



Coordinated multiple *wh*-sluicing in English: A corpus-based perspective*

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Kim, Hee-Yeon and Jong-Bok Kim. 2025. Coordinated multiple *wh*-sluicing in English: A corpus-based perspective. *Linguistic Research* 42(2): 443-474. The so-called coordinated multiple (CM) *wh*-sluicing in English involves a sluicing with two *wh*-remnants being coordinated. Previous literature notes that the structure of the remnants can be re-constructed with that of the antecedent clause: they can constitute a mono-clausal, bi-clausal bulk-sharing, and bi-clausal non-bulk-sharing structure. The validity of these structures are questioned in this study with the empirical data observed from various types of corpora. In order to widen the accountability of CM-slucing data, this paper suggests a corpus-based approach that licenses the coordination of multiple *wh*-phrases in sluicing. (University of Delaware · Kyung Hee University)

Keywords sluicing, multiple sluicing, *wh*-expressions, coordination, corpus

1. Introduction

Sluicing is an elliptical construction can be observed cross-linguistically in which everything but the *wh*-word in the predicate structure is elided (Ross 1969; Chung et al. 1995; Giannakidou and Merchant 1998; Ginzburg and Sag 2000; Merchant 2001, 2003; Chung 2013; Kim 2013). This *wh*-word, referred as the *wh*-remnant, has two types: sprouting and merger.

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- (1) a. He's reading something. I can't imagine **what**. [Merger]
 (Chung et al. 1995: (4b))
 b. He's writing, but you can't imagine **where/why/how/how fast/
 with whom**. [Sprouting]
 (Chung et al. 1995: (3a))

The *wh*-remnant of the merger example in (1a) corresponds to 'something' in the antecedent clause while that of the sprouting example in (1b) has no corresponding correlate in the antecedent clause.

There can also be two overt or covert correlates in the antecedent. This syntactic phenomenon is referred to as 'multiple sluicing'. Multiple sluicing is regarded as grammatical in languages that allow multiple *wh*-fronting such as Hungarian and Romanian. Since English is not a multiple *wh*-fronting language, multiple sluicing is restricted in limited environments (Rudin 1988; Merchant 2001, 2003; Hoyt and Teodorescu 2012; Lasnik 2014; Kotek and Barrows 2018; Vicente 2019; Citko and Gračanin-Yuksek 2020):

- (2) a. *John gave someone something, and I want to know **who what**.
 (Hoyt and Teodorescu 2012: (8a))
 b. ?John gave something to someone, but I don't know **what to whom**.
 (Hoyt and Teodorescu 2012: (8b))

In (2a), we have two possible indefinite correlates which may be linked to the two *wh*-remnants in the sluicing. Examples like (2a) violate the superiority effect constraint that requires the closest *wh*-remnant to undergo movement first. The acceptability of multiple sluicing improves, however, when the second *wh*-remnant is a prepositional adjunct, as in (2b). This is because the second conjunct is now an adjunct and hence it is not required to move (Richards 1997; Gračanin-Yuksek 2007; Hoyt and Teodorescu 2012; Citko 2013; Citko and Gračanin-Yuksek 2020). The intriguing fact is that unacceptable examples like (2a) can be saved with a coordinating conjunction:

- (3) John gave someone something, and I want to know **who and what**.
 (Hoyt and Teodorescu 2012: 86)

We would like to refer to this type of sluicing construction as coordinated multiple *wh*-sluicing in English (henceforth CM-sluicing). This paper aims to discuss two questions regarding CM-sluicing: first, we would like to observe how (3) is more acceptable than the restricted multiple sluicing construction shown in (2). Also, we question the internal syntactic structure of CM-sluicing, since it seems to be a distinct structure from that of multiple sluicing.

Regarding these aspects, this paper aims to investigate real-time usage of the phenomenon with a corpora investigation. Section 2 discusses some key properties of this construction referring to the previous literatures. Section 3 introduces several previous approaches to the syntactic structure of CM-slucing from a Minimalist viewpoint. Section 4 reports our corpora search of the phenomenon. In section 5, we present attested data that could challenge Minimalist approaches (Richards 1997; Kazenin 2002; Zhang 2007; Haida and Repp 2011; Citko 2013; Citko and Gračanin-Yuksek 2020, among others), and section 6 concludes the paper.

2. Basic properties

CM-sluicing share several properties with multiple sluicing, but also differs in several aspects. First, as noted earlier, sluicing has two subtypes: merger and sprouting. As noted by Chung et al. (1995), Merchant (2001), among others, multiple sluicing exhibits a range of remnant types, many of which are also observed in CM-sluicing.

- (4) a. Someone ate something, but I don't know **who and what**.
[Merger-merger type]
b. John ate something, but I don't know **what and when**.
[Merger-sprouting type]
c. John ate the rock, but I don't know **how and why**.
[Sprouting-sprouting type]
(Adapted from Citko and Gračanin-Yuksek 2020: (2))

The examples in (4) are felicitous across all subtype pairings. The two argument-denoting *wh*-remnants in (4a) illustrate that while they share an identical argument structure, their interpretations may vary (Kim 2021; Park et al. 2024). The

reconstructed source for ‘who’ denotes ‘who ate something’, whereas ‘what’ corresponds to ‘what someone ate’. As argued by Chung (2013), the argument structure of the elided putative clause must match that of the antecedent clause. This argument structure constraint also extends to cases involving *wh*-remnants that co-occur with prepositions.

- (5) a. The vase was stolen, but we don’t know **by whom and why**.
 b. ?The vase was stolen, but we don’t know **who and why**.

(Adapted from Chung 2013: 34)

The example (5a) satisfies the argument structure imposed by the passive construction with the remnant ‘by whom’. However, the condition is partially fulfilled in (5b), for it lacks the preposition ‘by’ (Chung et al. 1995). This condition shows structural parallelism in that the *wh*-remnants in CM-slucing inherit the identical argument structure as their correlates in the antecedent.

Second, the *wh*-remnants, bearing different grammatical functions, can be coordinated in a quite flexible way (Citko 2013; Citko and Gračanin-Yuksek 2020):

- (6) a. Someone married Bill, but I don’t know **who and when**.
 b. Bill married someone, but I don’t know **who and when**.
 c. Someone ate something, but I don’t know **who and what**.

(Citko and Gračanin-Yuksek 2020: (44))

In the first two examples in (6), subject- and object-denoting *wh*-remnants occur with an adjunct without violating structural constraints. In (6c), the coordination of two argument-denoting remnants is also permitted when their corresponding correlates differ in grammatical function or when the discourse context provides sufficient cues for distinction in interpretation.

This characteristic of CM-slucing on the coordination of *wh*-remnants is related to the structural flexibility of CM-slucing, since it is not under the restriction imposed by the superiority effect. Moreover, CM-slucing is not subject to restrictions such as the clause-mate condition, which requires all *wh*-remnants to originate in the same finite clause. This has been noted as a crucial distinction between CM-slucing and multiple sluicing (Merchant 2003; Abels and Dayal 2023). Observe the following:

- (7) a. [Someone told Lee to give the book to someone], but Lee doesn't recall **who to whom**.
 b. *[Someone told Lee to give the book to someone], but Lee doesn't recall **to whom who**.
 c. ?[Someone told Lee to bring the book to the fair [because he had to give it to someone]], but Lee doesn't recall **who to whom**.

