langle Student; b\rangle\rangle,\ \lambda c.\langle\langle Die; c\rangle\rangle\rangle\rangle)$, a polar interrogative question semantically equivalent to 'Did some student die?' This QUD will provide the backbone of the meaning to the following sluicing construction, a detailed account of which will be provided below.

What is important to note is that G&S adopts a speaker-oriented view of the utterance and allows a QUD trigger even without an explicit utterance.[9] That is, if the speaker thinks a certain question can and should be discussed immediately in the current discourse context, that question can become the maximal QUD. Related examples presented in G&S are as follows:

(33) [Milling around on first day of conference, participants ignorant of location of talks go up to harried organiser:] Hey, could you tell us which room so we can go in and wait for things to start? (Ginzburg & Sag 2000: 298)

(34) [In an elevator] What floor? (*ibid.*)

The advantage of choosing G&S is manifold. First, it presents a more genuinely discourse-oriented QUD approach, one that does not mandate the existence of a linguistic antecedent. Thus, it admits the possibility

[9]For example, Ginzburg (2012) argues that what counts as a relevant utterance in a discourse is constrained by activity relevance, which is modeled in terms of *conversational genres*. Even in the absence of an overt linguistic antecedent, a conversational genre may support the accommodation of a relevant question. If the speaker believes that an utterance addresses such an accommodated QUD, an exophoric non-sentential utterance can be licensed. Although the current analysis does not make reference to the notion of conversational genres, it crucially adopts the underlying insight that a QUD may be accommodated based on the speaker's assessment of the discourse context.

that a QUD can be triggered without an antecedent, given an appropriate discourse context. Furthermore, since it denies transformational operations, island insensitivity and the possibility of multiple sluicing across a finite clause boundary are more easily accounted for. However, several modifications to this system are necessary to extend this to multiple sluicing cases, since the original approach only dealt with single sluicing cases. In the following subsection (§4.1), we propose an HPSG analysis to multiple sluicing constructions, building on G&S. Then in the next subsection (§4.2), it will be shown how this account can capture the key properties of the construction discussed in Section 2.

4.1 Representing Multiple Sluicing Constructions

Since G&S only deals with the cases of single sluicing constructions, some modifications should be made to its type hierarchy and type constraints. The modified type hierarchy is presented in Figure 1. First, unlike G&S, which regards the type *hd-frag-ph* representing Non-Sentential Utterances (NSUs) as a headed phrase, we revise it into a non-headed phrase, renaming it as *frag-ph*. This is motivated by the fact that NSUs do not show a typical property of a headed structure in that the mother ('S') and the head daughter ('NP') do not share categorical identity or semantic headedness. Moreover, when they comprise more than one fragment daughter, they do not constitute a head-mother relationship with any of their daughters. In addition, we change *slu-int-cl*, which originally represented single sluices, into a cover type subsuming *mult-slu-int-cl* (for multiple sluices) and *sg-slu-int-cl* (for single sluices).

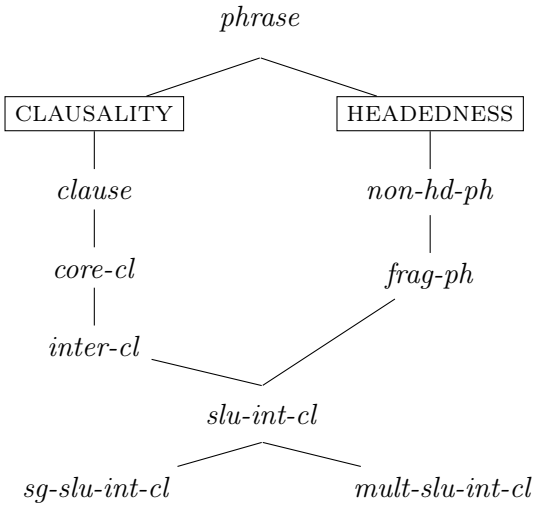


Figure 1: Type Hierarchy Associated with Multiple Sluicing Constructions

In addition, the constraint imposed on *frag-ph* is revised as in (35) below. Unlike the original constraint where the SAL-UTT (salient-utterance) takes a singleton set, it now takes an ordered list of multiple items, only the first one of which is mandatory. The SAL-UTT represents the (sub)utterance that are in focus in the maximal QUD. They correspond to the correlates in case there are linguistic antecedents. Note that their CAT (category) and INDEX values are matched with that of the fragments in order. This matching ensures that they share syntactic category and have same referents as the corresponding fragment daughters. The only exception is the first fragment. In the case of first fragment, it merely shares a VAL value with SPR and COMPS saturated, which means that they should be a maximal projection. This is to accommodate the fact that only the first fragment of multiple sluicing constructions allows the omission of preposition when the relevant correlate is a PP (Romero 1997, Merchant 2006, Cortés Rodríguez 2026).[10]

