The Syntax of Wh-Interrogatives in Hijazi Arabic: A Non-Transformational Approach

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Abstract—Unbounded dependencies are structures where two elements that typically co-occur appear far from one another in spite of the syntactic dependency between them. *Wh*-interrogatives are one of the mostly investigated types of unbounded dependencies cross-linguistically. To contribute to the ongoing linguistic research in *wh*-interrogatives, the current paper attempts to explore them in one of the Arabic varieties: Hijazi Arabic (HA). The paper primarily focuses on how to account for the constructions of HA *wh*-interrogatives using one of the prominent non-transformational theories in generative syntax: Head-Driven Phrase Structure Grammar (HPSG). The analysis proposed herein also sheds light on the word order used in HA. The paper concludes that there are two constraints to which *wh*-interrogatives in HA are subject.

Index Terms—unbounded dependencies, wh-interrogatives, HPSG, Hijazi Arabic

I. INTRODUCTION

Throughout the decades, syntacticians tried to formally account for unbounded dependencies, structures that involve a gap of some kind and a higher constituent that contains a filler for this gap. The filler normally has the gap's syntactic and semantic properties, and neither can appear without the other. Such a phenomenon provokes syntactician's desire to investigate the syntactic specifications at play. Unbounded dependencies also present itself as a challenging area of research in almost all modern syntactic theories. Among the unresolved issues regarding the syntax of *wh*-interrogatives is whether their constructions can be accounted for by the mechanism of 'movement' assumed in transformational theories of syntax (e.g., Minimalist Program proposed by Chomsky, 1995). Borsley (2022), among others, argues that it is rather problematic to assume that a mechanism which "allows a constituent to occupy one position at one stage of a derivation and a different position at a later stage" can directly account for such complex phenomena (p. 204).

Within generative grammar theories, Head-driven Phrase Structure Grammar (HPSG) proposes its own account for such instances. Adopting an HPSG approach that does not employ the mechanism of 'movement', we attempt herein to provide a systematic analysis of *wh*-interrogatives in Hijazi Arabic (HA), an Arabic variety spoken in the western region of the Kingdom of Saudi Arabia.

The rest of the paper proceeds as follows. Section [2] provides a general introduction to the framework adopted along with a description of unbounded dependencies. Section [3] explains basic assumptions that underlie the analysis of *wh*-interrogatives in HPSG. Section [4] and section [5] attempts to examine the word orders and *wh*-interrogatives in HA, respectively. Section [6] introduces and discusses the analysis proposed for HA. Section [7] concludes the paper.

II. THEORETICAL PRELIMINARIES

Through the high flexibility it offers, the non-transformational framework of HPSG has proved itself to be successful in accounting for naturally occurring structures, particularly in controversial linguistic phenomenon like the one under discussion here. By being a constraint-based theory, HPSG assumes that grammar comprises a set of type *signs* and a set of constraints to which these signs are subject (Pollard & Sag, 1987, 1994).[1] For example, for the declarative sentences in (1), HPSG proposes systematically organized constraints that specify all the necessary requirements that license such structures. If, however, any of these constraints is violated, ungrammaticality looms as exhibited in (2). HPSG formally specifies that these sentences in (1) are all grammatical because they satisfy the subcategorization of the verbs used, while those in (2) do not.

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[1] For a general introduction to the framework of HPSG, see, for instance, Sag et al. (2003), Abeillé and Borsley (2021), and Borsley and Müller (2021).

(1) a. John likes football.
    b. The boy hit the table.
    c. The mother handed the salt to Yousef.
(2) a. *John likes to the football.
    b. *The boy hit.
    c. * The mother handed to Yousef.

Interestingly, there are cases in which the transitivity of verbs seems to be violated as shown in (3). What makes these sentences unique is that they maintain grammaticality even though they appear to miss an argument.

(3) a. Who hit the table?
    b. What does John like?
    c. To whom did the mother handed the salt?

Intuitively, there is a kind of linkage between the missing arguments and the initial *wh*-phrases. For example, (3a) is an interrogative structure that asks about the NP subject of the transitive verb *hit* and that subject is something referred to by the initial *wh*-phrase *who*. Thus, syntactically speaking, the *wh*-phrase is the NP subject of the transitive verb and hence no violation of the transitivity has occurred. In other words, the sentences in (3) do not miss arguments; rather, the arguments merely do not appear in their canonical positions; they occupy left peripheral positions as illustrated in (4).[2]

(4) a. Who _____hit the table?
    b. What does John like____?
    c. To whom did the mother handed the salt_____?

Other than English, this phenomenon is attested cross-linguistically, such as in French, Irish, Chamorro, and Standard Arabic as exemplified in (5) respectively.

(5) a. Quand [s partira ton ami _____]**?**
    'When will your friend leave?'   (Kayne & Pollock, 1978, p. 959)
    b. C én uair   aL   th ánig   siad   na bhaile_____
    [which time]   COMP   came   they   home e
    'What time did they come home?'   (Levine, 2017, p. 272)
    c. Hayi   f-um- ágasi _____ i   kareta
    who   UM-wash   the   car
    'Who washed the car?'   (Kim & Lim, 2008, pp. 189-194)
    d. Ɂaeena   ðahaba   Yousef-u_____?
    where   went   Yousef-NOM
    'Where did Yousef go?'

Generally, this phenomenon is called *unbounded dependency*. Unbounded dependencies are "constructions in which the locality of co-occurrence restrictions appears to be violated in a more radical way" (Sag et al., 2003, p. 427). They are unbounded in the sense that elements that normally co-occur appear to be far from each other in these constructions. Other than *wh*-interrogatives, relative clauses, topicalization, and clefts are instances of these constructions.[3] However, for the purpose of this paper, we will focus on *wh*-interrogatives. We seek to examine HA in which this phenomenon is also attested as shown in (6).

(6) a. Ɂeeʃ   t-ħub   Noura_____?
    what   3.Fem.Sg-love.Pres   Noura
    'What does Noura love?'
    b. *meen*_____Ɂakaal   ʕala   Ɂatˤ-tˤawlah?
    who   eat.PST-3.Fem.Sg   on   the-table
    'Who ate on the table?'

III. Unbounded Dependencies Within HPSG

A successful linguistic theory should systematically code the linkage between the remote element and its canonical position. To this end, HPSG breaks its analysis to account for three important parts of the dependency: (i) the bottom, (ii) the middle, and the (iii) the top of the dependency.