The unacceptability of adjunct *wh*-remnant scrambling or fronting in (7b) indicates that multiple sluicing is sensitive to structural parallelism and the superiority condition, both of which appear to constrain its grammaticality. With respect to the clause-mate condition, the first two examples in (7) conform to the requirement that both remnants originate from a single matrix clause. By contrast, the structure in (7c) is only marginally acceptable, for it violates the clause-mate constraint: while the first remnant is associated with the matrix clause, the second originates from an embedded adjunct clause.

Comparing the examples from (7) to those of (8), it can be observed that the CM-sluicing is not under the same syntactic restrictions as multiple sluicing:

- (8) a. [Someone told Lee to give the book to someone], but Lee doesn't recall **who and to whom**.
 b. [Someone told Lee to give the book to someone], but Lee doesn't recall **to whom and who**.
 c. [Someone told Lee to bring the book to the fair [because he had to give it to someone]], but Lee doesn't recall **who and to whom**.

While the ordering of *wh*-remnants had to reflect that of the antecedent in multiple sluicing due to the superiority effect, CM-sluicing allows both canonical ordering of the remnants as in (8a) and the non-canonical ordering in (8b), in which the adjunct *wh*-remnant is fronted. CM-sluicing also allows violation of the clause-mate condition, so it does not require the two *wh*-remnants to derive from the same clause as in (8c) (Citko and Gračanin-Yuksek 2020).

Sluicing as an elliptical phenomenon is known to repair island constraints (Merchant 2001, 2003, among others).

- (9) a. They want to hire someone who speaks a Balkan language, but I don't remember **which**. [Complex NP Constraint]
 b. Bob ate dinner and saw a movie last night, but he didn't say **which**. [Coordinate Structure Constraint]
 c. Ben will be mad if Abby talks to one of the men, but she couldn't remember **who**. [Adjunct island]
 (Merchant 2003: 6)

Example (9a) illustrates a case in which the remnant 'which' is extracted from within a complex noun phrase, where the remnant is subject to the Complex Noun Phrase Constraint. In (9b), 'which' originates from a conjunct within a coordinated structure, where extraction is generally prohibited by the Coordinate Structure Constraint. In (9c), the remnant 'who' is associated with its correlate 'one of the men' in the adjunct clause of the antecedent. However, the structure does not exhibit ungrammaticality due to locality violation repaired by sluicing. These patterns indicate that CM-sluicing, like single *wh*-sluicing, is not sensitive to island constraint violations (Merchant 2003).

- (10) a. Bob ate dinner and saw a movie last night, but he didn't say **what and where**. [Coordinate Structure Constraint]
 b. Ben will be mad if Abby talks to one of the men, but she couldn't remember **who and why**. [Adjunct island]
 (Adapted from Merchant 2003: 6)

The coordination of the argument *wh*-remnant 'what' with an adjunct *wh*-remnant 'where' is possible, as in (10a), although the argument remnant violates the Coordinate Structure Constraint. This is consistent in an adjunct island violation of an argument-denoting *wh*-remnant 'who', which is followed by an adjunct-denoting remnant, in (10b).

Finally, multiple sluicing in English has a pragmatic force that restricts the answering option to the Pair-List reading, which offers several pairs of answers to the question raised by multiple *wh*-remnants (Merchant 2001; Gračanin-Yuksek 2007; Citko and Gračanin-Yuksek 2020).

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

(Adapted from Abels and Dayal 2023: (37a))

- b. #Possible response: Kim on coordinated *wh*-sluicing.

[Single-Pair Reading]

- c. Possible response(s): Kim on coordinated *wh*-sluicing, extraposition,
 and VP ellipsis, Jung on irregular *wh*-questions...

[Pair-List Reading]

The multiple sluicing sentence in (11a) gives rise to multiple pairs of answers in (11c), not only a single pair, as in (11b). This is due to the existential quantification implied by the correlates 'some student' and 'some topic', as there should be at least one answer for each remnant. Also, since the remnants are not coordinated, they are able to generate multiple pairs of answers. Furthermore, Merchant (2001) suggests that a Pair-List reading is obligatory when multiple sluicing hosts a correlate with the universal quantifier.

- (12) ?**Everyone** brought something, but I couldn't recall **who what**.

(Adapted from Merchant 2013: (50))

The quantifier 'every' from the subject of the antecedent induces Pair-List answers, since it refers to more than one entity. The verb 'bring' also allows the interpretation of multiple entities to bring distinct objects.

CM-sluicing, in contrast, cannot sluice a correlate with a universal quantifier, and therefore the answer to the remnants can only consist of a Single-Pair reading (Citko and Gračanin-Yukseki 2020; Abels and Dayal 2023). It can only host the existential quantifier as correlates in the antecedents, as illustrated in the following examples:

- (13) Single-Pair Reading

- a. **Some student** has published on some topic, but I couldn't tell you
which student and on which topic. (Abels and Dayal 2023: (37a))

- b. Possible response(s): Kim on coordinated *wh*-sluicing.

(14) Pair-List Reading

- a. **#Every student** has published on some topic, but I couldn't tell you
which student and on which topic.

(Abels and Dayal 2023: (37b))

- b. #Possible response(s): Kim on coordinated *wh*-sluicing, Lee on
 extraposition, Park on extraposition, Jung on irregular *wh*-questions...

In (13), only one pair of answer can be derived from the *wh*-remnants of CM-sluicing, one from 'which student' and the other from 'on which topic'. If they are listed in pairs of answers, as given in (14), the remnants consisting of 'which' are unable to license the universal quantifier in the antecedent, for they cause a contradiction in terms of quantification. In addition, the use of coordination 'and' in CM-sluicing can only coordinate one single answer from each conjunct, and does not produce multiple pairs of answers to be coordinated.

As discussed in this section, CM-sluicing has distinct properties which are not shared with multiple sluicing and are on the basis of single *wh*-sluicing. It has quite flexible syntactic properties, for it does not restrict any combinatory pairs regarding the sprouting and merger types or the grammatical functions of its *wh*-remnants. It can also repair island constraint violation and allow the violation superiority effect and clause-mate conditions. Since the interpretation of the sluiced sites is based on the argument structure of the antecedent, that of the remnants of CM-sluicing should acquire the same. Lastly, CM-sluicing can only generate a single pair of answer rather than a list of answers, characterized by the use of the conjunction and the inability to accommodate correlates with universal quantifier. These features of CM-sluicing show that it is a distinct subtype of sluicing that should be understood and analyzed on its own.