(35)

$$\left[\begin{array}{l}\textit{frag-ph}\\ \text{CAT}\ \left[\begin{array}{l}\text{HEAD}\ \left[\begin{array}{l}v\\ \text{VFORM}\ \textit{fin}\end{array}\right]\\ \text{VAL}\ \left[\begin{array}{l}\text{SUBJ}\ \langle\rangle\\ \text{SPR}\ \langle\rangle\end{array}\right]\end{array}\right]\\ \text{SAL-UTT}\ \left\langle\left[\begin{array}{l}\text{CAT}\ \left[\begin{array}{l}\text{HEAD}\ \textit{nominal}\\ \text{VAL}\ \boxed{1}\left[\begin{array}{l}\text{SPR}\ \langle\rangle\\ \text{COMPS}\ \langle\rangle\end{array}\right]\end{array}\right]\\ \text{INDEX}\ \boxed{2}\end{array}\right],\left(\left[\begin{array}{l}\text{CAT}\ \boxed{3}\left[\text{HEAD}\ \textit{nominal}\right]\\ \text{INDEX}\ \boxed{4}\end{array}\right]\right),\ldots,\left(\left[\begin{array}{l}\text{CAT}\ \boxed{m}\left[\text{HEAD}\ \textit{nominal}\right]\\ \text{INDEX}\ \boxed{n+1}\end{array}\right]\right)\right\rangle\end{array}\right]\rightarrow$$

$$\left[\begin{array}{l}\text{CAT}\ \left[\begin{array}{l}\text{HEAD}\ \textit{nominal}\\ \text{VAL}\ \boxed{1}\left[\begin{array}{l}\text{SPR}\ \langle\rangle\\ \text{COMPS}\ \langle\rangle\end{array}\right]\end{array}\right]\\ \text{INDEX}\ \boxed{2}\end{array}\right]\ \left(\left[\begin{array}{l}\text{CAT}\ \boxed{3}\\ \text{INDEX}\ \boxed{4}\end{array}\right]\right)\ \ldots\ \left(\left[\begin{array}{l}\text{CAT}\ \boxed{m}\\ \text{INDEX}\ \boxed{n+1}\end{array}\right]\right)$$

Moving onto the dimension of CLAUSALITY, *inter-cl* represents all *wh*-interrogative clauses which require *wh*-retrieval. By the Interrogative Retrieval Constraint (IRC) imposed on this type, *wh*-phrases in an interrogative clause can find its appropriate scope. In G&S, the *wh*-retrieval in the IRC was mediated through a head-mother relationship, since all subtypes of *slu-int-cl* were a headed phrase. However, in our approach, since *slu-int-cl* is a non-headed construction, we add a new mode of *wh*-retrieval in the IRC, where non-head *wh*-fragment daughters mandatorily find its scope in its mother. In the modified IRC in (36) below, it specifies that the parameters in the STORE of fragment daughters must be retrieved in the mother's PARAMS set. As in G&S, the STORE represents scopal elements which have yet to find their scope. Every *wh*-phrase mandatorily introduces one parameter (in its STORE), which is a restriction-bearing index corresponding to the entity that gets abstracted away.

[10]This way of treating preposition omission in fragments is partly based on Nykiel & Kim (2022).

(36) *inter-cl*:

(i) In *hd-ph*

$$\begin{bmatrix}\text{STORE} & \boxed{\Sigma_1} \\ \text{CONT} & \left[\text{PARAMS} \quad \boxed{\Sigma_2}\right]\end{bmatrix} \rightarrow \mathbf{H}\left[\text{STORE} \quad \boxed{\Sigma_1} \quad \uplus \quad \boxed{\Sigma_2}\right]$$

(ii) In *non-hd-ph*

$$\left[\text{CONT} \quad \left[\text{PARAMS} \quad \boxed{\Sigma_1} \uplus \ \ldots \ \uplus \boxed{\Sigma_n}\right]\right] \rightarrow \left[\text{STORE} \quad \boxed{\Sigma_1}\right] \ldots \left[\text{STORE} \quad \boxed{\Sigma_n}\right]$$

