Proceedings of the 24th International Conference on Head-Driven Phrase Structure Grammar

University of Kentucky, Lexington

Stefan Müller (Editor)

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Contents

1 Editor's Note

The 24th International Conference on Head-Driven Phrase Structure Grammar (2017) was held at the University of Kentucky, Lexington.

The conference featured 2 invited talks, 16 papers, and 4 posters selected by the program committee (Anne Abeillé, Doug Arnold, Emily Bender, Francis Bond, Gosse Bouma, George Broadwell, Rui Chaves (chair), Philippa Cook, Berthold Crysmann, Kordula De Kuthy, Daniel Flickinger, Antske Fokkens, Petter Haugereid, Fabiola Henri, Anke Holler, Jong-Bok Kim, Jean-Pierre Koenig, Robert D. Levine, Nurit Melnik, Philip Miller, Stefan Müller, Tsuneko Nakazawa, Joanna Nykiel, Gerald Penn, Manfred Sailer, Pollet Samvellian, Sanghoun Song, Stephen Wechsler, Shûichi Yatabe, Eun-Jung Yoo).

We want to thank the program committees for putting this nice program together.

Thanks go to Fabiola Henri, who was in charge of local arrangements, and her assistants.

As in the past years the contributions to the conference proceedings are based on the five page abstract that was reviewed by the respective program committees, but there is no additional reviewing of the longer contribution to the proceedings. To ensure easy access and fast publication we have chosen an electronic format.

The proceedings include all the papers except the one by Justin Bai, Maksymilian Dąbkowski, Kalinda Pride, and Nicholas Tomlin.

Simple and Complex Comparatives in Modern Standard Arabic

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Abstract

Modern Standard Arabic (MSA) has simple and complex comparatives, which look rather like their counterparts in many other languages. MSA simple comparatives are indeed like those of other languages, but MSA complex comparatives are quite different. They involve an adjective with a nominal complement, which may be an adjectival noun or an ordinary noun. They are rather like so-called adjectival constructs. Simple comparatives, complex comparatives, and adjectival constructs can all be analysed with lexical rules.

1. Introduction

Like many languages, Modern Standard Arabic (MSA) has simple comparatives with a comparative form of an adjective and complex comparatives with two separate elements.

(1) a. heya ʔaTwal-u min Xalid-in
she taller.M.SG-NOM from Khalid-GEN
'She is taller than Khalid.'

b. ʔanaa ʔakthar-u thakaʔ-an min ʕali-in
I.1SG.M/F more-NOM intelligence-ACC from Ali-GEN
'I am more intelligent than Ali.'

Superficially, these examples are much like their English translations and like simple and complex comparatives in other languages, e.g. Welsh, which has *dalach* 'taller' but *mwy deallus* 'more intelligent', or Polish, which has *wyższy* 'taller' but *bardziej inteligentny* 'more intelligent'. However, there is an important difference between the MSA complex comparatives and complex comparatives in the other languages. As the gloss of (1b) makes clear, *thakaʔ-an* is not an adjective like *intelligent*, *deallus*, and *inteligentny*, but what we will an adjectival noun. (In traditional Arabic grammar it is known as masdar.) An adjective is not possible, as (2) shows:

(2) *ʔanaa ʔakthar-u thakay-an min ʕali-in
I.1SG.M/F more-NOM intelligent.ACC from Ali-GEN
'I am more intelligent than Ali.'

This might seem like a minor, unimportant difference. We will show, however,

* An earlier version of this paper was presented at the Fourth European Colloquium on HPSG, Paris, March 24-25, 2007. We are grateful to members of the audience for a number of helpful comments. We are also grateful various anonymous reviewers and the audience at HPSG17 for their comments and discussion. We alone are responsible for what appears here.

that it is an important matter, reflecting the fact that MSA complex comparatives are quite different from the complex comparatives of many other languages. The most important evidence for this comes from the fact that they can contain not just adjectival nouns but also ordinary nouns:

(3) ʔanaa ʔakthar-u maal-an min ʕali-in
I.1SG.M/F more-NOM money.ACC from Ali-GEN
'I have more money than Ali.'

We will also show that the MSA construction is rather like what is called the adjectival construct construction, illustrated in (4).

(4) ʔanta ʕaziim-u l-Hazz-i
you.2SG.M/F great-NOM DEF-fortune-GEN
'You have great luck'/'You are very lucky'

Both constructions involve an adjective with a nominal complement and both have what can be called a possessive interpretation. In this paper, we will investigate both simple and complex comparatives in MSA and the related adjectival constructs. We will set out the facts and then develop analyses within the Head-driven Phrase Structure Grammar (HPSG) framework.

The paper is organized as follows. In section 2, we set out the basic properties of both simple and complex comparatives, noting among other things that the latter are head-complement structures. Then in section 3, we show that Arabic complex comparatives are quite different from the superficially similar structures in English and many other languages. We also show that they are broadly similar to adjectival constructs. We then proceed in section 4 to develop HPSG analyses for simple and complex comparatives and adjectival constructs. In section 6, we look at a further issue. Finally, in section 5, we summarize the paper.

2. Basic data

In this section, we will first consider simple comparatives, which are quite similar to their counterparts in many languages. Then we will look at complex comparatives, which look quite similar to complex comparatives in many other languages, but which, as we have said, are rather different.

Simple adjectival comparatives involve what is known as the elative form of an adjective and a PP expressing the standard of comparison. The example in (1a) illustrates. Here is a further example:

(5) kamal-un ʔakbar-u min ʕali-in
kamal-NOM older-NOM from Ali-GEN
'Kamal is older than Ali.'

The elative is also used with a genitive nominal complement in superlatives, such as (6).

(6) kamal-un ʔakbar-u l-ʔiXwaan-i
kamal-NOM oldest-NOM DEF-brothers-GEN
'Kamal is the oldest of the brothers.'

We will say nothing more about this use. The PP in a comparative is headed by *min* 'from', and we will call it a *min*-phrase. As one might expect, *min* may have either an NP or a clause as its complement. The latter is illustrated in (7).

(7) kamal-un ʔakbar-u mi-maa kaan ʔab-uu-hu
kamal-NOM older-NOM from-what was father-NOM-his
'Kamal is older than his father was.'

In (1a), (5), and (7), the comparative is the predicate in what is known as a nominal sentence. These are counterparts of sentences in various languages with a present tense form of the copula. Past tense counterparts of these sentences have a past tense form of the copula. Thus, (8) is a past tense counterpart of (5).

(8) kamal-un kana ʔakbar-a min ʕali-in
kamal-NOM was older-ACC from Ali-GEN
'Kamal was older than Ali.'

As one might expect, simple comparatives can also be used attributively, as in the following:

(9) kamal-un rajul-un ʔakbar-u min ʕali-in
kamal-NOM man-NOM older-NOM from Ali-GEN
'Kamal is an older man than Ali.'

The attributive comparative follows the noun like any attributive adjective.

A further important point about comparative adjectives is that they are masculine singular, whatever the gender and number of the subject or the modified noun. The following illustrate with predicative comparative adjectives:

(10) a. l-ʔawlaad-u ʔakbar-u min l-banaat-i
DEF-boys-NOM older.M.SG-NOM from DEF-girls-GEN
'The boys are older than the girls.'
b. n-nisaaʔ-u ʔakbar-u min r-rijaal-i
DEF-women-NOM older.M.SG-NOM from DEF-men-GEN
'The women are older than the men.'

Here are examples with an attributive comparative:

(11) a. hum rijaal-un ʔakbar-u min ʔiXwaani-him
they.P.M men-NOM older.M.SG-NOM from brothers-their.P.M
'They are older men than their brothers.'

b. hunna nisaaʔ-un ʔakbar-u min
they.P.F women-NOM older.M.SG-NOM from
ʔaXwaat-i-hinna
sisters-GEN-their.P.F
'They are older women than their sisters.'

Although comparatives do not show number and gender agreement, they show agreement for case and definiteness when attributive. Consider e.g. the following:

(12) tuHibbu l-marʔat-u r-rajul-a l-ʔaTwal-a
like.3SG.F DEF-woman-NOM DEF-man-ACC DEF-taller-ACC
min-haa
from-her
'The woman likes the man who is taller than her.'

Here the comparative adjective is definite and accusative in agreement with the modified noun. Predicative adjectives do not show definiteness or case agreement.

Some MSA adjectives do not have an elative form for morphological or phonological reasons. Some adjectives have extra consonants or vowels as part of their essential word structure and hence cannot inflect into the elative pattern without losing some of their identity and meaning (e.g. *Hayii* 'shy' and *mustaʕid* 'prepared'). Other adjectives are inherently in the elative pattern 'ʔaCCaC' (e.g. adjectives expressing colour and handicap such as *ʔabyaD* 'white' and *ʔaʕraj* 'leg crippled') (see, e.g., Ryding, 2005: 249; Al-Nadiri, 2005 and Hasan, 1976). The meaning that these nonexistent elative forms would express has to be expressed by a complex comparative construction, involving one of a small number of general comparative words and an accusative adjectival noun. (1b) illustrates, and so do the following:

(13) ʕali-un ʔakthar-u ʔistiʕdaad-an min Xalid-in
Ali-NOM more-NOM preparation-ACC from Khalid-GEN
fi l-iXtibaar-i
in DEF-exam-GEN
'Ali is more prepared than Khalid for the exam.'

(14) qaabal-tu rajul-an ʔakthar-a thakaʔ-an min
met-1SG.M/F man-ACC more-ACC intelligence-ACC from
Xalid-in
Khalid-GEN
'I met a man more intelligent than Khalid.'

(15) taHadath-tu maʕa rajul-in ʔakthar-a thakaʔ-an
spoke-1SG.M/F to man-GEN more-GEN intelligence-ACC
min Xalid-in
from Khalid-GEN
'I spoke to a man more intelligent than Khalid.'

We have case agreement here although the genitive and accusative forms of *ʔakthar* are identical. We also have definiteness agreement, as the following shows:

(16) tuHibbu l-marʔat-u r-rajul-a l-ʔakthar-a
like. 3SG.F DEF-woman-NOM DEF-man-ACC DEF-more-ACC
thakaaʔ-an min-haa
intelligence-ACC from-her
'The woman likes the man who is more intelligent than her.'

As one might also expect, there are similar examples with *ʔaqall* 'less' and an adjectival noun. The following illustrate:

(17) ʔanaa ʔaqall-u thakaʔ-an min ʕali-in
I.1SG.M/F less-NOM intelligence-ACC from Ali-GEN
'I am less intelligent than Ali.'
(18) qaabal-tu rajul-an ʔaqall-a thakaʔ-an min
met-1SG.M/F man-ACC less-ACC intelligence-ACC from
Xalid-in
Khalid-GEN
'I met a man less intelligent than Khalid.'

These obviously express meanings which are never expressed by a simple adjectival word.

One further point to note is that *ʔakthar* also appears in simple comparatives with just a *min*-phrase complement such as (19).

(19) l-mashaakil-u ʔakthar-u min l-furaS-i
DEF-problems-NOM more-NOM from DEF-opportunities-GEN
'The problems are more than the opportunities.'

This is a comparative counterpart of the following:

(20) l-mashaakil-u katheer-uun
DEF-problem-NOM many-PL.MAS.NOM
'The problems are many'.

Of course, *ʔakthar* normally appears in complex comparatives.

Simple adjectival comparatives pose no obvious analytic problems. They are essentially just adjectival forms with a distinct morphology and semantics

and an extra complement. Complex adjectival comparatives a different matter. They raise some complex questions, as we will see in the next section.

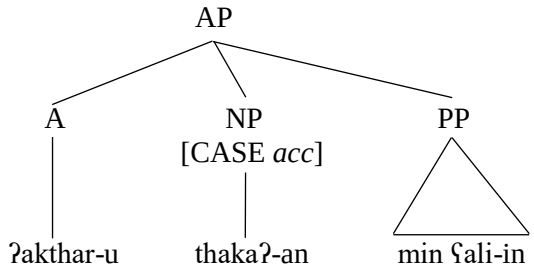
3. The nature of complex comparatives

The basic structure of complex adjectival comparatives is a straightforward matter, but questions arise about whether they should be seen as filling a slot in an adjectival paradigm and about why they contain an adjectival noun. These questions are related.

3.1. The basic structure

Bonami (2015) proposes that complex adjectival comparatives in English are head-adjunct structures in which the comparative word (often called a degree word) is an adjunct and the adjective a head. Essentially the same analysis is proposed in Kay and Sag (2012). This may well be the right analysis for English and other languages, but it is not appropriate here. As shown by the examples above, the adjectival noun is always accusative, but the case of the comparative word reflects the position of the construction. When used predicatively in a nominal sentence it is nominative, and when used attributively it has the same case as the modified noun. This suggests very strongly that it is a head with an accusative complement and hence that we have a head-complement structure. Since the construction appears in AP positions, it must be a type of AP, and on fairly standard assumptions the comparative word that heads it must be a type of adjective. Thus, we will have schematic analyses like the following for the construction in (1b):

(21)



We will develop this analysis in detail below.

3.2. Periphrasis

Bonami (2015) assumes, as have others, that complex adjectival comparatives in English are a case of periphrasis, where a slot in a paradigm is filled not by a single word but by a pair of words. Various approaches to periphrasis have been explored in Bonami (2015), Bonami and Webelhuth (2013), Bonami and Samvelian (2015) and Bonami, Borsley, and Tallerman (2016), and one might

suppose that one of them is relevant here. It is clear, however, that the MSA construction is not a case of periphrasis. One thing that suggests that it is not is the fact that it may contain a number of comparative words. The earlier examples contain *ʔakthar* 'more'. It is also possible to have *ʔashadd* 'stronger' and *ʔaHsan* 'better', as in the following:

(22) hatha l-HiSaan-u ʔashadd-u bayaaD-an min
this DEF-horse-NOM stronger-NOM whiteness-ACC from
thalika l-HiSaan-i
that DEF-horse-GEN
'This horse is whiter than that horse.'

(23) ʔanaa ʔaHsan-u thakaʔ-an min ʕali-in
I.1SG.M/F better-NOM intelligence-ACC from Ali-GEN
'I am more intelligent than Ali.'

A more important argument against a periphrastic analysis comes from the fact that a complex comparative is available for all adjectives. Thus, the following are possible as alternatives to (1a) and (5):

(24) heya ʔakthar-u Tuul-an min Xalid-in
she more-NOM tallness-ACC from Khalid-GEN
'She is taller than Khalid.

(25) kamal-un ʔashadd-u kubr-an min ali-in
Kamal-NOM stronger-NOM oldness-ACC from Ali-GEN
'Kamal is older than Ali.'

This suggests that what we have is not periphrasis but a situation where an independent construction can express the meaning that would be expressed by certain missing forms. In other words, the situation is rather like that exemplified by the following English data:

(26) a. Kim must go home.
b. *Kim musted go home.

(27) a. It was necessary for Kim to go home.
b. It is necessary for Kim to go home.

(26b) shows that the modal *must* does not have a past tense. The meaning that (26b) would express if it were grammatical can be expressed by (27a). However, this is clearly not a periphrastic past tense form of *must* because, as (27b) shows, the same construction can express the meaning that is expressed by (26a). The MSA complex adjectival comparative has a similar status to the construction in (27).

3.3. Ordinary nouns

The MSA complex adjectival comparative appears to be a head-complement structure with a surprising complement, an adjectival noun instead of an adjective. However, there is evidence that this is not at all surprising. This comes from examples with an ordinary noun instead of the adjectival noun. We have predicative examples in (28) and (29) and attributive examples in (30) and (31)

(28) ʔanaa ʔakthar-u maal-an min-ka
I.1SG.M/F more-NOM money-ACC from-you
'I have more money than you.'

(29) ʔanta ʔaHsan-u Xuluq-an min-nii
you.2SG.M better-NOM Morals-ACC from-me
'You have better morals than me.'

(30) qaabal-tu rajul-an ʔakthar-a kutub-an min ʕali-in
met-1SG.M/F man-ACC more-ACC books-ACC from Ali-GEN
'I met a man with more books than Ali.'

(31) taHadath-tu maʕa rajul-in ʔakthar-a kutub-an min
spoke-1SG.M/F to man-GEN more-GEN books-ACC from
ʕali-in
Ali-GEN
'I spoke to a man with more books than Ali.'

It is clear that these examples involve the same construction as the examples with an adjectival noun. As we might expect, we can have examples in which an adjectival noun and a noun are conjoined.

(32) ʔanaa ʔakthar-u thakaʔ-an wa maal-an min
I.1SG.M/F more-NOM intelligence-ACC and money-ACC from
ʕali-in
Ali-GEN
'I have more intelligence and money than Ali.'

(33) qaabal-tu rajul-an ʔakthar-a thakaʔ-an wa
met-1SG.M/F man-ACC more-ACC intelligence-ACC and
maal-an min ʕali-in
money-ACC from Ali-GEN
'I met a man with more intelligence and money than Ali.'

Thus, what we have called complex adjectival comparatives are just a special case of a construction in which a comparative adjective takes an accusative nominal complement. The complement may be an adjectival noun or it may be an ordinary noun.

We have translated the examples with an ordinary noun with 'have' when used predicatively and with 'with' when used attributively. Examples with an

adjectival noun could be translated in the same way. That is, we could have ‘He has more intelligence’ and ‘a man with more intelligence’ rather than ‘he is more intelligent’ and ‘a more intelligent man’. The same kinds of meaning can be expressed with a verb meaning ‘have’ and a preposition meaning ‘with’, as the following show:

(34) ʔanaa ʔamliku maal-an / thakaʔ-an ʔakthar-a
I.1SG.M/F have.1SG.M/F money-ACC intelligence-ACC more-ACC
min-ka
from-you
‘I have more money/intelligence than you.’

(35) rajul-un ʕinda-hu maal-un / thakaaʔ-un ʔakthar-u
man-NOM with-him money-NOM intelligence-NOM more-NOM
min ʕali-in
from Ali-GEN
‘a man with more money/intelligence than Ali’

However, these examples involve not a complex comparative but an ordinary NP with a noun or adjectival noun modified by an attributive comparative adjective. Thus, they are syntactically quite different from the examples that we are concerned with here.

One further point to note here is that essentially any comparative can combine with a noun in a complex comparative. Here are a few relevant examples:

(36) a. ʔanaa ʔaTwal-u qaamat-an min ʕali-in
I.1SG.M/F taller-NOM height-ACC from Ali-GEN
‘I am taller in height than Ali.’

b. ʔanaa ʔakbar-u sinn-an min ʕali-in
I.1SG.M/F older-NOM age-ACC from Ali-GEN
‘I am older in age than Ali.’

c. ʔanaa ʔafSaH-u lisaan-an min ʕali-in
I.1SG.M/F more fluent-NOM tongue-ACC from Ali-GEN
‘I have a more fluent tongue than Ali.’

Only a small number of comparatives can combine with an adjectival noun, but we asume this is just a matter of semantics, of what makes sense.

It is clear, then, that complex adjectival comparatives in MSA are just a special case of a construction in which a comparative adjective takes an accusative nominal complement. It is unsurprising, therefore, that they contain an adjectival noun and not an adjective.

3.4. Adjectival constructs

MSA complex comparatives are one construction in which an adjective takes a nominal complement, but they are not the only one. MSA also has adjectives with a nominal complement in what are known as adjectival constructs (see Ryding 200: 253-4 and Al-Sharifi and Sadler 2009.) The following illustrate:

(37) l-walad-u ʕaziim-u l-Hazz-i
DEF-boy-NOM great.SG.M-NOM DEF-fortune-GEN
'The boy is very lucky.'

(38) ʔimraʔ-at-un jamiil-at-u l-wajh-i
woman-F-NOM beautiful-F-NOM DEF-face-GEN
'a woman with a beautiful face'

These have a non-comparative adjective and the nominal complement is genitive and definite, but they seem to have the same basic structure and essentially the same kind of meaning, 'have' when used predicatively and 'with' when used attributively. As one might expect, we have paraphrases with 'have' and 'with':

(39) yamliku l-walad-u Hazz-an ʕaziim-an
have.3SG.M DEF-boy-NOM fortune-ACC great-ACC
'The boy has great fortune/is very lucky.'

(40) ʔimraʔ-at-un la-haa wajh-un jamiil-un
woman-F-NOM with-her face-NOM beautiful-NOM
'a woman with a beautiful face'

The examples contain an ordinary NP with a noun modified by an attributive adjective.

In addition to the differences in case and definiteness, there are two other differences between complex comparatives and adjectival constructs. Firstly, unlike a complex comparative, the adjective in an adjectival construct shows agreement with the subject in number and gender when predicative and with the modified noun in number, gender, case, and definiteness when attributive. Thus, while the adjective in (37) is masculine singular, in the following it is feminine plural:

(41) l-banaat-u ʕaziim-aat-u l-Hazz-i
DEF-girls-NOM great-P.F-NOM DEF-fortune-GEN
'The girls are very lucky.'

Similarly, while the adjective in (38) is feminine, singular, and indefinite, in the following it is masculine, plural, and definite:

(42) r-rijaal-u T-Taweel-uu l-ʔaqdaam-i
DEF-men-NOM DEF-long-P.M.NOM DEF-legs-GEN
'the men with long legs'

Secondly, there is a difference in word order. In complex comparatives the nominal complement need not be adjacent to the comparative word. They can be separated by the *min*-phrase. Thus, (43) is an alternative version of (1b):

(43) ʔanaa ʔakthar-u min ʕali-in thakaʔ-an
I.1SG.M/F more-NOM from Ali-GEN intelligence-ACC
'I am more intelligent than Ali'

In contrast, adjectival constructs require the nominal complement to be adjacent to the adjective and do not allow another complement to intervene.

(44) a. hwa saliim-u S-Sadr-i min l-Hasad-i
he clean-NOM DEF-heart-GEN from DEF-envy-GEN
'He has a heart free from envy.'
b. *hwa saliim-u min l-Hasad-i S-Sadr-i
he clean-NOM from DEF-envy-GEN DEF-heart-GEN

This is like the situation with nominal constructs, in which a noun has a genitive nominal complement expressing possession and related meanings. As the following show, the nominal complement cannot be separated from the noun by some other complement:[1]

(45) a. kitaab-u ʕali-in fi n-naHw-i
book.NOM Ali-GEN in DEF-syntax-GEN
'Ali's book about syntax'
b. *kitaab-u fi n-naHw-i ʕali-in
book.NOM in DEF-syntax-GEN Ali-GEN

Thus, there are some important differences between adjectival constructs and complex comparatives, but they involve broadly similar structures with similar interpretations.

[1] Adjectival constructs are unlike nominal constructs in allowing the adjective to marked as definite (something seen in (42)). The noun in a nominal construct cannot be marked definite. We have (i) and not (ii)

(i) raʔiis-u l-qism-i
head-NOM DEF-department-GEN
'the head of the department'
(ii) *r-raʔiis-u l-qism-i
DEF-head-NOM DEF-department-GEN.

Siloni (2002) notes that adjectival constructs are limited to inalienably possessed nouns in Hebrew**.** If MSA adjectival constructs were limited in this way, it would be a further difference between complex comparatives and adjectival constructs. However, the following examples suggest that there is no such restriction in MSA:

(47) ʔanaa kathiir-u l-maal-i
I.1SG.M/F much-NOM DEF-money-GEN
'I have a lot of money.'

(48) qaabal-tu rajul-an kathiir-a l-maal-i
met-1SG.M/F man-ACC much-ACC DEF-money-GEN
'I met a man with a lot of money.'

It seems, then, that we do not have a further difference between the constructions here.

4. HPSG analyses

We will now develop analyses for the full range of examples discussed above. All we really need are lexical descriptions for the various kinds of adjectives. These obviously need appropriate syntactic and semantic properties. However, we will just consider the syntactic properties. Our analysis will make crucial use of a number of lexical rules.

Before we provide any analyses, we need to consider the fact that the various kinds of adjectives that we are concerned with here have both predicative and attributive uses. We will assume that predicative adjectives have a non-empty SUBJ value reflecting the first member of the ARG-ST list and are [MOD *none*] and that attributive adjectives have a value for the MOD feature coindexed with the first member of the ARG-ST list and are [SUBJ <>]. The following constraint will ensure that these are the two possibilities for adjectives:

(49) $\begin{bmatrix} word \\ \text{HEAD } adj \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD}\,[\text{MOD } none] \\ \text{SUBJ} < [1] > \\ \text{ARG-ST} < [1] > \oplus \text{L} \end{bmatrix} \vee \begin{bmatrix} \text{HEAD}\,[\text{MOD N'}_{[i]}] \\ \text{SUBJ} <> \\ \text{ARG-ST} < []_{[i]} > \oplus \text{L} \end{bmatrix}$

This is an adjective-specific version of the Argument Realization Principle, which has been proposed in much HPSG work. It will apply both to basic adjectives and to adjectives which are the product of a lexical rule. For many adjectives L will be the empty list, but for some it will be non-empty.[2]

[2] Any adjectives which only have a predicative or an attributive use can be specified as [MOD *none*] and [SUBJ <>], respectively.

4.1. Simple comparatives

As we noted above, simple adjectival comparatives pose no obvious analytic problems since they are just adjectival forms with a distinct morphology and semantics and an extra complement. We obviously need some way to identify comparative adjectives. For this purpose we will assume a fairly conventional feature AFORM with the values *pos*(*itive*), *comp*(*arative*), and *super*(*lative*). Given this assumption, we will have descriptions of the form in (50) for the adjective *Taweel* 'tall' and of the form in (51) for the comparative adjective *ʔaTwal*:

(50) $\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } pos \end{bmatrix} \\ \text{ARG - ST} < \text{NP} > \end{bmatrix}$ (51) $\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } comp \end{bmatrix} \\ \text{ARG - ST} < \text{NP}, (\text{PP}[min]) > \end{bmatrix}$

We ignore the MOD, SUBJ, and COMPS features. As we have seen, the value of the first two will depend on whether the adjective is predicative or attributive, while the value of the latter will be identical to the ARG-ST list minus its first element. This will often be the empty list since many adjectives have just a single argument, but some have two and for those the value of COMPS will be non-empty. We can derive descriptions like (51) from descriptions like (50) with the following lexical rule:

(52) Simple comparative lexical rule

$$\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } pos \end{bmatrix} \\ \text{ARG - ST L} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } comp \end{bmatrix} \\ \text{ARG - ST L} \oplus < (\text{PP}[min]) > \end{bmatrix}$$

This changes the value of AFORM and adds an optional PP[*min*] to the end of the ARG-ST list. For many adjectives L will be a single member list, but for some it will have two members. Obviously, if we were dealing with semantics, it would also need to make appropriate changes to the semantics. The rule will derive all comparative forms from their positive counterparts. Among other things, it will derive a lexical description for *ʔakthar* in simple comparatives like (19) from *katheer* 'many', 'much' in examples like (20).

We noted earlier that a comparative adjective is masculine singular, whatever the gender and number of its subject or the modified noun. There are two possible approaches to this fact. On one approach, the NUMBER and GENDER features of comparatives have the values *sing* and *masc*, respectively, whatever the number of these features in the subject or modified noun. This would mean that they are an exception to whatever constraint ensures agreement with ordinary adjectives. On an alternative approach, the

NUMBER and GENDER features of comparatives have the same values as these features in the subject or the modified noun, but they have the same masculine singular forms, whatever the values of these features. We will not try to choose between these approaches.

4.2. Complex comparatives

We have argued that complex comparatives involve an adjective with a nominal complement, which may be an adjectival noun or an ordinary noun and must be accusative and indefinite. The complement has essentially the same role as the first argument of a basic comparative. We assume, therefore, that adjectives in a complex comparative have an extra argument as the first member of their ARG-ST list, which is the subject if it is predicative or is coindexed with the modified NP if it is attributive. Given these assumptions, *ʔakthar* 'more' in examples like (1b) and (12) will have the following description:

(53) $$\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } comp \end{bmatrix} \\ \text{ARG-ST} < \text{NP}, [\text{DEF} -, \text{CASE } acc], (\text{PP}[min]) > \end{bmatrix}$$

Again, we ignore the MOD, SUBJ, and COMPS features. Descriptions like this can be derived from descriptions like (51) by the following lexical rule:

(54) Complex comparative lexical rule

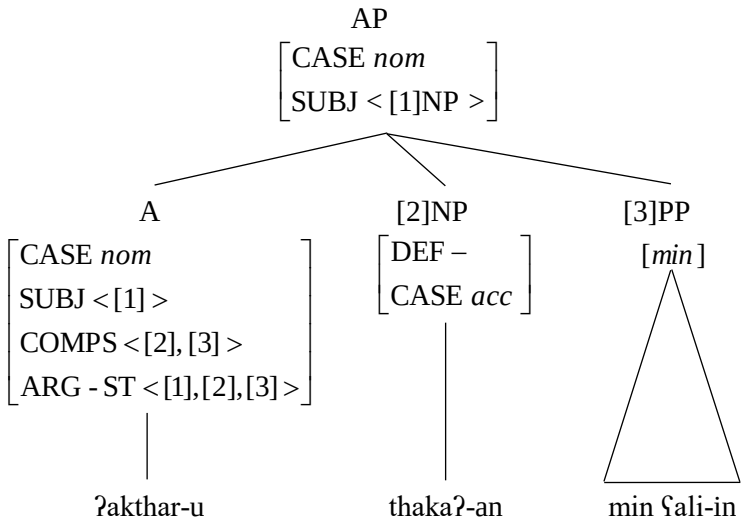
$$\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } comp \end{bmatrix} \\ \text{ARG-ST} < [1] > \oplus \text{L} > \end{bmatrix} \Rightarrow$$

$$\left[\text{ARG-ST} < \text{NP} > \oplus < [1] [\text{DEF} -, \text{CASE } acc] > \oplus \text{L}\right]$$

This adds an extra argument to the beginning of the ARG-ST list and marks the original initial argument, which is now the second argument, as [DEF –] and [CASE *acc*]. L will often contain just PP[*min*], but where the basic non-comparative adjective has a complement, there will be another member. In a full analysis, the rule will also need to provide an appropriate semantic analysis for the derived adjective. We make the standard assumption that the output is the same as the input except where specified. This entails that the output in this case is [AFORM *comp*]. Among other things, this lexical rule will derive a lexical description for *ʔakthar* in complex comparatives from the lexical description that it has in simple comparatives like (19), where it just takes a *min*-phrase complement.

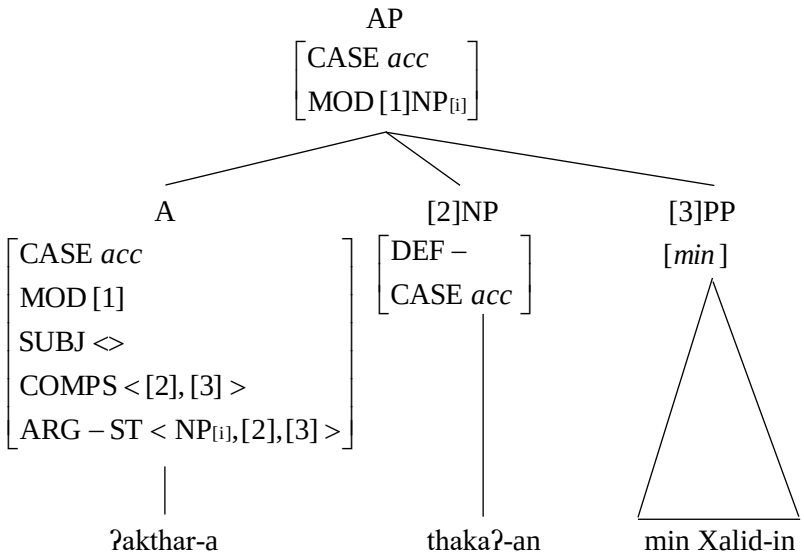
Given a lexical description of the form in (53), the predicative complex comparative in (1b) will have an analysis which can be represented as follows:

(55)



All the predicative complex comparatives will have essentially the same analysis, including those with an ordinary noun. The attributive AP in (14) will have the following analysis:

(56)



Again, all the earlier examples will have the same analysis, including those with an ordinary noun.[3]

4.3 Adjectival constructs

As we have seen, adjectival constructs involve an adjective with a nominal complement, which must be genitive and definite. As in complex comparatives, the complement has essentially the same role as the first argument of a basic adjective, and the adjective has an extra argument as the first member of its ARG-ST list. For *azīm* in (37) and *ğamīl* in (38), this means lexical descriptions like the following:

(57) $$\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } pos \end{bmatrix} \\ \text{ARG - ST} < \text{NP}, [\text{DEF} +, \text{CASE } gen] > \end{bmatrix}$$

Descriptions like this can be derived from descriptions like (50) by the following lexical rule:

(58) Construct adjective lexical rule

$$\begin{bmatrix} \text{HEAD} \begin{bmatrix} adj \\ \text{AFORM } pos \end{bmatrix} \\ \text{ARG - ST} < [1] > \oplus \text{L} > \end{bmatrix} \Rightarrow$$

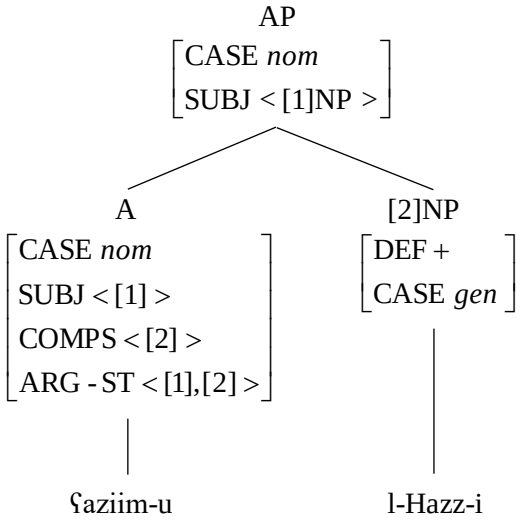
$$\left[\text{ARG - ST} < \text{NP} > \oplus < [1][\text{DEF} +, \text{CASE } gen] > \oplus \text{L}\right]$$

This adds an extra argument to the beginning of the ARG-ST list and marks the original initial member as [DEF +] and [CASE *gen*]. L will often be the empty list. Obviously, in a full analysis, it will also need to provide the appropriate semantics. Among other things, this lexical rule will derive a lexical description for *katheer* in (47) and (48), where it heads an adjectival construct, from the lexical description that it has in examples like (20), where it has no complement.