3. Previous approaches

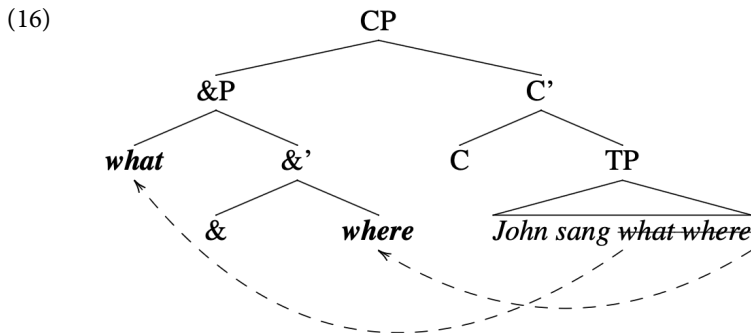
Within the Minimalist framework, three major analyses have been proposed for CM-sluicing, all involving a move-and-delete mechanism: the mono-clausal analysis, the bi-clausal bulk-sharing analysis, and the bi-clausal non-bulk-sharing analysis. The mono-clausal approach posits that the *wh*-remnants form a single complex

coordination phrase (&P), and that the corresponding source clause undergoes ellipsis as a whole (Haida 2007; Zhang 2007; Haida and Repp 2011, among others).

- (15) a. John sang something, but I don't know **what and where**.
 b. John sang something, but I don't know



This analysis, shown in (15b), involves sideward movement, whereby both *wh*-remnants are extracted from the same source clause and subsequently fronted. Given that English does not allow multiple *wh*-fronting, the remnants must be merged within an &P occupying the SpecCP position, as illustrated in (16).



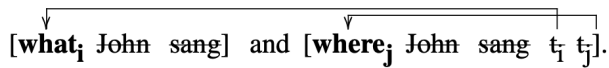
(Adapted from Citko 2013: 297)

In the structure above, both *wh*-remnants are extracted from a single TP and merged into an &P, with one occupying the specifier and the other an adjunct position. The *wh*-element 'what', which is closer to the specifier position, is raised, while the adjunct 'where' remains in the lower position. Under this mono-clausal analysis, CM-slucing accounts only for canonical and frequent remnant orderings, namely, argument-adjunct and adjunct-adjunct pairs.

The bi-clausal bulk-sharing structure, as shown below in (17), is somewhat similar to the mono-clause structure because the *wh*-remnants should be extracted from the same source clause. However, the difference is that the *wh*-remnants undergo movement to two separate CPs. The sluiced elements of the second conjunct are shared

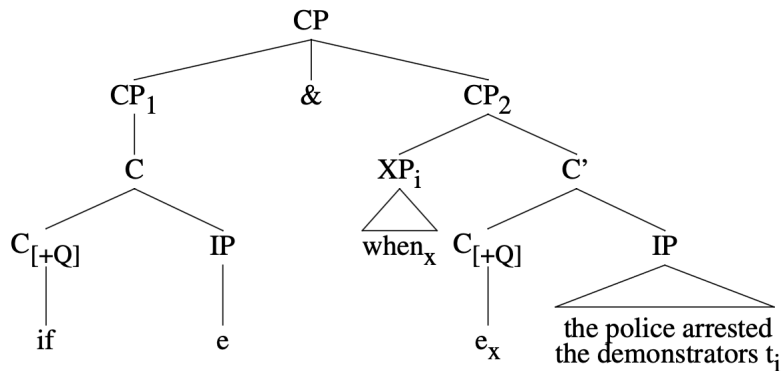
in bulk by the first remnant, so the first conjunct has structural dominance over the second conjunct (Giannakidou and Merchant 1998; Kazenin 2002; Gračanin-Yuksek 2007, among others). This bi-clausal analysis assumes the following structure:

- (17) a. John sang something, but I don't know **what and where**.
 b. John sang something, but I don't know



In this structure shown in (17b), the second conjunct shares the source clause with the first conjunct. This process can also be referred to as the reverse sluicing phenomenon (Giannakidou and Merchant 1998), in which the antecedent of the first conjunct undergoes movement and is followed by ellipsis, while the second remains in-situ, implemented by the process of IP-recycling (Chung et al. 1995).

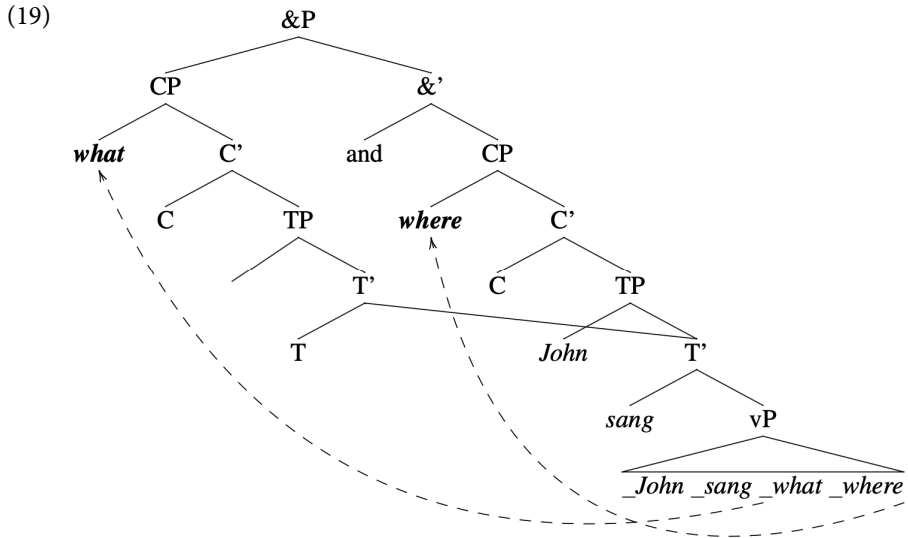
- (18) a. It's not clear if and when [the police arrested the demonstrators].
 b.



(Adapted from Giannakidou and Merchant 1998: 235)

As illustrated in (18b), the second conjunct bears a C[Q+] feature, which licenses the recycling of the IP to the first conjunct. The interrogative complementizer 'if' functions as the locus of the Q-operator, while the *wh*-word in the SpecCP position restricts the scope of the recycled IP. As noted by Giannakidou and Merchant (1998), the linear ordering of the conjuncts is not syntactically constrained.

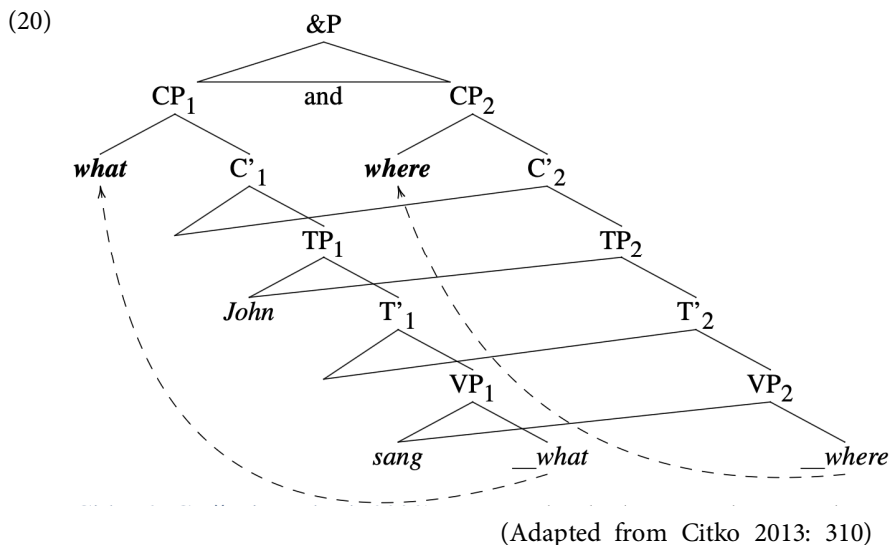
This reverse sluicing pattern extends to the bi-clausal bulk-sharing structure in (19), where the vP of the second conjunct serves as the elided source clause of the first conjunct.