Next, to capture the common properties of sluicing constructions in general, we impose the constraint on *slu-int-cl* in (37). As in G&S, the mother has the feature MAX-QUD, which represents the maximal QUD in the current context. The maximal QUD of *slu-int-cl* has a propositional argument containing up to two wide-scoping quantificational items.[11] It represents a correlate or a quantifier associated with the *wh*-fragment(s) of sluicing constructions. In case the given sluicing construction has two fragment daughters, there will be at least two quantifiers, each corresponding to a different fragment daughter. Then, the CONT value of the mother, which represents the meaning of the construction itself, is also a question, with the same SIT (situational index) and NUCL (key semantic relation) as the MAX-QUD. This indicates that the meaning of a sluicing construction references the same situation and semantic relation as the maximal QUD. Note also that the fragment daughter(s) mandatorily has a non-empty set of parameters, suggesting that they must be a *wh*-phrase.

(37)

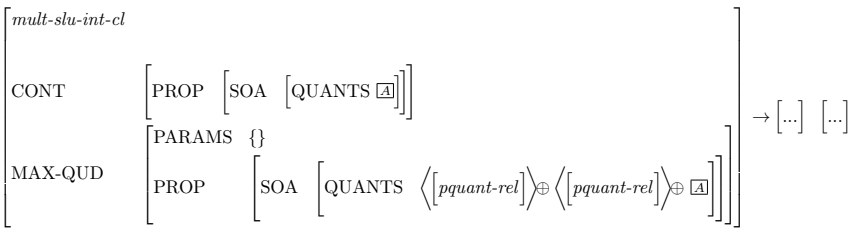
$$\begin{bmatrix}\textit{slu-int-cl} & & \\ \text{CONT} & \begin{bmatrix}\textit{question} & \\ \text{PROP} & \begin{bmatrix}\textit{proposition} & \\ \text{SIT} & \boxed{1} \\ \text{SOA} & \begin{bmatrix}\text{QUANTS} & \boxed{A} \\ \text{NUCL} & \boxed{2}\end{bmatrix}\end{bmatrix}\end{bmatrix} \\ \text{STORE} & \{\} \\ \text{MAX-QUD} & \begin{bmatrix}\textit{question} & \\ \text{PARAMS} & \{\} \\ \text{PROP} & \begin{bmatrix}\textit{proposition} & \\ \text{SIT} & \boxed{1} \\ \text{SOA} & \begin{bmatrix}\text{QUANTS} & \left\langle \textit{pquant-rel} \right\rangle \oplus \left(\left\langle \textit{pquant-rel} \right\rangle\right) \oplus \boxed{A} \\ \text{NUCL} & \boxed{2}\end{bmatrix}\end{bmatrix}\end{bmatrix}\end{bmatrix} \rightarrow$$

$$\left[\text{STORE} \quad \textit{neset}(\textit{param})\right] \ \left(\left[\text{STORE} \quad \textit{neset}(\textit{param})\right]\right)$$

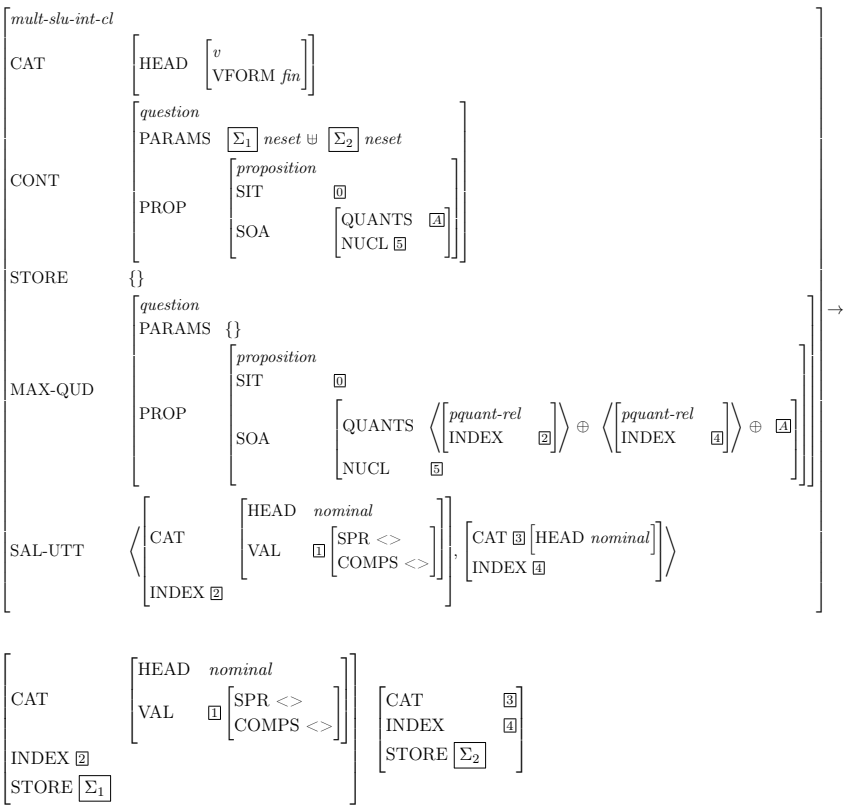
[11] Non-sentential utterances such as gapping may allow more than two fragment daughters, which is permitted by the *frag-ph* in (35). On the other hand, since sluicing does not appear to allow more than two daughters in English, we limited the number of the fragment daughters to two in (37).