To analyze the bottom of the dependency, the feature SLASH was declared (Bouma et al., 2001; Ginzburg & Sag, 2000).[4] SLASH is a set-valued feature which indicates that a given phrase is missing an element of a particular kind. More particularly, the SLASH feature generally expresses the LOCAL feature of the missing element; in a nutshell, the element's syntactic and semantic properties. For instance, a verbal head that misses an NP subject will have a SLASH feature that indicates what the head lacks precisely. In other words, SLASH works as "a placeholder for missing elements" (Bouma et al., 2001, p. 18). This specification allows the structure to be built syntactically regardless of the missing

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[2] The gap represents the canonical positions of the arguments.
[3] For discussions about other types of unbounded dependencies, see Kim and Michaelis (2020), Levine (2017), and Sag et al. (2003), to name a few.
[4] Sag et al. (2003) alternatively propose a list-valued feature called GAP.

element (Sag et al., 2003). Since the missing element is not as any canonical argument, it is realized only in the ARG-ST of the head.[5]

To account for the middle of the dependency, Ginzburg and Sag (2000), following Bouma et al. (2001), proposed the SLASH-Amalgamation constraint, given in (7).

(7) SLASH-Amalgamation Constraint

$$word \rightarrow / \begin{bmatrix} \text{SS|SLASH} & [\Sigma_1] \cup \ldots \cup [\Sigma_n] \\ \text{ARG-ST} & < [\text{ SLASH } [\Sigma_1]], \ldots, [\text{ SLASH } [\Sigma_n]] \end{bmatrix}$$

(Ginzburg & Sag, 2000, p. 169)

(7) states that, by default, the SLASH value of a word is the union of the SLASH values of the arguments with which it combines. In other words, to keep track of the missing element, the SLASH value is passed from the head daughter to the mother and then to the higher node throughout the extraction structure. As explained by Ginzburg and Sag (2000), "extraction is thus treated entirely in terms of the inheritance of SLASH specifications" (p. 167). In fact, such inheritance of SLASH specifications follows logically from the Generalized Head Feature Principle (GHFP) proposed also in Ginzburg and Sag (2000). However, whenever a suitable filler is found in a higher position, the SLASH specification is consumed.

Turning to consider the top of the dependency, the phrasal type *head-filler-phrase* (*hd-fill-ph*) was declared (Bouma et al., 2001; Ginzburg & Sag, 2000). This phrasal type comprises subtypes to account for the various types of unbounded dependencies according to the multiple inheritance hierarchy shown in (8). These include: (i) topicalization clauses (*top-cl*), (ii) *wh*-interrogative clauses (*wh-inter-cl*), and (iii) *wh*-relative clauses (*wh-rel-cl*), among others.

(8)
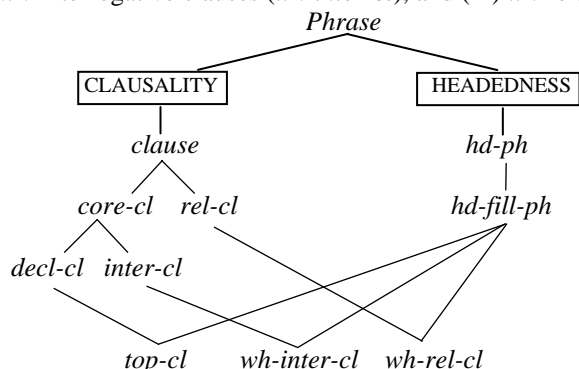
(Adapted from Ginzburg & Sag, 2000)

All subtypes of *hd-fill-ph* are subject to the constraint in (9) (Bouma et al., 2001; Ginzburg & Sag, 2000). As shown in (9), *hd-fill-ph* introduces the compatible filler as its non-head daughter while it takes the slashed head that lacks an element as its head daughter. Moreover, (9) guarantees that the head daughter, and hence the phrase itself, is a verbal projection. The SLASH set of this head daughter might contain several elements. The first member corresponds to the LOCAL value of the filler daughter while any other members shall constitute the SLASH value of the mother, which is normally empty.[6]

(9) *hd-fill-ph:*

$$[\text{ SLASH } [\Sigma_2]] \rightarrow [\text{ LOC } [1]], \mathbf{H} \begin{bmatrix} phrase \\ \text{HEAD} & v \\ \text{SLASH} & \{[1]\} \uplus [\Sigma_2] \end{bmatrix}$$

(Ginzburg & Sag, 2000, p. 174)

To narrow down the analysis of *hd-fill-ph* to its subtype *wh-inter-cl*, the feature of WH was declared.[7] As the SLASH feature, WH is a set-valued feature that is essentially based on the semantic CONTENT value of the mother (Borsley & Crysmann, 2021; Ginzburg & Sag, 2000). Hence, it denotes that the structure in hand is an interrogative one and contains a *wh*-phrase. To warrant that the WH value is kept on track throughout the structure, Ginzburg and Sag (2000) proposed the *WH*-Amalgamation constraint given in (10).

(10) WH-Amalgamation Constraint

$$word \rightarrow / \begin{bmatrix} \text{SS|WH} & [\Sigma_1] \cup \ldots \cup [\Sigma_n] \\ \text{ARG-ST} & < [\text{ WH } [\Sigma_1]], \ldots, [\text{ WH } [\Sigma_n]] \end{bmatrix}$$

(Ginzburg & Sag, 2000, p. 189)