(Adapted from Citko 2013: 310)

The key distinction between the reverse sluicing analysis and the bi-clausal bulk-sharing approach lies in the difference in the headedness. In the latter, each conjunct projects its own CP, and the two CPs form a coordinated &P, as opposed to deriving a single CP. Under this view, each *wh*-remnant occupies the SpecCP position of its respective conjunct, yet IP-recycling remains operative, given that the TP of the first conjunct c-commands the T' of the second conjunct, which contains the shared vP source.

Though this analysis accounts for conjuncts with distinct internal structures, it raises the question of why ellipsis targets only the remnant in the first conjunct, solely leaving the interpretation of the second intact. This asymmetry in ellipsis application is addressed under the bi-clausal non-bulk-sharing analysis, which introduces multi-dominance of the two *wh*-remnants. In this structure, neither remnant asymmetrically dominates the other, thereby eliminating the need to impose a deletion asymmetry (Citko 2013; Citko and Gračanin-Yuksek 2020).



In this structure, Citko (2013) and Citko and Gračanin-Yuksek (2020) propose that both TP_1 and TP_2 undergo ellipsis, and that the trace associated with the *wh*-remnant in the first conjunct can be shared by the second conjunct. Since the trace of ‘what’ in the first conjunct is required to satisfy the syntactic identity condition in the second conjunct, structural connectivity across the two CPs allows for such sharing despite their structural independence.

The Minimalist accounts given in this section thus offer three distinct syntactic analyses for CM-sluicing, each differing in how the remnants access and share the putative source clause. In the next section, we turn to authentic corpus data to assess the empirical adequacy of these analyses.

4. Corpus investigation

4.1 Methodology

To examine naturally occurring instances of CM-sluicing, this study conducted a corpus-based investigation drawing on multiple sources, including the Corpus of Contemporary American English (COCA)¹, News on the Web (NOW)², as well as

the Movies³ and TV⁴ corpora, both of which are distinct corpus within the English-Corpora family. The data was collected from a range of English dialects, including Canadian, American, and British English from the NOW, TV, and Movies corpora, while COCA was used to extract data specifically from American sources. The following search strings were used in order to search for cases of CM-slauicing:

- (21) a. * wh* and wh* PUNC
 b. * how and wh* PUNC
 c. * wh* and how PUNC
 d. * which NOUN and wh* PUNC
 e. * wh* and which NOUN PUNC
 f. * which NOUN and how PUNC
 g. * how and which NOUN PUNC

From over 1,862 results from all of the corpora search, a total of 701 instances were manually sorted for analysis.

Table 1. Total number of data collected for CM-slauicing from each corpus

| | COCA | NOW | Movies | TV | total |
|-------|------|-----|--------|-----|-------|
| total | 242 | 230 | 124 | 105 | 701 |

The following examples show instances of irrelevant data that were excluded from further analysis:

-
- 1 The Corpus of Contemporary American English (COCA) is the only large and “representative” corpus of American English. COCA is probably the most widely-used corpus of English. The corpus contains more than one billion words of text (25+ million words each year 1990-2019) from eight genres: spoken, fiction, popular magazines, newspapers, academic texts, TV and movies subtitles, blogs, and other web pages (Davies 2008-).
 - 2 The NOW corpus (News on the Web) contains 18.0 billion words of data from web-based newspapers and magazines from 2010 to the present time from 20 English-speaking countries (Davies 2016-).
 - 3 The Movies Corpus contains 200 million words of data in more than 25,000 movies from the 1930s to the current time (Davies 2019).
 - 4 The TV Corpus contains 325 million words of data in 75,000 TV episodes from the 1950s to the current time. The Movie Corpus (along with the TV Corpus) serves as a great resource to look at very informal language – at least as well as with corpora of actual spoken English (Davies 2019).

- (22) a. The geodynamic equation of state: **what and how**. (COCA 2018 ACAD)
 b. I just want to know who kissed **who and why**. (The TV Corpus 2013 US/CA)

Example (22a) is referring to ‘what’ and ‘how’ as respective interrogative *wh*-expressions rather than remnants of sluicing. The example (22b) is an indirect multiple *wh*-interrogative that questions the information of ‘who kissed who’ and ‘why they kissed one another’.

Excluding the irrelevant cases, we examined the remaining instances using five variables. The first variable concerns register, distinguishing between spoken and written forms of data. The second, remnant pair distribution, categorizes the data according to the syntactic type of the remnants: argument-argument, argument-adjunct, adjunct-argument, or adjunct-adjunct. The third variable characterizes the grammatical function of argument-denoting remnants, thereby identifying preferences in the types of correlates that license sluicing. The fourth variable, correlate overtness, observes whether the correlates in the antecedent clause are overtly realized or covert. Finally, the source clause-sharing variable examines whether the two remnants are interpreted as originating from a shared source clause. Taken together, these variables reveal consistent patterns underlying within CM-sluicing and contribute to the understanding of its structure and interpretation.

4.2 Data distribution and findings

4.2.1 Register

The register distribution of CM-sluicing instances is categorized into two: spoken and written. The spoken register includes data drawn from the spoken register of COCA and from the Movies and TV corpora. The written register consists of instances extracted from the NOW corpus and fiction, magazine, newspaper, and academic registers of COCA.

- (23) a. I told them I believed something happened. I couldn’t say **what and when**. (COCA 1991 SPOK)
 b. If someone’s trying to kill her I need to know **who and why**. (NOW)

2013 US)

As shown in (23), no qualitative difference is observed between the spoken example in (23a) and the written counterpart in (23b). Nonetheless, the distributional frequency suggests a preference for the spoken register, with 382 instances attested in spoken contexts, compared to 316 in written cases.