Finally, the constraint imposed on the terminal type *mult-slu-int-cl*, which represents multiple sluices, is presented in (38). It ensures that the maximal QUD must have two wide scoping positive quantifiers, whose scope interaction will give rise to a pair of entities queried by the multiple sluice. Also, it makes sure that the number of the fragment daughters must be two. (39) below illustrates all the constraints on *mult-slu-int-cl* inherited from its supertypes mentioned so far.

(38)



(39)



To summarize the essence of what has been presented so far, a multiple sluicing construction has a maximal QUD of a polar question, whose propositional argument has two wide-scoping positive quantifiers. The CONT of the mother is largely drawn from this maximal QUD, suggesting that the construction meaning is referencing the situation and the semantic relation of the propositional argument of the maximal QUD. Importantly, the difference

between the maximal QUD and the mother's CONT is that while the former has an empty PARAMS set, thus being a polar question, the mother's CONT has two items in its PARAMS set. This is a consequence of the modified IRC, where all the parameters in the STORE set of the fragment daughters must be retrieved in the mother. Since the parameters contributed by the fragment daughters are retrieved in the mother node, it ends up having the meaning of querying the identity of the pair of entities associated with them.

4.2 A Comprehensive Picture

In this section, we demonstrate how the proposed analysis in §4.1 can address diverse examples of multiple sluicing constructions. First, Figure 2 below shows the analysis of the basic case of multiple sluicing in (18), repeated below in (40).

(40) ?One of the students spoke to one of the professors, but I don't know *which to which*.

In this case, the maximal QUD has a propositional argument semantically equivalent to *one of the students spoke to one of the professors*. This fact is reflected in the MAX-QUD value of Figure 2. Here, the MAX-QUD has two *some-rel* quantifiers, each corresponding to *one of the students* and *one of the professors*. Note also that it has a NUCL value of *speak-to-rel*, where $\boxed{2}$ (INDEX of the student) speaks to $\boxed{4}$ (Index of the professor). Then, the mother's content is a question with the same SIT and NUCL values as the MAX-QUD, indicating that the mother's meaning is derived from the situation and the semantic relation of the maximal QUD. Also, since the fragment daughters each contain one parameter in its STORE, which is each associated with *some student* and *some professor*, those parameters will end up finding its scope in the mother's QUANTS. As a result, the mother will have a meaning of querying the identity of student-professor pairs where the former spoke to the latter.

Now, we move onto the key phenomena mentioned in Section 2. To begin with, we discussed in Section 2 how multiple sluicing can take place across the finite clause-boundary. Although it is seemingly subject to a clause-boundedness constraint where two *wh*-phrases must belong to a single finite clause, we have seen quite a few exceptions where this constraint does not hold and drew a conclusion that it is not a solid syntactic constraint. In our analysis, the CONT value of the multiple sluicing example in (13), which is repeated in (41), can be presented as in (42).

(41) Some student claimed that there was a problem with some professor, but I can't recall *which student with which professor*.