Given a lexical description of the form in (57), the predicative adjectival construct in (37) will have the following analysis:

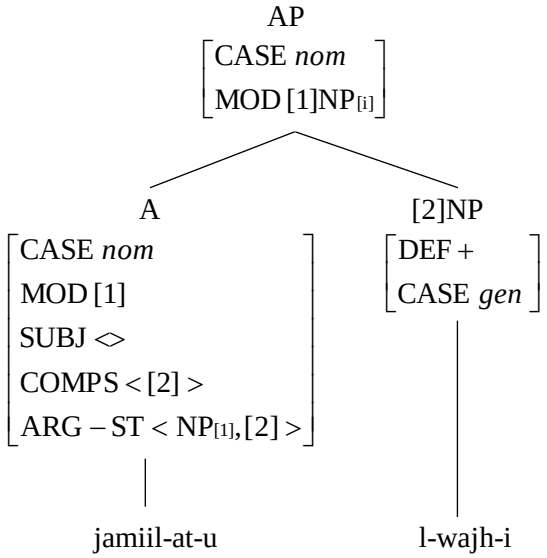
[3] We assume that adjectival nouns are derived from adjectives by another lexical rule, but we will not consider what form this should take.

(59)



For the attributive adjectival construct in (38), we will have the analysis in (60):

(60)



What about the fact that the genitive NP in an adjectival construct cannot be separated from the preceding adjective whereas this is possible with he accusative NP in a complex comparative? We suggest that this is a consequence of a linear precedence constraint requiring a genitive NP to precede a phrasal sister. We can state this as follows:

(61) NP[CASE *gen*] < XP

This will also ensure that a genitive NP in a nominal construct is not separated from the preceding noun.

The construct adjective lexical rule and the complex comparative lexical rule are obviously quite similar. Both add an extra argument to the beginning of an ARG-ST list and turn the original initial member into the second member so that it is realized as a complement. They differ in whether they apply to [AFORM *pos*] or [AFORM *comp*] adjectives and in whether they require the original initial member the ARG-ST list be indefinite and accusative or definite and genitive. It is natural to ask whether the two lexical rules could be combined. In fact, it is not too difficult. We can do this as follows:

(62) $\left[\begin{array}{l}\text{HEAD}\left[\begin{array}{l}adj\\ \text{AFORM}\,[1]\end{array}\right]\\ \text{ARG-ST} < [2] > \oplus \text{L}\end{array}\right] \Rightarrow$

$\left[\text{ARG-ST} < \text{NP} > \oplus < [2][\text{DEF}\,[3]\,\text{CASE}\,[4]] > \oplus \text{L}\right]$

([1] = *comp* & [3] = – & [4] = *acc*) ∨ ([1] = *pos* & [3] = + & [4] = *gen*)

Here we have a rule with an attached disjunctive statement of the possible values of the features AFORM, DEF and CASE. The first disjunct specifies the values for complex comparatives and the second gives the values for construct adjectives. This is quite complex, but it does capture the similarity between the two sets of words.

5. A further issue

There is a further issue that we need to consider here, arising from examples like the following:

(63) a. ʔanaa ʔakthar-u thakaʔ-an fi n-naHw-i
I.1SG.M/F more-NOM intelligence-ACC at DEF-syntax-GEN
min ʕali-in
from Ali-GEN
'I am more intelligent in syntax than Ali.'

b. ʔanaa ʔakthar-u/ thakaʔ-an min ʕali-in fi
I.1SG.M/F more-NOM intelligence-ACC from Ali-GEN at
n-naHw-i
DEF-syntax-GEN
'I am more intelligent than Ali in syntax.'

Here, *fi n-naHw-i* 'about syntax' is a complement of *thakaʔ-an* 'intelligence'. In (a) it precedes the *min*-phrase, which is a complement of *ʔakthar-u* 'more', but in (b) it follows. These examples involve an adjectival noun. We have similar examples with an ordinary noun:

(64) a. ʔanaa ʔakthar-u Kutub-an fi n-naHw-i min
I.1SG.M/F more-NOM books-ACC at DEF-syntax-GEN from
ʕali-in
Ali-GEN
'I have more books about syntax than Ali.'

b. ʔanaa ʔakthar-u Kutub-an min ʕali-in fi
I.1SG.M/F more-NOM books-ACC from Ali-GEN at
n-naHw-i
DEF-syntax-GEN
'I have more books than Ali about syntax.'

These examples appear to suggest that a PP complement of an adjectival noun or an ordinary noun in a complex comparative is a sister of the *min*-phrase. This might suggest an analysis in which the adjective takes as its complements not an NP and a *min*-phrase but an N and whatever complements it requires and a *min*-phrase. In other words, it might suggest an argument composition analysis. This would obviously require more complex lexical descriptions for complex comparatives and a more complex lexical rule. However, there is evidence that there is a more general phenomenon here not specifically connected with complex comparatives. Consider the following:

(65) a. ʔaʕTaa kamal-un kitaab-an fi n-naHw-i
gave. 3SG.M Kamal-NOM book-ACC at DEF-syntax-GEN
ʔila ʕali-in
to Ali-GEN
'Kamal gave a book to Ali about about syntax.'

b. ʔaʕTaa kamal-un kitaab-an ʔila ʕali-in fi
gave. 3SG.M Kamal-NOM book-ACC to Ali-GEN at
n-naHw-i
DEF-syntax-GEN
'Kamal gave a book to Ali about syntax.'

Here, *fi n-naHw-i* 'about syntax' is a complement of *kitaab-an* 'book' and *ʔila ali-in* is a complement of *ʔa-ʕTaa* 'gave', but they can appear in either order. It seems that Arabic like English allows a PP complement of a noun to be separated from it by a sister of the NP that the noun heads. In other words, it seems that they allow certain PPs to be extraposed. A plausible approach to PP extraposition is the EXTRA mechanism of Kay and Sag (2012) and much earlier work. But whatever analysis is proposed for extraposition in examples like (65b) will also account for examples like (63b) and (64b). Hence, there is no need to revise our analysis of complex comparatives.

6. Conclusions

We have shown in this paper that while MSA simple comparatives are much like those in other languages, complex comparatives are very different from their counterparts in many languages. The latter involve adjectives with a nominal complement and what can be called a possessive interpretation. They are rather like adjectival constructs, which also involve an adjective with a nominal complement and the same kind of possessive interpretation. We have developed HPSG analyses for all three constructions involving lexical rules. We have shown in particular that a single lexical rule can be formulated to provide for both complex comparatives and adjectival constructs. We have also shown that certain discontinuities that may arise with complex comparatives are a reflection of a more general phenomenon and do not require any revisions to the analysis. Thus, the complex set of facts that we have investigated here are unproblematic for HPSG.

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Agreement and interpretation of binominals in French

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Abstract

This paper investigates the structure and agreement of coordinated binominals in the form *Det N1 and N2* in French. We provide corpus data and experimental data to show that different agreement strategies exist, depending on their readings: singular *Det* for joint reading (*mon collègue et ami*, 'my.MSG colleague.MSG and friend.MSG'), plural *Det* (*mes frère et soeur*, 'my.PL brother.MSG and sister.FSG') or closest conjunct agreement (*mon nom et prénom*, 'my.MSG last name.MSG and first name.MSG') for split reading. These results challenge previous syntactic analyses of binominals (Le Bruyn and de Swart, 2014), stating that *Det* combines with *N1*, forming a DP and the later coordinates with N2. We then propose an HPSG analysis to account for French binominals.

1 Introduction

In French, bare nouns are not permitted in argument position (1). A singular noun requires a singular determiner (1-a) and a plural noun requires a plural determiner (1-b). But bare nouns are possible in argument position if they are coordinated (Roodenburg, 2004), with (2-b) or without (2-a) a shared determiner .

(1) a. La fille/*Fille est dans le jardin.
the.FSG girl.FSG/girl.FSG be.PRS.3SG in the.MSG garden
'The girl is in the garden.'

b. Les filles/*Filles sont dans le jardin.
the.PL girl.PL/girl.PL be.PRS.PL in the.MSG garden
'These girls are in the garden.'

(2) a. Filles et garçons sont dans le jardin.
girl.PL and boy.PL be.PRS.3PL in the.MSG garden
'Boys and girls are in the garden.'

b. Des filles et garçons sont dans le jardin.
a.PL girl.PL and boy.PL be.PRS.3PL in the.MSG garden
'Some boys and girls are in the garden.'

The determiner agreement in binominal expressions *Det N1 and N2* as illustrated in (2-b), has raised a lot of discussions. Crosslinguistically, various strategies exist: a shared singular determiner requires the conjuncts to be singular in English (3-a), and conjuncts with different numbers cannot be coordinated ((3-b), (3-c)) (Dalrymple and Nikolaeva, 2006), whereas Spanish exhibits closest conjunct agreement (4) (Demonte and Perez-Jimenez, 2012).

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(3) a. This boy and girl.
b. *This boy and girls
c. *These boys and girl

(4) [El/*Los abdomen y pecho] aparecen
the.MSG/MPL abdomen.MSG and chest.MSG appear.PRS.3PL
relativamente abultados.
relatively swollen.MPL
'The abdomen and chest look relatively swollen.'

One purpose of this paper is to establish the empirical facts of binomials agreement in French, showing that determiners can agree either with their closest conjunct or with the whole coordination.

Syntactically, two structures have been proposed, either *[Det [N1 and N2]]* (Dalrymple and Nikolaeva, 2006) or *[[Det N1] and N2]* (Le Bruyn and de Swart, 2014). The fact that the determiner can agree with the whole coordination in French challenges Le Bruyn and de Swart (2014)'s analysis considering that the determiner is combined only with the first conjunct. Furthermore, the agreement mismatch between determiner and coordinated bare nouns raised problems for the previous HPSG analysis of agreement, based on INDEX feature and CONCORD feature (Pollard and Sag (1994),Wechsler and Zlatić (2000)). We follow Villavicencio et al. (2005) using two additional agreement features: LAGR for the leftmost conjunct and RAGR for the rightmost conjunct, to explain for the different agreement strategies existing in French.

The article is organised as follows: section 2 introduces the semantic readings of *Det N1 and N2* and how the agreement varies according to the interpretation. Section 3 examines the agreement strategies employed in French using corpus data and experimental data. Section 4 provides a syntactic analysis of structure *Det N1 et N2*, arguing that *Det* is placed above coordination. Section 5 presents the HPSG formalization and section 6 consists of conclusion and some open questions.

2 Interpretations and agreement of binominals

Binominals can have two distinct readings: a joint reading ((5-a), *colleague* and *friend* are co-referent) and a split reading ((5-b), *the mother and son* denotes two distinct individuals).

(5) a. A friend and colleague has come.
b. The mother and son are coming tonight.

The semantics of joint coordination is the standard set intersection proposed by Partee and Rooth (1983): *a friend and colleague* returns one individul which is both friend and colleague (6-a). Le Bruyn and de Swart (2014) develop a special matchmaking semantic for split *Det N1 and N2* constructions: the discourse referent for the second conjunct is matched to the (discourse) referent introduced by the

DP in the first conjunct, and vice versa. In (5-b), they are *mother* and *son* of each other, unlike *the mother and the son* which could refer to two unrelated individuals.

(6) a. $[\![\text{and}_{joint}]\!] = \lambda P\ \lambda Q \lambda x(x \epsilon (Q \cap P))$
b. $[\![\text{and}_{split}]\!] = \lambda P\ \lambda Q \lambda z(z \epsilon (\text{RtoI}((Q \times E) \cap (E \times P))))$
(E refers to the universe, and RtoI the function of Relation to Individuals is defined as follows: $\text{RtoI}(R)=\{x \oplus y: R(x,y)\}$)

The split binominals are an instance of natural coordination (cf., Haiman (1983), Wälchli (2005)), in which the coordinated parts express semantically closely associated concepts. Not all bare coordinations are equally felicitous. *Boy* and *girl* are quite related semantic concepts and refer to a couple (7-a) while it is hard to form a semantic union comprising *boy* and *cat* unless in a context where *boy* and *cat* can be a pair (7-b).

(7) a. this boy and girl
b. ?this boy and cat

For singular joint reading, in French as in many languages, only the singular determiner is allowed (8).

(8) Le/*Les collègue et ami de Jean est
the.MSG/PL colleague.SG and friend.MSG of Jean be.PRS.3SG
venu hier.
come.PRSPT.MSG yesterday.
'The colleague and friend of Jean came yesterday.'

For split reading, Heycock and Zamparelli (2005) and Le Bruyn and de Swart (2014) assume that French is an exception, as singular nouns are infelicitous (9).

(9) *Ce/*Ces marin et soldat sont souvent
this.MSG/PL sailor.MSG and soldier.MSG be.PRS.3PL often
ensemble.
together
(Heycock and Zamparelli, 2005)

However, the examples in Heycock and Zamparelli (2005) and Le Bruyn and de Swart (2014) only consist of animate nouns. We will present a corpus study (corpus FrWAC) and an experiment of acceptability judgement challenging these data for singular nouns.

Plural binominals are accepted in French (Heycock and Zamparelli, 2005). We assume that both joint and split readings can be allowed. Example (10) is ambiguous between a joint reading and a split reading (it could be possible that someone at the same time is a sailor a and soldier). In the following sections, we will focus on singular binominals.

(10) Ces marins et soldats sont souvent ensemble.
this.PL sailor.MPL and soldier.MPL be.PRS.PL often together
'These sailors and soldiers are often together' (Heycock and Zamparelli, 2005)

3 Empirical evidence of binominal agreement in French

We first established a database extracting binominals from a website corpus (FrWAC) and then tested the number agreement with an experiment.

3.1 Corpus data

In FrWAC (1.6 billion words, Baroni et al. (2009)), which is a large corpus constructed from the Web, we found 371.000 tokens (96.612 types) for the construction *Det N1 et N2*. We annotated the *Detsg*/*Detpl* and *Nsg*/*Nsg* with *Flemm* (Namer, 2000). There are 51 711 tokens (31 412 types) for *Detsg N1sg et N2sg* with either joint reading ((11) for animate nouns and (12) for inanimate nouns) or split reading (13), 5137 tokens (1308 types) for *Detpl N1sg et N2sg* with only split reading(14).

(11) Le chanteur et poète québécois Gilles Vigneault
the.MSG singer.MSG and poet.SG Quebec.M Gilles Vigneault
publie en France un livre d' entretiens.
publish.PRS.3SG in France a book of interviews
'The singer and poet of Quebec, Gilles Vigneault, publishes a book of interviews in France' (FrWAC, *republique-des-lettres.fr*)

(12) Le restaurant et bar Starlight propose un
the.MSG restaurant.MSG and bar.MSG Starlight offer.PRS.3SG a
menu international.
menu international
'The restaurant and bar, Starlight, offers an international menu.' (FrWAC, *expedia.fr*)

(13) Présentez -vous à la date et lieu
introduce.IMP yourself at the.FSG date.FSG and place.MSG
indiqué pour suivre votre formation.
indicated.MSG to follow.INF your training.
'Introduce yourself at the date and place indicated to follow your training.' (FrWAC, *secours57.fr*)

(14) Les lieu et programme seront
the.PL place.MSG and program.MSG be.FUT.3PL
précisés sur le bulletin.
specified.PRSPT.MPL on the bulletin
'The places and programs will be specified on the bulletin' (FrWAC, *rao.free.fr*)

We extracted the binominals with more than five occurrences and removed the errors. We annotated noun animacy with an external dictionary (Bonami pc.) and the joint or split reading manually. Animate nouns include only humans.

The results (table. 1) show that for the joint reading, only the *Detsg* is allowed, whereas for the split reading both *Detsg* and *Detpl* are allowed : 3084 token (60 type) for *Detpl*, 7545 tokens (444 types) for *Detsg*.

	joint reading		split reading				
	Detsg		*Detsg*		*Detpl*		
	types	tokens	types	tokens	types	tokens	total
animate	196	2304	5	38	7	87	2637
inanimate	3	31	439	7507	53	2997	11030
total	199	2335	444	7545	60	3084	13667

Table 1: Numbers of binominals with joint/split reading in FrWAC

Furthermore, there is an interaction with animacy: the joint reading is more frequent with animate than inanimate nouns. For the split reading, there is also an interaction between *Det* agreement and animacy: for split animate binominals, plural determiners are preferred in a two-tailed binomial test ($p < .001$), whereas singular determiners are preferred ($p < .001$) for split inanimate binominals.

This result reveals that singular binominals do exist in French, for both joint reading and split reading. We suppose that French can permit different agreement strategies for binominals, depending on the noun animacy and context.

3.2 Acceptability judgment experiment

To test our agreement hypothesis, we then run an experiment, creating contexts where binominals can only have plural interpretations, to test the acceptability of *Detsg/Detpl* for both animate and inanimate split binominals.

We had 30 sets of experimental items: 12 singular animate binominals, illustrated in (15-a) and 12 singular inanimate binominals, illustrated in (15-b) as well as 6 control items (grammatical or not) without coordination, illustrated in (15-c). These items were inspired by corpus data. We included 15 fillers, for a total of 45 sentences.

(15) a. Le/Les directeur et sous-directeur du
the.MSG/the.PL director.MSG and assistant director.MSG of.MSG
secteur se sont mis d' accord sur
sector.MSG REFL.3 be.PRS.3PL put.PRSPT.M of agreement on
le projet.
the project
'The director and assistant director of the sector agreed on the project.'

b. Il arrive souvent que votre/vos identifiant
it happen.PRS.3SG often that your.SG/your.PL username.MSG
et mot de passe ne soient pas reconnus
and password.MSG NEG be.SBJV.3PL NEG recognized.PRSPT.PL
par le site.
by the site
'It often happens that your username and password are not recognized by the site.'

c. La tête dans le/les genoux, je
the.FSG head.FSG in the.MSG/the.PL knee.PL, I
dormirais peut-être deux heures.
sleep.COND.1SG perhaps two hour.PL
'With the head in the knee, I would sleep perhaps two hours.'

43 subjects participated in the experiment, recruited from the website RISC (*http://www.risc.cnrs.fr/*). One participant was removed as non native and 42 were retained. Participants were asked to rate the acceptability of each sentence, from 1 to 10, which is the usual scale in the French school system. They could only see one possible *Det* (singular/plural) for each binomial, the number of which was counterbalanced across participants. The binominals are in subject position and the predicate is plural and collective, in order to force the split reading.

The results (Fig.1) report the mean and standard error of acceptability judgments. They show that the judgments of experimental items are slightly lower than good controls in green, but much higher than bad controls (with grammatical agreement error) (in yellow).

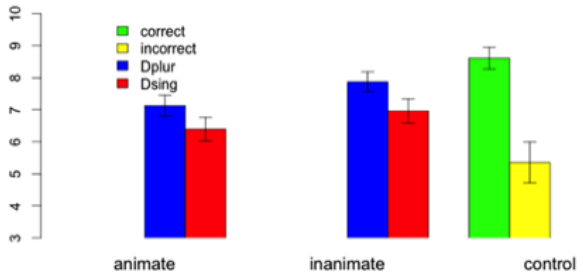

Figure 1: Acceptability judgment of split *Det N1 et N2*

We run a mixed-effect linear regression model with items and participants included as random factors. Our dependent variable is participants' acceptability judgements, which were z-score transformed prior to analysis, which can help eliminate some forms of scale bias. Independent predictors are noun animacy and determiner number. We find significant effects for both animacy (p=0.01) and determiner number(p=0.03) and there is no interaction between these factors(p=0.62).

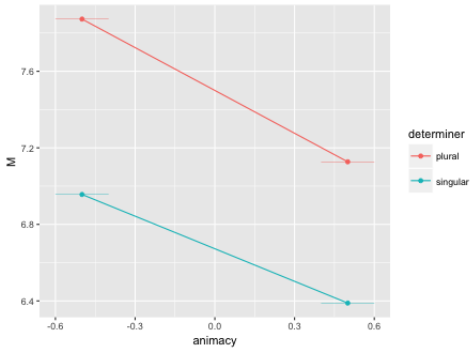

Figure 2: Results of Experiment: x values are noun animacy, -0.5 represent inanimate nouns and 0.5 represent animate nouns. y values are acceptability judgment aggregated over items and subjects. Lines show best linear fit on the data.

The acceptability judgment experiment reveals that if we use a plural verb to force the split reading, the plural determiner is more acceptable than the singular one. Meanwhile, inanimate binominals are better judged than animate ones, both with *Detsg* and *Detpl*.

However, compared with our corpus data, where *Detsg* is more frequent for split inanimate binominals and *Detpl* for split animate binominals, the experiment has a strong bias for *Detpl* given by the plural verbs. The result confirms that two strategies are permitted in French, either closest conjunct agreement (*Detsg*) or synthetic agreement (*Detpl*) and that animacy has an effect on the determiner agreement.

4 Syntactic structures of binominals in French

4.1 Le Bruyn and de Swart (2014)'s analysis

Le Bruyn and de Swart (2014) propose two different syntactic structures depending on the meaning. For the joint reading, *Det* lives in a position above the coordinated phrase (16-a). For the split reading, *Det* combines with the first conjunct only (16-b), predicting thus the ungrammaticality of *Detpl* when followed by two coordinated *Nsg*, as in English (17-a), Spanish (17-b) and supposedly for French (17-c).

(16) a. joint reading: [$_{DP}$ D [$_{CoordP}$ NP and NP]]
b. split reading: [$_{CoordP}$ [$_{DP}$ D NP] and NP]

(17) a. *These boy and girl are eating a pizza (Dalrymple and Nikolaeva, 2006)
b. *Los abdomen y pecho
the.M.PL abdomen.MSG and chest.MSG
(Demonte and Perez-Jimenez, 2012)

c. *Les homme et femme sont venus
the.PL man.MSG and woman.FSG be.PRS.3PL come.PRSPT.PL
'The man and woman have come.' (Le Bruyn and de Swart, 2014)

According to Le Bruyn and de Swart (2014), (16-b) is also compatible with bare binomials *N1 et N2*, which only have the split reading (Roodenburg, 2004), as illustrated in (18) :

(18) Nom et prénom doivent être écrits en
last name.MSG and first name.MSG must.PRS.3PL be.INF write in
noir.
black
'First and last name must be written in black'

4.2 The number agreement

We agree with Le Bruyn and de Swart (2014)'s syntactic structure for the joint reading. However, we argue that this structure should still be valable for the split reading: *Det* is placed above coordinated nouns for the split reading as well. On the one hand, the data presented above show that *Detpl* is acceptable in French, as long as the two *N* form a natural pair (19).

(19) Les mari et femme sont d' accord sur le
the.PL husband.MSG and wife.FSG be.PRS.3PL of agreement on the
partage des biens.
division of.PL property.PL
'The husband and wife agree on the division of these property.'
(FrWAC, *judiciaire.blog.20minutes.fr*)

Moreover, plural numerals may be used: example (20) refers to a pair, one brother and one sister. Following Greenberg (1963)'s Universal 20, numerals are placed lower than determiners. If the numeral is combined with the whole coordination, the determiner must be.

(20) [Mes deux [frère et sœur]]
my.PL two brother.MSG and sister.FSG

Our data show that closest conjunct agreement is also permitted in French. *Detsg* is possible for singular binominals, at least with inanimates (524 tokens for *vos nom et prénom* >'your.PL last name.SG et first name.SG', 383 for *votre nom et prénom* >'your.SG last name.SG et first name.SG'). When there is a mismatch of numbers, the determiner may also agree with the closest conjunct (21), (22).

(21) La plupart de nos établissements sont ouverts tous les
the most of our facilities be.PRS.3PL open.PL all the.PL

jours y compris le dimanche et jours fériés.
day.PL including the.MSG Sunday.MSG and day.PL holiday.PL
'Most of our facilities are open every day including Sunday and public holidays.' (FrWAC, *casino-cafeteria.fr*)

(22) Chacun essaye de trouver sa place en fonction de ses dons et charisme.
everyone try.PRS.3SG to find.INF his place in accordance of his.PL gift.MPL and charisma.MSG
'Everyone tries to find his place according to his gifts and charisma.' (FrWAC, *plaisir-catholique-yvelines.cef.fr*)

We thus assume that singular *Det* agreement for split binominals does not involve an abstract structure but is fairly superficial, like what has been proposed for Welsh by Borsley (2009), where the initial verb (*gwelais*) can agree with its adjacent subject (*i*) rather than with the coordinated phrase (23). Moreover, Demonte and Perez-Jimenez (2012) show that in Spanish the adjective adjacent to N2 can show singular agreement (24-a), while the second adjective takes syntactic plural agreement, but that the reverse pattern is not possible (24-b).

(23) Gwelais [i a Megan] ein hunain.
see.PAST.1SG I and Megan 1PL self
'I and Megan saw ourselves.'

(24) a. la radio y television pública catalanas
the.FSG radio.FSG and television.FSG public.FSG Catalan.FPL
'the Catalan public radio and television'
b. *la radio y television públicas catalana
the.FSG radio.FSG and television.FSG public.FPL Catalan.FSG

4.3 The gender agreement

We now turn to gender agreement, which is marked for *Detsg* ((25-a), (25-b)), but not for *Detpl*(25-c).

(25) a. la fille
the.FSG girl.FSG
b. le garçon
the.MSG boy.MSG
c. les filles/garçons
the.PL girl.FPL/MPL

Wechsler and Zlatić (2003) show that in French, when the subject is a coordination, the predicate adjective shows with its subject a gender resolution agreement (Corbett, 1991): a mixture of genders is resolved to the masculine (26).

(26) Le garçon et la fille sont
the.MSG boy and the.FSG girl.FSG be.PRS.SPL
compétents/*compétentes.
competent.MPL/competent.FPL
'The boy and the girl are competent.' (Wechsler and Zlatić, 2003)

Our data show that in binominals, when there is a mismatch of gender, the determiner always agrees with its closest conjunct. As illustrated in (27), with the same pair of nouns in their two possible word orders, the determiner is feminine when the first conjunct is feminine (cf.(13), repeated in (27-a)), and masculine when the first conjunct is masculine (27-b), the resolution rule cannot be applied(27-a). Note that in (27-a), the postnominal adjectif (*indiqué*) agrees with its closest conjunct (*lieu*).

(27) a. la/*le date et lieu indiqué
the.FSG/the.MSG date.FSG and place.MSG indicated.MSG
'the date and place indicated' (FrWAC, *secours57.fr*)
b. Le/*La lieu et date de
the.MSG/the.FSG place.MSG and date.FSG of
rédaction/publication
writing/publishing
'the place and date of writing/publishing' (FrWAC, *gfii.asso.fr*)

For more cases of the gender and number mismatch in coordination, see Shiraishi and Abeillé (2016). They found that French allows determiner coordination with number or gender mismatch: in (28-a), travail 'job' is the non syncretic plural of travaux 'jobs' and in (28-b), chanteuse the non syncretic feminine of chanteur 'singer'.

(28) a. . . . pour rediriger le ou les travaux vers leur nouvelle
to redirect the.MSG or the.PL job.PL to their new
destination.
destination.
'. . . to redirect the jobs to their new destination.' (Gilles Lemaitre, *Backup exec pour Windows server: sauvegarde et restau*, 2007)
b. Il faut attendre que le, ou la chanteuse soit au
It must wait that the.MSG, or the.FSG singer.FSG is to.MSG
top.
top
'One must wait until the singer is at the top.' (Bernard Tellez, *L'aube d'hiver de Barcelone*, 2010)

5 An HPSG analysis

5.1 Previous work

In HPSG, two distinct agreement features are used, CONCORD for morphosyntactic agreement and INDEX for semantic agreement (Pollard and Sag (1994),Wechsler and Zlatić (2000)). Nouns, determiners, and attributive adjectives carry a CONCORD feature, closely related to inflection. INDEX agreement is more semantic, whose value is related to the referential/semantic possibilities of the associated nominal. INDEX and CONCORD are both head features.

Dalrymple and Nikolaeva (2006) propose an LFG analysis where CONCORD features are distributive. The conjuncts require the *Det* to have the same CONCORD value as the conjuncts. INDEX features are non-distributive, representing the set formed by the coordinate structure and triggering verb agreement.

Villavicencio et al. (2005) show that in Portuguese, the determiner always agrees in gender with the first conjunct, and in number either with the first conjunct (29) or with the coordinate structure (30).

(29) No povo e gente hebreia
on.the.M.SG population.M.SG and people.F.SG Hebrew.F.SG
'on the Hebrew population and people'

(30) Os provaveis director e ator principal
the.MPL probable.PL director.MSG and actor.MSG principal.MSG
'the likely director and main actor'

In addition to CONCORD and INDEX, they propose two new features: LAGR for the leftmost conjunct, RAGR for the rightmost conjunct. In closest conjunct agreement, *Det* agrees with the first *N* via LAGR, while a postnominal adjective may agree with the last N via RAGR. LAGR and RAGR are head features. The value of LAGR of the coordinate structure comes from the LAGR of the leftmost daughter. The CONCORD value, on the other hand, reflects the resolved agreement features of the coordinate structure, with identical values of INDEX.

5.2 The coordinated phrase

We propose a hierarchy of nominal-coordinate-phrase (Fig.3). Two subtypes are introduced given the semantic interpretations: one for joint reading and the other for split reading. Within split-nominal-coordinate-phrase, we distinguish: NP coordination (*le garcon et la fille* 'the.MSG boy.MSG and the.FSG girl.FSG') and bare nonimal coordination, with (*votre/vos nom et prénom* 'your.MSG/PL last name.MSG and first name.MSG'). or without (*nom et prénom* 'last name.MSG and first name.MSG') a shared determiner.

For joint-nominal-coordinate-phrase, the determiner can also be omitted in the predicate use (31-a). NP coordination can give a joint reading as well (31-b).

(31) a. Il devient Eric Weiss, agent de la CIA, collègue
he become.PRS.3SG Eric Weiss, agent of the.FSG CIA, colleague
et ami de Michael Vaughn.
and friend of Michael Vaughn
'He becomes Eric Weiss, agent of the CIA, colleague and friend of Michael Vaughn.' (FrWAC, *vatzhol.club.fr*)

b. C' est un ami et un collègue
this be.PRS.3SG a.MSG friend.MSG and a.MSG colleague.MSG
qui nous a quittés.
who us have.PRS.3SG leave.PRSPT.MSG
'This is one friend and one colleague who has left us.'

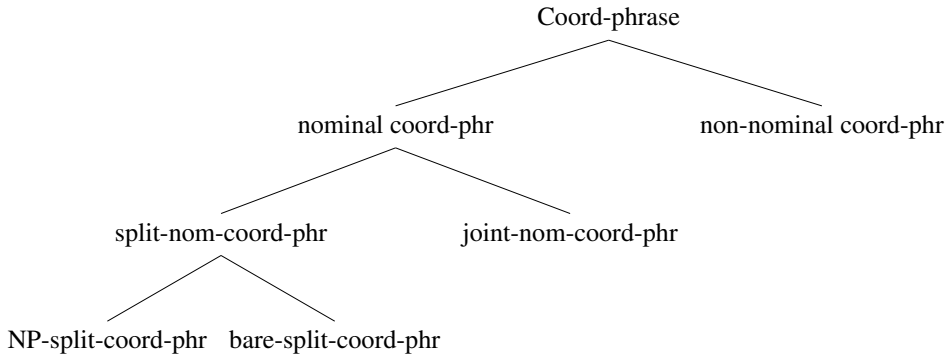

Figure 3: Hierarchy of nominal coordinate phrases

Following Borsley (2005) who argues that coordinated phrases are analysed as unheaded, we assume coordinating conjunctions to be weak heads (Abeillé (2005),Abeillé (2006)), inheriting the HEAD and Valence features from their conjunct complement and contributing a feature CONJ. Disregarding conjunction features, SLASH features are shared between the conjuncts and the coordinate phrase (Abeillé (2005), Mouret (2007)) and VALENCE features are shared by default (/)(32).