To determine whether this difference is statistically significant, a Fisher's exact test, a non-parametric variant of the chi-squared test, was conducted.⁵ The resulting p-value smaller than 0.05 indicates that the distributional asymmetry is statistically reliable, suggesting that CM-sluicing is more frequently realized in spoken contexts than in written discourse.⁶

4.2.2 Remnant pair

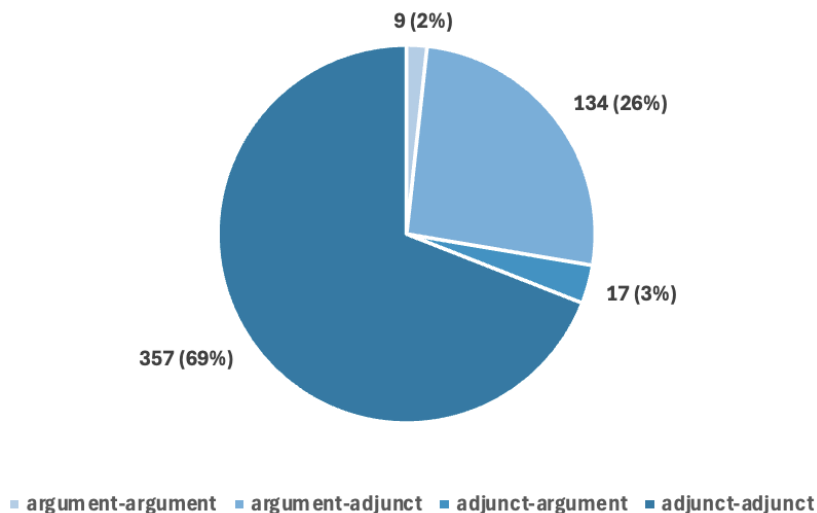
In order to examine which remnant pairs of *wh*-remnants are preferred in CM-sluicing, the study observed the pairs of remnants in corpora data:

- (24) a. Someone was keeping something a secret. The only way to get Gella out of there is to find out **what and who**. (COCA 1991 FIC)
[argument-argument pair]
b. If someone is following us, we're going to find out **who and why**.
(The Movie Corpus 2009 US/CA) [argument-adjunct pair]
c. Something had been achieved, even though he was not quite sure **how and what**. (NOW 1994 BrE) [adjunct-argument pair]
d. If Derek was murdered, we need to know **how and why**. (The TV Corpus 2016 US/CA) [adjunct-adjunct pair]

The remnants can consist of the same types, as in (24a) and (24d), or of different types in different orders, such as in (24b) and (24c). The pie chart below shows the distribution of *wh*-remnant pairs observed in the collected corpora data of CM-sluicing:

5 The analysis was done on a categorical variable, and therefore the Chi-squared test was chosen rather than the t-test, which is usually performed on numerical variables.

6 A two-tailed Fisher's exact test revealed a p-value of 0.0005.

Figure 1. Distribution of *wh*-remnant pair types of CM-sluicing

As illustrated in the chart above, CM-sluicing accommodates a range of remnant pairings, including all four combinations. The presence of both argument-adjunct and adjunct-argument types indicates that the construction imposes no strict linear ordering constraint on remnant types. Notably, the distribution reveals a strong preference for adjunct-adjunct pairs over those involving argument-denoting remnants.

The low frequency of argument-argument pairings may be attributed to the limited variety of argument-denoting *wh*-expressions, which are typically restricted to core grammatical functions such as subject, direct object, or prepositional object. In contrast, adjunct-denoting *wh*-words exhibit greater syntactic flexibility, accounting for the predominance of adjunct-adjunct configurations in the dataset.

Furthermore, a Fisher's exact test confirms that the difference in frequency between argument-adjunct and adjunct-argument pairs is statistically significant, suggesting a preference for canonical argument-adjunct ordering.⁷ These findings indicate that while CM-sluicing allows varied remnant combinations, it exhibits a tendency toward canonical ordering and pairs including adjuncts.

⁷ A two-tailed Fisher's exact test derived a p-value of 1.359e-06.

4.2.3 Covarying collexeme analysis

As noted by Stefanowitsch and Gries (2005), when a construction involves two or more variable slots that carry semantically interdependent elements, a covarying collexeme analysis can be run to detect statistically significant associations between lexical or categorical choices across slots. Although this method is typically used to examine the preferential association between specific verb types and argument structures, this study applies the covarying collexeme analysis to investigate the interdependence between *wh*-remnant types in CM-sluicing.

Specifically, the analysis seeks to determine whether the category (argument or adjunct) of the first *wh*-remnant influences the distribution of the second remnant. To this end, a 2×2 table was constructed, coding the first and second remnant types as either ‘argument’ or ‘adjunct’. The table below presents the frequency distribution used to evaluate whether the observed combinations reflect a non-random, statistically supported preference.

Table 2. A 2x2 table of types of *wh*-remnants in CM-sluicing data set

| | argument _{Slot1} | adjunct _{Slot2} |
|---------------------------|---------------------------|--------------------------|
| argument _{Slot1} | 33 | 137 |
| adjunct _{Slot1} | 72 | 459 |

Based on the frequency data in the table, the covarying collexeme analysis was conducted using the statistical script by Stefanowitsch and Gries (2005). This analysis applies a Generalized Linear Model incorporating log-likelihood values, in which the output identifies significant associations between remnant pairings, categorizing them either as attraction, indicating a statistically meaningful co-occurrence, or as repulsion, reflecting a lack of statistical correlation.

The resulting values are summarized in Table 3, which lists the remnant pairings that exhibit significant attraction effects.⁸

⁸ Note that the LLR values are rounded up to the one-hundredth decimal point.

Table 3. *Wh*-remnant pairs with attraction and repulsion

| Attracted pairs | LLR | Repelled pairs | LLR |
|-------------------|--------|--------------------|---------|
| <i>what-when</i> | 79.51 | <i>who-how</i> | -0.01 |
| <i>how-why</i> | 465.83 | <i>who-when</i> | -0.01 |
| <i>when-where</i> | 463.72 | <i>who-why</i> | -0.09 |
| <i>why-how</i> | 255.48 | <i>what-why</i> | -1.27 |
| <i>where-when</i> | 203.41 | <i>who-where</i> | -3.07 |
| <i>what-who</i> | 14.02 | <i>when-who</i> | -4.70 |
| <i>who-what</i> | 21.73 | <i>how-who</i> | -4.90 |
| <i>where-who</i> | 8.18 | <i>when-what</i> | -11.53 |
| <i>where-what</i> | 6.80 | <i>how-what</i> | -10.45 |
| <i>why-what</i> | 6.39 | <i>who-who</i> | -10.40 |
| <i>what-where</i> | 4.68 | <i>what-why</i> | -10.07 |
| <i>what-how</i> | 1.01 | <i>what-what</i> | -13.96 |
| <i>why-who</i> | 0.53 | <i>what-where</i> | -16.62 |
| | | <i>where-how</i> | -29.22 |
| | | <i>why-when</i> | -29.90 |
| | | <i>how-how</i> | -45.17 |
| | | <i>how-when</i> | -45.17 |
| | | <i>where-why</i> | -52.64 |
| | | <i>why-why</i> | -53.87 |
| | | <i>when-how</i> | -71.11 |
| | | <i>when-when</i> | -71.11 |
| | | <i>where-where</i> | -87.47 |
| | | <i>why-where</i> | -89.53 |
| | | <i>when-why</i> | -130.27 |
| | | <i>how-where</i> | -136.29 |

The table above shows significantly fewer remnant pairings exhibit attraction compared to repulsion. Notably, certain remnant pairs display direction-sensitive effects: for instance, *what-when* yields a strong attraction score (79.510), whereas the reverse order *when-what* results in repulsion (-11.53). These results suggest that specific *wh*-remnant types tend to occupy preferred linear positions, indicating positional asymmetries in remnant pairing within CM-slucing.