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[5] Such a demand caused Ginzburg and Sag (2000) to reformulate their Argument Realization Principle (ARP) to ensure that when the verb is slashed, then the missed element must be realized in the ARG-ST.
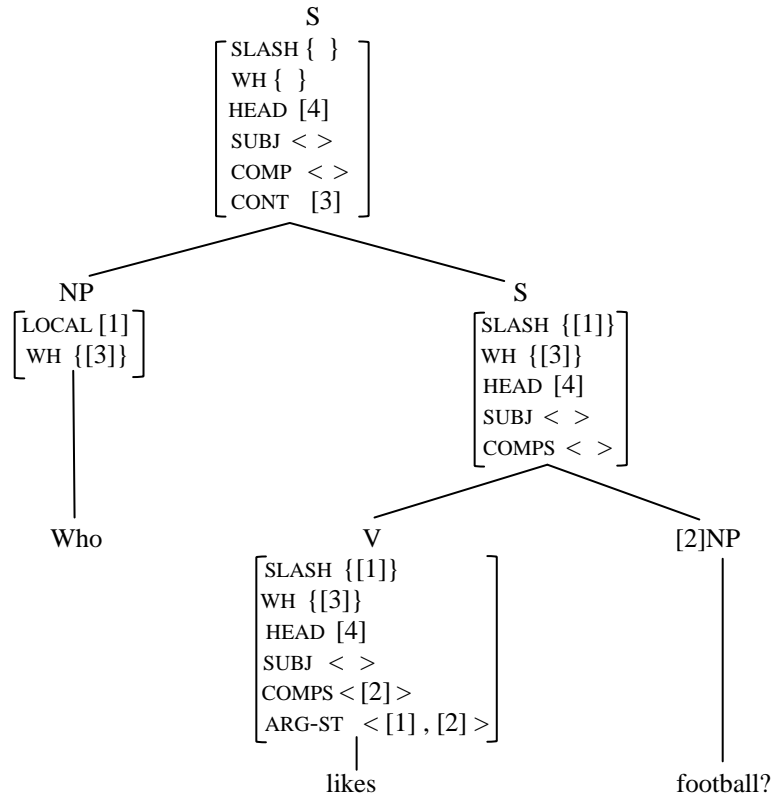
[6] The symbol '⊎' refers to the operation of disjoint set union.

[7] Other references follow Pollard and Sag (1994) in proposing the feature QUE which roughly corresponds to WH.

(10) guarantees that the WH value of any word is the union of the WH values of its arguments. In simple words, together with the SLASH-Amalgamation constraint, the two constraints ensure that the relevant feature's specifications are *percolated* throughout the extraction structure until consumed in a proper position. It is worth noting, however, that the WH feature was also declared to differentiate between *wh*-interrogative clauses and exclamative clauses in English.

Finally, the two features incorporate elegantly to provide a full analysis of *wh*-interrogative clauses. Thus, an interrogative clause as '*who likes football?*' can be analyzed as a *wh-inter-cl* that has a clausal head daughter. That head daughter has SLASH features whose values correspond to the filler daughter's LOCAL value. The two daughters are WH-specified and tagged with the CONTENT value of the mother as shown in (11).

(11)

```
                                  S
                        ⎡ SLASH { }      ⎤
                        ⎢ WH { }         ⎥
                        ⎢ HEAD [4]       ⎥
                        ⎢ SUBJ < >       ⎥
                        ⎢ COMP < >       ⎥
                        ⎣ CONT [3]       ⎦
                   ╱                          ╲
              NP                                  S
      ⎡ LOCAL [1] ⎤                    ⎡ SLASH {[1]} ⎤
      ⎣ WH {[3]}  ⎦                    ⎢ WH {[3]}    ⎥
                                       ⎢ HEAD [4]    ⎥
                                       ⎢ SUBJ < >    ⎥
                                       ⎣ COMPS < >   ⎦
              │                            ╱            ╲
            Who                          V               [2]NP
                              ⎡ SLASH {[1]}      ⎤
                              ⎢ WH {[3]}         ⎥
                              ⎢ HEAD [4]         ⎥
                              ⎢ SUBJ < >         ⎥
                              ⎢ COMPS < [2] >    ⎥
                              ⎣ ARG-ST < [1], [2] > ⎦
                                       │                │
                                     likes           football?
```

IV. PRELIMINARY CONSIDERATIONS ON HA

In general, HA flexibly licenses different word orders, as many other Arabic varieties. VSO and SVO word orders are the commonly permitted word orders in HA, as shown in (12-13), respectively.

(12) a. *ders-at*   *Noura*   *an-naħu*
study.PST-3.Fem.Sg   Noura   the-syntax
'Noura studied syntax'

b. *ʔakaal-at*   *Noura*   *ʕala*   *ʔatˤ-tˤawlah*
eat.PST-3.Fem.Sg   Noura   on   the-table
'Noura ate on the table'

c. *t-ħub*   *Noura*   *ʔal-kutub*
3.Fem.Sg-love.Pres   Noura   the-books
'Noura loves books'

d. *ʔarsal-at*   *Noura*   *ʔal-kitab*   *li-Sara*
send.PST-3.Fem.Sg   Noura   the-book   to-Sara
'Noura sent the book to Sara'

(13) a. *Noura*   *ders-at*   *an-naħu*
Noura   study.PST-3.Fem.Sg   syntax
'Noura studied syntax'

b. *Noura*   *ʔakaal-at*   *ʕala*   *ʔatˤ-tˤawlah*
Noura   eat.PST-3.Fem.Sg   on   the-table
'Noura ate on the table'

c. *Noura*   *t-ħub*   *ʔal-kutub*
Noura   3.Fem.Sg-love.Pres   the-books

'Noura loves books'

d. *Noura   ʔarsal-at   ʔal-kitab   li-Sara*
    Noura   send.PST-3.Fem.Sg   the-book   to-Sara
    'Noura sent the book to Sara'

In HPSG, verb-initial clauses as those in (12) can be analyzed as *hd-subj-comp-ph* in which the verbal head takes its subject and complement as sisters (Borsley, 1995; Althawab, 2022).[8] In the case of subject-initial clauses, two competing analyses have been proposed (e.g., Borsley, 1989, 1995; Wintner, 2001; Vaillette, 2001). First, some syntacticians analyze them as *hd-subj-cl* analogously to their English counterparts. On the other hand, others merely analyze them as slashed *hd-subj-comp-ph* in which the subject has been fronted. A third party assumes that both analyses are available.

To accommodate the following discussion, this section provided a very concise explanation of the word orders adopted in HA generally. Despite the different analysis proposed in the literature, and for the sake of consistency, we show with data from HA that the slashed *hd-subj-comp-ph* analysis is the one that should be presumed.

V. WH-INTERROGATIVES IN HA

Wh-interrogatives in HA are unbounded dependencies that involve displacing arguments from their canonical positions as shown in (14-15). The data in (14) shows subject *wh*-interrogatives while the data in (15) shows non-subject *wh*-interrogatives. As explained in section [2], the transitivity of the verbs used is respected despite the fact that the arguments' requirements are remotely filled by displaced constituents.