(32) Coord-phrase ⇒

$$\begin{bmatrix} \text{VAL} & /\boxed{1} \\ \text{SLASH} & \boxed{2} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{VAL} / \boxed{1} \\ \text{SLASH } \boxed{2} \end{bmatrix}, \ldots \begin{bmatrix} \text{VAL} / \boxed{1} \\ \text{SLASH } \boxed{2} \end{bmatrix} \right\rangle \end{bmatrix}$$

In this paper, we only deal with the nominal coordination, and we add LAGR and RAGR features for closest conjunct agreement.

(33) nom-coord-phr ⇒

$$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{noun} & \\ \text{LAGR} & \boxed{1} \\ \text{RAGR} & \boxed{n} \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONCORD} & \boxed{1} \\ \text{LAGR} & \boxed{1} \\ \text{RAGR} & \boxed{1} \end{bmatrix} \end{bmatrix}, \ldots \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONCORD} & \boxed{n} \\ \text{LAGR} & \boxed{n} \\ \text{RAGR} & \boxed{n} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

5.3 Binominals with joint/split reading

For joint nominal coordinated phrases, we assume that both NUM and GEN features are shared (*mon collèque et ami*, 'my.MSG colleague.MSG and friend.MSG'; *ma collègue et amie*, 'my.FSG colleague.FSG and friend.FSG'). INDEX features are also shared. (34) does not specify *Det* since it is compatible with bare noun coordination (*mon collègue et ami*) and NP coordination (c.f (31-b)).

(34) joint-nom-coord-phr ⇒

$$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONCORD} & \begin{bmatrix} \text{NUM} & \boxed{1} \\ \text{GEN} & \boxed{2} \end{bmatrix} \\ \text{INDEX} & \text{i} \end{bmatrix} \\ \text{DTRS} & \text{list}\left(\begin{bmatrix} \text{CONCORD} & \begin{bmatrix} \text{NUM} & \boxed{1} \\ \text{GEN} & \boxed{2} \end{bmatrix} \\ \text{INDEX} & \text{i} \end{bmatrix} \right) \end{bmatrix}$$

For split nominal coordination, the coordinated phrase has a different INDEX value than the conjuncts. For CONCORD features of the coordinated phrase, the NUM value is plural because it denotes a plural entity (35), the GEN value follows a resolution rule, which is feminine only when all its daugters' GEN values are feminine (and with the default masculine value otherwise).

(35) split-nom-coord-phr ⇒

$$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONCORD} & \begin{bmatrix} \text{NUM} & \text{pl} \\ \text{GEN} & \boxed{0} \end{bmatrix} \\ \text{INDEX} & \text{k=i+...+n} \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{CONCORD} & [\text{GEN} & \text{a}] \\ \text{INDEX} & \text{i} & \end{bmatrix}, \ldots \begin{bmatrix} \text{CONCORD} & [\text{GEN} & \text{z}] \\ \text{INDEX} & \text{n} & \end{bmatrix} \right\rangle \end{bmatrix}$$

$\boxed{0}$=fem iff a $\cup \cdots$ z = fem

For the NP coordination (*le frère et la soeur*, 'the brother and the sister'), the valence features of the conjuncts are saturated.

We then consider bare binominals. For them, we assume the SPR value to be optional. We propose that a split bare coordinated phrase does not necessarily share its NUM feature with the conjuncts. The LAGR feature inherits from the first conjunct and RAGR feature from the last conjunct and the CONCORD feature represents the resolved number (plural). Its SPR can have the same value of NUM as the resolved one or as that of LAGR, expecting a *Detsg* if its closest conjunct is singular and a *Detpl* if it is plural. The GEN value of SPR inherits that of its first conjunct because the *Det* only shows closest conjunct gender agreement in French, as in Spanish and Portuguese (36).

(36) bare-split-coord-phr ⇒

$$\begin{bmatrix} \text{HEAD} & \left[\text{CONCORD} \quad [\text{NUM} \quad \text{pl}]\right] \\ \text{VAL} & \left[\text{SPR} \left\langle (\text{D} \quad \left[\text{CONCORD}\begin{bmatrix}\text{NUM} & \text{pl} \vee \boxed{1} \\ \text{GEN} & \boxed{2}\end{bmatrix}\right]) \right\rangle\right] \\ \text{DTRS} & \left\langle \left[\text{HEAD}\left[\text{LAGR} \quad \boxed{3}\begin{bmatrix}\text{NUM} & \boxed{1} \\ \text{GEN} & \boxed{2}\end{bmatrix}\right] \right.\right. \\ & \left.\left. \text{VAL}\left[\text{SPR}\left\langle \text{D} \quad \left[\text{CONCORD}\ \boxed{3}\right]\right\rangle\right]\right], \ldots \left[\begin{array}{l}\text{HEAD}\left[\text{LAGR} \quad \boxed{4}\right] \\ \text{VAL}\left[\text{SPR}\left\langle \text{D} \quad \left[\text{CONCORD}\ \boxed{4}\right]\right\rangle\right]\end{array}\right]\right\rangle \end{bmatrix}$$

As a result, joint-coord-phrase (*mon collègue et ami*) and bare-split-coord-phrase (*votre nom et prénom*) are presented in the following trees (Fig.4 and Fig.5).

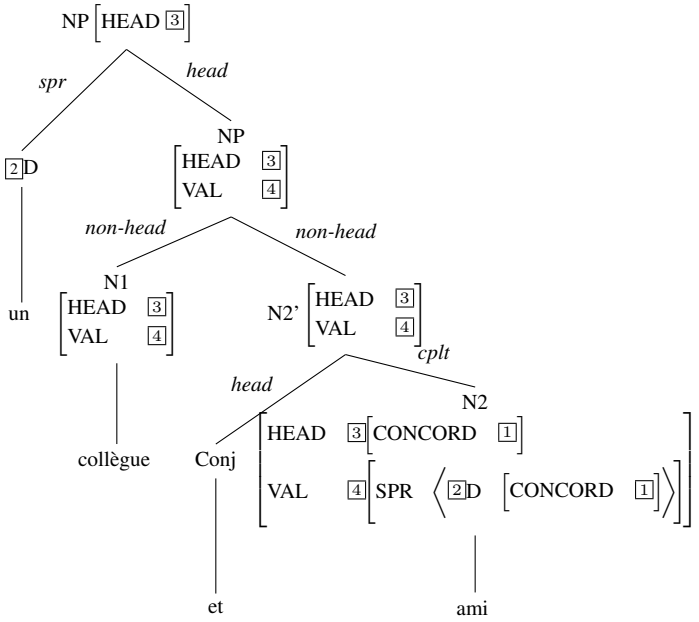

Figure 4: Joint-nom-coord-phrase

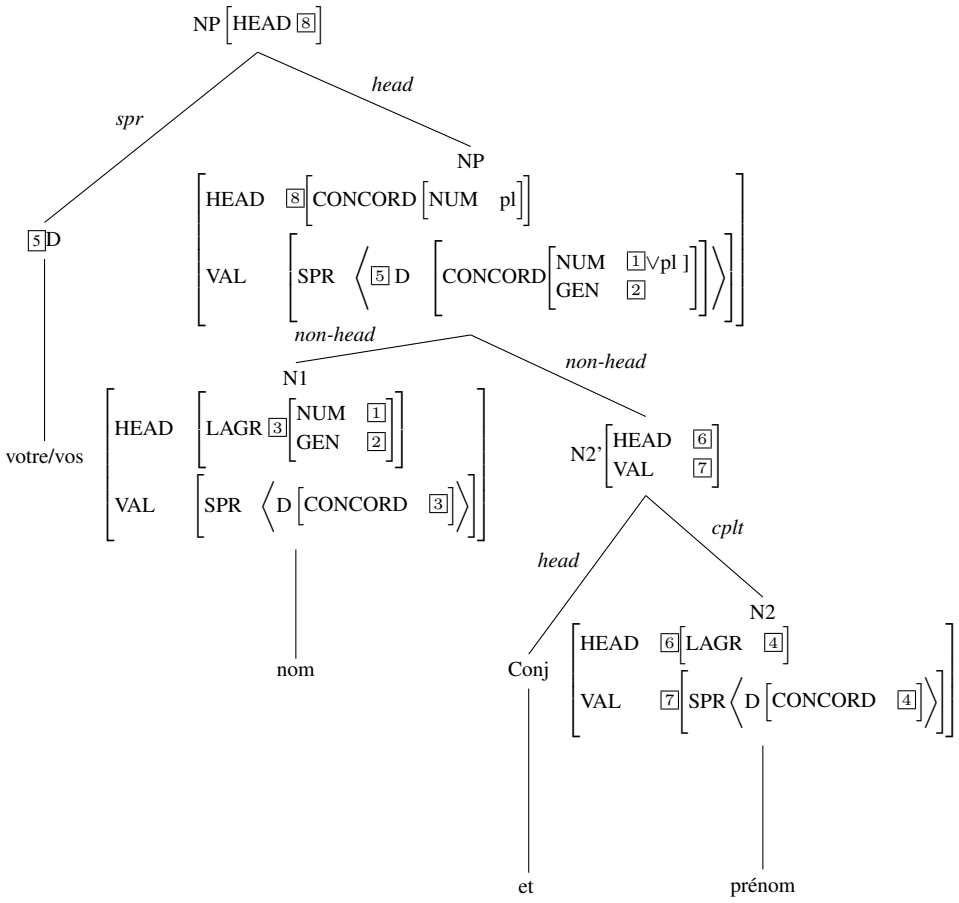

Figure 5: Bare-split-coord-phrase

6 Conclusion

On the basis of large corpus data, we argue that singular split binominals do exist in French, and that both singular and plural determiners are possible. Our experimental data further show that animacy plays a role in the acceptability judgments: inanimate binominals are better accepted than animate binominals. The fact that the determiner can agree with the coordinated phrase suggest that the determiner is placed above the coordinated nouns, contrary to Le Bruyn and de Swart (2014).

We also propose the same syntactic structure for joint and split reading, and different agreement patterns. The *Det* may agree in number with the whole coordinated phrase or the first conjunct, while it must agree in gender with the first conjunct. In the HPSG analysis, we follow Villavicencio et al. (2005), using LAGR and RAGR features to capture different agreement patterns. We leave the postnominal agreement for further study.

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Backward control in Modern Standard Arabic

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Abstract

This paper is the third in a series of papers dedicated to the investigation of subjunctive complement clauses in Modern Standard Arabic. It began with Arad Greshler et al.'s (2016) search for obligatory control predicates in the language and continued with Arad Greshler et al.'s (2017) empirical and theoretical investigation of the backward control construction. In this paper we show that Arad Greshler et al.'s (2017) findings and ultimate analysis, which is cast in a transformational framework, can be straightforwardly formalized using the existing principles and tools of HPSG. Our proposed analysis accounts for all the patterns attested with subjunctive complement clauses in Modern Standard Arabic, including instances of control and no-control.

1 Introduction

Subjunctive complement clauses in Modern Standard Arabic (MSA) are used in contexts where English (and other languages) uses the infinitives. However, unlike English infinitivals, subjunctives in MSA exhibit agreement. Moreover, they alternate between control interpretations, where the matrix subject and the embedded subject share reference, and no-control interpretations, where they have disjoint reference. A corpus-based investigation conducted by Arad Greshler et al. (2016) (henceforth AHMW) revealed that there are no obligatory control (OC) predicates in MSA. Consequently, they propose a uniform *pro*-drop based analysis of control and no-control. The analysis accounts for all patterns, except one – backward control – which exhibits a surprising agreement pattern. AHMW explain the discrepancy by suggesting that this construction may involve extra-grammatical factors.

Arad Greshler et al. (2017) propose an alternative account of the backward control construction, which builds on new corpus findings regarding the types of predicates which are licensed in this construction. They propose that these predicates can optionally form complex predicates with the embedded subjunctives. When this occurs, the complex predicate exhibits the regular agreement patterns associated with VSO and SVO clauses in MSA.

The focus of Arad Greshler et al. (2017) is mostly on the implications of this construction in the context of the current debate in the transformational literature regarding the theory of control (e.g., Hornstein, 1999; Landau, 2007). Consequently, they propose a possible formalization of their account in a transformational framework. The current paper takes the previous research further by proposing an HPSG analysis of the data. We show that the insights of Arad Greshler et al. (2017) can be straightforwardly formalized using the existing principles and tools of HPSG to account for all the patterns attested with subjunctive complement clauses in MSA.

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2 Background

Modern Standard Arabic is a *pro*-drop language whose unmarked word order is VSO, yet SVO order is also available. The two word orders differ in their agreement patterns. VSO clauses exhibit partial subject–verb agreement, where the verb agrees with its subject in gender and person, yet its number is invariably singular (1a). SVO clauses, on the other hand, exhibit full subject–verb agreement and therefore the verb bears plural agreement when it has a plural subject (1b). The full/partial agreement distinction is only discernable with plural human subjects. Plural inanimate subjects always trigger singular-feminine agreement.

(1) a. qaraʔat t$^{\text{ʕ}}$-t$^{\text{ʕ}}$aalibaat-u l-kitaab-a.
read.3SF the-students.PF-NOM the-book-ACC
'The female students read the book.'

b. ʔat$^{\text{ʕ}}$-t$^{\text{ʕ}}$aalibaat-u qaraʔna l-kitaab-a.
the-students.PF-NOM read.3PF the-book-ACC
'The female students read the book.'

Pro-dropped subjects trigger full agreement on the verb, as demonstrated in (2).

(2) qaraʔat l-kitaab-a.
read.3SF the-book-ACC
'She read the book.' (Not: 'They read the book.')

MSA subjunctive complement clauses are preceded by the particle *ʔan* and are obligatorily verb-initial. They typically resemble complements of control constructions in English (and other languages), where an unexpressed subject is controlled by a matrix argument. However, the agreement marking on the subjunctive verb reveals the agreement properties of the intended subject. In (3a) the subjunctive *yaktuba* '*write*' exhibits 3SM agreement. Consequently, the understood embedded subject can be construed as the matrix subject (*control*) or as a different singular–masculine referent (*no-control*). The control and no-control interpretations are also possible in the backward pattern illustrated in (3b), where the subject appears in the embedded clause.

(3) a. ħaawala muħammad-un [ʔan yaktuba maqaal-an].
tried.3SM Muhammad-NOM(M) AN write.3SM.SBJ article-ACC
'Muhammad tried to write an article.'
'Muhammad$_i$ tried that he$_j$ would write an article.'

b. ħaawala [ʔan yaktuba muħammad-un maqaal-an].
tried.3SM(M) AN write.3SM.SBJ Muhammad-NOM(M) article-ACC
'Muhammad tried to write an article.'
'He tried that Muhammad would write an article.'

In addition, embedded subjunctives may exhibit agreement properties distinct from the matrix predicate. In (4) the embedded subject is optional but control is impossible due to the agreement mismatch (matrix 3SM and embedded 3SF).

(4) ħaawala muħammad-un [ʔan taktuba (hind-un)
tried.3SM Muhammad-NOM(M) AN write.3SF-SBJ (Hind-NOM(F))
maqaal-an].
article-ACC
'Muhammad tried that Hind/she would write an article.'

3 Subjunctive reference patterns in MSA

AHMW conducted a corpus-based investigation with the goal of finding whether all *ʔan*-clause selecting predicates allow for both control and no-control between the two subjects, or whether there are OC predicates. They used the 115-million-token sample of the *arTenTen* corpus of Arabic (Arts et al., 2014), which has been tokenized, lemmatized and part-of-speech tagged with MADA (Habash & Rambow, 2005; Habash et al., 2009) and installed in the Sketch Engine (Kilgarriff et al., 2004).

The corpus investigation led AHMW to conclude that there are no OC predicates in MSA. They found evidence for control and no-control with various types of predicates: volitionals, implicatives, manipulatives, modals, and aspectuals. These findings echo Habib (2009), who claims that there are no "real" control predicates in MSA. They do constitute, however, counterexamples to the generalization made by Landau (2013, p.106), who predicts that "[t]here cannot be a language where modal, aspectual and implicative verbs or evaluative adjectives allow an uncontrolled complement subject", provided that the embedded predicate exhibit morphological agreement.

Under the assumption that there is no OC in MSA, AHMW argue for one structure for all cases, namely, a no-control structure (Figure 1).[1] Constructions with *ʔan* complement clauses are structures with two independent subjects. The omission of a subject in either clause is due to the *pro*-drop property of MSA; each of the clauses, the matrix clause and the embedded clause, can either have an overt subject or a *pro*-dropped subject. There are no constraints on the agreement relations between the two predicates, and therefore they do not need to match. What resembles subject control is in actuality co-indexation at the semantico-pragmatic level.

One pattern proved problematic for this analysis. The simple example of the backward pattern in (3b) masks a more complex agreement pattern which is only discernable with plural human subjects, for which agreement varies depending on

[1]Note that the NP/$pro_{[nom]}$ node is an abbreviated notation to indicate the possibility of either using a lexical NP or *pro*-dropped subject and does not imply the existence of empty categories in syntax.

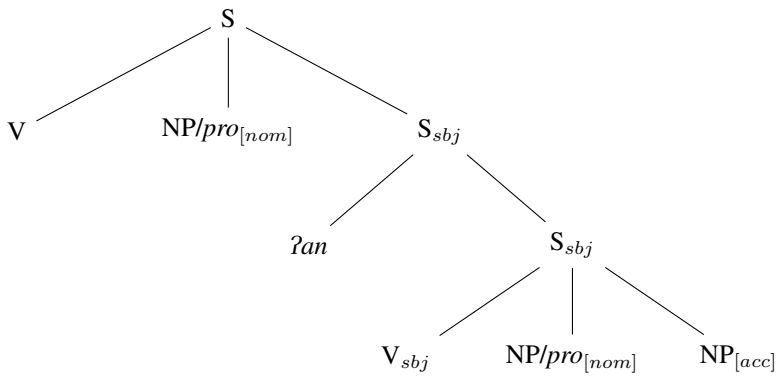

Figure 1: A no-control analysis

the position of the subject relative to the verb. AHMW found that when the embedded subject is both human and plural the matrix verb exhibits partial agreement (i.e., only in gender and person) with the subject (5).

(5) ħaawalat [ʔan taktuba l-banaat-u maqaal-an].
tried.3SF AN write.3SF.SBJ the-girls-NOM article-ACC
'The girls tried to write an article.'

This is unexpected under the *pro*-drop analysis. *Pro* subjects are assumed to trigger full agreement on their predicates. If so then it is not clear how a 3SF *pro* matrix subject can co-refers with the plural embedded subject.

AHMW conclude that there is no evidence for the existence of OC predicates in MSA. A one-structure *pro*-drop analysis accounts for most of the data, with the exception of the agreement pattern attested in the backward construction (5). They suggest that the use of partial agreement in this pattern is motivated by analogy to the partial subject–verb agreement found in simple VSO clauses, and that the integration of this construction into the theory requires some additional assumptions, which may involve extra-grammatical factors, possibly related to the non-native status of MSA.[2]

4 The distribution of backward control

An alternative account of the backward control construction illustrated in (5) is proposed by Arad Greshler et al. (2017). They begin by conducting more focused corpus investigations of the backward pattern. First, they consider whether it is indeed the case that there are no instances of full agreement when the subject is expressed in the embedded clause. Moreover, they extend the range of predicates

[2]MSA is the literary standard of the Arab world, but it is acquired in school. The mother tongue of its speakers is some regional dialect of Arabic.

examined by AHMW to investigate whether all predicates are compatible with backward control.

With regards to agreement, contrary to AHMW, Arad Greshler et al. (2017) found instances of full agreement on the matrix predicate. However, unlike a similar raising construction discussed by Wurmbrand & Haddad (2016), whose matrix predicates alternate between full and partial agreement with no change in meaning, the difference in the agreement marking was found to affect the interpretation of the two variations. When the embedded subject is plural and human and the matrix predicate exhibits partial agreement with it the sentence is ambiguous (6a). The unexpressed matrix subject can be construed as the embedded subject (control) or as a singular-feminine referent (no-control). When the matrix predicate is plural, there is only one no-control interpretation (6b).

(6) a. ħaawalat$_{i/j}$ [ʔan taktuba l-banaat-u$_i$ maqaal-an].
tried.3SF AN write.3SF.SBJ the-girls-NOM article-ACC
'The girls tried to write an article.'
'She$_j$ tried that the girls$_i$ would write an article.'

b. ħaawalna$_{*i/j}$ [ʔan taktuba l-banaat-u$_i$ maqaal-an].
tried.3PF AN write.3SF.SBJ the-girls-NOM article-ACC
'They$_j$ tried that the girls$_i$ would write an article.'
Not: 'The girls tried to write an article.'

The control interpretation licensed by the backward pattern in (6a) was found to occur only with a subset of the *ʔan*-clause-taking predicates in MSA, which we will refer to as 'backward control predicates' (BC predicates). A corpus investigation limited to cases with plural animate subjects revealed instances of backward control with volitionals, implicatives, modals and aspectuals. No instances of backward control were found with the following predicates: *qarrara* '*decide*', *xaʃiya* '*fear*', *rafadˁa* '*refuse*', *tarradada* '*hesitate*', and *ʔiqtaraħa* '*propose*'. With these predicates, structures such as the one illustrated with a BC predicate in (6a) are unambiguous, with only a disjoint reference reading available (7).

(7) qarrarat$_{*i/j}$ [ʔan taktuba l-banaat-u$_i$ maqaal-an].
decided.3SF AN write.3SF.SBJ the-girls-NOM article-ACC
'She decided that the girls would write an article.'
Not: 'The girls decided to write an article.'

Unlike the backward pattern, the agreement patterns in the forward pattern are straightforward. The type of agreement exhibited by the matrix predicate depends on its position relative to its subject: partial agreement with post-verbal subjects (8a) and full agreement with pre-verbal subject (8b). The embedded predicate invariably exhibits full agreement with its construed subject. Moreover, the two interpretations (control/no-control) are always possible, regardless of the predicate type.

(8) a. ħaawalat l-banaat-u$_i$ [ʔan yaktubna$_{i/j}$ maqaal-an].
decided.3SF the-girls-NOM AN write.3PF.SBJ article-ACC

b. l-banaat-u$_i$ ħaawalna [ʔan yaktubna$_{i/j}$ maqaal-an].
the-girls-NOM decided.3PF AN write.3PF.SBJ article-ACC

'The girls tried to write an article.'
'The girls$_j$ tried that they$_i$ would write an article.'

A similar phenomenon is found in Modern Greek (MG), a language which shares a number of syntactic properties with MSA. Subjunctive complement clauses in MG fall into two categories: controlled-subjunctives (C-subjunctives), which enforce control between the matrix and embedded subject, and free-subjunctives (F-subjunctives), which, like in MSA, allow for both control and no-control. Also similarly to MSA, in both types of constructions the subject can be expressed either in the matrix clause or the embedded clause, yet the backward pattern with F-subjunctives is more restricted.

With C-subjunctives a control interpretation is the only option regardless of the position of the subject. With F-subjunctives, on the other hand, the forward pattern in (9a) is ambiguous between control and no-control, but in the backward pattern (9b) the embedded subject cannot be controlled by the matrix subject (Alexiadou et al., 2010, ex. 39). This is similar to the MSA data in (6b).

(9) a. o Janis$_i$ elpizi [na fai pro$_{i/j}$ to tiri].
John-NOM hopes subj eats pro the cheese
'John hopes to eat the cheese.'
'John$_i$ hopes that he$_j$ will eat the cheese.'

b. pro$_{*i/j}$ elpizi [na fai o Janis$_i$ to tiri].
pro hopes subj eats John-NOM the cheese
'He hopes that John will eat the cheese.'
Not: 'John hopes to eat the cheese.'

Alexiadou et al. (2010) propose a *pro*-drop analysis for F-subjunctives, similar in spirit to the one proposed by AHMW. Consequently, they attribute the impossibility of coreference in (9b) to Principle C. The embedded referential subject, *Janis*, cannot be bound by the matrix *pro* subject. The fact that there is no Principle C effect in the case of C-subjunctives is taken by Alexiadou et al. (2010) as evidence that control with these predicates does not involve a *pro*-dropped subject.

The similarity between MSA and MG is even greater when the types of predicates which are licensed by the different constructions are considered. Landau (2004) argues that the predicates which select C-subjunctives in MG belong to a category of predicates which cross-linguistically select *semantically untensed* complements, and include the implicatives, aspectuals, modals, and evaluative adjectives. Predicates which select F-subjunctives, on the other hand, are those which select *semantically tensed* complements (factives, propositional, desiderative, and interrogatives). Arad Greshler et al.'s (2017) corpus investigations reveal that the

predicates which are licensed in backward control in MSA belong to the same category as those which select C-subjunctives in MG. Thus, although contrary to Landau's (2013) prediction AHMW found that they are not OC predicates, the association between this category and backward control in MSA cannot be coincidental.

5 Complex predicates and control

Complex predicates is a term that is used to describe a situation whereby two (or more) predicates function as a unit in a monoclausal structure. This is also referred to as 'restructuring' in the context of infinitival complements in Germanic and Romance languages (Wurmbrand, 2001). Roussou (2009) proposes a conceptually similar analysis for subjunctive complements in MG which she refers to as 'clause-union'. She argues that since C-subjunctives lack semantic tense they do not constitute an independent event. Consequently, they trigger clause-union with their selecting predicate and "event composition leads to composition of argument structure as well" (Roussou, 2009, p.1827). F-subjunctives, on the other hand, do not trigger clause-union. A similar proposal is made by Grano (2015).

Arad Greshler et al. (2017) list a number of properties exhibited by backward control in MSA which motivate a complex-predicate analysis. First, the predicates which are licensed in this construction belong to the same category as those which select C-subjunctives in MG. Similarly to the MG predicates, the embedded clauses of these predicates cannot be temporally modified independently from the matrix clause. Having only one tense associated with a construction suggests a monoclausal structure. Second, there are strict adjacency conditions with respect to the linear position of the selecting predicate, *ʔan*, and the subjunctive. Finally, by proposing that the backward control construction has a monoclausal structure the partial agreement on the matrix predicate (as well as the embedded predicate) is expected since the two predicates precede their (shared) subject.

Arad Greshler et al. (2017) propose a possible formalization of their analysis in a transformation-based framework. Their point of departure is Habib's (2009) no-control analysis, which they adapt to account for backward control. In this particular framework, restructuring (or complex predicate formation) is derived by head-to-head movement and incorporation. In their analysis backward control is derived by the BC predicate "attracting" the subjunctive verbal complex, which then moves and incorporates with it. In the following section we adopt the conceptual insights of Arad Greshler et al. (2017) and formalize them within the HPSG framework.

6 Analysis

We propose that all *ʔan*-clause-taking predicates in MSA are lexically specified as verbs which take subjunctive clauses as complements. An additional lexical rule

relates BC predicates, which constitute a subset of these verbs, to verbs which combine with subjunctive verbs to form complex predicates. With the two alternations, we are in a position to account for all the patterns attested with *ʔan* complement clauses.

Let us begin with the more general case, which applies to all *ʔan*-clause-taking predicates. As an example, consider the abbreviated description of the lexical entry of the verb *ħaawala* '*try*' in (10).

(10)
$$\left[\begin{array}{l} \text{CAT} \mid \text{VAL} \left[\begin{array}{l} \text{SUBJ} \left\langle \boxed{1}\text{NP}\ \boxed{2} \right\rangle \\ \text{COMPS} \left\langle \text{V} \left[\begin{array}{l} \text{MARKING } \textit{sbj} \\ \text{CAT} \mid \text{VAL} \left[\begin{array}{l} \text{SUBJ} \langle\rangle \\ \text{COMPS} \langle\rangle \end{array}\right] \\ \text{CONT } \boxed{3} \end{array}\right] \right\rangle \end{array}\right] \\ \text{CONT} \left[\begin{array}{l} \textit{try-rel} \\ \text{ACT } \boxed{2} \\ \text{SOA-REL } \boxed{3} \end{array}\right] \end{array}\right]$$

The embedding verb *ħaawala* '*try*' selects an NP as subject and a *sbj*-marked fully saturated clause as complement. The fully instantiated semantic relation denoted by the embedded clause (tagged 3) is projected as a semantic argument in the relation denoted by the embedding predicate. Importantly, each verb select for its own syntactic arguments.

The combination of such predicates with their arguments is licensed by a no-control construction, similar to the one proposed by AHMW (see sketch in Figure 1). The analysis of the forward pattern in (8a) is illustrated in Figure 2. In this pattern the matrix predicate combines with its subject and clausal complement in a *head-subj-comp-phrase* phrase type. The complement clause is headed by a subjunctive verb *yaktubna* '*write*', which combines with the subjunctive marker *ʔan* to produce a *head-marker* phrase. The marked subjunctive combines with its complement in a *head-comp-phrase* configuration. Its subject, however, is not realized syntactically, since it is *pro*-dropped. The analysis of *pro*-drop adopted here builds on the disassociation between ARG-ST and VALENCE; the least oblique argument in ARG-ST is not mapped to a VALENCE slot, yet remains in ARG-ST as a personal pronoun *ppro* and contributes its 3PF index features to the semantic relation denoted by the verb (Ginzburg & Sag, 2000).

The no-control construction in Figure 2 does not impose constraints on the agreement relations between the two predicates, and therefore they do not need to match. When their agreement properties are compatible a control interpretation is possible but not obligatory. What resembles subject control is in actuality co-indexation at the semantico-pragmatic level. Thus, the two readings of example (8a), namely control and no-control, are licensed by the same structure.

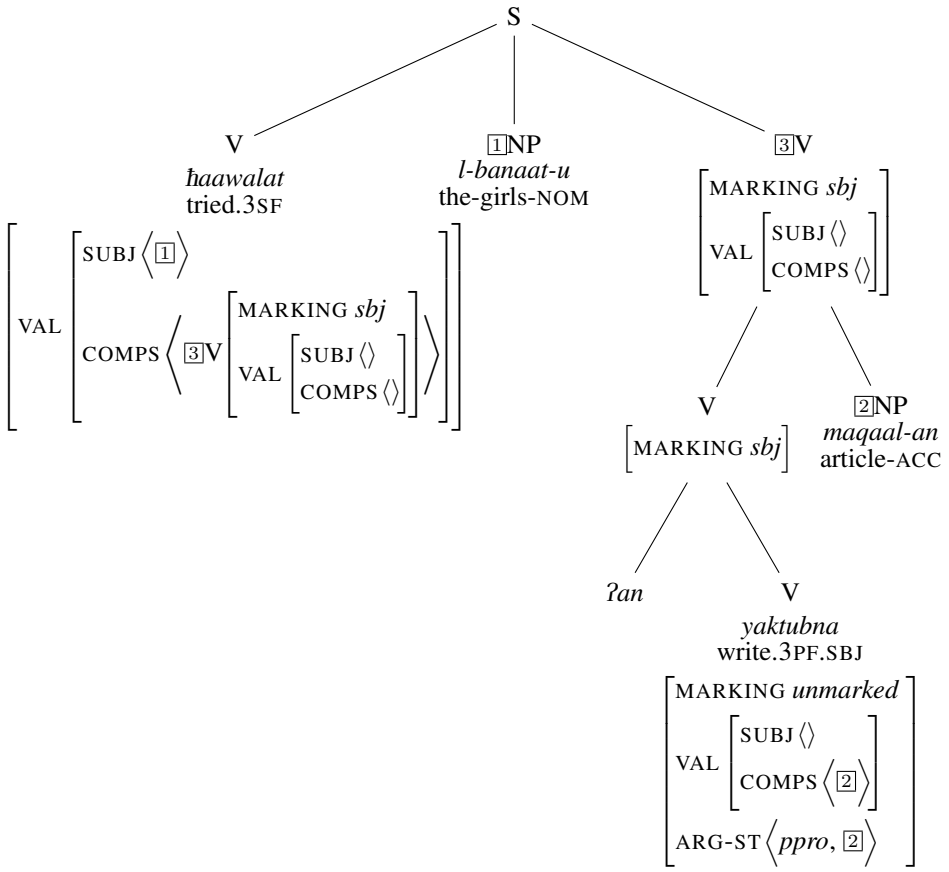

Figure 2: No control - the forward pattern

This is not the case with the backward pattern. Although, similarly to the forward pattern in (8a), the backward pattern in (6a) is ambiguous, we propose that each reading in the backward pattern is associated with a distinct syntactic structure. The no-control interpretation is licensed by the no-control structure in its backward pattern realization (Figure 3).