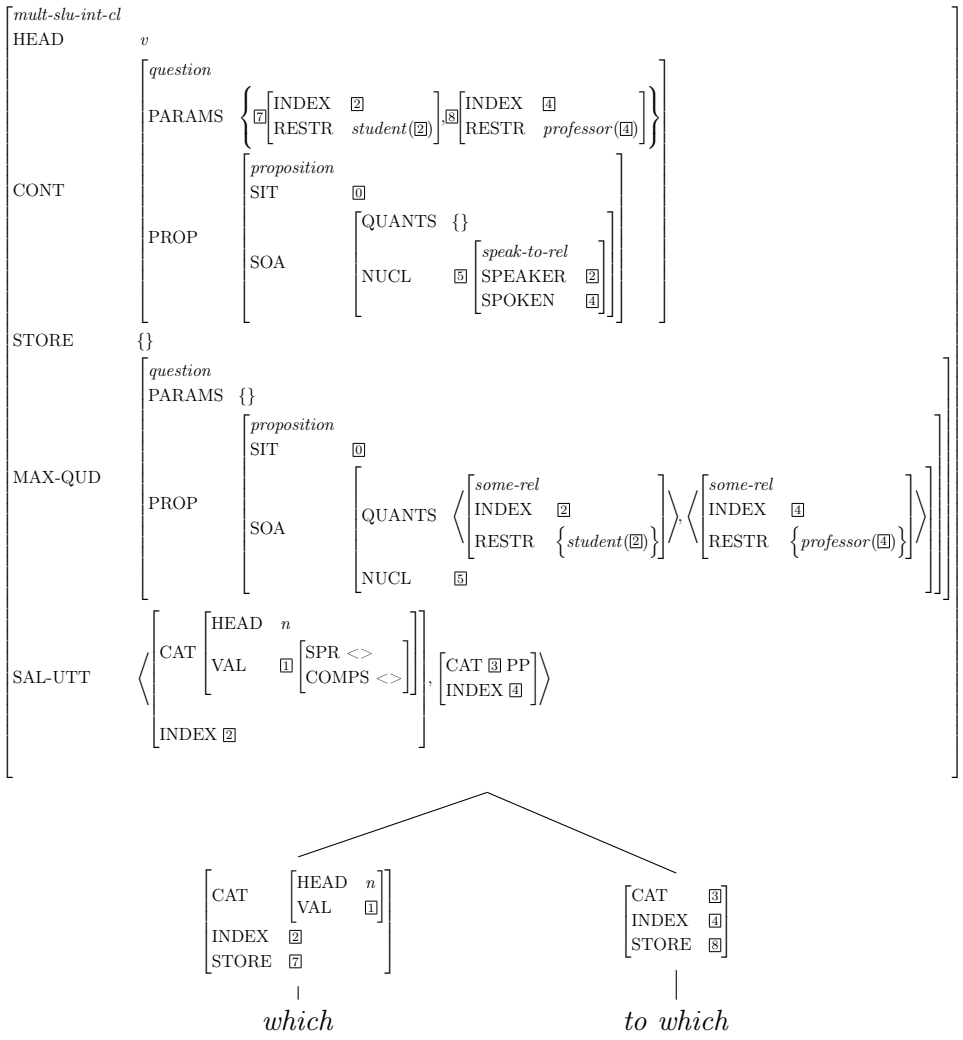
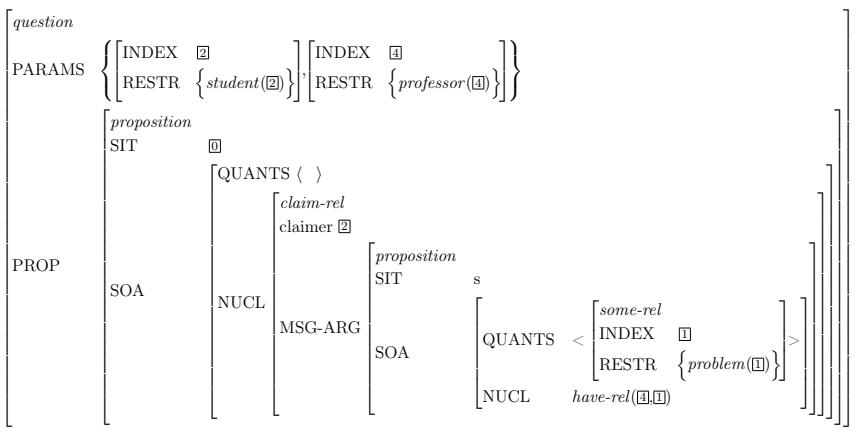


Figure 2: Analysis of *which to which* in (40)

(42)



In (42), the NUCL value of the type *claim-rel* is structure-shared with that in the MAX-QUD, as required by the type constraint on *slu-int-cl* in (37). Since we do not impose any structural constraint on the NUCL value of MAX-QUD or CONT, we can posit a nested semantic relation like this. Crucially, we do not rely on the syntactic structure of a linguistic antecedent, but focus on whether a given QUD is pragmatically plausible given the context. Therefore, it can be more flexible to cover the cases of multiple sluicing across a clause-boundary.