(14)a. *meen   deres   an-naħu?*
     who   study.PST.3.Masc.Sg the-syntax
     'Who studied syntax?'

   b. *meen   ʔarsaal   ʔal-kitab   li-Sara?*
     who   send.PST.3.Masc.Sg   the-book   to-Sara
     'Who gave the book to Sara?'

   c. *meen   ju-ħub   ʔal-kutub?*
     who   3.Masc.Sg-love.Pres   the-books
     'Who loves books?'

   d. *meen   ʔakaal   ʕala   ʔatˤ-tˤawlah?*
     who   eat.PST.3.Masc.Sg   on   the-table
     'Who ate on the table?'

(15)a. *ʔeeʃ   ders-at   Noura?*
     what   study.PST-3.Fem.Sg   Noura
     'What did Noura study?

   b. *ʔeeʃ   ʔarsal-at   Noura   li-Sara?*
     what   send.PST-3.Fem.Sg   Noura   to-Sara
     'What did Noura send to Sara?'

   c. *ʔeeʃ   t-ħub   Noura?*
     what   3.Fem.Sg-love.Pres   Noura
     'What does Noura love?'

   d. *feen   ʔakaal-at   Noura?*
     where   eat.PST-3.Fem.Sg   Noura
     'Where did Noura eat?'

Generally, the first thing that can be noticed is that the *wh*-phrase is always followed by the main verb of the clause; otherwise, ungrammaticality looms either in subject or non-subject *wh*-interrogatives as shown in (16). Moreover, verbs are always inflected for masculine gender in subject *wh*-interrogatives. Since verbs must be inflected for gender in HA, this leads to the assumptions that whenever the subject's gender is unknown, the masculine is the default one.

(16)a. **meen   ʔal-kitab   li-Sara   ʔarsaal?*
     who   the-book   to-Sara   send.PST.3.Masc.Sg
     'Who gave the book to Sara?'

   b. **meen   li-Sara   ʔarsaal   ʔal-kitab?*
     who   to-Sara   send.PST.3.Masc.Sg t   he-book
     'Who gave the book to Sara?'

   c. **ʔeeʃ   Noura   li-Sara   ʔarsal-at?*
     what   Noura   to-Sara   send.PST-3.Fem.Sg
     'What did Noura send to Sara?'

   d. **ʔeeʃ   li-Sara   ʔarsal-at   Noura?*

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[8] An alternative analysis treats these structures as extra complements in which both the subject and complement are members of COMPS. Yet, Borsley (1995) argues that such an analysis is plausible for Welsh, but not for Arabic.

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what   to-Sara   send.PST-3.Fem.Sg   Noura
'What did Noura send to Sara?'

Digging rather deep into the data, an interesting behavior can be detected. Considering the word orders explained in section [4], the mechanisms of forming *wh*-interrogatives might be different for each of them. In the case of verb-initial clauses, the missing arguments are basically fronted in either subject or non-subject *wh*-interrogatives as illustrated in (17a-b) respectively.

(17) *ʔarsal-at*   *Noura*   *ʔal-kitab*   *li-Sara*
    send.PST-3.Fem.Sg   Noura   the-book   to-Sara
    'Noura sent the book to Sara'
    a. *meen*   *ʔarsaal*_____   *ʔal-kitab*   *li-Sara?*
       who   send.PST.3.Masc.Sg   the-book   to-Sara
       'Who gave the book to Sara?'
    b. *ʔeeʃ*   *ʔarsal-at*   *Noura*_____*li-Sara?*
       what   send.PST-3.Fem.Sg   Noura   to-Sara
       'What did Noura send to Sara?'

Likewise, in subject-initial clauses, the missing arguments are fronted in subject and non-subject *wh*-interrogatives as in (18). However, the verb must be inverted in non-subject *wh*-interrogatives in order to follow the *wh*-phrase as shown in (18b). This results in having the subject occupying a post-verbal position exactly as in verb-initial clauses above. Whenever the verb is not inverted, the outcome is ungrammatical non-subject *wh*-interrogatives as shown in (19).

(18) *Noura*   *ʔarsal-at*   *ʔal-kitab*   *li-Sara*
    Noura   send.PST-3.Fem.Sg   the-book   to-Sara
    'Noura sent the book to Sara'
    a. *meen*_____*ʔarsaal*   *ʔal-kitab*   *li-Sara?*
       who   send.PST.3.Masc.Sg   the-book   to-Sara
       'Who gave the book to Sara?'
    b. *ʔeeʃ*   *ʔarsal-at*   *Noura*_____*li-Sara?*
       what   send.PST-3.Fem.Sg   Noura   to-Sara
       'What did Noura send to Sara?'
(19) **a.** **ʔeeʃ*   *Noura*   *ʔarsal-at*_____*li-Sara*
       what   Noura   3.Fem.Sg-love.Pres   to-Sara
       'What did Noura send to Sara?'
    b. **ʔeeʃ*   *Noura*   *ders-at*_____?
       what   *Noura*   study.PST-3.Fem.Sg
       'What did Noura study?
    c. **ʔeeʃ*   *Noura*   *t-ħub*_____?
       what   Noura   3.Fem.Sg-love.Pres
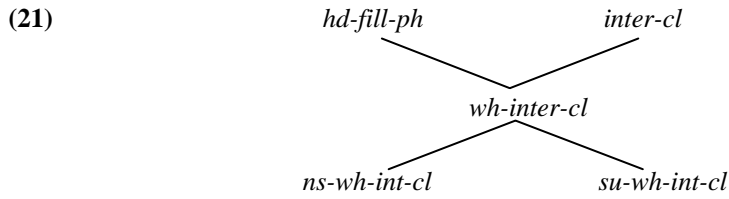   'What does Noura love?'

The inversion of the verb in non-subject *wh*-interrogatives is also attested in English (Ginzburg & Sag, 2000). Specifically, the verb must be inverted in English non-subject direct interrogatives while no inversion is required when the interrogative is embedded. In English, the inverted version can occur independently unlike the non-inverted one as illustrated in (20). Contrarywise, inverted or not, they are both independent in HA as elucidated above.

    (20) **a.** [Who [will Sandy visit__]]?
       b. *[Who [Sandy will visit__]]?
       c. They wonder [who [Sandy will visit__]]?
       d. *They wonder [who [will Sandy visit__]]?   (Ginzburg & Sag, 2000, p. 231)

This section attempted to describe the *wh*-interrogative in HA with regard to the word orders attested in this variety. The unique behavior of non-subject *wh*-interrogatives in subject-initial clauses poses the question about the kind of syntactic conditions at play that license such discrepancy. To this end, the next section will provide a formal analysis of *wh*-interrogatives in HA within the framework of HPSG.