The embedded subjunctive predicate *taktuba* '*write*' combines with the particle *ʔan* to produce a *head-marker* phrase. The marked subjunctive then combines with its subject and complement in a *head-subj-comp-phrase* configuration. This clause satisfies the COMPS requirement of the embedding predicate *ħaawala* '*try*', and thus their combination is licensed by a *head-comp-phrase* phrase type. Similarly to the embedded verb in the forward pattern (Figure 2), the *pro*-dropped subject of the matrix verb is not realized syntactically, yet it appears as the least oblique item on the ARG-ST list. With no SUBJ requirements to fulfill, the combination of the matrix verb with its complement produces a fully saturated (independent) clause.

The only interpretation that is possible for the structure in Figure 3 is one with two distinct subjects: the 3PF embedded subject *l-banaat-u* '*the-girls*' and a 3SF

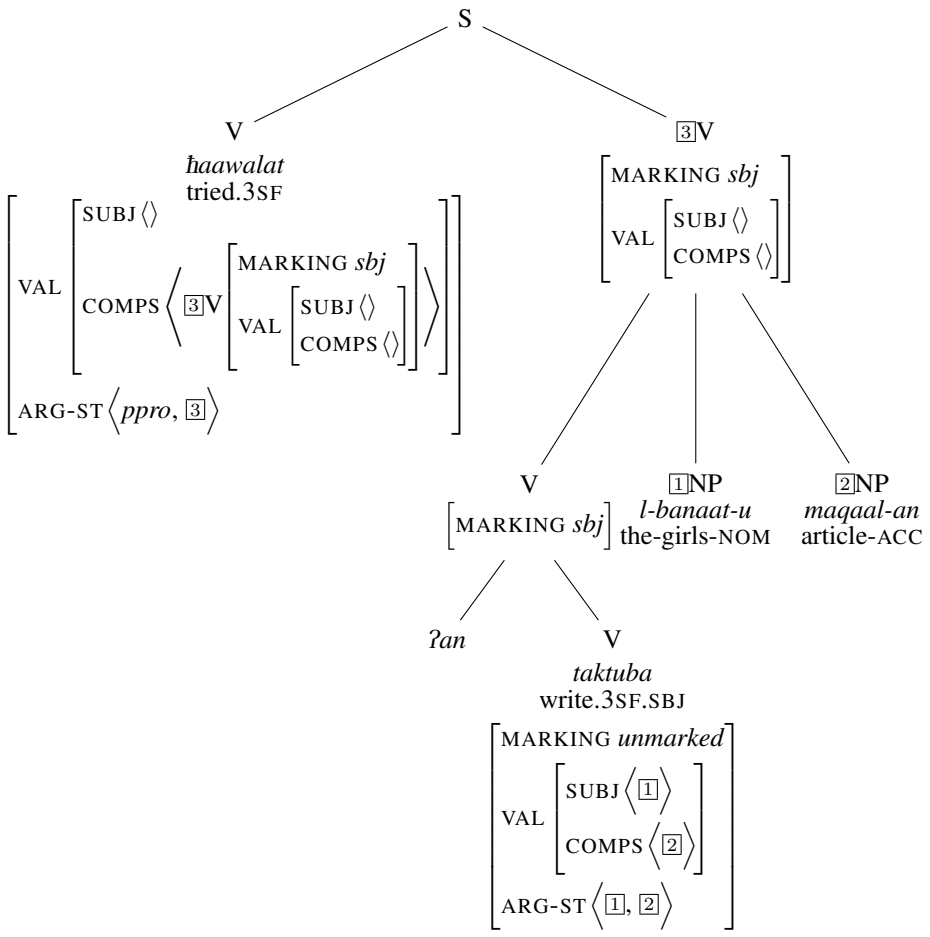

Figure 3: No control - the backward pattern

pronoun, as is determined by the agreement marking on the matrix verb. However, as was illustrated by (6b), when the agreement properties of the embedded subject and the matrix verb match a control interpretation is still not licensed. Following Alexiadou et al. (2010), we explain the unavailability of the coreference reading in (6b) by invoking Principle C, which bars a nonpronominal from being co-indexed with an o-commanding expression. In the HPSG binding theory, as it is formulated in Pollard & Sag (1994, sec. 6.8.3), o-command relations are defined recursively: the least oblique element of the matrix verb's ARG-ST list o-commands all the rest of the list's elements, as well as all the elements in their respective ARG-ST list. Thus, in Figure 3, *ppro*, the least oblique element of the ARG-ST of *ħaawalat* '*tried*', o-commands the two elements in the ARG-ST of the complement clause, namely *l-banaat-u* '*the-girls*' and *maqaal-an* '*article*'. Principle C, then, prevents the co-indexation of a *pro*-dropped matrix subject with the embedded subject.

The no-control construction can account for all the attested patterns but one:

backward control. Recall that AHMW attribute the licensing of the control reading of (8a) to extra grammatical factors. We assume, following Arad Greshler et al.'s (2017), that the backward control reading is licensed by a complex predicate. We follow previous HPSG analyses of complex predicates that have been used to account for phenomena in diverse languages (e.g., Hinrichs & Nakazawa, 1990; Abeillé et al., 1998; Monachesi, 1998; Müller, 2002, among others) and propose a similar analysis for backward control in MSA.

In addition to the no-control lexical types, which are described in (10), BC predicates can also optionally combine with marked subjunctive verbs (not clauses) to form a complex predicate. Consider the abbreviated description in (11) of the verb *ħaawala* '*try*' in its BC instantiation.

(11)
$$\left[\begin{array}{l}\text{CAT}\left[\begin{array}{l}\text{HEAD}\,|\,\text{AGR}\ \boxed{3}\\ \text{VAL}\left[\begin{array}{l}\text{SUBJ}\left\langle \boxed{1}\text{NP}\ \boxed{4}\right\rangle\\ \text{COMPS}\left\langle \text{V}\left[\begin{array}{l}\text{MARKING}\ \textit{sbj}\\ \text{CAT}\left[\begin{array}{l}\text{HEAD}\,|\,\text{AGR}\ \boxed{3}\\ \text{VAL}\left[\begin{array}{l}\text{SUBJ}\left\langle \boxed{1}\right\rangle\\ \text{COMPS}\ \boxed{2}\end{array}\right]\end{array}\right]\\ \text{CONT}\ \boxed{5}\left[\text{ACT}\ \boxed{4}\right]\end{array}\right]\right\rangle \oplus \boxed{2}\end{array}\right]\end{array}\right]\\ \text{CONT}\left[\begin{array}{l}\textit{try-rel}\\ \text{ACT}\ \boxed{4}\\ \text{SOA-REL}\ \boxed{5}\end{array}\right]\end{array}\right]$$

The embedding BC predicate selects as its complement a marked subjunctive verb with matching agreement properties. Moreover it "inherits" the SUBJ requirement of the subjunctive and also appends the subjunctive's COMPS list to its own. The referential index of the inherited subject, tagged [4], is structure-shared with the values of the semantic arguments in the relations denoted by each of the predicates, as is expected in a control construction. More concretely, the syntactic subject of the embedding predicate assumes the ACTOR role in *try-rel*, the semantic relation denoted by this predicate, as well as the semantic role assigned to it by the semantic relation denoted by the embedded verb. This captures the control-like interpretation of the backward pattern.

Figure 4 illustrates the analysis of the control reading of the backward pattern in (6a). In this construction, similarly to the no-control construction, the embedded subjunctive predicate *taktuba* '*write*' combines with the particle *ʔan* to produce a marked *head-marker* phrase. This phrase, tagged [4], is selected as complement by the matrix predicate, which, in turn, inherits the SUBJ requirement of the subjunctive ([1]) and concatenates the member of it COMPS list ([2]) to its own list.

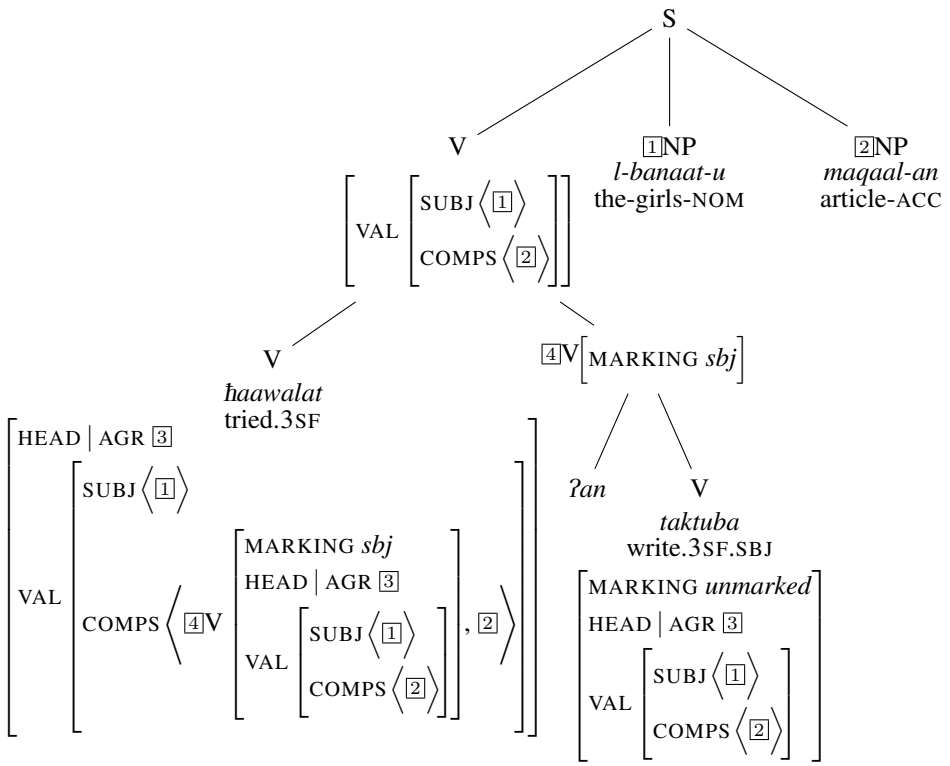

Figure 4: Backward control

The combination of the embedding verb with the marked subjunctive verb forms one inseparable syntactic unit (or complex head) with valence specifications that are identical to that of the embedded predicate.[3] As such, it can function similarly to a simple predicate. In Figure 4 it combines with its subject and complement to form a *head-subj-comp-phrase* phrase type, which is the unmarked option in MSA. The verbal complex in this case precedes its (shared) subject and consequently exhibits partial agreement with it.

An alternative clausal configuration in MSA is the marked SVO clause. This option, too, is available for complex predicates. An example sentence is given in (8b) above. To account for SVO structures in MSA we adopt Alotaibi & Borsley's (2013) proposal, which echoes the analysis proposed by traditional Arab grammarians. Under this account, in SVO structures what looks like a pre-verbal subject is in fact a topic which is associated with *pro* subject resumptive pronoun. The occurrence of a *pro* subject accounts for the full agreement exhibited by the verb.

Similarly to the simple SVO clause illustrated in (1b), in (8b) the verbal complex exhibits full agreement with the pre-verbal subject. Consequently, the forward

[3]The inseparability of this complex is supported by corpus searches which did not reveal instances of the backward coreference pattern with material intervening between the matrix predicate and *ʔan*.

pattern with the pre-verbal subject is compatible with both the complex-predicate analysis and the no-control. This, however, is not the case with the forward pattern in (8a), where the post-verbal matrix subject intervenes between the matrix verb and the *ʔan* complex, and the two verbs exhibit distinct agreement marking. This pattern can only be licensed by the no-control construction (Figure 3).

7 Conclusion

In this paper we proposed an HPSG analysis of subjunctive complement clauses in Modern Standard Arabic, with a special focus on one construction: backward control. This paper is the third in a series of papers dedicated to this topic. Initially, Arad Greshler et al. (2016) proposed a straightforward *pro*-drop based analysis of subjunctive complement clauses, which accounted for all the attested patterns except for backward control. In a subsequent paper Arad Greshler et al. (2017) reveal that only a subset of the verbs which take subjunctive clauses is licensed in the backward control construction. Moreoever, they find that this particular set of verbs has been associated cross-linguistically with biclausal-like structures which exhibit monoclausal properties. Consequently, they propose that alongside the *pro*-drop based construction MSA employs an additional mechanism – complex predication – which accounts for what was considered an exceptional agreement pattern by Arad Greshler et al. (2016).

The formal analysis proposed by Arad Greshler et al. (2017) is cast in a transformational framework and contributes to a theory-internal debate regarding the theory of control (e.g., Hornstein, 1999; Landau, 2007). In this paper, however, we show that abstracting away from the transformational mechanisms, the conceptual insights of Arad Greshler et al. (2017) can be straightforwardly formalized using the existing principles and tools of HPSG. Building on the HPSG analyses of *pro*-drop (Ginzburg & Sag, 2000), Binding Theory (Pollard & Sag, 1994) and complex predication (Hinrichs & Nakazawa, 1990) we account for all the patterns attested with subjunctive complement clauses in MSA, including instances of control and no-control.

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“VP” Adverbs without a VP: The syntax of adverbs in Tongan

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Abstract

The Polynesian language Tongan appears to lack surface-oriented motivation for a VP constituent. Even so, adverbial elements appear in both a rightwards location and a leftwards location, superficially similar to the S-adverbs and VP-adverbs in well-studied western European languages. This paper explores how the Tongan "VP-adverbs" (as well as others) can be analyzed in HPSG without a VP for those adverbs to attach to. Several kinds of analyses, representing different strands of research on the syntax of adjuncts in HPSG, are explored: a Adjuncts-as-Valents analysis, a VAL-sensitive Adjuncts-as-Selectors analysis, and a WEIGHT-sensitive Adjuncts-as-Selectors analysis. All suggest that an analysis of the adverbs without a VP is possible; a WEIGHT-sensitive Adjuncts-as-Selectors seems to have the fewest issues.

1 Introduction

This paper examines the syntax of (mostly) single-word adverbial elements in the language of Tongan, a language of the island-nation of Tonga in the South Pacific. Tongan is a member of (from smallest to largest) the Polynesian, Oceanic, and Austronesian language families. As one might expect, Tongan shares many syntactic properties with other members of these families, and, in particular, it seems likely that many of the syntactic issues surrounding adverbial elements discussed herein are not just found in Tongan, but are widespread in other Polynesian languages and, at least, in other closely related Oceanic languages. However, the discussion below will focus on Tongan in order to ensure a thorough discussion and analysis for one language.

As in many languages, Tongan allows expressions functioning as modifiers of predicates – adverbial elements – in different places within the clause. In very broad strokes, the locations in Tongan are akin to Jackendoff's (1972) two categories for English: S-adverbs (more linearly leftwards) and VP-adverbs (more linearly rightwards). While it is not presently clear whether these two locations in Tongan have strong semantic motivations (enough to consider them "sentence

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Abbreviations used include: ABS = absolutive case; CAT = category feature; CONT/CNT = content feature; DEF = definitive accent; DEM = demonstrative; DEPS = dependents feature; DET = determiner; DU = dual number; *elist* = empty list; ERG = ergative case; ESS = essive case; EXCL = exclusive; FUT = future tense; HD = head feature; IND = index feature; LOC = local feature; MOD = modifiee feature; *nelist* = non-empty list; PHON = phonology feature; PFT = perfect aspect; PL = plural number; PLUR = pluractional; PN = proper noun/pronoun; POSS.O = O-class (subordinate) possession; Pred/*pred* = predicate word class; $\text{Pred}^{\max}$ = expression headed by a member of the predicate word class, requiring no further valents; *prep* = preposition; PROX = proximal; PST = past tense; S or SG = singular number; SU or SUBJ = subject grammtical relation; SYNSEM/SS = syntax-semantics feature; TAM = tense-aspect-mood word; TR = transitive affix; VAL = valence feature; VP = verb phrase; XARG = external argument feature

operators" and "predicate operators" like Thomason & Stalnaker (1973) propose for English); *prima facie*, there seems to be similarities.

However, as will become clear, the "VP-adverb" location in Tongan is, in fact, quite surprising. This is because the location contravenes the conventional wisdom that adjuncts appear further away from their heads than arguments do, and, given this location and conventional approaches to adverb syntax (see Pollock (1989) and Potsdam (1998) for some older, classic approaches), it would appear that the Tongan VP-adverbs do not have an obvious phrasal constituent (that is, either a X′ or XP category) to attach to. Thus, this class of adverb does not seem to have an obvious or straightforward analysis, in both constraint-based lexicalist frameworks as well as in movement-based syntactic frameworks.[1]

Thus, this paper looks to explore Tongan adverbs further – especially the "VP-adverbs" – and works to develop the best analysis of them within the constraint-based lexicalist framework of Head-driven Phrase Structure Grammar (HPSG) (Pollard & Sag, 1987, 1994; Ginzburg & Sag, 2000; Sag et al., 2003). After providing a discussion of the foundations of Tongan clause structure, the paper will turn to the basics of adverbial syntax in Tongan, noting that there are, in fact, three areas (or zones, as they will be called) that adverbial elements can occupy in Tongan. The paper next considers the analysis of the adverbial elements in the two peripheral zones – Zones 1 and 3 – in the context of the two dominant approaches to adjunct syntax within HPSG: Adjuncts-as-Selectors and Adjuncts-as-Valents. From this discussion, it seems as though the Adjuncts-as-Selectors approach seems to offer a slightly better analysis for the peripheral zones, and so the paper next considers how the Adjuncts-as-Selectors approach might handle the middle zone's adverbial elements. After sketching an analysis sensitive to valence, a problem for that analysis is pointed out. The paper then offers a final sketch analysis of another Adjuncts-as-Selectors approach – this one making use of grammatical weight – that provides a fix to the problems found in the previous analysis, before wrapping up with some concluding remarks.

The sketch formal analyses will employ the version of HPSG from Ginzburg & Sag (2000) – for concreteness – with one minor alteration: the VAL(ence) list will be one single list, rather than split into separate SUBJECT and COMPLEMENTS lists. A few further features not utilized in Ginzburg & Sag (2000) will be used in this paper, too, but they will be discussed as they become relevant. The choice to follow Ginzburg & Sag (2000) does not seem particularly confining and I am confident that the analyses presented herein could be fairly easily be ported into the framework of the Sign-Based Construction Grammar (SBCG) (Sag, 2012).[2]

The analyses contained herein will sidestep the issue of whether these adverbials words are truly a separate class of words – which one might call adverbs – or

[1]Massam (2010) provides a movement-based analysis for the adverbial elements in Tongan's sibling language, Niuean, using "Roll Up Movement" of Cinque (2005). However, as Massam's paper discusses, this analysis is not entirely without problems, even within the confines of Minimalist assumptions. Also see (Massam, 2013) for further analysis of this area of the clause in Niuean

[2]In fact, Ball (2008), on which this paper builds, is entirely couched within the SBCG framework.

have some other categorization. There is some reason to think that the adverbials words in Tongan might be verbs or at least closely aligned with them: the so-called adverbs can appear with verbal derivational morphology and at least some of them can function as main predicates. However, the analyses would only be minutely different if the adverbial words are treated as verbs or as part of a distinct adverb class, so I will default to treating them as adverbs (and will, henceforth, call them just by that term).

2 Basic Tongan Clause Structure

2.1 Empirical Basics of Clauses

The morphosyntax of Tongan involves little-to-no inflectional morphology and, instead, uses a fair amount of function words. The phrases are strongly head-initial, with the aforementioned function words appearing at the left-edges of the relevant groupings. A basic sentence, which illustrates these properties, is given in (1):

(1) Na‘e tāmate‘i ‘e Tēvita ‘a Kōlaiate.
PST kill.TR ERG David ABS Golaith
‘David killed Golaith.’ (Churchward, 1953, 67)

Within (1), *na‘e* ‘PST’ is from a word class I will call *TAM* (tense-aspect-mood marker), a class of words that seems to function quite similar to auxiliary verbs in other languages. *Tāmate‘i* ‘kill’ is from a word class I will call *predicate*, a class that I assume includes both traditional verbs as well as adjectives. The phrases *‘e Tēvita* ‘ERG David’ and *‘a Kōlaiate* ‘ABS Goliath’ are post-predicate argumental phrases related to this predicate; for concreteness, I will assume these are PPs. As the glosses in (1) indicate, the prepositions which signal predicate-argument relationships in Tongan are ergatively-aligned. Figure 1 gives a schematic view of the clause in Tongan. Within the scheme of Figure 1, the TAM and predicate are

TAM	Predicate	Argumental Phrases

Figure 1: Basic Components of the Tongan Clause

strictly ordered; the argumental phrases, on the other hand, can be flexibly ordered within their region of the clause, with information-structural import.

While many arguments occur in the post-predicate location, not all do. Some arguments are not, in fact, overtly realized at all (these would be instances of “zero anaphora”). An example of this occurs in (2):

(2) Na‘e hola.
PST run.away
‘(He) ran away.’ (Chung, 1978, 39)

A further class of principled exceptions to the generalization that all arguments occur after their predicate comes from certain arguments with pronominal meaning. These are realized before the predicate, but after the TAM. One such element is *ku* '1SG.SUBJ' in (3):

(3) Na'á ku manuatu'i ia.
PST 1SG.SUBJ remember.TR 3SG
'I remembered him.' (Churchward, 1953, 66)

As is evident from the glosses in (3), these elements are *not* ergatively-aligned; rather, they index the traditional subject category. These "preposed pronouns" (the term for them from Churchward (1953) that I will adopt[3]) do seem to play a role in determining the best analysis of the Tongan "VP-adverbs," as I will return to in section 5.

2.2 Analysis of Basic Clauses in Tongan

In (1), as with any VSO ordering, the verb (or predicate) and the object (or patientive argument) are realized discontinuously, and this is regularly possible in Tongan. This raises a question: should a constituent of a verb + object (alternatively, a predicate + its non-subject arguments) – what I will call a VP – be recognized? This question is considered in-depth in Ball (2008, ch. 3), and the finding there is that there is no strong surface-oriented motivation for recognizing a VP for Tongan. To summarize the motivations for Ball's (2008) conclusion: (1) no auxiliary or other verb class obviously subcategorizes for a VP; (2) VP-coordination 'over' a subject is not possible; (3) "VP-fronting" is possible, but seems to involve a nominalized construction, so it could be seen as just a subspecies of NP-fronting; and (4) ellipsis is possible, but "VP-ellipsis" seems like the elided element is better analyzed (again) as a nominalized construction. Furthermore, "VP-ellipsis" does not always clearly pick out just the predicate and its non-subject arguments.

However, does that mean that there is no immediate constituents in Tongan between the clause as a whole and the phrases serving as arguments? This question is considered in-depth in Ball (2008, ch. 4) and the finding there is that a unit consisting of the predicate and *all* of its arguments does appear to be a constituent. I will informally call such a constituent Pred^{max}. To summarize the motivations for Pred^{max} in Ball (2008): (1) both TAMs and other verbs, termed "quasi-auxiliaries," do appear to subcategorize for a Pred^{max} and (2) Pred^{max} coordination is possible.

With these constituency ideas as a backdrop, let me next sketch the analysis presented in Ball (2008) for the Tongan clause, which incorporates these constituents. On this analysis, the Tongan clause is principally put together with the Head-All-Valents Rule, given in (4):[4]

[3] In spite of the connotations of this term, there do seem to be compelling reasons to view the "preposed pronouns" as suffixes on the TAMs; see the discussion in Ball (2008, ch. 4). The discussion that follows does not crucially hinge on how exactly the "preposed pronouns" relate morphophonologically to the TAM word, and so I leave the issue aside here.

[4] Bolded **H** stands for the head, in both rules and tree structures.

(4) Head-All-Valents Rule

$$\left[\text{VAL} \quad \langle\ \rangle\right] \quad \rightarrow \quad \mathbf{H}\left[\text{VAL} \quad \langle\ \boxed{1}, \ldots, \boxed{n}\ \rangle\right] \quad \boxed{1} \ldots \boxed{n}$$

The rule allows a head with some number of valents to combine with all its requisite valents to form a constituent. Every instance of the Head-All-Valents Rule creates a "saturated" constituent, one where no further arguments are required to complete the unit. Although (4) is quite similar to previous HPSG (or SBCG) proposals for verb-initial structures—including Schema 3 from Pollard & Sag (1994, 40), *sai-ph* from Ginzburg & Sag (2000, 36), *aux-initial-cxt* from Sag (2012, 188)—the rule in (4) is slightly different in one key way: its head is left underspecified for *word*/*phrase* distinction, for reasons that will be crucial for the later analysis of adverbs.

To build a canonical Tongan clause, such as the one from (1), two instances of (4) are all that is needed. Looking at the structure bottom-up (though nothing intrinsically requires this), the predicate head *tāmate'i* 'killed' is combined with its two arguments, *'e Tēvita* 'ERG David' and *'a Kōlaiate* 'ABS Goliath' via (4) to form a $\text{Pred}^{\max}$. Then, to make the sentence (the TAM phrase), the TAM head *na'e* 'PST' combines with the aforementioned $\text{Pred}^{\max}$ via (4). The resulting structure is as in Figure 2.

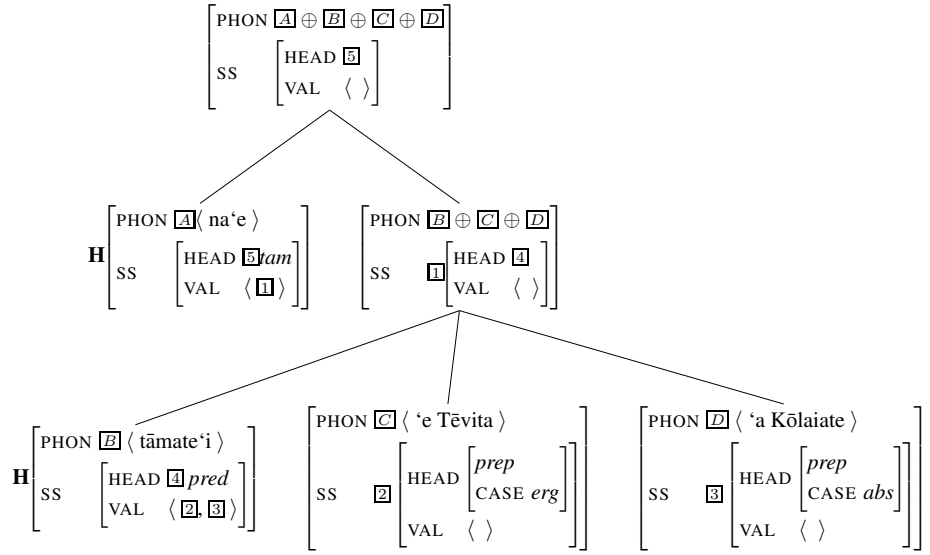

Figure 2: Tree Structure for Example (1)

3 Basics of Adverbial Syntax in Tongan

With the Tongan clause basics established, I turn to the basics of the syntax of adverbs in Tongan. Following in the footsteps of the clear discussion of French adverbs in Bonami et al. (2004), it seems useful to talk about adverb locations in

terms of pre-analytical zones. In his seminal grammar of Tongan, Churchward (1953) suggests that there are just two adverb zones: "preposed" (before the predicate) and "postposed" (after the predicate). This division would seem to exactly line up with the S-adverb–VP-adverb distinction mentioned in the introduction. However, careful examination of adverb location suggests that there are actually at least 3 zones in which adverbs can appear in Tongan. Their positioning with respect to the landmarks of the Tongan clause noted in Figure 1 are given in Figure 3. On the scheme in Figure 3, Churchward's (1953) "postposed" adverbs are split

Zone 1		Zone 2		Zone 3
TAM	↓	Predicate	↓ Argumental Phrases	↓

Figure 3: The Locations of the Adverb Zones

between Zone 2 and Zone 3. While the difference between Zone 2 and Zone 3 can be slight (and, thus, Churchward's distinctions were not without merit), there do seem to be some differences between the two, which will be highlighted further below.

The ability of the same adverb to appear in different zones across sentences (a property of some English adverbs, as noted by Jackendoff (1972), and some French adverbs, as note by Bonami et al. (2004)) in Tongan is presently not well-understood. Preliminarily, potential positioning of a single adverb in multiple zones in Tongan seems like it is rare, if not impossible. However, further research is needed to clarify this empirical area.

I turn now to considering the adverbs of each zone in slightly more depth. As Figure 3 indicated, the Zone 1 adverbs are located between the TAM and predicate. Examples of Zone 1 adverbs include the italicized words in (5)–(7):

(5) Na'e *toutou* fakama'a 'e Tēvita e faliki.
PST repeatedly clean ERG (name) ABS.DET floor
'Tēvita cleaned some (particular) floor repeatedly.' (Ball, 2008, 65)

(6) Na'e *kei* kata 'a e ongo ki'i ta'ahine faka'ofa'ofá.
PST still laugh ABS DET DU small girl beautiful.DEF
'The two beautiful girls were still laughing.' (Broschart, 2000, 353)

(7) Ko e tangata tonu pē ia na'á ne *fa'a* fakakaungāme'a
ESS DET man exact very that PST 3S.SU habitually associate
mo iá.
with 3SG.DEF
'That was the very man with whom he habitually associated.' (Churchward, 1953, 128)

It seems plausible that some adverbs in Zone 1 (such as the adverbs in (6) and (7)) have "high" scopal properties (maybe equivalent to semantically applying to the whole eventuality denoted by the $\text{Pred}^{\max}$ or otherwise have some semantic affinity

with the TAM), but how widespread this is remains to be empirically verified. It, however, is clear that multiple adverbs are possible in this zone at one time, as with *fu'u* 'excessively' and *kei* 'still' in (8):[5]

(8) 'Oku *fu'u* *kei* si'i.
PROG excessively still small
'It is still too small.' (Churchward, 1959, 260)

Zone 2 adverbs, as Figure 3 indicated, appear between the predicate and any and all of the argumental phrases. Examples include the italicized words in (9)–(13), many of which seem to come from semantically coherent subclasses of adverbs. Examples (9) and (10) illustrate that manner adverbs appear in Zone 2:

(9) Na'e fakama'a *fakalelei* 'e Pita e faliki.
PST clean well ERG (name) ABS.DET floor
'Pita cleaned some (particular) floor well.' (Ball, 2008, 49)

(10) Na'e tali *totoka* 'a Mele ki he pasi.
PST wait calmly ABS (name) to DET bus
'Mele waited calmly for some (particular) bus.' (own data)

A subclass of adverb widely found in the Polynesian languages is what Polynesian grammarians refer to as directionals. Directionals function to place events in time or space, sometimes in quite abstract or idiomatic ways. Example (11) shows that directionals – *atu* 'forth' is one – likewise appear in Zone 2 in Tongan:

(11) Na'e fakatau *atu* 'e Sione hono 'ū sū.
PST transact forth ERG (name) 3SG.POSS.O PL shoe
'Sione sold his shoes.' (Ball, 2008, 87)

Yet another subclass of adverbs is what Churchward (1953) dubbed the adverbs of uncertainty. *Nai* 'maybe', a member of this subclass, appears in (12), exemplifying that the adverbs of uncertainty appear in Zone 2, too:

(12) Na'e kai *nai* 'e Sione e mata'i ika lahi?
PST eat maybe ERG (name) ABS.DET piece fish big
'Sione ate some big piece of fish?' (Ball, 2008, 87)

Finally, the above subclasses are not an exhaustive list of the kinds of adverbs that are potentially able to appear in Zone 2. Still other adverbs can appear in Zone 2, as (13) shows:

(13) Na'e tō *'anefē* 'e Sione 'a e manioke?
PST plant when.PST ERG (name) ABS DET cassava
'When did Sione plant some cassava?' (own data)

[5] On the assumption that the Zone 1 adverb further to the left should apply to the larger semantic domain, the translation provided by Churchward for (8) is a bit surprising. It remains for future work to determine how anomalous, if at all, (8) might actually be.

Impressionistically, of the three zones, it appears that Zone 2 has more diverse collection of members, as the above discussion suggests.

Certainly, the presence of manner adverbs in the Zone 2 seems unsurprising, as manner adverbs seem intuitively to have a strong semantic affinity for the main predication itself (suggesting the semantically-based approach to adverb syntax of Ernst (2002) may also be applicable to Tongan). However, as with the Zone 1 adverbs, an exhaustive study of the unity of the semantic subclasses awaits future research.

It is clear, however, that multiple adverbs are possible in this zone at the same time, as exemplified in (14):

(14) Na‘e fakama‘a *fakalelei ma‘u pē* ‘e Sione ‘a e faliki.
PST clean well always ERG (name) ABS DET floor
‘Sione always cleaned some (particular) floor properly.’ (own data)

Furthermore, from example (14), it seems reasonable to conclude that, at least within this zone, the more rightwards an adverb is, the larger semantic domain it applies to.

Lastly, we come to the adverbs of Zone 3, which, as Figure 3 indicated, appear clause-finally, after any argumental phrases. Adverbs appearing in Zone 3 include the italicized words in (15) and (16):

(15) Na‘á ne fai eni *‘aneafi*.
PST 3SG.SUBJ do PROX.DEM yesterday
‘He did this yesterday.’ (Churchward, 1953, 66)

(16) ‘E ha‘u ia kiate kimautolu *‘apongipongi*.
FUT come 3SG to.PN 1PL.EXCL tomorrow
‘He is coming to us tomorrow.’ (Chung, 1978, 148)

As examples (15) and (16) clearly indicate, Zone 3 seems to be the spot for deictic temporal adverbs. Whether other kinds of adverbs are found here remains to be empirically discovered.