4.2.4 Grammatical function of argument-denoting remnants

This variable examines the distribution of grammatical functions associated with argument-denoting *wh*-remnants such as *what* or *who(m)*.⁹ As illustrated in the

examples below, these remnants may serve as a range of syntactic roles, including the following:

- (25) a. If somebody's walking through walls, the United States government needs to know **who** and how. (The TV Corpus 2009 US/CA) [Subject]
 b. You can see characters often at the Magic Kingdom although it's hard to pin down exactly **who** and when. (NOW US 2020) [Object]
 c. In his October 1994 staff memo, he noted that when a sea change occurs and customers have no choice but to "upgrade" to a new way of computing, the only questions are **whose** and when. (COCA 1995 MAG) [Genitive]
 d. She's interfacing with other cells in the deep Web. But we don't know **who** and where. (COCA 2013 MOV) [Oblique complement]
 e. He knew this was an important occasion, although she could not remember precisely **what** and why. (COCA 1998 FIC) [Predicative complement]

As in (25a) and (25b), *wh*-remnants functioning as subjects or direct objects represent the more canonical grammatical roles among argument-denoting elements. In contrast, cases where the remnant appears as a genitive, oblique, or predicative complement are less frequent. Since CM-slucing allows three types of remnant pairings that include at least one argument-denoting *wh*-expression, a total of 264 such instances were identified and categorized accordingly. The distribution is presented in the bar graph below.

9 From this variable, 114 instances from COCA, 90 instances from NOW, 32 instances from the Movies corpus, 28 instances from the TV corpus were analyzed in the dataset.

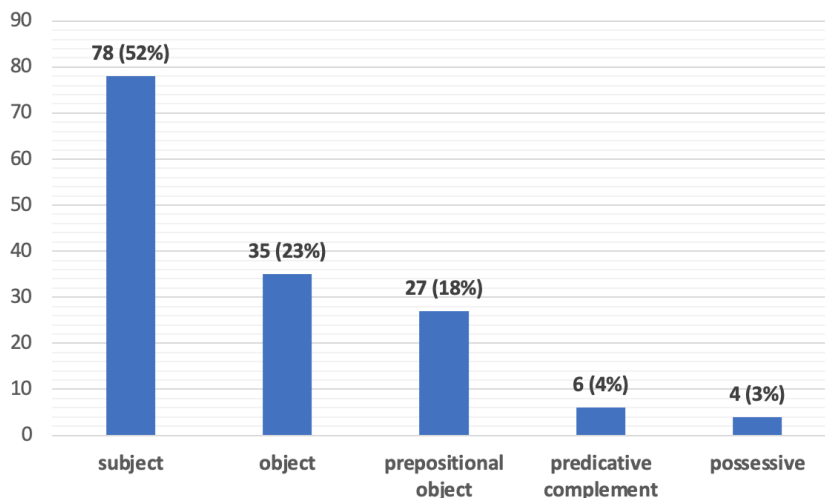


Figure 2. Grammatical functions of argument-denoting *wh*-remnants of CM-slucing

In the graph above, subject and object constitute the majority of argument-denoting *wh*-remnants, which indicates that they are canonical. In contrast, oblique and predicative complement grammatical functions show lower frequency. Notably, genitive, or possessive *wh*-remnants occur only in written registers, such as those found in NOW and COCA. Although infrequent, these instances are of particular interest, as they involve left branch island violation, which is an issue to be discussed in detail in the following section. These observations indicate that while subject and object positions are most common, CM-slucing also accommodates *wh*-remnants functioning as prepositional objects, predicative complements, and possessives, suggesting a broader syntactic distribution than assumed in previous literatures.

4.2.5 Correlate overtness

This variable investigates the distribution of sprouting and merger in CM-slucing. Cases were classified as merger when an indefinite noun phrase appeared in the antecedent, providing an overt correlate that facilitated the interpretation of the ellipsis. In contrast, instances lacking such overt correlates, in which the remnant lacked an identifiable antecedent, were treated as sprouting, involving covert or contextually inferred elements.

- (26) a. Someone was keeping something a secret. The only way to get Gella out of there is to find out **what and who**. (COCA 1991 FIC)
[overt-overt pair]
- b. Someone covered up the death of these slaves. I want to know **who and why**. (The TV Corpus 2008 UK/IE) [overt-covert pair]
- c. I knew I had to do something. I had no idea **why and what**. (COCA 1997 FIC) [covert-overt pair]
- d. We think discrimination wrong, we are against injustice, we are against killing, it doesn't matter **where and who**. (NOW 2017 Canada)
[covert-covert pair]

Examples (26a)-(26c) show that one or both *wh*-remnants are associated with overt correlates, such as 'someone' or 'something', in the antecedent clause. By contrast, 'why' in (26b) and (26c), as well as both remnants in (26d), lack overt antecedents, representing cases of covert or inferred correlates. Similar to the flexibility observed in remnant pair types, CM-sluicing also permits variation in correlate overtness. The table below presents the distribution of overt and covert correlate types across corpora.

Table 4. Overtness types of CM-sluicing remnants by corpus type

| | COCA | NOW | Movies | TV | total |
|---------------|------|-----|--------|-----|-------|
| overt-overt | 27 | 15 | 5 | 4 | 51 |
| overt-covert | 57 | 37 | 18 | 11 | 123 |
| covert-overt | 23 | 25 | 7 | 9 | 64 |
| covert-covert | 135 | 153 | 94 | 81 | 463 |
| total | 242 | 230 | 124 | 105 | 701 |

The distribution in the table above indicates that the covert-covert pattern is most frequently attested, largely due to the prevalence of sprouting with adjunct-denoting *wh*-remnant pair in CM-sluicing. The overt-covert type is also frequent, which corresponds to the high proportion of argument-adjunct pairs. Although less common, it is noteworthy that overt correlates are attested not only with argument-denoting remnants, but also with adjunct-denoting *wh*-expressions, indicating that correlate

overtness is not restricted to certain grammatical functions.

- (27) If memory storage requires alterations in the biochemistry and structure of particular cells, then when memories are formed, something, somewhere must be changing within the brain; but we don't know exactly **what and where**. (NOW 1991 BrE)

In (27), the adjunct remnant 'where' is linked to the overt correlate somewhere in the antecedent clause. Across the dataset, approximately 24 adjunct-denoting *wh*-remnants were observed to have overt counterparts of this type. However, a comparison between overt and covert cases reveals a clear preference for sprouting structures, in which *wh*-remnants lack overt correlates. This suggests that CM-slucing more frequently licenses sprouting, or covert correlates than merger cases involving overt antecedents.