VI. THE ANALYSIS

Within HPSG's framework, the two types of *wh*-interrogatives are analyzed in a multiple inheritance hierarchy in which they are treated as subtypes of *wh-inter-cl* which is in turn a subtype of *hd-fill-ph* and *inter-cl* simultaneously as in (21).

(21)

$$
\begin{array}{ccc}
\textit{hd-fill-ph} & & \textit{inter-cl} \\
& \diagdown\diagup & \\
& \textit{wh-inter-cl} & \\
& \diagup\diagdown & \\
\textit{ns-wh-int-cl} & & \textit{su-wh-int-cl}
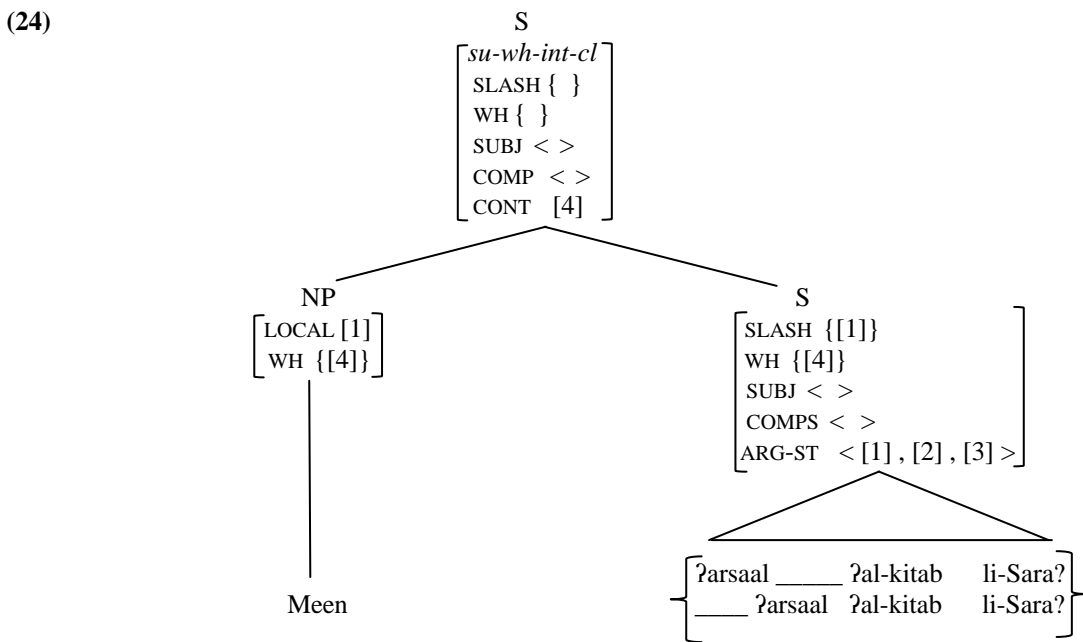\end{array}
$$

<div align="right">(Adapted from Ginzburg & Sag, 2000)</div>

Since they show a consistent behavior in both word orders, the first type of interrogatives to be formally analyzed here is subject *wh*-interrogative clauses (*su-wh-int-cl*). At the moment, we are collectively following the analyses adopted by Ginzburg and Sag (2000) for English, and Johnson and Lappin (1997) for Iraqi Arabic (IA). Hence, leaving the semantic specifications aside, instances of the type *su-wh-int-cl* are subject to the constraint in (22)[9] on both word orders in HA.

(22) *su-wh-int-cl:*

$$
[\ ] \rightarrow [\text{LOC} \quad [\text{A}]]\,, \mathbf{H}\begin{bmatrix} \text{SUBJ} \ \langle \ \rangle \\ \text{ARG-ST} \ \langle [\text{A}] \rangle \end{bmatrix}
$$

Therefore, the instance of *su-wh-int-cl* in (23) has structure in (24), regardless of the word order assumed prior the extraction.[10]

(23)

Meen	*ʔarsaal*	*ʔal-kitab*	*li-Sara?*
who	send.PST.3.Masc.Sg	the-book	to-Sara

'Who gave the book to Sara?'

(24)

$$
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\textit{su-wh-int-cl} \\
\text{SLASH } \{\ \} \\
\text{WH } \{\ \} \\
\text{SUBJ } \langle \ \rangle \\
\text{COMP } \langle \ \rangle \\
\text{CONT } [4]
\end{bmatrix}
\end{array}
$$

$$
\begin{array}{cc}
\begin{array}{c}
\text{NP} \\
\begin{bmatrix} \text{LOCAL } [1] \\ \text{WH } \{[4]\} \end{bmatrix} \\
| \\
\text{Meen}
\end{array}
&
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\text{SLASH } \{[1]\} \\
\text{WH } \{[4]\} \\
\text{SUBJ } \langle \ \rangle \\
\text{COMPS } \langle \ \rangle \\
\text{ARG-ST } \langle [1]\,, [2]\,, [3] \rangle
\end{bmatrix} \\
\begin{bmatrix}
\textit{ʔarsaal} \ \underline{\quad} & \textit{ʔal-kitab} & \textit{li-Sara?} \\
\underline{\quad} \ \textit{ʔarsaal} & \textit{ʔal-kitab} & \textit{li-Sara?}
\end{bmatrix}
\end{array}
\end{array}
$$