If there are no overt argumental phrases of a given predicate, Zone 2 and Zone 3 adverbs look like they appear in the same location. An example of this is in (17), where the adverb again is italicized:

(17) ‘E fai *‘apongipongi*.
FUT do tomorrow
‘It will be done tomorrow.’ (Churchward, 1953, 197)

Other examples (like (16)) clarify that *‘apongipongi* ‘tomorrow’ does seem to pattern as a Zone 3 adverb; but from just (17), that conclusion is not so clear. So, in the very least, the distinction between Zone 2 and Zone 3 adverbs can be tricky to tease apart; at worse, the difference is a false dichotomy. Even if the difference is not a false dichotomy, it does seem that these two kinds of adverbs share some affinities; any good analysis should group the adverbs of these zones together in a principled fashion.

4 Approaching An Analysis

4.1 Approaching Adjuncts in HPSG

A vast majority of HPSG analyses of structure-building crucially rely on dependencies between the elements combining to license the said structure. This is true for the syntax of adjuncts (adjectives, adverbs, and others) as much other kinds of syntactic relationships. However, there have been two styles of approaches to the syntax of adjuncts in HPSG and I will outline them here.

On the classic HPSG approach to the syntax of adjuncts – as presented in Pollard & Sag (1994, 55–57) – the adjunct is viewed as imposing requirements on the head that it goes with (in line with some observations about the nature of semantic restrictions on the head-adjunct relationship; for example, see Muehleisen (1997) for the discussion of these kinds of relationships with the domain of adjectives in English). I will refer to this style of analysis as the Adjuncts-as-Selectors approach. These adjunct-mandated requirements, in HPSG analyses, are mediated via the MODIFIED (MOD) feature: the value of MOD is a description of the syntactic (and semantic) expression that the adjunct goes with. Thus, adjunct combination in HPSG can generally be seen as involving the following rule:[6]

(18) Head-Adjunct Rule (underspecified version)

$$\left[\text{VAL}\quad \boxed{C}\right] \rightarrow \mathbf{H}\boxed{1}\left[\text{VAL}\quad \boxed{C}\right],\ \left[\text{MOD}\quad \boxed{1}\right]$$

The comma between the two daughters (on the right-side of the rule) indicates that, at this level of abstraction, the daughters could be in either order, subject to further constraints that a given language, combination, or syntactic item might impose. Despite what differences in notation might lead one to believe, the rule in (18) actually is very close to the usual phrase structure grammar approach to adjuncts (used by a wide variety of frameworks): it allow a head element and an adjunct to together form a phrase. However, unlike in the standard X-bar approach, the rule in (18) does not stipulate that the head must be of category X'; instead, the adjunct is free to make its own requirements. This flexibility will be of great help in the analyses in section 5.

The alternative style of analysis (pursued by Pollard & Sag (1987); Bouma et al. (2001); Levine & Hukari (2006); Bonami & Godard (2007); Sato & Tam (2008), among others), flips the selection relationship (though not the headedness relationship). On this style of analysis, the head selects for the adjunct, just as head selects for arguments. Thus, syntactic analyses involved this style (which I will dub Adjuncts-as-Valents approach) manipulate adjuncts in a head-driven fashion. In many versions of this style of analysis, the adjuncts are added to the VAL list of the head by an argument-extending lexical rule, such as the (generic) one in (19):

[6]This rule is highly comparable to Schema 5 of Pollard & Sag (1994, 58), the *head-adjunct-phrase* of Ginzburg & Sag (2000), and the Head-Modifier Rule of Sag et al. (2003, 146).

(19) $$\left[\text{CAT}\ \left[\begin{array}{ll}\text{HD} & \boxed{1}\textit{pred}\\ \text{VAL} & \boxed{A}\end{array}\right]\right] \mapsto_{LR} \left[\text{CAT}\ \left[\begin{array}{ll}\text{HD} & \boxed{1}\\ \text{VAL} & \boxed{A} \oplus \left\langle \left[\text{MOD} \mid \text{HD}\ \ \boxed{1}\right] \right\rangle\end{array}\right]\right]$$

Once adjuncts are added to a VAL list, they could be combined with their heads by rules such as the Head-All Valents Rule (given earlier in (4)).

With these two possibilities available, I next consider how plausible each might be for the adverbs of the two peripheral zones, Zones 1 and 3.

4.2 Approaching an Analysis of Zone 1 and 3 Adverbs

Zone 1 and Zone 3 adverbs appear to be easier to analyze than Zone 2 adverbs because, due to their locations, they can straightforwardly be seen as attaching to the local $\text{Pred}^{\max}$ constituent. An analysis where this attachment metaphor is actualized is considerably easier to implement under the Adjuncts-As-Selectors approach.[7] In fact, on this approach, Zone 1 and Zone 3 adverbs would have the same value for the MOD attribute: namely, that in (20):

(20) $$\left[\text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD}\ \ \left[\text{MOD}\ \left[\begin{array}{ll}\text{HEAD} & \textit{pred}\\ \text{VAL} & \langle\ \rangle\end{array}\right]\right]\right]$$

The two kinds of adverbs can be distinguished by boolean valued attribute: POST-HEAD (taken from Sag et al. (2003, 161)). A specification of − for POST-HEAD will require the adverb to appear in Zone 1; a specification of + for POST-HEAD will required the adverb to appear in Zone 3, as long as (18) is further specified as the two rules in (21):[8]

(21) a. Post-Head Head-Adjunct Rule

$$[\textit{phrase}] \rightarrow \mathbf{H}\boxed{1}[\textit{sign}]\ \left[\begin{array}{ll}\text{POST-HEAD} & +\\ \text{MOD} & \boxed{1}\end{array}\right]$$

b. Pre-Head Head-Adjunct Rule

$$[\textit{phrase}] \rightarrow \left[\begin{array}{ll}\text{POST-HEAD} & -\\ \text{MOD} & \boxed{1}\end{array}\right]\ \mathbf{H}\boxed{1}[\textit{sign}]$$

Thus, the Adjuncts-as-Selectors analysis for Zone 1 and Zone 3 adverbs is straightforward and quite uniform.

[7] However, such an attachment metaphor also is compatible with the idea that Zone 1 adverbs are actually higher predicates with $\text{Pred}^{\max}$ complements; i.e., Zone 1 adverbs are actually main predicates, involved in a multi-clausal construction. This appears to be characteristic of adverbs in some languages; however, due to my ultimate focus on Zone 2 adverbs, I will leave this analytical avenue unexplored here.

[8] The VAL specifications from (18) should be understood as applying in (21a) and (21b) as well.

An Adjuncts-as-Valents analysis of Zone 1 and Zone 3 adverbs is technically feasible, but it is not as straightforward, uniform, or, in some cases, empirically validated as the Adjuncts-as-Selectors analysis is for them. Given their locations in the clause and the general head directionality in Tongan, for a uniform analysis, the Zone 1 adverbs would have to be taken as valents of the TAM, while Zone 3 adverbs would be valents of the predicate itself. This immediately brings up an issue because this analysis predicts that Zone 1 adverbs should always co-occur with a TAM marker. However, they do not, as the example in (22) shows:

(22) Talu ia mo e *toutou* hoko kiate au 'a e ngaahi
since that COM DET repeatedly be.next to.PN 1SG ABS DET PLURAL
faingata'a.
difficulty
'Since that I have been in difficulty again and again.' (Churchward, 1953, 122)

As revealed in example (5), *toutou* 'repeatedly' clearly is a Zone 1 adverb. In (22), it appears with a predicate *hoko* ' be next to'; however, this predicate is not preceded by a TAM marker, and, in fact, seems to be in some sort of nominalization construction, where a TAM marker would be highly unlikely, if not downright impossible. Because Zone 1 adverbs actually do not obligatorily co-occur with a TAM marker, the Zone 1 adverbs do not plausibly seem to be treated as TAM valents. Thus, already the Adjuncts-as-Valents Analysis is pushed into a non-uniform analysis of Zone 1 and Zone 3 adverbs, an undesirable result.

Evidence that Zone 3 adverbs should not be treated as valents of the predicates is not so easy to come by. Still, it seems that the two principal motivations (per Sato & Tam (2008)) for the Adjuncts-as-Valents approach either are not found or may not be found with Zone 1 and Zone 3 adverbs. The first of these motivations is definitely absent: case assignment. While Adjuncts-as-Valents might be motivated for some languages because there is interaction between the case of some adverbial element and its head (perhaps interacting further with the case of some argument), this is irrelevant for Tongan adverbs. The adverbs under consideration here (which, recall, do not include prepositional phrases) do not seem to be very nominal in nature and most certainly do not seem to have any morphological requirements imposed by the predicate (let alone case requirements). The second motivating factor, the ability to "extract," may not be found. Preliminarily, it seems unlikely that Zone 1 adverbs can be "extracted;" Zone 3 adverbs may or may not.[9]

[9]Interestingly, Zone 2 adverbs can "extract," as the example in (23) shows (compare (23) with (13)):

(23) Ko 'anefē na'e tō ai 'e Sione 'a e manioke?
ESS when PST plant there ERG (name) ABS DET cassava
'When did Sione plant some cassava?'

This may, in fact, be an argument for treating Zone 2 adverbs as adjuncts that are valents. However, there are also accounts, like Chaves (2009), that allow for adverbs to be extracted without treating them as valents. If the Chaves' proposal is adopted, the extraction data's motivation for the Adjuncts-

While the above discussion, especially regarding zone 3 adverbs, does not render the Adjuncts-as-Valents analysis fatally eliminated, it does seem that Adjuncts-as-Valents analysis is not especially well-motivated for Tongan adverbs. With this diminished motivation and the fact that the Adjuncts-as-Selectors analysis seems quite simple and uniform, it seems worthwhile to see if Zone 2 adverbs can be analyzed within the Adjuncts-as-Selectors approach (all the while, allowing for Zone 2's specific properties). The next section turns to this very question.

5 Analyzing Zone 2 Adverbs

As noted earlier, Zone 2 adverbs seem trickier to analyze because their position is not obviously adjacent to a phrasal constituent. However, due to the HPSG approach to combinatorics, it is possible to license adverbs right next to predicates, without positing any additional structure (such as a covert phrasal category just for adverb attachment purposes). Furthermore, such an approach differs only minimally from the treatment of the adverbs of the other two zones, so this would offer a fairly unified analysis of all kinds of adverbs in Tongan. This section offers some sketches of this sort of analysis: first considering a VAL-sensitive approach, then, after noting some issues that such an approach raises, a WEIGHT-sensitive analysis.

5.1 A VAL-Sensitive Adjuncts-As-Selectors Analysis

Combinatoric rules in HPSG generally depend on "level of saturation," that is, the amount or presence of valents in the relevant sister constituents within the phrase. This property renders HPSG structures "bare" in the sense of Chomsky (1995): there are no unary branching tree structures (or, at least, no unary branching tree structures without semantic effect) and the grammar does not explicitly refer to the word/phrase distinction. This property turns out to have great utility in dealing with the problem of the Tongan Zone 2 adverbs. As every syntactic expression is specified with some VAL value and individual classes of words can control which syntactic features they require, the stage is set to allow Zone 2 adverbs to require the exact specification that would allow them to appear where they do.

The specification that the Zone 2 adverbs seem to empirically require is one where they modify any non-saturated predicate-headed expression, either a single word or a phrase. In formal terms, these adverbs would be specified as in (24):

(24)
$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD} & \begin{bmatrix} \text{POST-HEAD} & + \\ \text{MOD} & \begin{bmatrix} \text{HEAD} & \textit{pred} \\ \text{VAL} & \textit{nelist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Note that the specification in (24) actually is not that different from the specification of a VP-adverb in English: in a similar framework to the one I have adopted

as-Valents approach is rendered moot.

here, the average English VP-adverb would have the specification [MOD|VAL *singleton-list*], rather than [MOD|VAL *nelist*].

The specification in (24) would interact with the requirements of both the Head-All Valents Rule (from (4)) and the Post-Head Head-Adjunct Rule (from (21a)). These three elements will force the adverb to be "low" (i.e. predicate-adjacent) in the structure. The resulting tree structure for the relevant part of the example from (10) is given in Figure 4. Let us consider how the structure in Figure 4 is licensed.

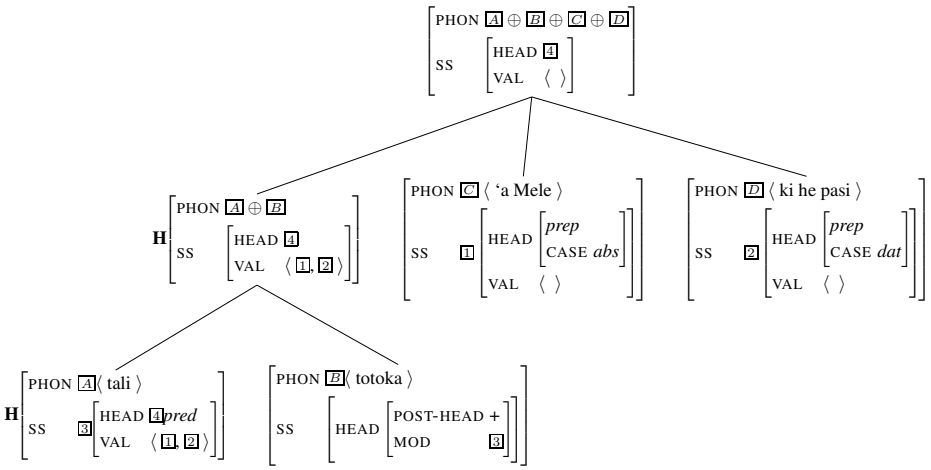

Figure 4: Tree Structure for Lower Part of Example (10)

Per (24), adverbs "look for" an *pred*-headed expression that has a non-empty VAL list (such as 3) and combine with it via the Post-Head Head-Adjunct Rule to create the higher head. This licenses the lower local subtree in Figure 4. The Head-All-Valents Rule can take a head with a non-empty VAL list and "empty" it, as it does in the highest local subtree of Figure 4. Thus, the Post-Head Head-Adjunct Rule must apply at a "low" level of structure, if it is to apply at all. If the Head-All-Valents Rule applies "first," the result ([VAL ⟨ ⟩]) will be a feature structure incompatible with the Zone 2 adverb's MOD value. Furthermore, the Post-Head Head-Adjunct Rule's maintenance of the head's valence, plus the underspecification of the head as being either a word or phrase, will allow this rule to iterate. Such iteration will license examples like (14), with multiple adverbs after the predicate.

5.2 The Problem With the VAL-Sensitive Adjuncts-As-Selectors Analysis

The VAL-sensitive Adjuncts-as-Selectors Analysis makes the clear prediction that Zone 2 adverbs should always co-occur with a post-predicate valent of the predicate. However, examples like (25), where there appears to be no post-predicate argumental phrases, raise questions about whether this prediction holds:

(25) Na‘a nau ō *leva*.
PST 3PL.SUBJ go.PLUR at.once
‘They went at once.’ (Churchward, 1953, 196)

One possibility for understanding (25) might be that *leva* ‘at once’ is actually a Zone 3 adverb (like the example in (17)) and, thus, the example in (25) is a non-issue for the VAL-Sensitive Adjuncts-as-Selectors Analysis. However, examples like (26) and (27) indicate that *leva* does appear to be in Zone 2:

(26) Na‘e tofi *leva* ‘e Siale ‘a e mā.
PST cut finally ERG (name) ABS DET bread
‘Siale finally cut some bread.’ (Ball, 2008, 87)

(27) Na‘e ha‘u *leva* ‘a e ki‘i tamasi‘i.
PST come finally ABS DET little boy
‘Finally a little boy came.’ (Broschart, 2000, 360)

Thus, *leva* does seem to be as problematic as originally thought.

Another possibility for understanding (25) is that “preposed pronouns” (like *nau* ‘3PL.SUBJ’ in (25)) are completely structure-shared with the lower predicate’s subject “argument slot”: a “raising” analysis. (Such a line of analysis was pursued in Dukes (2001).) On this analysis, *ō* ‘go’, the predicate in (25), would be specified as [VAL <[*sign*]>] and it would be compatible with the Zone 2 adverb’s MOD value, licensing (25). Yet, if “raising” is the correct analysis for “preposed pronouns,” precisely how the Head-All-Valents-Rule behaves would need to be slightly revised.

However, there is some reason to be skeptical of a “raising” analysis for (25). As (28) reveals, a “preposed pronoun” (like *ne* ‘3SG.SUBJ’ in (28)) can co-occur with a post-predicate argumental phrase of the same meaning (*‘e ia* ‘ERG 3SG’ in (28)) in a “doubling” construction:[10]

(28) Kuó *ne* lau *‘e ia* ‘a e tohí ni.
PFT 3SG.SUBJ read ERG 3SG ABS DET book this
‘He had read this book.’ (Dukes, 2001, 72)/(Ball, 2008, 131)

If “preposed pronouns” are connected to the lower argument position by “raising,” two syntactic elements would necessarily be related to the same thematic slot on a single ARG-ST list, complicating the analysis. (Dukes (2001), again, suggests one possible solution that preserves the “raising” analysis.) To avoid these complications, Ball (2008, ch. 5) pursued an analysis along the lines of “copy raising.” Under the “copy raising" approach, the preposed pronoun and post-predicate argument just share their semantic value, rather than the entire feature structure – and this relationship is not entirely encoded just on the respective VAL lists. Within this “copy raising” approach, Ball (2008) assumed that when there is no post-predicate

[10]Note that “doubling” is only possible in Tongan with pronominal meaning argumental phrases. It is impossible to for a “preposed pronoun" to “double” a content-filled argumental phrase.

pronominal argumental phrase, the relevant "argument slot" of the main predicate is "filled" by a *non-canonical* element. By the Argument Realization Principle (one formulation is given in Ginzburg & Sag (2000, 171)), *non-canonical* elements are not allowed on VAL lists; thus, an intransitive predicate with a "preposed pronoun," like *ō* in (25), is specified [VAL ⟨ ⟩], not [VAL *nelist*], and is not compatible with MOD value of the adverb.

A possible solution that would preserve the VAL-sensitive Adjuncts-as-Selectors Analysis would be to treat instances where "preposed pronoun" appears without a corresponding post-predicate pronominal argumental phrase as having, in actuality, a *pro-ss* item acting as the subject on the head predicates's VAL list (similar to the treatment of infinitival clauses with "Pro_{arb}" subjects in English, discussed in Ginzburg & Sag (2000, 51–57)). This would require a slightly different Argument Realization Principle than the one mentioned above, but this could be accomplished easily as long as *pro-ss* belong to a type that was permitted on an ARG-ST list, even while still being a covert element. Thus, *ō* 'go' in (25) could be specified [VAL ⟨ *pro-ss* ⟩] – and would not be [VAL ⟨ ⟩] – allowing it to meet the specification in (24). This analytical move does raise the question of whether this is just positing elements to preserve what might otherwise be a problematic analysis, but this remains a possible fix to the VAL-sensitive Adjuncts-as-Selectors Analysis.

5.3 A WEIGHT-Sensitive Adjuncts-As-Selectors Analysis

The problem created by the "preposed pronouns" for the valence part of the VAL-sensitive Adjuncts-As-Selectors Analysis raise the possibility that maybe valence is not a good foundation for an analysis of the Zone 2 adverbs and may, in fact, by irrelevant for them. Instead, one might consider approaching the problem using weight, following the proposals of Abeillé & Godard (2004).[11] Introduced in Abeillé & Godard (2000), the feature WEIGHT encodes a notion of syntactic complexity. Following Abeillé & Godard (2004), I will assume that the two (relevant) possible values of WEIGHT are *lite* (≈ syntactic complexity is low) and *non-lite*. Furthermore, I will assume that all individual words are constrained to be *lite* (in keeping with the aforementioned Abeillé & Godard works). On the weight-sensitive view of Tongan Zone 2 adverbs, the relevant adverbs are not specified as in (24), but as in (29):

(29)
$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD} & \begin{bmatrix} \text{POST-HEAD} & + \\ \text{MOD} & \begin{bmatrix} \text{HEAD} & \textit{pred} \\ \text{WEIGHT} & \textit{lite} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

As is evident in (29), the VAL value of the modified element is not explicitly constrained, so it can, in principle, be anything; this renders VAL irrelevant.

[11] My thanks to Emily Bender for suggesting this approach; apparently, it has been used for a wide variety of languages by students in her Knowledge Engineering for NLP course.

The interaction of the specification in (29), the Post-Head Head-Adjunct Rule, and the Head-All Valents Rule will create a tree structure for most relevant sentences with the same configuration as in Figure 4. As the VAL value of the modified predicate does not matter, this approach is equally adept at licensing the sentence in (25). The relevant tree structure (with some details left open about the syntax of the "preposed pronoun") is shown in Figure 5. As included in Figure 5, I

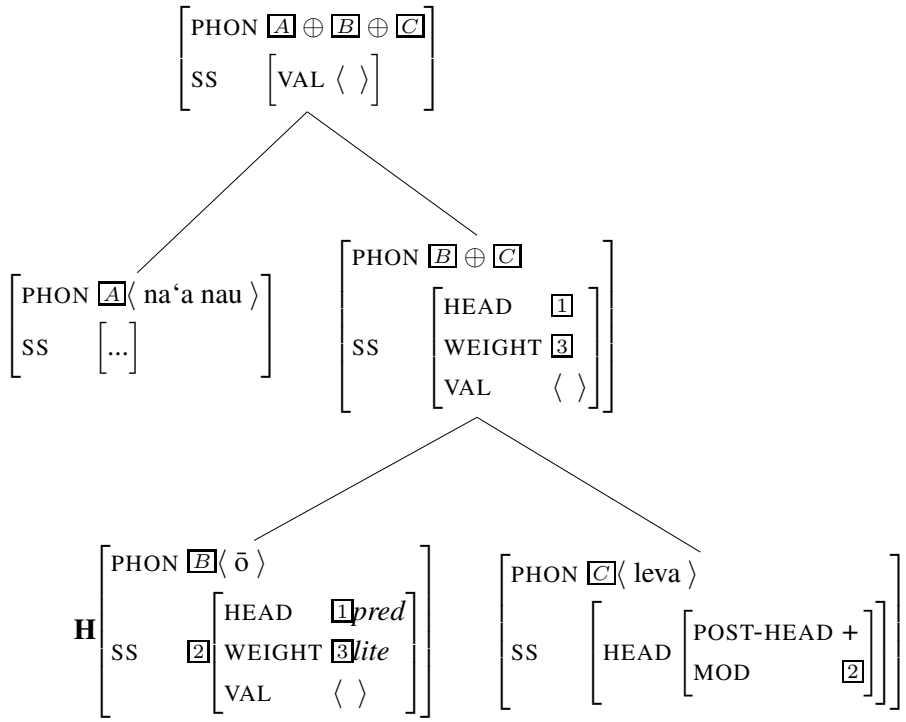

Figure 5: Tree Structure for Example (25)

assume that, minimally, the Post-Head Head-Adjunct Rule is constrained to maintain the WEIGHT value between head-daughter and mother. Thus, in Figure 5, the constituent containing just *ō* 'go' and the constituent *ō leva* 'go at once' are both [WEIGHT *lite*] (3). The purpose of this constraint is to allow the rule to iterate, in order to license multiple adverbs, such as was shown in the example in (14). Consequently, while all words are specified as [WEIGHT *lite*], all [WEIGHT *lite*] items are not words – a few select phrases are also *lite*.

The discussion above indicates that a WEIGHT-sensitive approach can solve the issues for the VAL-sensitive approach. Given its success in this regard, a further question worth considering is whether the Zone 1 and Zone 3 adverbs are amenable to an improved analysis utilizing the WEIGHT feature. Perhaps the specification [VAL ⟨ ⟩] might be replaced with the specification [WEIGHT *non-lite*]. Presently, the kind of data that could adjudicate between these proposals is not obvious, so I leave the exploration of this question for future research.

The net effect of the WEIGHT-sensitive approach is that, in essence, brings

back the rough equivalent of the feature [BAR 0], found, especially, in the Generalized Phrase Structure Grammar framework (GPSG) (Gazdar et al., 1985), HPSG's predecessor. The WEIGHT-sensitive approach, furthermore, could be viewed as a proposal for "head adjunction" (to borrow a term from movement-based syntactic frameworks) within HPSG: that is, a way to allow syntactic constituents to combine directly with lexical heads. As with other proposals for "head adjunction" in constraint-based grammatical frameworks (see, for instance, the proposal within the framework of Lexical-Functional Grammar by Toivonen (2003)) – and in contrast to movement-based approaches – this proposal does not involve any interleaving of word-building and phrase-building. Still, it does raise a question, with bearing beyond just HPSG: is a combinatoric system that is "bare" (and just sensitive to "level of saturation") enough to adequately characterize the syntax of natural languages?

6 Concluding Remarks

Out of the discussion in section 5, it seems that, while the WEIGHT-sensitive approach does have features that might lead one to preliminarily prefer it, the overall best analysis for Tongan adverbs still remains, to a degree, open. Partly, this has to do with further empirical areas that need to be verified or otherwise explored to give an even clearer picture of the syntax of adverbs in Tongan. Nevertheless, I hope that the above discussion has clarified some empirical points surrounding Tongan adverbs and narrowed down some of their analytical space. Of particular empirical note, this paper has advanced the claim that Tongan adverbs appear in not just two locations (as Churchward (1953) suggested), but, in fact, in three zones: one before the predicate and two after it. Furthermore, while adverbs in linearly second zone are plentiful and a bit analytically challenging, the apparent problem of Zone 2 adverbs not having an obvious constituent to attach to is an illusion: there are no fewer than three analytical possibilities for Zone 2 adverbs (and, really, all adverbs) in Tongan. All require slightly more flexible views on either the nature of head-adjunct dependencies or the nature of what adjuncts can select for, but have a natural fit within the confines of the HPSG framework. They furthermore open interesting doors on how the syntax of adverbs might be analyzed, not only in Tongan, but in other Polynesian, Oceanic, and Austronesian language, and potentially other languages around the globe.

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Explanations and 'Engineering Solutions'? Aspects of the Relation between Minimalism and HPSG

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Abstract

It is not simple to compare Minimalism and HPSG, but it is possible to identify a variety of differences, some not so important but others of considerable importance. Two of the latter are: (1) the fact that Minimalism is a very lexically-based approach whereas HPSG is more syntactically-based, and (2) the fact that Minimalism uses Internal Merge in the analysis of unbounded dependencies whereas HPSG employs the SLASH feature. In both cases the HPSG approach seems to offer a better account of the facts. Thus, in two important respects it seems preferable to Minimalism.

1. Introduction

More than a quarter of a century after its emergence, Chomsky's Minimalist framework still seems the most influential approach to syntax. For anyone who thinks that Head-driven Phrase Structure Grammar (HPSG) offers a better approach, this is a problem, and one that needs to be addressed. It can only be addressed by comparing and contrasting Minimalism and HPSG and seeking to show that the latter is more satisfactory. The issues are clouded by rhetoric, but, as Levine and Sag (2003) and Müller (2013) have shown, it is possible to make meaningful comparisons. In this paper, I will try to do something similar. I will focus on two major differences between Minimalism and HPSG. I will also say something about the rhetoric surrounding Minimalism and a number of other differences. I will argue that comparisons between the two frameworks favour HPSG.

The paper is organized as follows. In section 2, I comment on the rhetoric of Minimalism, and in section 3, I look briefly at some distinguishing features of the framework which are not so important. Then I turn to distinguishing features which are undoubtedly important. In section 4, I look briefly at the complex structures of Minimalism, then in section 5, I look in more detail at its lexically–based nature, and finally in section 6, I consider the movement or Internal Merge approach to unbounded dependencies. In section 7, I conclude the paper**.**

2. Rhetoric

As noted above, Minimalism is surrounded by a thicket of rather obscure rhetoric which anyone interested in discussing the framework has to hack a

* I am grateful to Stefan Müller and the audience at HPSG17 for their comments and discussion. Of course, I alone am responsible for what appears here.

way through. In -the early days of the framework it was said to be guided by the notion of virtual conceptual necessity, but no clear meaning was ever assigned to this concept.[1] A little later it was said that its focus was the 'perfection of language' or 'how closely human language approaches an optimal solution to design conditions that the system must meet to be usable at all' (Chomsky 2002: 58). As Lappin, Levine and Johnson (2000) and others noted, this idea does not fit well with the idea that language is a biological system. Biologists do not ask of physical organs how closely they approach an optimal solution to design conditions that the system must meet to be usable at all.

Minimalism has also been said to offer explanations (unlike other frameworks). Thus, Chomsky (2000) remarks that Minimalism 'encourages us to distinguish genuine explanations from "engineering solutions" – a term I do not mean in any disparaging sense'. An 'engineering solution' is presumably something that works. It is not a bad thing to produce something that works. It is certainly better than producing something that doesn't work. It is no doubt good to provide explanations as well. But there seems to be no basis for the idea that Minimalism is more explanatory than other frameworks. Consider a peculiarity of English non-finite relative clauses, the fact, illustrated by the following, that they only allow a PP and not an NP as a filler:

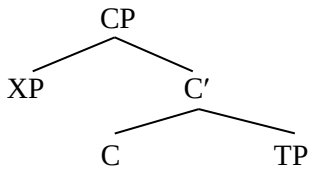
(1) a. a man [on whom to rely]
    b. *a man [whom to rely on]

This raises the question: why do non-finite relatives only allow a PP as the filler? For HPSG an answer is offered in Sag (1997):

(2) Because the relevant phrase type only allows a PP as a non-head Daughter.

For Minimalism *wh*-relative clauses are CPs of the following form where XP is a *wh*-phrase:

(3)



Thus, the Minimalist answer must be the following:

[1] See Postal (2003) and Atkinson and Al-Mutairi (2012) for discussion.

(4) Because the relevant phonologically empty complementizer only allows a PP as its specifier.

The two frameworks offer different answers, but there is no reason at all to think that one is just engineering whereas the other offers an explanation. I will return to this matter in section 5.[2]

What lies behind all this rhetoric? It is hard to escape the feeling that it is an attempt to suggest that Minimalism is quite different from other approaches and that it should not be assessed in the same way, or in the words of Postal (2003: 19), 'an attempt to provide certain views with a sort of privileged status, with the goal of placing them at least rhetorically beyond the demands of serious argument or evidence'. However, like other approaches, Minimalism tries to make sense of syntactic phenomena and provides analyses (or at least sketches of analyses), and the analyses can be compared with those in other frameworks.

3. Differences between Minimalism and HPSG which are not so important

There are a number of notable features of Minimalism which are not essential in the sense that it would still be Minimalism without them. I will comment briefly on these features and then turn in section 4 to features which seem essential in the sense that without them it would be a different framework.

One feature of Minimalism that has often been commented on is that it generally lacks the kind of detailed and precise analyses that one would expect within generative grammar. In this it contrasts with HPSG. It is not uncommon in HPSG to find substantial appendices setting out formal analyses. See, for example, Sag (1997), and especially Ginzburg and Sag (2000), which has a 50 page appendix. There are no such appendices in Minimalism. This is a notable contrast. However, Minimalism would still be Minimalism if its practitioners developed a taste for detailed formal analyses.

It has also often been noted that Minimalist work tends to be less careful about data than work in HPSG. Thus, in a review of a collection of Minimalist papers, Bender (2002: 434) comments that: 'In these papers, the data appears to be collected in an off-hand, unsystematic way, with unconfirmed questionable judgments often used at crucial points in the argumentation'. She goes on to suggest that the framework encourages 'lack of concern for the data, above and beyond what is unfortunately already the norm in formal syntax, because the connection between analysis and data is

[2] There is, of course, a field of grammar engineering and HPSG has interacted with it in productive ways (see e.g. Bender 2008, Müller 2015), but this is a separate matter.

allowed to be remote.' Similar things could be said about a variety of Minimalist work. Consider, for example, Aoun and Li (2003), who argue for quite different analyses of *that*-relatives and *wh*-relatives on the basis of the following (supposed) contrasts, which appear to represent nothing more than their own judgements:

(5) a. The headway that Mel made was impressive.
    b. ??The headway which Mel made was impressive.

(6) a. We admired the picture of himself that John painted in art class
    b. *We admired the picture of himself which John painted in art class

(7) a. The picture of himself that John painted in art class is impressive.
    b. *?The picture of himself which John painted in art class is impressive.

None of the native speakers I have consulted find significant contrasts here which could support different analyses. However, in the present context, the important point is that Minimalism would not be a new framework if the practitioners were to become less cavalier about data.