4.2.6 Putative source clause sharing

This variable examines whether the reconstructed structures between the putative source clauses associated with each *wh*-remnant are identical. While it is generally assumed that multiple remnants share a common source, this data set shows possibility that the source clauses may diverge within remnants. Such flexibility, however, is subject to restrictions, including the argument structure condition (Chung et al. 1995), which limits the range of permissible mismatches and accounts for the distributional patterns attested in naturally occurring data.

- (28) a. We knew the plane crashed, but we wanted to know how and why.
(NOW 2018 US) [Completely sharing]
b. Something was different, but I wasn't sure what_i <was different> and why <it_i was different>. (NOW 2019 Canada) [Partially sharing]
c. Someone was keeping something a secret. The only way to get Gella out of there is to find out what_i <someone_j was keeping a secret> and who_j <was keeping it_i a secret>. (COCA 1991 FIC) [Not sharing]

In (28a), both *wh*-remnants share the same argument structure and are interpreted

from a single putative source clause. In (28b), the argument structure is parallel between the remnants, but the interpretation of ‘why’ depends on ‘what’, yielding a partially shared source. In (28c), the two argument-denoting remnants differ in grammatical function, requiring distinct source clauses. These patterns show that CM-slucing allows full, partial, or non-sharing cases of putative source sharing, depending on the syntactic and interpretive relation between the remnants.

- (29) a. When the sadness erupted over his happy life, the abyss opened beneath him and he fell. In this headlong plunge he instinctively reached out and grabbed hold of something, he didn’t know **who** <he reached out and grabbed hold of> and **what** <he reached out and grabbed hold of>. (COCA 2011 FIC)
- b. Maurice was being blackmailed. And I need to know **by who** <Maurice was being blackmailed> and **why** <Maurice was being blackmailed>. (NOW 2017 UK)

Also, both argument-argument and argument-adjunct pairs may share a fully identical putative source with the antecedent clause, which can be shown in (29). The table below summarizes the distribution of matching and mismatching source structures observed in the corpus data.

Table 5. Antecedent putative source cases of CM-slucing by corpus type

| | COCA | NOW | Movies | TV | total |
|-------------|------|-----|--------|-----|-------|
| completely | 141 | 158 | 99 | 84 | 482 |
| partially | 81 | 61 | 23 | 18 | 183 |
| not sharing | 20 | 11 | 2 | 3 | 36 |
| total | 242 | 230 | 124 | 105 | 701 |

Approximately 31% of the data (219 instances) involves a mismatch between the remnants and their putative source clauses, suggesting that CM-slucing does not uniformly favor fully matching structures. To determine whether this distribution reflects a statistically significant preference, a Fisher’s exact test was conducted. The resulting p-value greater than 0.05 indicates that the difference between matching and mismatching cases is not statistically robust.¹⁰ These findings call for a closer

10 A two-tailed Fisher’s exact test yielded a p-value of 1.

examination of the internal reconstruction patterns observed in mismatching cases, which will be discussed in the following section.

5. Discussion

5.1 Island violation and repair

As discussed in Section 2, CM-sluiting shows a tendency to repair a range of island violations.

- (30) a. You need someone's help, but I don't know **whose** and **why**.
(COCA 2013 FIC) [Left Branch island]
- b. *You need someone's help, but I don't know whose_i <you need ____i help> and why <you need their_i help>.
- (31) a. Achievements made by great minds burdened him, but I couldn't pinpoint **why** and **who**. (NOW 2022 US)
[Complex Noun Phrase island]
- b. *Achievements made by great minds burdened him, but I couldn't pinpoint why <achievements made by great minds_i burdened him> and who_i <achievements made by ____i burdened him>.
- (32) a. It seems like they are watching something, or absorbing something, but it's difficult to know **what** and **how**. (COCA 2012 BLOG)
[Coordinate Structure Constraint]
- b. *It seems like they are watching something, or absorbing, but it's difficult to know what_i <they are watching ____i or absorbing ____i> and how <they are watching it_i or absorbing it_i>

As illustrated in (30)–(32), CM-slucing can repair a range of island violations. In (30a), a left branch island violation involving extraction of the possessive ‘whose’ is repaired, unlike the ungrammatical case in (30b). Similarly, (31a) demonstrates that extraction from a complex noun phrase is licensed under CM-slucing, whereas (31b) is unacceptable. In (32a), extraction from a coordinate structure is also repaired, contrasting with the less acceptable form in (32b). These examples confirm that

CM-sluicing can repair locality constraints.

5.2 Syntactic identity issues

The dataset includes cases of preposition omission, where a preposition present in the antecedent clause is absent in the putative source clause, or vice versa. Such instances pose a challenge to structural parallelism between the antecedent and the elided clause, as the antecedent cannot fully serve as the syntactic source for the *wh*-remnants under ellipsis.

- (33) a. Danny realizes Yang was attacked, and tries to find out **why and who**.
(NOW 2018 US)
b. He was murdered. And we'll find out **who and why**. (COCA 1991 FIC)

In (33a), the anticipated putative source for 'Yang was attacked' would be 'Yang was attacked by someone', which derives the remnant 'by whom' rather than the bare 'who' observed in the example. A similar pattern is found in (33b). If the antecedent clause were to serve as the direct syntactic source, the structure would instead yield a form like 'by whom', which more transparently preserves structural parallelism with the antecedent.

- (34) a. *?Danny realizes Yang was attacked, and tries to find out **why** <Yang was attacked> **and who** <Yang was attacked>.
b. *?He was murdered. And we'll find out **who** <he was murdered> **and why** <he was murdered>.

These cases suggest that reliance solely on syntactic identity is insufficient for identifying the putative source clauses of the *wh*-remnants. A similar issue concerning structural parallelism also arises in relation to possessive constructions, particularly in the distribution of the possessive marker and the *wh*-expression 'whose'.

- (35) a. I kept my silence for their sakes. It didn't matter to me **why and who**.
(NOW 2023 US)
- b. *?I kept my silence for their sakes. It didn't matter to me **why** <I kept my silence for their_i sakes> **and who**_i <I kept my silence for sakes for ____i sakes>.

As shown in (35a), the antecedent contains the possessive marker 'their', which licenses the remnant 'whose' under structural parallelism. However, in (35b) the remnant 'who' lacks the possessive marker, and the reconstructed source for the second conjunct omits the NP sakes, which carries referential information crucial to the interpretation of 'who'.

These examples illustrate that structural parallelism between the antecedent and the putative source clauses does not consistently hold in CM-slucing. Such mismatches make it difficult to identify of the source structure for each remnant, as well as the possibility of a unified clause-sharing process, as in a mono-clausal or bi-clausal bulk-sharing cases. In certain cases, the source structure may not be directly recoverable from the antecedent.

- (36) a. Experts claim that there could be another attack possible, but none of us know **who and what**. (COCA 2016 MOV)
- b. *Experts claim that there could be another attack possible, but none of us know **who** <there could be another attack possible> **and what** <the attack will be>.

Example (36a) shows that the antecedent clause does not provide a recoverable putative source for either of the *wh*-remnants. In such cases, it is the contextual interpretation, rather than the syntactic structure of the antecedent, that must serve as the basis for reconstructing the source clauses associated with each remnant, as illustrated in the following example.