Particularly, if we assume that this clause is essentially verbal-initial, then the *su-wh-int-cl* has a filler daughter as a non-head daughter and a slashed *hd-subj-comp-ph* as its head daughter. Both daughters are WH-specified; they are tagged with the CONTENT value of the mother as a result of being a *wh-int-cl*. Satisfying the constraint on *hd-fill-ph*, the SLASH value of the head daughter corresponds to the LOCAL value of the filler daughter, which is the remote filler needed. Analogously, if we assume that this clause is essentially subject-initial, then the *su-wh-int-cl* has a filler daughter as a non-head daughter and a slashed *hd-subj-ph* as its head daughter. As with the verb-initial clauses, the daughters are WH-specified and hence tagged with the CONTENT value of the mother. In addition, the SLASH feature of the head daughter and the LOCAL feature of the filler daughter agree in value due to the constraint on *hd-fill-ph*. Recall that, despite the simplification in tree (24), both features are amalgamated throughout the extraction structure to satisfy the constraints discussed in section [3].
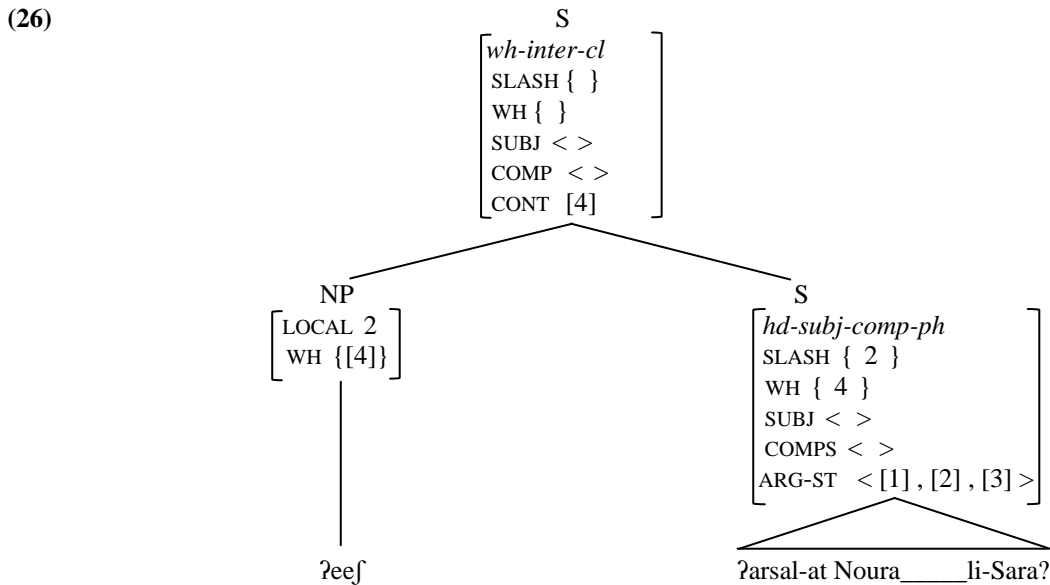
In considering non-subject *wh*-interrogatives, and before giving them a certain phrasal type, specifications about each word order shall be taken into account. Assuming a verbal-initial word order, the structure shall be simply analyzed as a *wh-int-cl* that has a filler daughter and a head daughter of the type *hd-subj-comp-ph* that is slashed. Thereby, the non-

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[9] The constraint has been slightly modified to accommodate only the assumptions introduced and discussed herein.
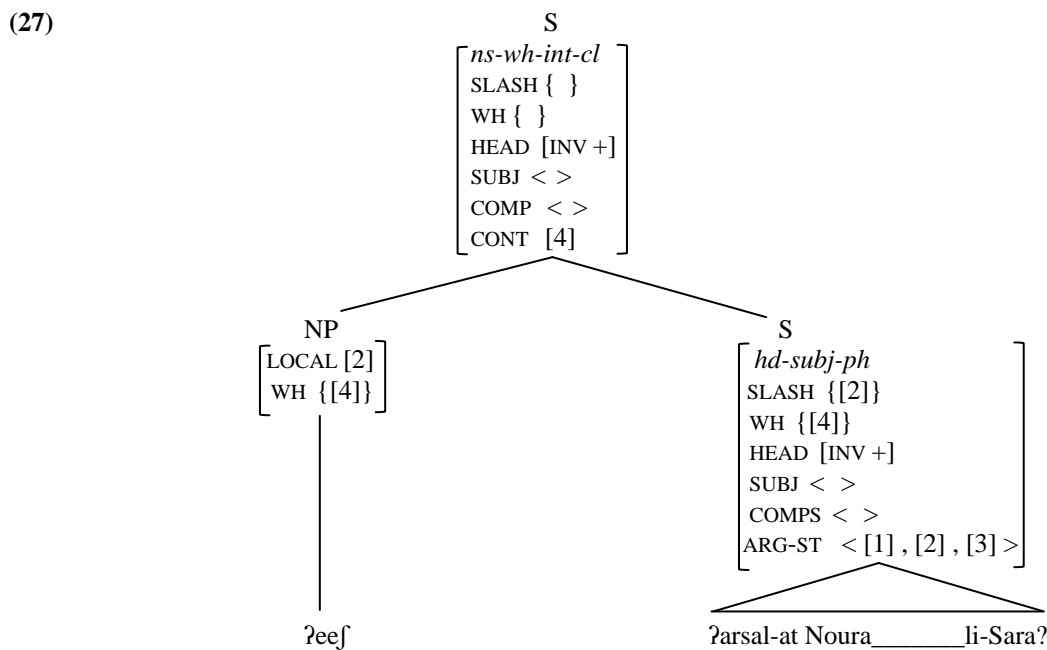
[10] For the rest of the paper, only features that are crucial for the analysis have been included, while others are underspecified.

subject *wh*-interrogative in (25) will have the structure in (26), which in many ways resembles the analysis of *su-wh-in-cl* explained above.

(25) *Ɂeeʃ*   *Ɂarsal-at*   *Noura*   *li-Sara?*
    what   send.PST-3.Fem.Sg   Noura   to-Sara
    'What did Noura send to Sara?'

(26)

$$
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\textit{wh-inter-cl} \\
\text{SLASH } \{ \ \} \\
\text{WH } \{ \ \} \\
\text{SUBJ } < \ > \\
\text{COMP } < \ > \\
\text{CONT } [4]
\end{bmatrix}
\end{array}
$$

NP
$$
\begin{bmatrix}
\text{LOCAL } 2 \\
\text{WH } \{[4]\}
\end{bmatrix}
$$

S
$$
\begin{bmatrix}
\textit{hd-subj-comp-ph} \\
\text{SLASH } \{ \ 2 \ \} \\
\text{WH } \{ \ 4 \ \} \\
\text{SUBJ } < \ > \\
\text{COMPS } < \ > \\
\text{ARG-ST } < [1] , [2] , [3] >
\end{bmatrix}
$$

Ɂeeʃ

Ɂarsal-at Noura_____li-Sara?

On the other hand, if the subject-initial word order is assumed, then the structure would be analyzed as *wh-int-cl* that has a filler daughter and a head daughter of the type *hd-subj-ph* that is slashed. The slashed head daughter has a head daughter that is inverted. Thereby, it behaves analogously to its English counterpart and hence requires a special constraint which should ensure that the verbal head in *hd-subj-ph* must be [INV+] to slash the non-subject argument. Consequently, the *wh-int-cl* in (25) will have the structure in (27).