Second, the cases exhibiting island insensitivity is dealt with. In (10), repeated below in (43), the correlates of the two *wh*-phrases belong to a *wh*-island, extraction out of which would be prohibited according to a deletion-based approach.

(43) Ben got mad when every student talked to some teacher, but he just couldn't remember which student to which teacher.

However, in the current analysis, this fact can be accounted for, since we assume that *wh*-phrases are simply generated as fragments without extraction or ellipsis.

This approach also provides a solution to another case of island insensitivity which was problematic to deletion-based approaches. In (24), repeated below in (44), the correlates of the *wh*-phrases belong to a conditional clause.

(44) A: Sally will be surprised if one of the students in her class wins a prize in some contest.
B: Which student in which contest?

As discussed in Section 3, such example is hard to be dealt with by either Lasnik (2014) or Abels & Dayal (2023), since a conditional clause cannot be accommodated and items in a conditional clause cannot be existentially presupposed. On the other hand, in our approach, we do not adopt a short-source approach and thus do not have to worry about any of those. The

possibility of generating a multiple sluicing construction crucially relies on whether a relevant QUD can be triggered based on the discourse context. That is, whether a relevant QUD based on the proposition of the entire sentence is pragmatically plausible is important in determining the possibility of multiple sluicing. In the case at hand, the relevant QUD that ought to be generated here would be 'what is the x-y pair where Sally will be surprised if a student x wins a prize in a contest y?' ($\lambda\langle$x,y$\rangle$. λw. (*student*(x) $\wedge$ *contest*(y) $\wedge$ (*win*(x,y,w) $\rightarrow$ *surprise*(w, Sally)))). Since the QUD is sufficiently plausible in this case, the multiple sluicing construction can be generated out of this without difficulty.

Finally, the cases where multiple sluicing is ungrammatical under certain embedding verbs can be explained in the same vein. Example (17), repeated in (45) below, shows that the type of the embedding verbs in the antecedent clause affects the availability of multiple sluicing.

(45) A: Fred denied/doubted that a certain boy talked to a certain girl.
B: ???I wish I could remember which boy to what girl.

To generate the multiple sluicing construction here, a relevant QUD 'what is the boy-girl pair such that Fred denied that the former talked to the latter' must be maximal in the current discourse context. However, compared to examples where the embedding verb is a bridge verb like *say* or *think*, such a QUD with the embedding verb *deny* or *doubt* is harder to conceive, because such a question is pragmatically less plausible. Since the QUD is less accessible, the formation of the multiple sluicing construction whose meaning is mainly dependent on it, is also much less plausible, making the construction significantly degraded.

5 Conclusion

This paper shows that an HPSG analysis with a direct interpretation approach has merits over deletion-based analyses in accounting for multiple sluicing constructions. Overall, deletion-based approaches are inherently constrained by their core assumptions. Since these analyses posit that the elliptical clause contains a fully specified syntactic structure, which is subsequently deleted under identity with an overt antecedent, they necessarily depend on the existence of a suitable linguistic antecedent. Furthermore, since deletion is assumed to follow a movement operation, whether it is an extraposition or a covert *wh*-movement, these accounts are subject to certain movement constraints such as clause-boundedness constraints and island constraints. As a result, deletion-based analyses are forced to adopt a "short source" approach, by which the ellipsis site must remain mono-clausal. This makes it difficult for such accounts to accommodate cases of multiple sluicing that cross finite clause boundaries or islands.

On the other hand, our direct interpretation approach offers a more flexible account to accommodate broader data. We assume that the construction involves no operations such as movement and deletion. Rather, fragment daughters project into a sentential mother by virtue of the constraints imposed on this construction. Furthermore, the mother's meaning is mainly derived from QUDs activated in the discourse context. Importantly, QUDs do not rely on the existence of linguistic antecedents. They can be triggered by overt linguistic antecedents but they can also be triggered implicitly by the discourse context. Given all this, our analysis accounts for empirical data that pose difficulties for deletion-based accounts, such as sluices without linguistic antecedents, island-insensitive cases, and multiple sluicing across a clause-boundary.

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