- (37) Experts claim that there could be another attack possible, but none of us know **who** <will cause another attack> **and what** <will cause another attack>.

The reconstructed form based on the semantics of the antecedent in (37) provides a more suitable putative source for both *wh*-remnants than the syntactically projected form in (36b), as it preserves both the intended propositional meaning and the interpretive correspondence between the remnants.

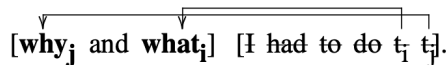
These observations from naturally occurring data suggest that CM-sluicing cannot be fully accounted for by assuming that both remnants are derived from a single shared syntactic structure, as assumed in many Minimalist analyses. Rather, the data indicate that contextual information plays a crucial role in licensing and interpreting the remnants, particularly in cases where structural identity is not maintained.

5.3 Cases that challenge the Minimalist approaches

First, under the mono-clausal analysis, the combination of *wh*-remnants is restricted to argument-adjunct pairings, as the position following the head & for adjunction. This structure rules out non-canonical orders, such as adjunct-argument pairs, which are not accounted for within this framework.

- (38) a. I knew I had to do something. I had no idea **why** and **what**. (COCA 1997 FIC)

- b. *I knew I had to do something. I had no idea



In the structure illustrated in (38b), the argument remnant ‘what’, though structurally closer to the &P, fails to raise to the specifier position and remains in the adjunct position. As a result, the adjunct ‘why’ must cross over ‘what’ to occupy the specifier position, yielding an ill-formed configuration under locality constraints.

A similar issue arises for adjunct-argument pairs under the bi-clausal bulk-sharing analysis. Since this approach assumes a fixed argument structure for the second conjunct, a non-canonical ordering of the remnants, such as adjunct preceding argument, cannot be licensed, as shown in the following structure.

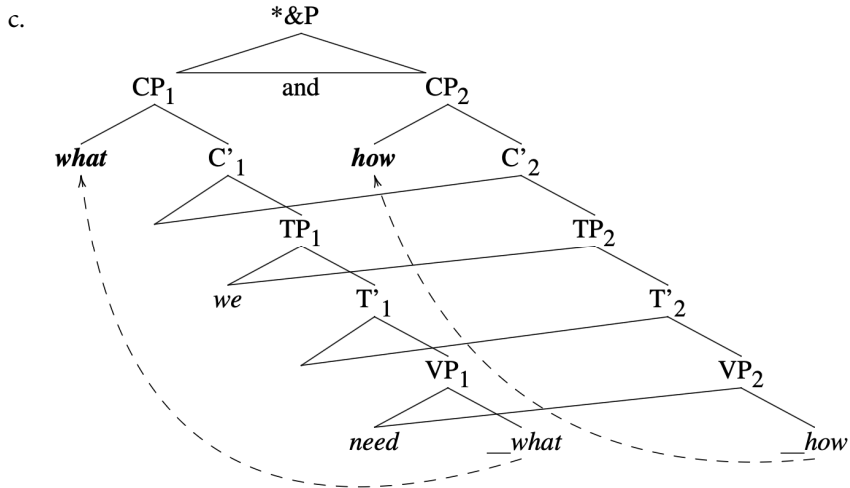
- (39) a. Something had been achieved, even though he was not quite sure
 how and what. (NOW 1994 UK)
 b. *Something had been achieved, even though he was not quite sure

A syntactic tree diagram for the sentence "[[how_j] [and what_i had been achieved t_i t_j]].". A horizontal line with two downward-pointing arrows indicates movement. The first arrow points from the trace *t_i* to the word *what_i*. The second arrow points from the trace *t_j* to the word *how_j*.

In the bulk-sharing bi-clausal analysis, the argument remnant appears post-verbally, while the adjunct ‘how’ is base-generated clause-finally. In order to derive the surface structure, the argument ‘what’ must raise to the matrix SpecCP position, outside the CP of the second conjunct. However, in the observed structure, ‘what’ remains within the lower conjunct, while ‘how’ undergoes fronting to the highest CP. Such ordering contradicts the locality constraints, indicating that neither the mono-clausal nor bulk-sharing analysis can adequately derive adjunct-argument remnant sequences attested in corpus data.

The non-bulk-sharing bi-clausal structure also faces empirical challenges, particularly in cases where the remnants correspond to distinct source clauses. Such structure complicates remnant licensing and cannot be captured under assumptions of clause sharing.

- (40) a. In our hearts we know we need a radical change but don’t know exactly
 what and how. (NOW 2019 UK)
 b. In our hearts we know we need a radical change but are struggling
 to work out exactly **what** <we need> **and how** <we will change>.



Under the non-bulk-sharing bi-clausal analysis, both *wh*-remnants are required to be associated with an identical putative source clause. In this analysis, the clausal interpretation of ‘how’ can only be derived as [how we need what]. Therefore, alternative interpretations such as *how they will change*, *how they will make a change*, or *how they will derive a radical change* fall outside the scope of this structure. As such, the analysis does not extend to cases where the putative source clauses are only partially shared or entirely distinct.

6. Conclusion

The CM-slucing, as we have seen so far, allows two-slucied *wh*-expressions to be coordinated whose semantic resolution is often dependent upon the preceding context. While the construction holds characteristics of single *wh*-sluicing, it differs from multiple sluicing in several respects: it is not subject to constraints such as the superiority effect and clause-mate condition. It shows flexibility in pairing the *wh*-remnants that are either arguments or adjuncts, and merger or sprouting cases of sluicing. It is able to sluice subject or object arguments. While the answer pairs for multiple sluicing can be that of listed pairs of answers (Pair-List) or also a single set of answer (Single-Pair), the answering mechanism of CM-slucing is constrained only to the Single-Pair reading.

This paper has examined the internal syntax of CM-slucing within the Minimalist framework, reviewing three major structural analyses: a mono-clausal and two bi-clausal structures involving either bulk-sharing or non-bulk-sharing mechanisms. The mono-clausal analysis assumes that both *wh*-remnants originate from a single TP and are merged within a coordinated &P. In contrast, the bi-clausal accounts posit two separate CPs, with remnants accessing a shared source clause via structural connectivity. A corpus investigation was conducted to assess whether these internal syntactic structures are supported by attested instances of CM-slucing. The findings suggest that while each analysis captures certain structural patterns, further empirical investigation is necessary to fully account for the range of naturally occurring data.

To verify the previous proposals as well as investigate the real-time uses of the construction, we performed a corpus investigation and collected a total of 701 instances of CM-slucing. We introduced five variables to analyze the data: register types, remnant pair types, grammatical functions of arguments, correlate overt-covert pairs, and lastly the putative source clause sharing cases. The corpora analysis revealed that cases in which the correlates are covert in the antecedent and the putative source clause sharing relation between the remnants are partial or not sharing at all challenge the previous analyses presented by the Minimalist approaches. This study highlights empirical investigations into CM-slucing, and calls the need for an alternative syntactic account of the construction that is not derivational.

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