(27)

$$
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\textit{ns-wh-int-cl} \\
\text{SLASH } \{ \ \} \\
\text{WH } \{ \ \} \\
\text{HEAD } [\text{INV } +] \\
\text{SUBJ } < \ > \\
\text{COMP } < \ > \\
\text{CONT } [4]
\end{bmatrix}
\end{array}
$$

NP
$$
\begin{bmatrix}
\text{LOCAL } [2] \\
\text{WH } \{[4]\}
\end{bmatrix}
$$

S
$$
\begin{bmatrix}
\textit{hd-subj-ph} \\
\text{SLASH } \{[2]\} \\
\text{WH } \{[4]\} \\
\text{HEAD } [\text{INV } +] \\
\text{SUBJ } < \ > \\
\text{COMPS } < \ > \\
\text{ARG-ST } < [1] , [2] , [3] >
\end{bmatrix}
$$

Ɂeeʃ

Ɂarsal-at Noura_____li-Sara?

One might argue to simply follow Ginzburg and Sag's (2000) analysis for *ns-wh-in-cl*, shown in (28). They assume that whenever the main verb is inverted (i.e., [INV+]), then the structure is independent (i.e., [IC+]), and vice versa. This

might be true for English; though, as exhibited in (26-27), it fails to reconcile HA data because non-subject *wh*-interrogatives can be independent regardless of whether the verb is inverted or not.

(28) *ns-wh-int-cl:*

$$[\ \ ] \ \rightarrow \ \dots \mathbf{H} \begin{bmatrix} \text{IC} & [1] \\ \text{INV} & [1] \end{bmatrix}$$

(Ginzburg & Sag, 2000, p. 231)

Collectively, this would lead to the conclusion that the analysis of subject *wh*-interrogatives in HA is consistent with English and IA. Conversely, the analysis of non-subject *wh*-interrogatives in HA requires the verbal head to be [INV+] in subject-initial clauses, under the assumption that they are *hd-subj-ph*. One might also reckon that the necessity to invert the verbal head applies to subject-initial word order in general and not only in cases of non-subject *wh*-interrogatives per se. This is because whether the verbal head has been inverted or not in subject *wh*-interrogatives, no disparity is surfaced as shown in (24) above. Such a postulation may be plausible; however, we believe that a more consistent and unified analysis could be pursued elsewhere.

Recall that two distinct analyses have been proposed for subject-initial clauses in HA. To this point, we have considered them to be of the type *hd-subj-ph*; nonetheless, assuming that they are essentially *hd-subj-comp-ph* that have been slashed would result in a more consistent analysis of *wh-inter-cl* in HA. Apart from consistency preferences, another motivation for this argument is the fact that HA is a subdialect of Standard Arabic, which is a VSO language (Alrajihi, 1999, 2000; Althawab, 2014).

Bearing this in mind, it should be assumed that subject and non-subject *wh*-interrogatives simply involve *wh-inter-cl* that has a filler daughter and a slashed *hd-subj-comp-ph*. In other words, they both stem from a single type and constraint as we have initially speculated. However, the possibility of (29) demands taking agreement's specification into consideration.

(29) a. *meen   ʃaaf   Noura?*
      who   see.PST-3.Masc.Sg   Noura
      'Who saw Noura?'
  b. *meen   ʃaaf-at   Noura?*
      who   see.PST-3.Fem.Sg   Noura
      'Who did Noura see?'

(29a) is an instance of subject *wh*-interrogatives, whereas (29b) is an instance of non-subject *wh*-interrogatives. The difference between the two lies in the verb's gender inflection. In subject *wh*-interrogatives, the verb is normally masculine while it agrees with the subject in non-subject *wh*-interrogatives.[11]

Consequently, in view of the above assumptions, we propose the types in (30-31) for *su-wh-int-cl* and *ns-wh-int-cl* in HA, respectively. These types are adopted from Ginzburg and Sag (2000) with the exception that the main verb must be inflected for masculine in subject *wh*-interrogatives.

(30) *su-wh-int-cl:*

$$[\ \ ] \ \rightarrow \ [\text{LOC} \ \ [A]\,] \,, \mathbf{H} \begin{bmatrix} \text{SUBJ} \ < \ > \\ \text{ARG-ST} \ < [A]\,, \dots , n > \\ \text{HEAD} \ [\text{GEN } masc] \end{bmatrix}$$
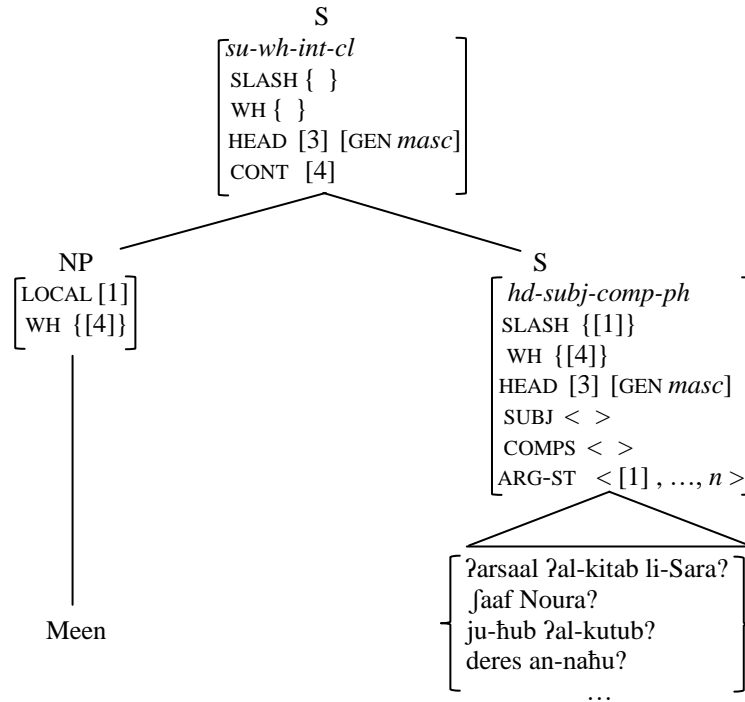
(31) *ns-wh-int-cl:*

$$[\ \ ] \ \rightarrow \ [\text{LOC} \ [B]\,] \,, \mathbf{H} \begin{bmatrix} \text{COMP} \ < \ > \\ \text{ARG-ST} \ < [A]\,, [B]\,, \dots , n > \end{bmatrix}$$