Another notable contrast between the frameworks is that Minimalism is a procedural approach, in which the grammar is a set of operations or procedures. Thus, (Chomsky 1995: 219) remarks that: 'We take L [a particular language] to be a generative procedure that constructs pairs (π, λ) that are interpreted at the articulatory–perceptual (A–P) and conceptual-intentional (C–I) interfaces, respectively, as "instructions" to the performance systems'. HPSG, in contrast, is a declarative approach, in which the grammar is a system of types and constraints. No argument seems to be offered for the procedural view, whereas various arguments have been presented for a declarative view.[3] However, as noted by Jackendoff (2011) and Müller (2013), Minimalism could be reformulated as a declarative approach. Consider, for example, the operation Merge, which produces structures of the following forms:

(8)

This could be reformulated as a constraint on complex signs of the following form:

[3] See e.g. Postal (2003), Sag and Wasow (2011).

(9) *complex-sign* $\rightarrow \begin{bmatrix} \text{LABEL } X \vee Y \\ \text{DTRS} < [\text{LABEL X}], [\text{LABEL Y}] > \end{bmatrix}$

The other Minimalist operations (Agree and Move/Internal Merge) could also be reformulated in declarative terms. I will consider Move/Internal Merge in section 6. So this difference too is probably of limited importance.

In the following sections I turn to differences between the frameworks which are clearly important.

4. Important differences 1: Complex vs. relatively simple structures

One difference between the two frameworks which is undoubtedly of considerable importance is the contrast between the exceedingly complex structures of Minimalism and the relatively simple structures of HPSG. For Minimalism the simplest of sentences have complex structures. All subjects are moved to their superficial position, Spec TP, from some lower position. Sentences with no auxiliary have a phonologically empty T element. Sentences also contain the light verb v as well as an ordinary verb. Some proposals add much more complexity. To account for various properties of adverbs, Cinque (1999) proposes that sentences have not T but 32 different functional heads. Kayne (1999) proposes that an innocent looking phrase such as *tried to sing* is the product of a complex sequence of movements, as follows:

(10) to $[_{VP}$ tried $[_{IP}$ sing$]] \Rightarrow$
$[_{IP}$ sing$]_i$ to $[_{VP}$ tried $t_i] \Rightarrow$
to_j $[_{IP}$ sing$]_i$ t_j $[_{VP}$ tried $t_i] \Rightarrow$
$[_{VP}$ tried $t_i]_k$ to_j $[_{IP}$ sing$]_i$ t_j t_k

To originates outside VP, and the IP complement of V is moved to the specifier position of *to*. To then moves to a higher position, and finally the VP, which only contains a verb moves to specifier of this higher position.[4] Specific proposals may or may not survive, but complex structures are an integral feature of Minimalism. Without them, it would be a very different framework.

Why does Minimalism have such complex structures? It sometimes seems as if complexity of a certain kind is seen as explanatory, as if treating some structure as the endpoint of a complex sequence of derivational steps explains it in a way that a set of constraints on superficial structures cannot. There is no obvious basis for such a view.

4 See Borsley (2001) for discussion.

There are clearly other, more sophisticated considerations at work here. Culicover and Jackendoff (2005) see a commitment to various notions of uniformity as major factors. In particular they highlight the role of Structural Uniformity, Interface Uniformity, and Derivational Uniformity, which they characterize as follows:

> Structural Uniformity. '[a]n apparently defective or disordered structure is actually a distorted regular form' (p. 46)
>
> Interface Uniformity. '[t]he syntax semantics interface is maximally simple, in that meaning maps transparently onto syntactic structure; and it is maximally uniform so that the same meaning always maps onto the same syntactic structure' (p. 47)
>
> Derivational Uniformity. '[w]here possible, the derivations of sentences are maximally uniform' (p. 47).

These all lead to considerable complexity.

A further factor that is surely important is the Minimalist commitment to a simple grammatical system involving just a few general mechanisms. This entails that the properties of constructions must derive from the lexical elements that they contain. Sometimes it is difficult to derive them from the properties of visible lexical elements. But there is a simple solution: postulate an invisible element. The result is a large set of invisible functional heads. Essentially Minimalism embodies an extreme version of the approach to relative clauses developed in Pollard and Sag (1994: chapter 5), which employed three empty relativizers. This will be the focus of the next section.

5. Important differences 2: A very lexically-based approach vs. a more syntactically-based approach

Properties of lexical elements are absolutely central to Minimalism. In other words, it is a very lexically-based approach.[5] The lexicon is also important within HPSG and has been a major focus of research, but the framework's complex hierarchies of phrase types or constructions mean that it is a much more syntactically-based approach.

A useful domain for exploring the relation between the two approaches is unbounded dependency constructions, such as *wh*-interrogatives and relative

---

[5] Oddly, the obvious implication – that the lexicon should be a major focus of research – seems to be ignored. As Newmeyer (2005: p.95, fn. 9) comments that '... in no framework ever proposed by Chomsky has the lexicon been as important as it is in the MP [Minimalist Program]. Yet in no framework proposed by Chomsky have the properties of the lexicon been as poorly investigated.'

clauses. Detailed HPSG analyses have been developed within HPSG in Sag (1997, 2010) and Ginzburg and Sag (2000). There seems to be no equally detailed Minimalist work. Therefore it is necessary to consider what might be proposed within Minimalism, not what has been proposed.

It has been clear since Ross (1967) and Chomsky (1977) that there are many different unbounded dependency constructions. Here, however, I will confine my attention to *wh*-interrogatives and relative clauses. An adequate account of the former needs to accommodate main and subordinate finite *wh*-interrogatives, and non-finite *wh*-interrogatives, as in (11).

(11) a. Who did Kim talk to?
b. I wonder [who Kim talked to].
c. I wondered [who to talk to].

An adequate account of the latter needs to deal with finite *wh*-relatives, finite non-*wh*-relatives, non-finite *wh*-relatives, and non-finite non-*wh*-relatives with and without a subject, as in (12).

(12) a. the man [who Kim talked to]
b. the man [(that) Kim talked to]
c. a man [to whom to talk]
d. a man [for you to talk to]
e. a man [to talk to]

A Minimalist analysis will have to attribute the properties of these constructions to a set of mainly phonologically empty complementizers. It will need to ensure: (a) that the complementizers take the right kind of complement, (b) that they have the right kind of specifier, (c) that they either attract or do not attract an auxiliary, i.e. require it to precede the subject, and (d) that their maximal projection either does or does not modify a nominal constituent of a certain kind. It might postulate eight complementizers with the properties specified in Table 1.

Clearly, we would have a much larger table if we considered the full range of unbounded dependency constructions.

There are obviously questions about how one might ensure that the complementizers have the necessary properties. Essentially, they need to be assigned appropriate features, but what these might be is not a simple matter. However, given appropriate features, they will have the necessary properties and do the necessary work. But a long list of complementizers makes no distinction between properties shared by some or all elements and properties restricted to a single element. There are a variety of shared properties. Four of the complementizers take a finite TP complement and the other four take a non-finite CP complement. The three interrogative complementizers allow the same specifier categories. The five relative complementizers all take a relative specifier. Only one of the C-elements here attracts an auxiliary, but

there will clearly be others with this property given examples like those in (13), where the auxiliary is in bold:

(13) a. Only in Colchester **could** such a thing happen.
b. Kim is in Colchester, and so **is** Lee.
c. Such **is** life.
d. The more Bill smokes, the more **does** Susan hate him.
c. **Had** I been there, I would have seen him.

Thus, there are generalizations to be captured here.

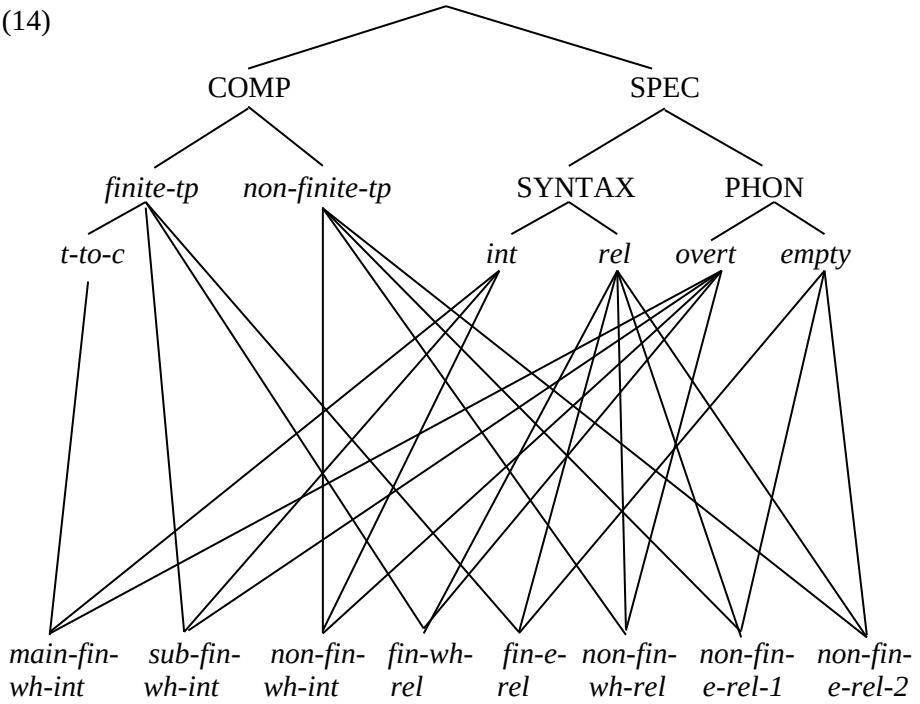
Complement-izer	Form	Complement	Specifier	Aux-attraction	N′-modif-ication
main-finite-*wh*-interrogative	∅	finite TP	int-*wh*-DP/PP/AP/AdvP	yes	no
subordinate-finite-*wh*-interrogative	∅	finite TP	int-*wh*-DP/PP/AP/AdvP	no	no
non-finite-*wh*-interrogative	∅	non-finite null-subject TP	int-*wh*-DP/PP/AP/AdvP	no	no
finite-*wh*-relative	∅	finite TP	rel-*wh*-DP/PP	no	yes
finite-empty-spec-relative	*that* or ∅	finite TP	empty-rel-DP	no	yes
non-finite --*wh*-relative	∅	non-finite null subject TP	rel-*wh*-PP	no	yes
non-finite-empty-spec-relative-2	*for*	non-finite overt subject TP	empty-rel-DP	no	yes
non-finite-empty-spec-relative-1	∅	non-finite null subject TP	empty-rel-DP	no	yes

Table 1: Complementizers

How could the various generalizations be captured? The obvious approach is that developed in the 1980s in HPSG work on the hierarchical lexicon, i.e. a detailed classification of complementizers which allows

properties to be associated not just with individual complementizers but also with classes of complementizers. We might propose the following classification:

(14)



Following standard HPSG practice, I use upper case letters for independent dimensions of classification and lower case italics for lexical types. The complementizers are classified on the basis of their complement selection properties and their specifier selection properties, and in the latter case they are classified both syntactically (is the specifier interrogative or relative?) and phonologically (is it overt or empty?). We have seven non-maximal types: *finite-tp*, *non-finite-tp*, *t-to-c*, *int*, *rel*, *overt*, *empty*. These will be associated with various features as in Table 2.

I am assuming here that a complementizer will not attract an auxiliary if it lacks certain features and hence that there is no need for a type for complementizers that do not attract an auxiliary. The maximal types that correspond to the eight complementizers will have some features of their own. *Fin-e-rel* will have features indicating that it optionally takes the form *that*, and *inf-e-rel-2* will have features indicating that it takes the form *for*. All the others will be associated with the information that they are phonologically empty. In addition, *inf-e-rel-2* must be specified as licensing an overt subject, *fin-wh-rel* as taking a DP or PP specifier, and *inf-wh-rel* as taking a PP specifier. However, most features of the eight complementizers will be inherited from some supertype.

Type	Features
finite-tp	features ensuring that a head takes a finite TP complement
non-finite-tp	features ensuring that a head takes a non-finite TP complement
t-to-c	features ensuring that an auxiliary is moved to C
int	features ensuring that a head requires an interrogative specifier
rel	features ensuring that a head requires a relative specifier and modifies an N′ agreeing with the rel value of the specifier
overt	features ensuring that the specifier has some phonology
empty	features ensuring that the specifier has no phonology and that it is a DP

Table 2: Non-maximal types and their features

This is only a sketch of an analysis, but it looks as if it may be possible to provide a broadly satisfactory lexical approach to unbounded dependency constructions given hierarchies of lexical types of the kind proposed within HPSG. Thus, it seems that we have a choice between hierarchies of phrasal types and hierarchies of lexical types. What can we say about this choice? The first point to make is that there is no reason to think that the lexical approach is any less stipulative than the syntactic approach. It involves different sorts of stipulations, but there is no reason to think that it requires any fewer stipulations. Probably the main difference is that the syntactic approach has a classification of overt constituents while the lexical approach has a classification of mainly phonologically empty elements. There is obviously no doubt about the existence of the elements that the syntactic approach classifies, but there is doubt about the existence of the elements that the lexical approach classifies. They are in fact rejected by most theoretical frameworks. The case for these elements is not very compelling. In absence of strong arguments for them, a syntactic approach of the kind developed in HPSG seems preferable to the kind of lexical approach that might be developed within Minimalism.[6]

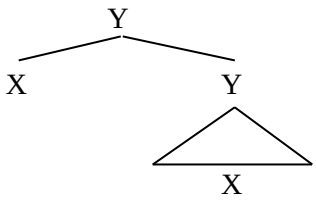
[6] See Borsley (2006) for further discussion of the issues, and see Borsley (2011) for a comparison of HPSG and Minimalist approaches to another unbounded dependency construction, the comparative correlatative.

6. Important differences 3: Movement/Internal Merge vs. SLASH

The preceding section compared Minimalist and HPSG approaches to the properties that distinguish various unbounded dependency constructions. In this section, I will compare their approaches to the property that these constructions share: the unbounded dependency.

For HPSG, unbounded dependencies involve the SLASH mechanism, originally developed by Gerald Gazdar (see e.g. Gazdar 1981)**.** For Minimalism, they are a product of movement or more precisely Internal Merge. This is an operation which takes a complex expression and merges it with a copy of one of its constituents, giving structures of the following form:

(15)



The lower X is deleted in PF. As an operation, this is unlike anything in HPSG. However, a declarative version of Minimalism could simply allow the kind of structures that are the output of Internal Merge. There are various ways in a declarative version of Internal Merge might be developed, some of which would make it quite similar to the SLASH mechanism. However, if it is not simply replaced by SLASH, it will differ from SLASH in two ways: (a) it is broader in scope and (b) it is less flexible.

Unlike SLASH, Internal Merge is assumed to be involved not just in unbounded dependency constructions but also in passives, unaccusatives, and raising sentences, such as the examples in (16).

(16) a. Kim [has been hit ~~Kim~~].
b. Kim [has disappeared ~~Kim~~].
c. Kim [seems [~~Kim~~ to be clever]].

Thus, Minimalism is committed to the claim that passives and unaccusatives like (16a) and (16b) have a gap in object position in the same way that unbounded dependencies with an object gap such as (17) have a gap in object position.

(17) Who did you think [Lee saw ___]?

Similarly, Minimalism is committed to the claim that subject raising sentences like (16c) have a gap in subject position in the same way that

unbounded dependencies with a subject gap such as (18) have a gap in subject position.

(18) Who do you think [___ saw Lee]?

There is no obvious evidence for these claims in English. If there is any evidence in other languages, this may just mean that they have rather different passive, unaccusative, or raising sentences.

We turn now to the inflexibility of Internal Merge. One aspect of this inflexibility is the following :

(19) With Internal Merge one expects to see a filler constituent in the tree matching a gap somewhere inside its sister.

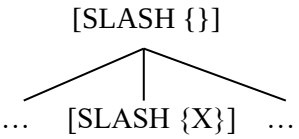
Obviously, many unbounded dependency constructions conform to this expectation. But there are also many unbounded dependency constructions in which there is no visible filler. Consider e.g. the following :

(20) a. the book [Kim bought ___]
b. Lee is too important [for you to talk to ___].
c. Lee is important enough [for you to talk to ___].
d. Kim is easy [for anyone to talk to ___].

Within Minimalist assumptions, it is more or less necessary to assume that such examples contain an invisible filler (a so-called empty operator). Unless there is some independent evidence for such invisible fillers, they are little more than an ad hoc device to maintain the Internal Merge approach.

Within the SLASH approach, there is no reason to think that there will always be a filler in an unbounded dependency construction. The top of a SLASH dependency takes the following form:

(21)



There is no reason why there should always be a filler as a sister of the [SLASH {X}] constituent. As is shown especially by Sag (1997, 2010), it is not difficult to accommodate unbounded dependencies in which there is no filler. I conclude, then, that unbounded dependencies with no filler cast doubt on Internal Merge but are no problem for SLASH.

Another aspect of the inflexibility of Internal Merge is the following:

(22) With Internal Merge one expects the gap to have all the properties of the filler.

Most unbounded dependency constructions conform to this expectation, but there are cases where the filler and the gap don't match. An interesting example is what Arnold and Borsley (2010) call auxiliary-stranding relative clauses (ASRCs), which are exemplified by the following:

(23) a. Kim will sing, which Lee won't ___.
b. Kim has sung, which Lee hasn't ___.
c. Kim is singing, which Lee isn't ___.
d. Kim is clever, which Lee isn't ___.
e. Kim is in Spain, which Lee isn't ___.
f. Kim wants to go home, which Lee doesn't want to ___.

Which in these examples appears to be the ordinary nominal *which*, but the gap is a VP in (a), (b), (c) and (f), an AP in (d), and a PP in (e). One response to these data might be to propose that *which* in such examples is not the normal nominal *which* but a pronominal counterpart of the categories which appear as complements of an auxiliary, mainly various kinds of VP. It is clear, however, that ordinary VP complements of an auxiliary cannot appear as fillers in a relative clause, as shown by the (b) examples in the following:

(24) a. This is the book, which Kim will read ___.
b. *This is the book, [read which] Kim will ___.
(25) a. This is the book, which Kim has read ___.
b. *This is the book, [read which] Kim has ___.
(26) a. This is the book, which Kim is reading ___.
b. *This is the book, [reading which] Kim is ___.

Thus, this doesn't seem a viable approach.

A further point to note is that there are also sentences rather like ASRCs with a topicalized demonstrative pronoun. Consider the following naturally occurring examples:

(27) a. They can only do their best and that they certainly will ___.
(http://www.britishcycling.org.uk/web/site/BC/gbr/News2008/ 200807018_Jamie_Staff.asp)

b. Now if the former may be bound by the acts of the legislature, and this they certainly may ___, ...
(Thomas Christie, *The Analytical Review, or History of Literature, Domestic and Foreign, on an Enlarged Plan*, Princeton University, 1792, p. 503)

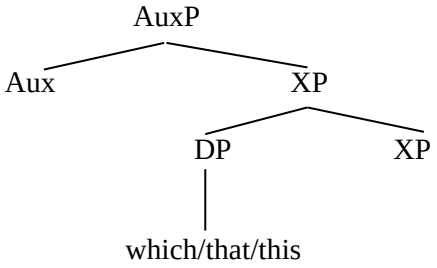
c. It was thought that he would produce a thought provoking chapter, and this he certainly has ___.

(J. B. Cullingworth (ed.), *British Planning: 50 years of Urban and Regional Policy*, Continuum International, 1999, p. 13)

It seems, then, that there is a serious challenge here.

In an Internal Merge approach one might try to accommodate the data by allowing the complement of an auxiliary to have a DP realized as *which* or *that* adjoined to it, as in (28).

(28)



The complement would have to be deleted in this situation. However, it is not clear how one could ensure that deletion applies. Hence, it is not clear how one could exclude the following:

(29) *Kim will sing, which Lee won't sing.

It is also not clear how one could ensure that a demonstrative introduced in such a structure is fronted. In other words, it is not clear how an example like the following, with or without *sing*, could be excluded:

(30) *Kim will that/this (sing).

Thus, this doesn't look like a promising approach.

As Arnold and Borsley (2010) show, the type of mismatch between filler and gap that we see in ASRCs is no problem for the SLASH approach. It simply requires a special kind of gap. Gaps normally have the following feature-makeup.

(31) $\begin{bmatrix} \text{LOCAL}\,[1] \\ \text{SLASH}\,\{[1]\} \end{bmatrix}$

However, as Webelhuth (2008) noted, there is no reason why we should not under some circumstances have what he calls a 'dishonest gap', one whose LOCAL value and SLASH value do not match. Developing this approach, Arnold and Borsley (2010) propose that when an auxiliary has an unrealized complement, the complement optionally has a certain kind nominal as the

value of SLASH, which is realized as relative *which* or a demonstrative. When SLASH has the empty set as its value, the result is an auxiliary complement ellipsis sentence. When SLASH has the nominal value, we have a dishonest gap because the value of LOCAL is whatever the auxiliary requires, normally a VP of some kind, and the result is an ASRC. Thus, filler–gap mismatches are problematic for Internal Merge but no problem for SLASH.

A further aspect of the inflexibility of Internal Merge is the following:

(32) With Internal Merge one expects there to be a gap in an unbounded dependency construction.

Perhaps this is normally the case, but in some circumstances in some languages there is not a gap but a resumptive pronoun (RP). Among many languages that are relevant here is Welsh, which has RPs in both *wh*-interrogatives and relative clauses, as the following illustrate:

(33) a. Pa ddyn werthodd Ieuan y ceffyl iddo **fo**?
which man sell.PAST.3SG Ieuan the horse to.3SGM he
'Which man did Ieuan sell the horse to?'
b. y dyn werthodd Ieuan y ceffyl iddo **fo**
the man sell.PAST.3SG Ieuan the horse to.3SGM he
'the man that Ieuan sold the horse to'

Willis (2011) and Borsley (2010, 2013) present evidence that Welsh RPs involve the same mechanism as gaps. For example, Borsley (2010, 2013) notes that while it is not generally possible to have a gap in just one conjunct of a coordinate structure, it is possible to have a gap in both or a gap in one and an RP in the other. The following illustrate:

(34) *y dyn [welais i ___ a gwelaist tithau Megan]
the man see.PAST.1SG I and see.PAST.2SG you Megan
*'the man that I saw and you saw Megan'

(35) y dyn [welais i ___ a gwelaist tithau ___
the man see.PAST.1SG I and see.PAST.2SG you
hefyd]
too
'the man that I saw and you saw too'

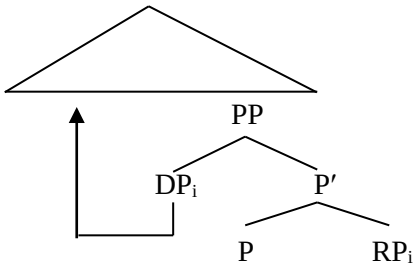
(36) y dyn [welais i ___ a soniais amdano
the man see.PAST.1SG I and talk.PAST.1SG about.3SGM
fo]
he
'the man that I saw and talked about'

Within Minimalism this means that they must involve Internal Merge.

How could such examples involve Internal Merge? One suggestion, outlined in McCloskey (2006), is that rather than being deleted, the lower X is (somehow) turned into a pronoun.[7] One problem, as McCloskey (2002: 192) pointed out, is that this would make the fact that RPs look just like ordinary pronouns surprising.

Another approach takes advantage of the complexity of Minimalist structures and claims that there is a gap in the structure somewhere near the RP. A version of this approach is proposed for Welsh by Willis (2011). Willis suggests that a PP whose head has an RP as its object may have a coindexed operator in its specifier position, which undergoes movement.

(34)



On this analysis RPs are ordinary pronouns. Hence, it is immune to the objection just advanced against an analysis in which RPs are the realization of copies left by Internal Merge. However, a question arises about the specifier position which it requires. In English, what Culicover (1999) calls sluice-stranding, exemplified by the following, seems to provide some support for a Spec PP position.

(35) a. Who with?
b. What about?
c. Who for?

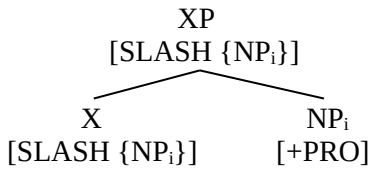
Welsh does not have examples like this. Hence, this approach seems rather dubious. There have been other attempts to combine a gap with an RP, but they also face problems (see Borsley 2013 for discussion). Thus, RPs seem problematic for Internal Merge.

Examples with an RP instead of a gap are no problem for the SLASH approach. Just as there is no reason why a non-empty SLASH should always be associated with a filler, so there is no reason why it should always be associated with a gap. We can assume that some languages allow certain heads that are [SLASH {NP}] to be associated not with a gap but with a pronominal sister coindexed with the value of SLASH (which must be

[7] McCloskey (pc) emphasizes that this is not an approach he favours.

nominal for coindexing to be possible). In other words we can assume that they have structures of the following form:

(36)



Borsley (2010, 2013) develops an analysis of Welsh RPs along these lines, in which prepositions and nouns, but not verbs and adjectives appear in structures of this kind. A verb or adjective with a non-empty SLASH value has an argument which is a gap or one which contains a gap or an RP, while a preposition or noun with a non-empty SLASH value has an argument which is a coindexed pronoun or one which contains a gap or an RP. This is a straightforward extension of standard HPSG analyses. Thus, examples with an RP instead of gap pose no problems for the SLASH approach.[8]

It seems, then, that all three of the example types that cast doubt on movement/Internal Merge are unproblematic for the SLASH approach. Hence the latter seems preferable.[9]

7. Conclusions

I have sought in this paper to compare and contrast Minimalism and HPSG and to show that the latter is more satisfactory. I have noted that the issues are clouded by rhetoric and that some of the distinguishing features of Minimalism seem inessential in that it would still be Minimalism without them. Others, however, are essential in that without them it would be a different framework. I have concentrated on two distinguishing features of the framework: (1) the fact that it is very lexically-based approach whereas HPSG is more syntactically-based, and (2) its use of Internal Merge in the analysis of unbounded dependencies where HPSG has the SLASH feature. I have argued that there is no reason to think that a system of generally invisible functional heads is preferable to a system of phrase types/constructions and that Internal Merge is less able than SLASH to accommodate the full range of unbounded dependency phenomena. I conclude that the comparisons favour HPSG.

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8 For a slightly different HPSG approach to RPs, see Crysmann (2012, 2016).

9 Levine and Sag (2003) show that multiple gap structure also pose problems for movement/Internal Merge but not for SLASH. For more discussion of the issues, see Borsley (2012).

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Parallel affix blocks in Choctaw

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Abstract

Choctaw, a Muskogean language, shows a complex set of restrictions on verbal prefixes which requires reference both to exponence and position class. An approach like that of Information-Based Morphology Crysmann and Bonami (2016) allows us to model the facts correctly.

1 Introduction

Choctaw is a Muskogean language, spoken in Oklahoma and Mississippi. There are several thousand speakers. Choctaw is a configurational language with consistent head-final constituent ordering. Choctaw shows a mix of head-marking and dependent-marking patterns. Verbal agreement works on an active/stative basis, while nominals show nominative/accusative case marking. Choctaw shows complex agglutinative morphology, but it is not polysynthetic and does not have (productive) noun incorporation. Data is from Broadwell (2006) and my notes, unless otherwise indicated.[1]

2 Syntactic overview

The simplest sentences in Choctaw consist of a verb plus a tense marker:

(1) Ǫba-tok.
rain-PT
'It rained.'

(2) Pi̲sa-tok.
see:NGR-PT
'She saw them.'

When there is an overt NP subject, it is marked for case:

[1] I thank Berthold Crysmann, Pam Munro, and Matthew Tyler for comments and discussion of this paper. Examples use the following abbreviations: 1 = first person, 2 = second person, I = agreement from the I set, II = agreement from the II set, III = agreement from the III set, AC = accusative, COM = comitative, CON = contrastive, INS = instrumental, LGR = lengthened grade, LOC = locative, N = negative, NEG = negation, negative, NGR = nasalized grade, NMLZ = nominalizer/nominalization, NM = nominative, P = patient-like argument of canonical transitive verb, PT = past, Q = question particle/marker, S = single argument of canonical intransitive verb, SG = singular, TNS = default tense (in Choctaw).

(3) John-at niya-h.
John-NM fat-TNS
'John is fat.'

Subject NPs are obligatorily marked with the nominative case /-at/. Object NPs are optionally marked with the accusative /-a/:

(4) Gus-at John-a písa-tok.
Gus-NM John-AC see:NGR-PT
'Gus saw John.'

(5) Gus-at písa-tok
Gus-NM see:NGR-PT
'Gus saw him/her/it/them.'

(6) John-a písa-tok.
John-AC see:NGR-PT
'He/she/it/they saw John.'

As these examples show, there is no subject or object agreement morphology for 3rd person. However, a few dozen verbs have suppletive dual and plural forms.

Word order is consistently head-final. The following example (7) shows head-final order in NP, PP, and S:

(7) [Henry im-ofi-yat] [aa-ípa-' nóta'] ittóla-h.
Henry III-dog-NM LOC-eat-NMLZ under lie:NGR-TNS
'Henry's dog is lying under the table.'

Choctaw adds objects via applicative prefixes. If a verb has multiple objects, their order is free:

(8) Charles-at báshpo' nípi' isht-bashli-h.
Charles-NM knife meat INS-cut-TNS
'Charles cut the meat with a knife.'

(9) Charles-at nípi' báshpo' isht-bashli-h.
Charles-NM meat knife INS-cut-TNS
'Charles cut the meat with a knife.'

3 Agreement

3.1 Agreement in intransitives

Intransitives fall into three classes (I, II, III), depending on their subject agreement:

(10) **I subject agreement**
(An-akoosh) baliili-li-tok.
(1SG-CON:NM) run-1:S:I-PT
'I ran.'

(11) **II subject agreement**
(An-akoosh) sa-niya-h.
(1SG-CON:NM) 1:S:II-fat-TNS
'I am fat.'

(12) **III subject agreement**
(An-akoosh) a-ponna-h.
(1SG-CON:NM) 1:S:III-skilled-TNS
'I am skilled.'

An overt subject for any of these clauses will be nominative. As expected in a pro-drop language, overt subjects only appear when contrastive. The overall agreement system is shown in the following table:

	I (nom)	**II (acc)**	**III (dat)**	**N**
1sg	-li	sa-	(s)am-/(s)a-	ak-
2sg	ish-	chi-	chim-/chi-	chik-
1pl paucal	il-/ii-	pi-	pim-/pi-	kil-/kii-
1pl multiple	il-/ii-	hapi-	hapim-/hapi-	kil-/kii-
2pl	hash-	hachi	hachim-/hachi-	hachik-
(default)	--	--	im-/i-	ik-

Table 1 The Choctaw agreement system

When two alternatives are shown, the first is before a vowel and the second is before a consonant. The 1st sg I affix –li is the only suffix in the system; all the other agreement is via prefix.

In some accounts Ulrich (1986), Davies (1986), the I, II, and III sets are called Nominative, Accusative, Dative agreement. Note, however, that overt subjects

show case morphology that works on a regular nominative/accusative basis. The use of the N agreement set is discussed in 3.3 below.

3.2 Agreement in transitives

Transitive verbs also fall into several classes, depending on the sort of agreement with subjects and objects. These are conventionally labelled with the type of agreement for the subject and object (I/II, I/III, II/II, II/III, III/II):

(13) **I/II verb (≈nominative/accusative)**
Chi-písa-li-h.
2:S:II-see:NGR-1:S:I-TNS
'I see you.'

(14) **I/III verb (≈nominative/dative)**
Chi-paya-li-h.
2:S:III-call-1:S:I-TNS
'I call you.'

(15) **II/III verb (≈accusative/dative)**
Chi-sa-yimmi-h.
2:S:III-1:S:II-believe-TNS
'I believe you.'

Choctaw verbs can have several prefixes, whose order is partly determined by position class and partly by syntactic function.

Among the agreement prefixes, there is considerable complexity. If the subject has type I agreement, then the order is I-III-II-verb, as shown in the following examples:

(16) **I agreement precedes II agreement**
Is-sa-písa-tok.
2:S:I-1:S:II-see:NGR-PT
'You saw me.'

(17) **I agreement precedes III agreement**
Ish-i-pila-tok.
2:S:I-III-throw-PT
'You threw it to him.'

(18) **III agreement precedes II agreement**
I-chi-tokcholi-tok.
III-2:S:II-tickle-PT
'He tickled you for her.'

It is difficult to get three agreement prefixes on the same verb; speakers generally rephrase the clause to avoid this outcome.

A small number of transitive verbs trigger II or III agreement for their subjects:

(19) **II subject, II object**
Chi-sa-banna-h
2:S:II-1:S:II-want-TNS
'I want you'

(20) **II subject, III object**
Chi-sa-noklhakacha-h
2:S:III-1:S:II-be:startled-TNS
'I was startled by you.'

(21) **III subject, II object**
Ofi' am-ahchiba-h
dog 1:S:III-tired-TNS
'I'm tired of the dog.'