The two types can be best clarified through the examples given in (32-33). (32) is a *su-wh-int-cl* which is a subtype of *wh-inter-cl*; therefore, it is also a subtype of *hd-fill-ph* and *inter-cl* according to the multiple inheritance hierarchy and inherits their constraints. Precisely, it has a head daughter and a filler daughter. To satisfy the constraint on *hd-fill-ph*, the head daughter is a slashed *hd-subj-comp-ph* and its SLASH value is tagged with the LOCAL value of the filler. Also, the first member of the *hd-subj-comp-ph*'s ARG-ST corresponds to the filler. Both the filler and the slashed *hd-subj-comp-ph* are WH-specified; they are tagged with the CONTENT value of the mother to obey *wh-int-cl*. Finally, to obey the constraint on *su-wh-int-cl*, the GENDER value of the verbal head is *masc.*
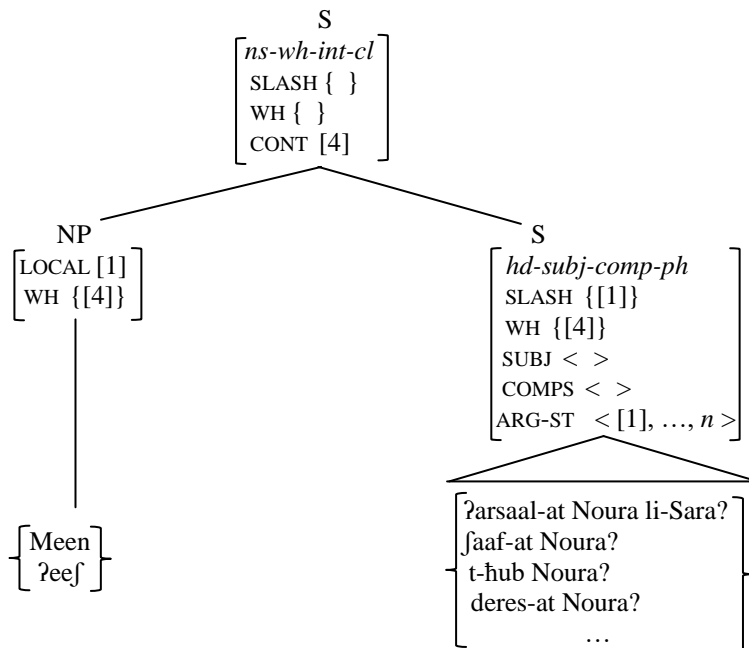
---

[11] This is a general statement because sometimes the verb might be inflected for feminine gender in subject *wh*-interrogatives depending on extralinguistic discourse where all the possible subjects are females. However, given the currently examined data, we will not consider this possibility.

(32)

$$
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\textit{su-wh-int-cl} \\
\text{SLASH } \{\ \} \\
\text{WH } \{\ \} \\
\text{HEAD } [3]\ [\text{GEN } \textit{masc}] \\
\text{CONT } [4]
\end{bmatrix}
\end{array}
$$

NP
$$
\begin{bmatrix}
\text{LOCAL } [1] \\
\text{WH } \{[4]\}
\end{bmatrix}
$$

S
$$
\begin{bmatrix}
\textit{hd-subj-comp-ph} \\
\text{SLASH } \{[1]\} \\
\text{WH } \{[4]\} \\
\text{HEAD } [3]\ [\text{GEN } \textit{masc}] \\
\text{SUBJ } < > \\
\text{COMPS } < > \\
\text{ARG-ST } <[1],\,…,\,n>
\end{bmatrix}
$$

Meen

$$
\begin{bmatrix}
\text{ʔarsaal ʔal-kitab li-Sara?} \\
\text{ʃaaf Noura?} \\
\text{ju-ħub ʔal-kutub?} \\
\text{deres an-naħu?} \\
…
\end{bmatrix}
$$

Likewise, the same goes with (33); nonetheless, to discriminate it from *su-wh-int-cl*, the GENDER value of the verbal head agrees with the subject, whether it is masculine or feminine. Needless to say, regardless of the simplification in the trees, SLASH and WH features are amalgamated throughout the structure to satisfy the constraints reviewed in section [3].

(33)

$$
\begin{array}{c}
\text{S} \\
\begin{bmatrix}
\textit{ns-wh-int-cl} \\
\text{SLASH } \{\ \} \\
\text{WH } \{\ \} \\
\text{CONT } [4]
\end{bmatrix}
\end{array}
$$

NP
$$
\begin{bmatrix}
\text{LOCAL } [1] \\
\text{WH } \{[4]\}
\end{bmatrix}
$$

S
$$
\begin{bmatrix}
\textit{hd-subj-comp-ph} \\
\text{SLASH } \{[1]\} \\
\text{WH } \{[4]\} \\
\text{SUBJ } < > \\
\text{COMPS } < > \\
\text{ARG-ST } <[1],\,…,\,n>
\end{bmatrix}
$$

$$
\begin{bmatrix}
\text{Meen} \\
\text{ʔeeʃ}
\end{bmatrix}
$$

$$
\begin{bmatrix}
\text{ʔarsaal-at Noura li-Sara?} \\
\text{ʃaaf-at Noura?} \\
\text{t-ħub Noura?} \\
\text{deres-at Noura?} \\
…
\end{bmatrix}
$$

Providing a consistent and systematic analysis that accommodates the *wh*-interrogatives in HA, here and throughout this section, again mirrors HPSG's flexibility to account for naturally occurring utterances with respect to their cross-linguistic diversity.

VII. CONCLUSION

Unbounded dependencies never cease to provoke syntacticians' attention. In this paper, we lay out a formal non-transformational analysis of *wh*-interrogatives in HA with the HPSG framework. The analysis also offers an insight into

the word order of HA. We argue for two phrasal types that underlie the *wh*-interrogatives in HA: subject *wh*-interrogative clauses (*su-wh-int-cl*) and non-subject *wh*-interrogative clauses (*ns-wh-int-cl*). Each one of these two types has its own information and constraints that account for its syntactic structure. The proposal of these types is mediated by the postulation that HA is a verbal-initial language in the first place.

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