The numbers of verbs with these agreement patterns is very small. As Broadwell (2006) shows, for most speakers, there is only one verb (bannah 'want') that shows agreement for II subject and II object. There are about ten verbs that show the II subject, III object pattern. And there are about four verbs that show the III subject and II object pattern.

The last group (III subject, II object) is restricted to 3rd person objects for most speakers. Contrast (21) with (22) below.

(22) *?Chi-am-ahchiba-h
2:S:II-1:S:III-tired-TNS
'I'm tired of you.'

The existence of a small number of transitive verbs with II or III subject agreement motivates a revised prefix template:

I/N >	III(dative) >	II(obj) >	II(subj) >	Verb

Table 2 Revised prefix template, version 1

In this template, the II prefixes for subject and object agreement are identical, but need to be ordered with respect to each other. Thus Choctaw displays what Stump (2001,2012) calls the Parallel Block problem – identical exponence in different position classes.

3.3 The status of N prefixes

The examples so far have all involved affirmative verbs. When a verb is negative, the subject agreement shifts from the usual I/II/III to the N prefix.[2]

For verbs with a I subject, the N prefix substitutes for the I.

(23) a. P<u>i</u>sa-li-h
see:NGR-1:S:I-TNS
'I see (him/her/it/them)'

b. ak-píis-o-h.
1:S:N-see:LGR-NEG-TNS
'I don't see'

For verbs with a II or III subject, the default 3rd person N precedes the II or III agreement.

(24) a. Sa-banna-h
1:S:II-want-TNS
'I want (him/her/it/them)'

b. Ik-sa-bánn-o-h.
N-1:S:II-want:LGR-NEG-TNS
'I don't want.'

N prefixes never co-occur with I prefixes, and the two occupy the same position class. Thus we can modify the previous ordering statement to

[2]Verbs in the negative also shift into the aspectual form called the l-grade, which lengthens and accents the penultimate vowel of the verb stem. Broadwell (2006:164-5)

I/N >	III(dative) >	II(obj) >	II(subj) >	Verb

Table 3 Revised prefix template, version 2

The following examples show the relative order of N, II, and III prefixes:

(25) a. Ik-i-makáach-o-h
N-III-say:LGR-NEG-TNS
N-III-say:l-neg-tns

b. Ak-chi-píis-o-h
1:S:N-2:S:II-see:LGR-NEG-TNS
'I didn't see you.'

c. Ik-chi-sa-noklhakáach-o-h
N-2:S:III-1:S:II-startled:LGR-NEG-TNS
'I'm not startled by you.'

3.4 Possessor raising

Choctaw also has rules of possessor raising which cause additional agreement markers to appear on a verb. Subject possessor raising makes the possessor of the subject an additional argument of the clause:

(26) a. John im-ofi-yat illi-h.
John III-dog-NM die-TNS
'John's dog died.'

b. John-at ofi(-yat) im-illi-h.
John-NM dog(-nom) III-die-TNS
('John's dog died (affecting him).'

Note that III agreement shows alienable possession on nouns as well as verbal agreement.

The possessor raising rule applies only to intransitive verbs. The most usual pattern is obligatory nominative for the possessor, and no overt case for the possessum. Some speakers also allow nominative on the possessum.

The rule is restricted to intransitives, but both unaccusatives and unergatives participate in the rule.

Object possessor raising makes possessors of objects into applied objects of the verb:

(27) a. A-shokha' nipi' apa-tok.
1:S:III-pig meat eat-PT
'He ate my bacon.'

b. Shokha' nipi' am-apa-tok.
pig meat 1:S:III-eat-PT
'He ate my bacon (affecting me).'

Although the III agreement that appears on the verb in possessor raising is identical in exponence to the kinds of III agreement already demonstrated, it must come before I or N agreement.

We can see this by examining examples like the following:

(28) John-at ofi-yat im-ik-íll-o-h.
John-NM dog-NM III-N-die:LGR-NEG-TNS
'John's dog didn't die.'

(29) Pallaska' a-chi-noktakali-tok-o?
bread 1:S:III-2:S:II-choke-PT-Q
'Did you choke on my bread?'

Contrast the order of III and N order seen in (28) with that in (30) below.

(30) Ik-i-makáach-o-h.
N-III-say:LGR-NEG-TNS
'He didn't say it to him.'

Thus III agreement from possessor raising occupies a different position in the prefix sequence. This leads us to revise the prefix template previously given to the following:

III(poss-raising) >	I/N >	III(dative) >	II(obj) >	II(subj) >	Verb

Table 4 Revised prefix template, version 3

3.5 Applicatives

A final complication to the description of Choctaw prefixes comes from the applicative system. Choctaw has five applicative prefixes and one applicative clitic, as shown in the list below:

- ibaa- 'comitative'
- aa- 'locative'
- imaa- 'ablative'
- on- 'superessive'
- imi- 'benefactive'
- isht= 'instrumental'.

Applicative prefixes usually follow the I/N markers but precede II and III markers:

(31) Yamma il-aa-hilha-tok
there:AC 1:S:I-LOC-dance-PT
'We danced there.'

(32) Aa-chi-písa-li-tok.
LOC-2:S:II-see:N-1:S:I-PT
'I saw you there.'

The previous claim that applicative prefixes precede II/III is too crude, however.

We need to distinguish direct and dative objects of the main verb, which follow the applicative, from objects of the applicative itself, which precede the applicative. Consider the following contrast:

(33) a. Aa-chi-písa-li-tok. Ulrich (1986:263)
LOC-2:S:II-see:NGR-1:S:I-PT
'I saw you there.'

b. Chi-aa-holaabi-tok.
2:S:II-LOC-lie-PT
'He lied about you.'

It is also possible for a verb to have both a direct and an applicative object:

(34) Chi-baa-sa-fama-h
2:S:II-COM-1:S:II-be:whipped-TNS
'I was whipped with you.'

While applicative prefixes follow the I/N prefix, the applicative clitic isht 'instrumental' precedes the I/N prefix. Consider the following example, where isht anopolih means 'talk about' and im-anopoli means 'talk to'.

(35) a. Alikchi' im-ohooyo' isht=il-anopoli-tok
doctor III-woman instr=1:P:I-talk-PT
'We talked about the doctor's wife.'

b. Alikchi' im-ohooyo' il-im-anopoli-tok
doctor III-woman 1:P:I-III-talk-PT
'We talked to the doctor's wife.'

When a verb has both III agreement resulting from PR and the clitic isht, the III agreement comes first:

(36) Alikchi-ya ohooyo' im-isht=il-anopoli-tok.
doctor-AC woman III-instr=1:P:I-talk-PT
'We talked about the doctor's wife (affecting the doctor)'

1 >	**2 >**	**3 >**	**4 >**	**5 >**	**6 >**	**7 >**	**8 >**	**Verb**
III	isht=	I/N	II	applic	III	II	II	
pr	instr	subj	app-obj		obl	obj	subj	

Table 5 Final prefix template

Note that II prefixes appear at three different places in the sequence and III prefixes appear at two different places in the sequence.

4 Two formal accounts

I will present here two fairly similar approaches to modeling these facts, in both Paradigm Function Morphology Stump (2001) and Information-based morphology Crysmann and Bonami (2016).

4.1 Paradigm-Function morphology

In Paradigm Function Morphology, we could create two agreement blocks, which we can call II-AGR and III-AGR. The rules for the two blocks will look approximately as follows:

Block II-AGR

- $\langle X_v, \sigma \rangle$: {Agr[Per:1, Num:sg]} → sa+X
- $\langle X_v, \sigma \rangle$: {Agr[Per:2, Num:sg]} → chi+X
- etc...

Block III-AGR

- <X_v, σ>: {Agr[Per:1, Num:sg]} → am+X
- <X_v, σ>: {Agr[Per:2, Num:sg]} → chim+X
- etc...

Continuing the PFM model, the system appears to need the following rules of reference.

Rules of reference

- X_v, σ: {SUBJ[acc]} → <X, σ > : II-AGR [slot 8]
- X_v, σ: {OBJ]} → <X, σ > : II-AGR [slot 7]
- X_v, σ: {APPLIED-OBJ]} → <X, σ > : II-AGR [slot 4]

These rules say that for accusative subject, direct object, and applied object, use the realization rules in the II-AGR block.

Similarly, the rules for an ordinary oblique and an external possessor use the realization rules in the III-AGR block.

- X_v, σ: {OBL} → <X, σ > : III-AGR [slot 6]
- X_v, σ: {EXT-POSS} → <X, σ > : III-AGR [slot 1]

4.2 Information-based morphology

In the Crysmann and Bonami (2016) approach, we can specify exponence and morphotactics separately. Here I use a feature AGR, with values {I, II, III, N}, which shows the agreement set used 1. Sample exponence rules for Choctaw are as follows:

$$\left[\begin{array}{ll} \text{MUD} & \left\{\left[\begin{array}{ll}\text{PER} & 1\\ \text{NUM} & \text{sg}\\ \text{AGR} & \text{III}\end{array}\right]\right\} \\ \text{MPH} & \left\{\left[\text{PH} \quad \text{am}\right]\right\} \end{array}\right] \left[\begin{array}{ll} \text{MUD} & \left\{\left[\begin{array}{ll}\text{PER} & 1\\ \text{NUM} & \text{sg}\\ \text{AGR} & \text{II}\end{array}\right]\right\} \\ \text{MPH} & \left\{\left[\text{PH} \quad \text{sa}\right]\right\} \end{array}\right]$$

Figure 1 Choctaw exponence rules

In addition to the exponence rules, we may also write morphotactic rules which specify which exponence and position class realize the various positions

in the Choctaw prefix string. Consider the following rule, which puts subject agreement of the type II class in position class 8.

$$\begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \textit{subj} & \\ \text{AGR} & \text{II} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PC} & 8 \end{bmatrix} \right\} \end{bmatrix}$$

Figure 2 Choctaw morphotactic rule

We can combine both morphotactic and exponence information in full entries like the following.

$$\begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \textit{ext-poss} & \\ \text{PER} & 1 \\ \text{NUM} & \text{sg} \\ \text{AGR} & \text{III} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PC} & 1 \\ \text{PH} & \text{am} \end{bmatrix} \right\} \end{bmatrix} \begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \textit{obl} & \\ \text{PER} & 1 \\ \text{NUM} & \text{sg} \\ \text{AGR} & \text{III} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PC} & 6 \\ \text{PH} & \text{am} \end{bmatrix} \right\} \end{bmatrix}$$

Figure 3 Sample full entries

Based on the data so far, both theories appear to account for the data equally well. However the data presented in 5 show additional complications in the cooccurrence of prefixes in Choctaw.

5 The person case constraint

5.1 Basics of the PCC

Tyler (2017) explores in more complete detail a fact mentioned in Ulrich (1986) (and overlooked by Broadwell (2006)).

When a verb has accusative subject agreement (slot 8) and accusative (slot 7) or dative object agreement (slot 6), there are severe restrictions on the person combinations that are allowed.

Compare the following grammatical and ungrammatical sentences in Choctaw.

(37) a. Chi-sa-banna-h
2:s:II-1:s:II-want-tns
'I want you'.

b. *Pi-chi-banna-h
1:p:II-2:s:II-want-tns
'You want us.'

(38) a. I-sa-nokshoopa-h
III-1:s:II-fear-tns
'I fear him.'

b. *A-chi-nokshoopa-h
1:s:III-2:s:II-fear-tns
'You fear me'

Tyler shows that the only grammatical combination are those in which the accusative subject agreement is 1sg /sa-/. All other combinations are ungrammatical.

We might characterize the constraint approximately as follows.

Person-Case Constraint: Where α, β, γ are non-null, [$_{PC6}$ α] [$_{PC7}$ β] [$_{PC8}$ γ PER=$_c$1, NUM=$_c$sg]

When a combination of clitics in the 6, 7, 8 slots violates the PCC, the verb shows a case alternation. Approximately

Case Alternation [V <NP[AGR II], NP [AGR II | III]>] → [V <NP[AGR I], NP [AGR II | III]>]

That is, the subject case shifts from type II agreement to type I agreement, and produces an output that obeys the PCC.

Alternative grammatical version of the forms in (37) and (38) are shown in below:

(39) a. *Pi-chi-banna-h
1:P:II-2:S:II-want-TNS
'You want us.'

b. Ish-pi-banna-h
2:S:I-1:P:II-want-TNS
'You want us.'

(40) a. *A-chi-nokshoopa-h
1:S:III-2:S:II-fear-TNS
'You fear me'

b. Is-sa-nokshoopa-h.
2:S:I-1:S:III-fear-TNS
'You fear me.'

There is, however, an outstanding problem that requires more fieldwork. The case alternation rule presented earlier seems to suggest that promotion from type II agreement to type III should always be available. The facts are not completely clear, but it seems that II/III verbs do freely alternate with I/III verbs. In contrast, the available evidence suggests that II/II verbs only shift to I/II in order to avoid a PCC violation.

5.2 Apparent exceptions to the PCC

Ulrich (1986:255) notes that there apparent exceptions to the PCC. If the III prefix represents not a dative object, but agreement via possessor raising, the agreement sequences are good. Contrast the following:

(41) a. *A-chi-nokshoopa-h
1:S:III-2:S:II-fear-TNS
'You fear me'

b. A-pallaska' chi-noktakali-h
1:S:III-bread 2:S:II-choke-TNS
'You choked on my bread.'

c. Pallaska' a-chi-noktakali-h
bread 1:S:III-2:S:II-choke-TNS
'You choked on my bread.'

Note in particular, that in example (41c), the prefix sequence a-chi-V is grammatical, while the same sequence is ungrammatical in (41a). This is due to the fact that the III agreement in (41c) is agreement with an external possessor.

It is also grammatical to have the sequence III-II-Verb when the II is agreement with an object. Contrast (42a) with the ungrammatical (41b).

(42) a. I-chi-tokcholi-tok.
III-2:S:II-tickle-PT
'He tickled you for her.'

b. *I-chi-nokshoopa-h
III-2:S:II-fear-TNS
('You are afraid of her.')

However examples like (41c) and (41c) do not violate our statement of the PCC, repeated below.

Person-Case Constraint: Where α, β, γ are non-null, [$_{PC6}$ α] [$_{PC7}$ β] [$_{PC8}$ γ PER=$_c$1, NUM=$_c$sg]

That is because the PCC only regulates the interaction between slots 6, 7, and 8. However, the III agreement marker in (41c) is in slot 1 (as is specified for agreement with an external possessor). Thus the constraint does not apply to it.

Similarly, (42a) is not a violation of the PCC because II object agreement is in slot 7. There is no agreement in slot 8, and thus the constraint does not apply.

5.3 The PCC in two theories

It seems relatively straightforward to build a constraint like the PCC into the morphotactic component of the Information-Based morphology. Here we might compare constraints on clitic sequences in Romance (Monachesi (1999, 2005) via a CLITICS list.

This effect appears to follow less naturally in a system like Paradigm Function Morphology where parallel rule blocks are handled via rules of reference. The difficulty is distinguishing the multiple effects of rules of referral and their interaction. The rule of referral for subjects with II agreement requires [Per 1, Num Sg] just in case the rules of referral for objects with II and III agreement are applied and yield non-null results.

More generally, the availability of a structure like a CLITICS list facilitates the statement of constraints on a sequence of affixes.

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Resumption and case: A new take on Modern Standard Arabic

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Abstract

Over the past few years, there has been renewed interest in the treatment of resumption in HPSG: despite areas of convergence, e.g. the recognition of resumptive dependencies as SLASH dependencies, as motivated by Across-the-Board (ATB) extraction, there is no unified theory to date, with differences pertaining, e.g., to the exact formulation of SLASH amalgamation (Ginzburg and Sag, 2000), or the place of island constraints in grammar. While Borsley (2010) and Alotaibi and Borsley (2013) relegate the difference in locality of gap and resumptive dependencies to the performance system, Crysmann (2012, 2016) captures insensitivity to strong islands as part of the grammar. Harmonising existing proposals becomes even more acute, if we consider the cross-linguistic similarity of the phenomenon, in particular, if we compare languages like Hausa and Arabic, which both feature island insensitivity to some degree, as well as bound pronominal resumptive objects and zero pronominal resumptive subjects, to name just a few of the parallels.

In this paper, I shall reexamine resumption (and extraction) in Modern Standard Arabic (henceforth: MSA) and propose a reanalysis that improves on Alotaibi and Borsley (2013) in several areas: in particular, I shall argue that controlling the distribution of gaps and resumptives by means of case is not only empirically under-motivated but also leads to counter-intuitive constraint specifications in the majority of cases. I shall show that the case-based account of Alotaibi and Borsley (2013) can be straightforwardly supplanted with the weight-based account I proposed in Crysmann (2016): in doing this, one does not only get a better alignment of case assignment constraints with overtly observable manifestations of case, but such an account is also general enough to scale from case languages, such as MSA, to languages without case, such as Hausa, or many Arabic vernaculars. Finally, I shall address case in ATB extraction and propose a refinement of the Coordination Constraint of Pollard and Sag (1994) that accounts for exactly the kind of mismatch observed in mixed gap/resumptive ATB extraction.

1 Gaps and resumptives in MSA

Unbounded dependency constructions in MSA provide evidence for both gap and resumptive strategies in the grammar of extraction: as shown in Alotaibi and Borsley (2013), some constructions only permit resumption, others only permit gap-type extraction, whereas extraction of direct objects displays both strategies.[1]

As shown in (1), arguments of prepositions, as well as possessor arguments of nouns may only extract with a resumptive element in situ (a bound pronominal affix).[2] The obligatoriness of resumption with obliques appears to be a recurrent pattern cross-linguistically, characterising e.g. Hausa (Tuller, 1986), Hebrew (Sells, 1984), or Welsh (Borsley, 2010).

[1] In this section, I follow essentially the empirical description of the basic patterns in Alotaibi and Borsley (2013).

[2] For reasons of space, I shall gloss over the possibility of pied piping which is immaterial for the points made here.

(1) a. ʔayy -u/*-i ʤaamiʕat-in ðahaba Aħmad-u ʔilai -ha / *∅ ?
which -NOM/-GEN university-GEN went.3SM Ahmad-NOM to -it
'Which university did Ahmad go to?' (A&B 2013, p. 7)

b. ʔayy -u/*-i muʔallif-in garaʔa Aħmad-u kitaab-a -hu / *∅ ?
which -NOM/-GEN author-GEN read.3SM Ahmad-NOM book-ACC -his
'Which author's book has Ahmad read?' (A&B 2013, p. 7)

What is interesting about MSA, is the case of the filler which does not match the case assignment in situ, which would be genitive, rather than nominative case.

By contrast, non-nominal complements, e.g. PP-complements of verbs or adjectives may only extract by means of a gap strategy.

(2) ʔila ʔayy-i ʤaamiʕat-in ðahaba Aliy-un ∅ ?
to which-GEN university-GEN went.3SM Ali-NOM
'To which university did Ali go?' (A&B 2013, p. 11)

(3) min maðaa kaana Aħmad-u khaaʔif-an ∅ ?
from what was Ahmad-NOM afraid-ACC
'Of what was Ahmad afraid?' (A&B 2013, p. 11)

Direct objects, however, witness overlap between the two strategies: while it is possible to extract by means of a gap strategy in certain constructions, cf. (4), others feature the presence of a bound pronominal affix on the governing verb (5).

(4) ʔayy-a T-tullaab-i qaabala l-qaaʔid-u ∅ ?
which-ACC the-students-GEN met.3SM the-leader-NOM
'Which of the students has the leader met?' (A&B 2013, p. 8)

(5) ʔayy-u T-tullaab-i qaabala-**hum** l-qaaʔid-u ?
which-NOM the-students-GEN met.3SM-them the-leader-NOM
'Which of the students has the leader met?' (A&B 2013, p. 8)

Choice between the two strategies depends on several factors: first, while both strategies are available with wh-extraction and relatives with a definite antecedent, only resumption is an option with indefinite antecedents (6). Furthermore, extraction out of strong islands, e.g. relative clauses make use of a resumptive obligatory (7).

(6) qaabaltu rajul-an [ʔaʕrifu -hu / *∅] ?
met.1SM man-ACC knew.1SM -him
'I met a man that I knew' (A&B 2013, p. 9)

(7) ʔayy -u/*-a bint-in raʔaita l-ʔasad-a llaðii ʔakala -ha / * ∅
which -NOM/-ACC girl-GEN saw.2SM the-lion-ACC that ate.3SM -her
'Which girl did you see the lion that ate?' (A&B 2013, p. 12)

Case marking of fillers correlates with the choice of extraction strategy: while gaps display a matching effect, giving accusative case on the filler, the fronted constituent bears nominative case in the event of a resumptive. Note that nominative case

marking of fronted possessors as in (1b) or complements of prepositions (1a), which appear in the genitive when in situ, is congruent with this observation.

As for subject extraction, Alotaibi and Borsley (2013) observe that the subject-agreement pattern (full agreement in person, number, and gender) in relativisation and wh-fronting (8) parallels that of topicalised (9) and pro-dropped (10) subjects, in contradistinction to post-verbal subjects (11) in situ (partial agreement in person and gender).

(8) ʔayy-u Tullaab-in ʕaraf-uu / *ʕarafa l-ʔijaabat-a?
which-NOM students-GEN knew.3PM knew.3SM the-answer-ACC
'Which students knew the answer?' (A&B 2013, p. 10)

(9) T-tullaab-u qaabaluu / *qaabala Aħmad-a
the-students-NOM met.3PM met.3SM Ahmad-ACC
'The students met Ahmad' (A&B 2013, p. 9)

(10) a. laqad qaabala Aħmad-a
indeed met.3SM Ahmad-ACC
'He met Ahmad.' (A&B 2013, p. 10)

b. laqad qaabaluu Aħmad-a
indeed met.3PM Ahmad-ACC
'They met Ahmad.' (A&B 2013, p. 10)

(11) qaabala / *qaabaluu T-tullaab-u Aħmad-a
met.3SM met.3PM the-students-NOM Ahmad-ACC
'The students met Ahmad' (A&B 2013, p. 9)

Alotaibi and Borsley (2013) therefore correlate fronting with the null subject property and conclude that subject extraction involves a zero resumptive, rather than a gap.

2 Alotaibi and Borsley (2013)

In order to capture the distribution of gaps vs. resumptives, Alotaibi and Borsley (2013) suggest that gap dependencies involve full reentrancy between an argument's LOC value with a member of SLASH, whereas resumptives, which are treated as ordinary pronominals in the spirit of McCloskey (2002) and Borsley (2010), give rise to an optional NP member on SLASH where reentrancy with the pronominal argument is limited to INDEX.

Now given that the slashed NP specification exhibits only very limited reentrancy with properties of the resumptive element, exempting most of CONT (leaving alone INDEX) and all of CAT, the exceptional assignment of nominal case to the filler of resumptive unbounded dependencies is finally accounted for by means of restricting this specific member of SLASH to nominative case. To this end, they propose an implicational constraint on words where a pronominal argument has its INDEX shared with an element in SLASH, see (12).

(12)
$$\begin{bmatrix} \textit{word} \\ \textsc{slash} & \left\{ \boxed{1} \begin{bmatrix} \textsc{index} & \boxed{2} \end{bmatrix} \right\} \\ \textsc{arg-st} & \left\langle \ldots \begin{bmatrix} \textit{pro} \\ \textsc{index} & \boxed{2} \end{bmatrix} \ldots \right\rangle \end{bmatrix}$$
$$\overrightarrow{\begin{bmatrix} \textsc{slash} & \left\{ \boxed{1} \begin{bmatrix} \textsc{case} & \textit{nom} \end{bmatrix} \right\} \end{bmatrix}}$$

Assignment is thus uniformly fixed at the bottom of the dependency, affecting both resumptive and gap dependencies. Given that case properties are imposed on SLASH elements, either by reentrancy (gap) or stipulation (resumptives), they inevitably percolate up, ensuring nominative fillers for resumptives and matching fillers for gaps.

Alotaibi and Borsley (2013) further propose that case can be used to control the distribution of gaps and resumptives in a more fine-grained way. While definite relatives marked by the complementiser *llaði* license both gaps and resumptives for direct objects, indefinite relatives, which are headed by a zero complementiser according to Alqurashi and Borsley (2012), only permit a resumptive. Alotaibi and Borsley (2013) suggest that this difference can be captured by the following lexical entries for *llaði* (13) and the zero relative complementiser (14):

(13)
$$\begin{bmatrix} \textsc{ph} & \left\langle \text{llaði} \right\rangle \\ \textsc{hd} & \begin{bmatrix} \textit{comp} \\ \textsc{mod} & \text{NP} \begin{bmatrix} \textsc{def} & + \\ \textsc{ind} & \boxed{i} \end{bmatrix} \end{bmatrix} \\ \textsc{comps} & \left\langle \text{S} \left[\textsc{slash} \left\{ \text{NP} \begin{bmatrix} \textsc{ind} & \boxed{i} \end{bmatrix} \right\} \right] \right\rangle \end{bmatrix}$$

(14)
$$\begin{bmatrix} \textsc{ph} & \left\langle \right\rangle \\ \textsc{hd} & \begin{bmatrix} \textit{comp} \\ \textsc{mod} & \text{NP} \begin{bmatrix} \textsc{def} & - \\ \textsc{ind} & \boxed{i} \end{bmatrix} \end{bmatrix} \\ \textsc{comps} & \left\langle \text{S} \left[\textsc{slash} \left\{ \text{NP} \begin{bmatrix} \textsc{case} & \textit{nom} \\ \textsc{ind} & \boxed{i} \end{bmatrix} \right\} \right] \right\rangle \end{bmatrix}$$

The crucial difference between the two entries is that (13) underspecified the case value for the NP on SLASH, whereas (14) restricts this value to nominative case.

3 Problems with case

3.1 ATB extraction

The idea to exploit case properties in order to regulate the distribution of resumptives and gaps runs into quite some serious problems once we consider ATB extraction.

In MSA, like in many other languages that offer both gap and resumptive strategies, mixing of gap and resumptives is possible, as shown, e.g. in (15): while the ATB constraint can be shown to be operative in the language, it apparently treats gap and resumptive dependencies alike.

(15) a. * man [[tuħibu ∅] wa [tušaʤiʕu Aħmad-a fii nafs-i l-waqt-iʕ]]
who like.2SM and support.2SM Ahmad-ACC in same-GEN the-time-GEN
'Who do you like and support Ahmad at the same time?' (A&B 2013, p. 13)

b. man [[tuħibu ∅] wa [tušaʤiʕu ∅ fii nafs-i l-waqt-iʕ]]
who like.2SM and support.2SM in same-GEN the-time-GEN
'Who do you like and support at the same time?' (A&B 2013, p. 13)

c. man [[tuħibu ∅] wa [tušaʤiʕu **-hu** fii nafs-i l-waqt-iʕ]]
who like.2SM and support.2SM -him in same-GEN the-time-GEN
'Who do you like and support at the same time?' (A&B 2013, p. 14)'

It is precisely for this reason that almost all approaches to resumption in HPSG treat both dependencies via SLASH.

As discussed by Alotaibi and Borsley (2013), mixing of resumptives and gaps leads to a conflict of case specifications on SLASH: if nominative case is assigned at the bottom of a resumptive dependency, yet standard accusative is assigned to object gaps, unification of SLASH values must fail. However, mixing is not only possible with case-ambiguous fillers, as in (15), but also with unambiguously case-marked fillers. Speakers find resolution to the gap's accusative case requirement perfectly acceptable, whereas judgements degrade for nominative: "[t]hey find examples like [(16b)] with nominative case less acceptable, but do not generally reject them" (Alotaibi and Borsley, 2013, p. 21).

(16) a. ʔayy -a Tullaab-in [[qaabalta ∅] wa [taħaddaϴta ʔilai**-hum**]]?
which -ACC students-GEN met.2SM and talked.2SM to-them
'Which students have you met and talked to?' (A&B 2013, p. 21)

b. ? ʔayy -u Tullaab-in [[qaabalta ∅] wa [taħaddaϴta ʔilai**-hum**]]?
which -NOM students-GEN met.2SM and talked.2SM to-them
'Which students have you met and talked to?' (A&B 2013, p. 21)

As admitted by the authors, both the perfectly well-formed accusative variant and the marginal nominative one are erroneously ruled out as ungrammatical by their account. This analysis of MSA resumption therefore contradicts the standard account of the ATB effect (Pollard and Sag, 1994), which derives the constraint quite elegantly by simple unification of the SLASH sets of the conjunct daughters.

3.2 *ʔanna* clauses

It is of note that MSA provides no evidence that case transmission is required in resumptive dependencies, owing to the absence of a matching effect: with wh-extraction, the stipulated nominative case assignment at the bottom hardly ever corresponds to what case would normally be assigned here, which is either accusative (for direct objects) or genitive (prepositions and possessed nouns).

Relative complementisers equally fail to provide any evidence for case matching. With indefinite relatives, where use of a resumptive is obligatory, no matching can ever be observed, due to the trivial fact that the complementiser is zero. Furthermore, the resumptives themselves are bound pronominals unmarked for (nominative) case or pro-dropped.

The definite relative complementiser *llaði*, by contrast, does inflect for case, but the case marking we observe is due to agreement with the antecedent noun (Alqurashi and Borsley, 2012, p. 29). As a result, we do not find any evidence for a matching effect along the SLASH dependency, whether for gaps or resumptives.

An admittedly paradoxical instance of case assignment (Borsley p.c.) is found with *ʔanna* clauses: in these clauses the complementiser assigns accusative case to its sister NP which stands in a non-local dependency with an NP argument contained within the finite clause it is subcategorised for. In (17), the complementiser takes as its accusative complement the topicalised subject of its clausal complement. Recall that full subject-verb agreement is only found with null subjects and topicalisation. Similarly, in (18) we find an accusative topicalised direct object. Interestingly enough, at the bottom of the dependency, we find a bound resumptive: use of a gap strategy, by contrast, is illicit.

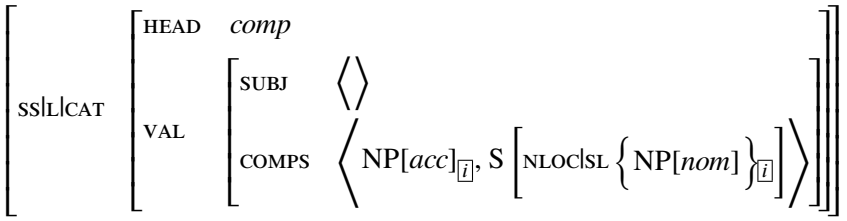
(17) ħasiba Aħmad-u [ʔanna l-ʔawlaad-a ðahabuu].
thought.3.S.M Ahmad-NOM that the-boys-ACC left.3.P.M
'Ahmad thought the boys had left' (A & B 2013, p. 19)

(18) a. ʕalimtu [ʔanna l-qiSat-a garaʔa**-ha** Ahmad-u]
knew.1S.M that the-story-ACC read.3S.M-it Ahmad-NOM
'I knew that (as for) the story, Ahmad read it.' (A & B 2013, p. 23)

b. * ʕalimtu [ʔanna l-qiSat-a garaʔa Ahmad-u ∅]
knew.1S.M that the-story-ACC read.3S.M Ahmad-NOM
(A & B 2013, p. 23)

It should be clear that using case on SLASH values in order to control the distribution of resumptives vs. gaps in MSA is not only under-motivated, but it also leads to counter-intuitive analyses as in the present case (see (19)): with *ʔanna* clauses, the local case the complementiser assigns to the topic never corresponds to the stipulated case assignment on the corresponding SLASH value, which in turn may not even correspond to the case that would normally be assigned at the bottom of the dependency, as for direct objects.

(19) Lexical entry for *ʔanna* (Alotaibi and Borsley, 2013, p. 24)



3.3 Long extraction

The third problem associated with using case properties to regulate the distribution of resumptives and gaps comes from long extraction out of relative clauses. As illustrated in (20), long extraction is possible e.g. out of relatives, yet only with a resumptive at the bottom of the long non-local dependency. I.e. while the dependency that the complementiser binds may involve either a gap or a resumptive, the dependency that passes through must be resumptive.

(20) ʔayy-u bint-in raʔaita l-ʔasad-a llaðii ʔakala-ha
which-NOM girl-GEN saw.2SM the-lion-ACC that ate.3SM-her
'Which girl did you see the lion that ate?' (A&B 2013, p. 12)

In the logic of Alotaibi and Borsley's approach, this fact would require *llaði* to constrain case on a member of SLASH that it neither binds, nor locally constructs with, i.e. an instance of long distance case assignment. This certainly constitutes a very marked analytical option. By contrast, the fact that relative clauses constitute strong islands is a common observation, and it is equally well attested that resumptive languages may treat gap and resumptive dependencies differently with respect to islandhood, barring long extraction with the former, while permitting it with the latter (cf. Tuller, 1986; Crysmann, 2012, for Hausa).

Synopsis

Taken together, the case-based approach by Alotaibi and Borsley (2013) not only appears to be empirically under-motivated in MSA, but has clearly paradoxical consequences, i.e. case assignment to SLASH in *ʔanna* clauses that correspond neither to what happens at the top or at the bottom. What is more, the kind of inside-out case assignment to an unrelated dependent, as necessitated by long extraction, appears not only counter-intuitive, but also fails to capture the fact that gaps and resumptives observe different locality conditions, an observation that is obscured by the case-based encoding.

On a more general note, it is far from clear how this particular approach to the distribution of gaps and resumptives will scale up to languages without case, which include many Arabic vernaculars.

Taking a closer look at where exactly case matters in the context of MSA nonlocal dependencies, we find that a matching effect is only ever observed for gap de-

pendencies, whereas with resumptives, case assignment is only ever relevant at the top: i.e. nominative with fillers of resumptive dependencies, accusative for the NP complement of *ʔanna*, and agreement case with the antecedent noun for *llaði*.

Thus, in what follows, I shall assume transmission of case in resumptive dependencies is unnecessary and I shall propose instead to regulate the distribution of gaps vs. resumptives in terms of a theory of strong islands that seems to be independently needed to make sense of long extraction in MSA, but which has the further potential to scale up to case-full and case-less languages alike.

4 A reanalysis

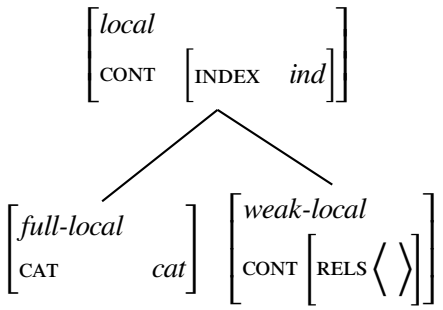
In order to resolve the problems associated with case assignment to SLASH values, I shall propose that gap dependencies are subject to a matching effect, readily modelled by percolation of *local* values, whereas resumptive dependencies in MSA are purely anaphoric dependencies, excluding transmission of categorial features, an option provided for by the underspecified theory of resumption I have proposed in previous work on Hausa (Crysmann, 2012, 2015, 2016). As a consequence, case assignment with resumptive dependencies will only ever be possible at the top, in accordance with the empirical evidence. The distribution of gaps vs. resumptives, however, will be regulated by reference to the amount of information being transmitted on SLASH: full local information for gaps, and purely indexical information for resumptives. Furthermore, we shall see that island constraints can be expressed solely in terms of this informational difference, providing an account that scales across languages with and without case.

4.1 A weight-based theory of extraction and resumption (Crysmann, 2016)

The weight-based theory of resumption and extraction implements a distinction of SLASH elements in terms of the amount of information that is minimally or maximally transmitted. As illustrated by the type hierarchy in (21), *local* values are differentiated according to the amount of information they carry: While *weak-local* contains no CAT, and only INDEX features in CONT, *full-local* has both CAT and CONT features, including semantic relations on RELS. The value of the LOC attribute of *synsem* objects therefore is of the latter type, cf. Figure 1. As a consequence, *weak-local* values essentially live on non-local features, such as SLASH sets.[3] Reentrancy of an element with a LOC feature, as with the standard filler-head schema (28) or for the type *gap-synsem* (Figure 1), automatically coerces the element into the full type.

(21) Types hierarchy of *local* values

[3]See Crysmann (2013) for a similar proposal regarding locality constraints on complement clause vs. relative clause extraposition.



The crucial point of this theory now is that resumptives by themselves may be underspecified as to the local type on their SLASH set: what they minimally require is sharing of INDEX.

4.2 The bottom of the dependency in MSA

Without anything else being said, resumptives should be able to occur wherever a gap can. While this is a valid observation for Hausa, MSA observes a stricter separation, witnessing more disjoint distributions of gaps and resumptives. To this end, I shall propose that in MSA the type *resump* restricts its SLASH set to contain an element of type *weak-local*, as shown in (22). Note that I have made explicit the information inherited from its super-types, namely *slashed* and *pronominal-synsem*.

(22)
$$\begin{bmatrix} \textit{resump} & \\ \textsc{loc} & \begin{bmatrix} \textsc{cont} & \begin{bmatrix} \textsc{ind} & \boxed{i} \\ \textsc{rels} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \textsc{nloc} & \begin{bmatrix} \textsc{inh}|\textsc{sl} & \left\{ \begin{bmatrix} \textit{weak-local} \\ \textsc{cont}|\textsc{ind} \quad \boxed{i} \end{bmatrix} \right\} \end{bmatrix} \end{bmatrix}$$

Regarding the distribution of gaps, which are attested only for NP and PP objects of verbs and adjectives, I shall follow Alotaibi and Borsley (2013) and restrict their distribution based on governing head's category. This can be done either by means of constraining the application of the Complement Extraction Lexical Rule to apply to the COMPS list of lexical heads of these two categories, as given in (23), or else by an implicational constraint, as suggested by Alotaibi and Borsley (2013).

(23)
$$\begin{bmatrix} \textsc{arg-st} & \langle \ldots \boxed{1} \ldots \rangle \\ \textsc{synsem} & \begin{bmatrix} \textsc{loc}|\textsc{cat} & \begin{bmatrix} \textsc{hd} & \textit{verb} \vee \textit{adj} \\ \textsc{val} & \begin{bmatrix} \textsc{comps} & \langle \boxed{1}\, \textit{gap} \rangle \oplus \boxed{c} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

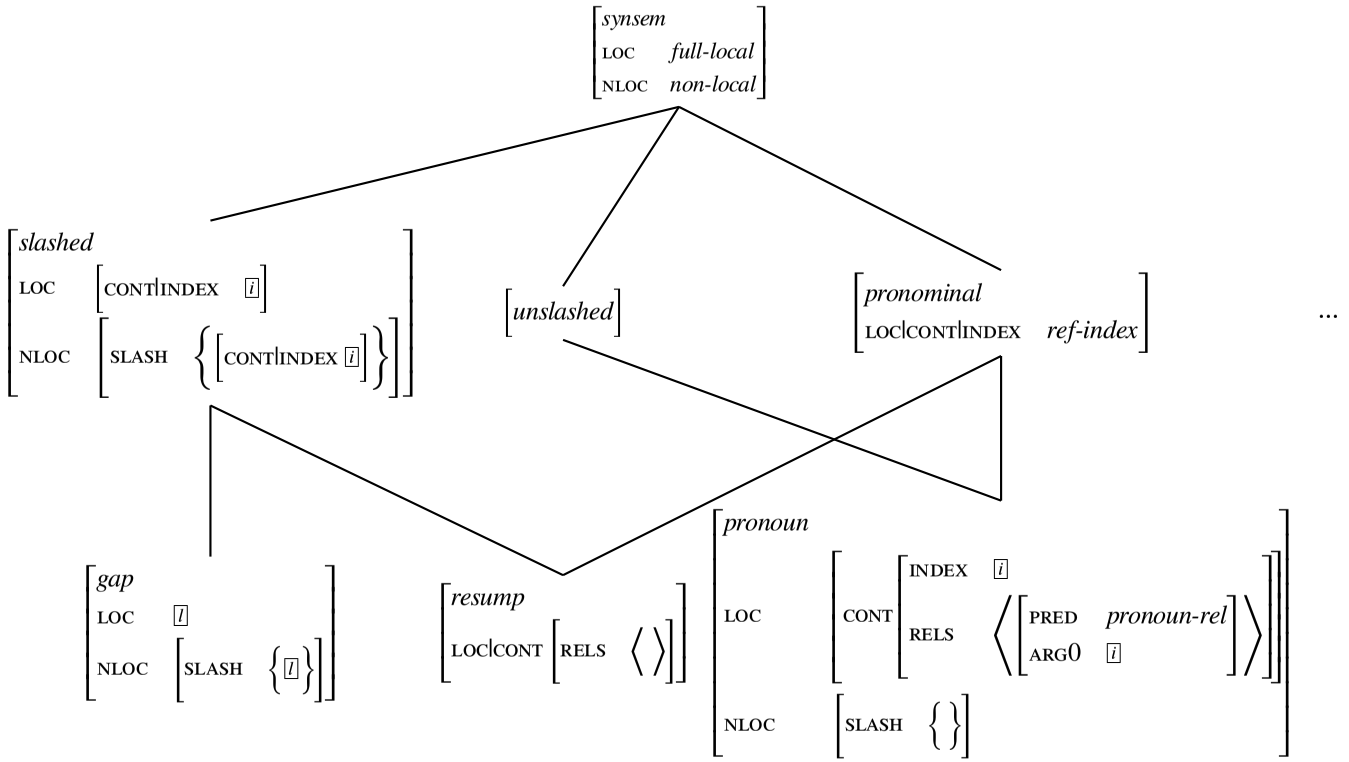


Figure 1: Hierarchy of synsem objects (Crysmann, 2016)

$$\mapsto \left[\text{SYNSEM} \quad \left[\text{LOC}|\text{CAT} \left[\text{VAL} \quad \left[\text{COMPS } \boxed{c} \right] \right] \right] \right]$$

This rule is quite restricted in its scope of application. Therefore, resumptive pronouns fill in (for) the missing gaps, by virtue of the fact that *pronominal-synsem* can either resolve to standard *pronoun-synsem*, or else to the type *resump*, which launches a non-local dependency. Thus, the resumptive dependency just goes piggy-back on the construction that normally licenses pronominal dependents: pro-drop for subjects and pronominal affixation for objects of verbs and prepositions, as well as possessor complements of nouns.

Note, though that this option is only available to individuals, not events, thus excluding the resumptive option e.g. for PP complements.

4.3 The top of the dependency

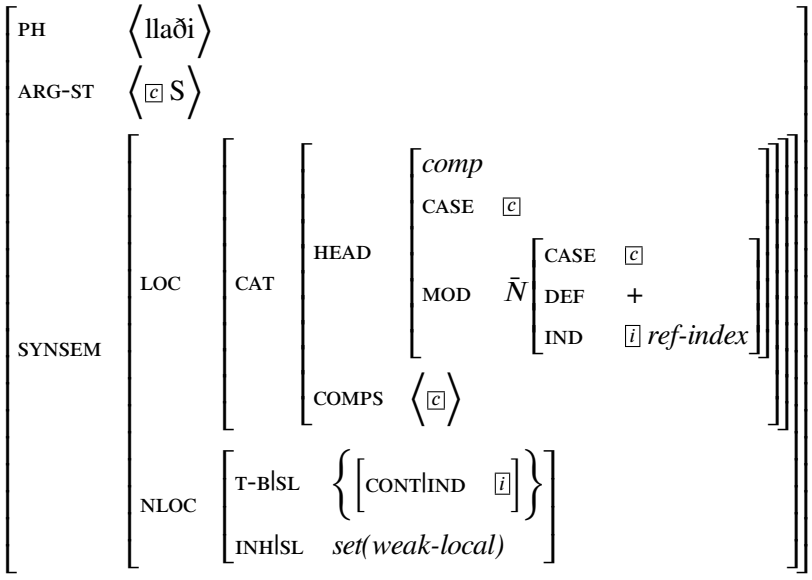
At the top of the dependency, we find at least three different constructions capable of binding a non-local dependency: a relative complementiser, which turns the non-local dependency into a local dependency with the antecedent noun the relative clause modifies, the complementiser *ʔanna*, a kind of weak UDC that turns the non-local dependency into an accusative-marked topic complement, and filler-head structures for wh-fronting.

4.3.1 Relative complementisers

Let us start with the treatment of relative complementisers. Recall that MSA distinguishes between the overt complementiser *llaði* used with definite antecedents and a null complementiser used with indefinites. While *llaði* can bind both gap and resumptive UDCs, the null complementiser obligatorily requires a resumptive at the bottom. What is common to both complementisers is that they do not show any matching effect: while this is obvious for the null complementiser, Alqurashi and Borsley (2012) have shown that agreement in case shown by *llaði* is controlled by the antecedent, not by the non-local dependency.

Compared to the previous analysis by Alotaibi and Borsley (2013), the entry for *llaði* can remain largely unchanged. The only crucial difference is that we need to suppress the restriction to an NP *local* value on the SLASH element, which would be incompatible with *weak-local*. Selectivity for nominal expressions is captured instead by the fact that the shared INDEX is of type *ref-index*, i.e. a referential index, a property which actually derives from the attachment to a nominal antecedent.

(24) Definite relative complementiser *llaði*



As given in (24), the complementiser *llaði* modifies a definite antecedent noun with which it shows case agreement (via MOD). The referential index of the antecedent noun needs to be token-identical with the index of the unbounded dependency that the complementiser binds via its non-empty TO-BIND|SLASH specification.

Given *Slash Amalgamation* (Ginzburg and Sag, 2000), a head's INH|SLASH value is the union of the INH|SLASH values on its argument structure (ARG-ST) minus its TO-BIND|SL. As a consequence, the referential index the relative clause modifies must be a member of the INH|SL value of the complementiser's sole argument, a finite clause. Any further SLASH elements will be passed on.

By way of restricting the complementiser's INH|SL to *weak-local*, we can easily account for the island properties of relative complementisers. Thus, while the *local* type of the dependency that *llaði* binds is itself underspecified, permitting both gaps and resumptives at the bottom, any dependency passing through is restricted to be of the weaker anaphoric type. Note that this analysis is entirely parallel to my previous analysis of long extraction in Hausa.

Turning now to the null relative complementiser, all we need to do is enforce its selectivity for a resumptive dependency.

(25) Null indefinite relative complementiser

$$\left[\begin{array}{ll}
\textsc{ph} & \langle\ \rangle \\
\textsc{arg-st} & \langle \boxed{c}\ \mathrm{S} \rangle \\
\textsc{synsem} & \left[\begin{array}{ll}
\textsc{loc} & \left[\begin{array}{ll}
\textsc{cat} & \left[\begin{array}{ll}
\textsc{head} & \left[\begin{array}{lll} \textit{comp} & & \\ \textsc{mod} & \bar{N} & \left[\begin{array}{ll} \textsc{def} & - \\ \textsc{ind} & \boxed{i}\ \textit{ref-index} \end{array}\right] \end{array}\right] \\
\textsc{comps} & \langle \boxed{c} \rangle
\end{array}\right]
\end{array}\right] \\
\textsc{nloc} & \left[\begin{array}{ll}
\textsc{t-b|sl} & \left\{\left[\begin{array}{ll} \textit{weak-local} & \\ \textsc{cont|ind} & \boxed{i} \end{array}\right]\right\} \\
\textsc{inh|sl} & \textit{set(weak-local)}
\end{array}\right]
\end{array}\right]
\end{array}\right]$$

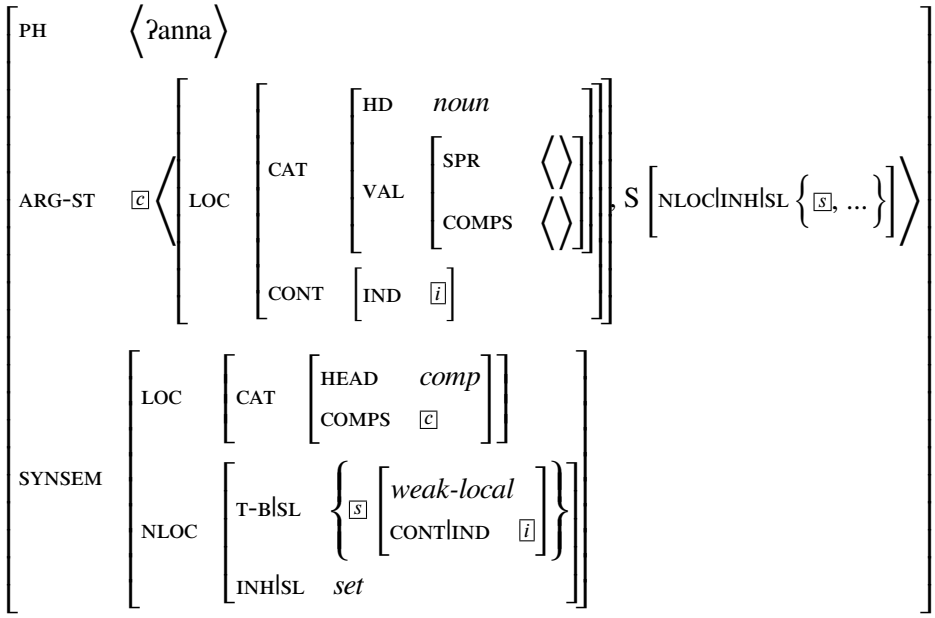
By constraining the element on its T-B|SL to *weak-local*, gaps are effectively banned at the bottom of this dependency, owing to the fact that they require reentrancy with a *full-local*.

Thus, we are able to straightforwardly account for the respective distribution of gaps and resumptives in definite and indefinite relative clauses without making any explicit reference to non-local percolation of case properties. This is in line with the observation that relative clauses in MSA do not provide any evidence for a matching effect. Furthermore, the present treatment of island constraints as a constraint on percolated information is not only entirely parallel to that of Hausa (Crysmann, 2012, 2016), but it also refrains from the kind of long-distance case assignment that would be required by Alotaibi and Borsley (2013).

4.3.2 *ʔanna*-clauses

The analysis of *ʔanna* I am going to propose is actually the mirror image of the analysis of *llaði* given above: while the latter underspecifies the type of unbounded dependency it binds, yet restricts the type of unbounded dependencies that pass through to be of the weaker anaphoric type, *ʔanna* does the exact opposite, requiring that it bind an anaphoric dependency, yet being indifferent about other dependencies passing through.

(26) Complementiser *ʔanna*



As depicted in (26), *ʔanna* takes an NP complement to which it assigns accusative case, as well as a clausal complement. The complementiser further requires that the NP complement's referential index corresponds to a non-local dependency it binds. It further constrains the type of local value to be bound to be of the weaker anaphoric type, possibly motivated by the fact that the NP complement of *ʔanna* is a topic.[4] Since CAT is not an appropriate feature for *weak-local*, categorial information cannot possibly be transmitted along the non-local dependency, including e.g. CASE, so no matching effect should arise. Thus *ʔanna* only ever specifies a case restriction for its complement, without that assignment being transmitted down to the extraction site.

The non-local dependency being bound by the complementiser's NP complement originates on the INH|SL of its clausal complement. Any additional non-local dependencies that may pass through are unconstrained as to their type.

(27) man taʕtaqidu [ʔanna l-ʔawlaad-a qaabaluu ∅]?
who think.2SM that the-boys-ACC met.3PM
'Who do you think that the boys have met?' (A&B 2013, p. 24)

This case is illustrated in (27) where the complementiser's accusative complement binds a null resumptive subject, while the object gap is bound by the matrix wh-filler.

4.3.3 Wh-fillers

Turning finally to fillers, I shall first assume that MSA may introduce phrasal fillers by way of a standard Filler-Head Schema (Pollard and Sag, 1994), as given in (28).

[4]Note that e.g. in Hausa, fronted topics equally choose resumptives, in contrast to focus fronting, which displays a preference for gap strategies (see Newman, 2000; Jaggar, 2001).

(28) Standard Filler-Head Schema

$$\begin{bmatrix} \textit{filler-head-rule} & \\ \textsc{ss} & \left[\textsc{nloc}|\textsc{sl} \quad \textit{set(weak-local)}\right] \\ \textsc{f-dtr} & \left[\textsc{ss}|\textsc{loc} \quad \boxed{1}\right] \\ \textsc{hd-dtr} & \left[\textsc{ss}|\textsc{nloc} \quad \left[\textsc{t-b}|\textsc{sl} \quad \left\{\boxed{1}\right\}\right]\right] \end{bmatrix}$$

Owing to the reentrancy between the filler's LOCAL value with the head-daughter's T-B|SLASH, we expect a restriction of the non-local dependency thus bound to *full-local*, and, as a consequence a matching effect for category and case. While the Filler-Head Schema correctly accounts for the properties of gap-type extraction in MSA, it cannot license any non-local dependencies with a filler at the top and a resumptive at the bottom, owing to incompatibility of *local* subtypes (cf. the definition of *resump* in (22)).

Note, though, that fillers binding a resumptive are special in that they do not enforce a matching effect, but uniformly constrain their fillers to be nominative NPs. I therefore propose that MSA has an additional parochial Filler-Head Schema that correlates binding of a weak anaphoric non-local dependency, devoid of categorial and therefore case properties, with constructional assignment of the unmarked case, i.e. nominative.

(29) Parochial Filler-Head Schema for MSA

$$\begin{bmatrix} \textit{resump-filler-head-rule} & \\ \textsc{ss} & \left[\textsc{nloc}|\textsc{sl} \quad \textit{set(weak-local)}\right] \\ \textsc{f-dtr} & \left[\textsc{ss}|\textsc{l} \left[\textsc{cat} \left[\textsc{hd} \left[\begin{matrix}\textit{noun} \\ \textsc{case} \quad \textit{nom}\end{matrix}\right] \right.\right.\right. \\ & \qquad \left.\left.\left. \textsc{val} \left[\begin{matrix}\textsc{subj} & \langle\,\rangle \\ \textsc{comps} & \langle\,\rangle \\ \textsc{spr} & \langle\,\rangle\end{matrix}\right]\right] \right. \\ & \qquad \left.\textsc{cont} \left[\textsc{ind} \quad \boxed{i}\right]\right] \\ \textsc{hd-dtr} & \left[\textsc{ss}|\textsc{nloc} \left[\textsc{t-b}|\textsc{sl} \left\{\left[\begin{matrix}\textit{weak-local} \\ \textsc{cont}|\textsc{ind} \quad \boxed{i}\end{matrix}\right]\right\}\right]\right] \end{bmatrix}$$

To summarise the difference between the current proposal and the previous one by Alotaibi and Borsley (2013), the main difference lies with the fact that the weight-based approach provides independent control of the distribution of resumptives and

gaps, allowing for the absence of a matching effect in case of the former, yet enforcing a matching effect for the latter. Furthermore, since case does not have to do double duty, we are free to impose constraints pertaining to this property exactly where they can be observed, i.e. at the top of the dependency. The availability of a parochial Filler-Head Schema for which full sharing is not enforced finally may serve to explain differences regarding long extraction: in MSA, availability of a schema like the one in (29) opens up the possibility for wh-fillers to undergo long extraction, provided a resumptives is found at the extraction site, as witnessed, e.g. in (20). In Hausa, by contrast, long extraction is only ever possible for relativisation: wh-fillers can never bind a dependency that originates inside a relative or embedded wh-clause, regardless of the use of a resumptive (Tuller, 1986; Crysmann, 2012). If indeed the grammar of MSA provides an alternate Filler-Head Schema, while Hausa does not, this difference regarding island status follows immediately.

4.4 ATB extraction

Now that we have seen how the basic facts of resumptive and gap-type extraction in MSA can be captured in a weight-based rather than case-based theory, we can move on and address the remaining issue of mismatches in Across-the-board (ATB) extraction.

(30) Coordination Constraint (Pollard and Sag, 1994)
coord-struc →

$$\begin{bmatrix} \text{SS} & \begin{bmatrix} \text{LOC} & [\text{CAT} \ \boxed{c}] \\ \text{NLOC} & \boxed{n} \end{bmatrix} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{SS} & \begin{bmatrix} \text{LOC} & [\text{CAT} \ \boxed{c}] \\ \text{NLOC} & \boxed{n} \end{bmatrix} \end{bmatrix}, \begin{bmatrix} \text{SS} & \begin{bmatrix} \text{LOC} & [\text{CAT} \ \boxed{c}] \\ \text{NLOC} & \boxed{n} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

Consider again the data in (15) and (16): the core problem for Alotaibi and Borsley (2013) was that object gaps and resumptives specify conflicting case values, which will lead to a unification failure on the SLASH value of the mother of the coordinate structure. Since we have replaced control by case with control by *local* subtype not much has been gained: a gap will introduce a *full-local* member on SLASH, whereas a resumptive will require a *weak-local*. Crysmann (2012, 2015) discussed similar ATB facts in Hausa and exploited the fact that, for individuals, a resumptive can always occur wherever a gap can, which made it possible to have resumptives underspecified as to the *local* subtype on their SLASH. Unfortunately, this possibility is not available for MSA, which necessitates somewhat finer control from the top of the dependency regarding the distribution of resumptives.

Thus, in order to establish a theory of ATB extraction that works across different languages with mixed gap/resumptives strategies independently of other factors, it is necessary to provide a more general solution. To this end, I shall decompose

the Coordination Constraint of Pollard and Sag (1994) into three implicational sub-constraints that will be flexible enough to permit the kind of mismatch observed in ATB extraction involving mixed gap/resumptive strategies.

The first constraint in (31), which I have split into two sub-statements for expository purposes, replicates most of the Coordination Constraint of Pollard and Sag (1994), requiring identity of CAT and NLOC features, except that reentrancy of SLASH values is now weakened to minimally identify indices.

(31) Minimal Coordination Constraint

a. *coord-struc* →

$$\left[\begin{array}{ll} \textsc{ss} & \left[\begin{array}{ll} \textsc{loc} & \left[\textsc{cat}\ \boxed{c}\right] \\ \textsc{nloc} & \left[\begin{array}{ll} \textsc{rel} & \boxed{r} \\ \textsc{que} & \boxed{q} \end{array}\right] \end{array}\right] \\ \textsc{dtrs} & \left\langle \left[\textsc{ss}\ \left[\begin{array}{ll} \textsc{loc} & \left[\textsc{cat}\ \boxed{c}\right] \\ \textsc{nloc} & \left[\begin{array}{ll} \textsc{rel} & \boxed{r} \\ \textsc{que} & \boxed{q} \end{array}\right] \end{array}\right]\right], \left[\textsc{ss}\ \left[\begin{array}{ll} \textsc{loc} & \left[\textsc{cat}\ \boxed{c}\right] \\ \textsc{nloc} & \left[\begin{array}{ll} \textsc{rel} & \boxed{r} \\ \textsc{que} & \boxed{q} \end{array}\right] \end{array}\right]\right] \right\rangle \end{array}\right]$$

b. *coord-struc* →

$$\left[\begin{array}{ll} \textsc{ss|nloc} & \left[\textsc{sl}\ \left\{\left[\textsc{cont|ind}\ \boxed{1}\right], \ldots \left[\textsc{cont|ind}\ \boxed{n}\right]\right\}\right] \\ \textsc{dtrs} & \left\langle \left[\textsc{ss|nloc}\ \left[\textsc{sl}\ \left\{\left[\textsc{cont|ind}\ \boxed{1}\right], \ldots \left[\textsc{cont|ind}\ \boxed{n}\right]\right\}\right]\right], \left[\textsc{ss|nloc}\ \left[\textsc{sl}\ \left\{\left[\textsc{cont|ind}\ \boxed{1}\right], \ldots \left[\textsc{cont|ind}\ \boxed{n}\right]\right\}\right]\right] \right\rangle \end{array}\right]$$

This minimal Coordination Constraint, which already derives the ATB constraint, can then be further refined. I propose a constraint for events on SLASH, that simply re-instantiates indiscriminate full sharing of local values on the mother's SLASH with corresponding members on the two daughters' SLASH sets, thus enforcing a matching effect for extraction of any non-individual denoting dependency, akin to the effect of the original Coordination Constraint of Pollard and Sag (1994). This will make sure that whatever relaxation of identity requirements we may want to permit in the face of NP-gaps and resumptives do not accidentally weaken matching requirements for events.

(32)
$$\left[\begin{array}{ll} \textit{coord-struc} & \\ \textsc{ss|nloc|sl} & \left\{\boxed{e}\left[\textsc{cont|ind}\ \textit{event}\right], \ldots\right\} \end{array}\right]$$

$$\rightarrow \left[\text{DTRS} \left\langle \left[\text{SS|NLOC|SL} \left\{ \boxed{e}, \ldots \right\} \right], \left[\text{SS|NLOC|SL} \left\{ \boxed{e}, \ldots \right\} \right] \right\rangle \right]$$

The last constraint, however, provides for the flexibility to project full sharing from either daughter in a coordinate structure. Or, put differently, it ensures that properties required of the SLASH value of the coordination must hold in full for at least one of the two daughters.

(33) *coord-struc* →

$$\left[\begin{array}{l} \text{SS|NLOC|SL} \quad \boxed{s} \\ \text{DTRS} \quad \left\langle \left[\text{SS|NLOC|SL} \quad \boxed{s} \right] \right\rangle \bigcirc \textit{list} \end{array} \right]$$

The combination of enforcing minimal INDEX sharing for all members of SLASH from all daughters with selective projection SLASH from one daughter will permit the two situations we observed in (16): given that none of the constraints we gave to replace the monolithic Coordination Constraint capitalises on the distinction between *weak-local* and *full-local*, it is clear that both *full-local* and *weak-local* constraints imposed on the mother will be fulfilled, as long as one of the daughters faithfully exhibits full sharing of SLASH with the mother. In case of an accusative filler, only the standard Filler-Head Schema can apply, enforcing a *full-local* percolating down. As a consequence of (33), one of the daughters in the coordinate structure will have a SLASH specification with a corresponding *full-local*, requiring a gap. In case of a nominative filler, only the parochial schema will apply, and a *weak-local* will be imposed as a member of the SLASH on the coordinate structure. Again, by virtue of (33), one of the daughters will have to fulfil this requirement, enforcing presence of a resumptive. The ATB constraint itself, including the sharing of indices for extracted items across conjuncts are independently accounted for by the minimal identity requirements stated in (31).

5 Conclusion

In this paper, I have proposed an analysis of resumption and ATB extraction in Modern Standard Arabic that builds on previous work on resumption in Hausa (Crysmann, 2016). In addition to providing a more unified theory of the phenomenon in the two languages, the weight-based model of locality permits fine-grained control over the distribution of gaps and resumptives in a more principled way than what is offered by the case-based approach of Alotaibi and Borsley (2013). In particular, the weight-based approach provides for a more streamlined approach of locality constraints, while at the same time it permits avoiding percolation of under-motivated case assignment. Postulating a parochial "resumptive" filler-head construction for Modern

Standard Arabic not only solves the case issue, but it also derives why wh-fillers can escape strong islands, in contrast to Hausa, which only features standard filler-head structures with full local reentrancy. Finally, I proposed to relax the Coordination Constraint of Pollard and Sag (1994) in such a way as to permit selective full projection from one conjunct while ensuring minimal sharing on the other, a formulation which preserves the basic insights into ATB extraction, while permitting at the same time mismatch between gaps and resumptives.

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Atomistic and holistic exponence in Information-based Morphology

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Abstract

In this paper we discuss two contrasting views of exponence in inflectional morphology: the atomistic view, where content is associated individually with minimal segmentable morphs, and the holistic view, where the association is made for the whole word between complex content and constellations of morphs. On the basis of data from Estonian and Swahili, we argue that an adequate theory of inflection should be able to accomodate both views. We then show that the framework of Information-based Morphology (Crysmann and Bonami, 2016) is indeed compatible with both views, thanks to relying on realisation rules that associate *m* units of forms with *n* units of content.

1 Introduction

A core concern of any theory of inflectional morphology is to capture the fact that the same exponents may be used in different ways in different contexts. Relevant phenomena are both wide-spread and varied. In this paper we shall examine the following two cases: (i) parallel exponence, where the same shapes in different positions realise related but distinct property sets, and (ii) 'gestalt exponence' (Blevins et al., 2016), where the cooccurrence of two (or more) exponents in a word realises a property that neither realises in isolation.[1] As we shall show, the first case is best conceived in terms of an *atomistic* view of exponence, which establishes correspondences between function and minimal segmentable morphs, whereas the second one is best understood in *holistic* terms, where form and function are established rather at the level of the whole word. Building on previous work in Information-based Morphology (Crysmann and Bonami, 2016), we suggest that both views can be reconciled under a single formal approach to morphology that relies crucially on underspecification in inheritance hierarchies of typed feature structures, and show how this conception improves over other realisational approaches to inflection.

Section 2 presents the Estonian and Swahili data that we will use to motivate the appeal of holistic and atomistic views of morphology, and then discusses how these views are conceived as irreconcilable opposites in the extant literature. In Section 3 we outline Information-based Morphology, a framework that is actually agnostic towards holistic versus atomistic views — in other words, both analyses with a holistic and an atomistic flavour can be expressed in this framework. Section 4 then presents

[†]Versions of this work were presented at the *Analysis of Morphological Systems* (AnaMorphoSys) conference (Lyon, June 2016), the 24th International Conference on HPSG (Lexington, July 2017), the DELPH-IN summit (Oslo, August 2017), as well as part of a tutorial on IbM at Frankfurt university. We would like to thank the respective audiences for their comments and suggestions, in particular Farrell Ackerman, Emily Bender, Jim Blevins, Aaron Broadwell, Dan Flickinger, Raphael Finkel, Elaine Francis, Jean-Pierre Koenig, Laura Michaelis, Frank Richter, Manfred Sailer, Andrea Sims, Géraldine Walther and Gert Webelhuth. Furthermore, we are also indebted to the comments from the anonymous reviewers of the HPSG and AnaMorphoSys conferences. This work was partially supported by a public grant overseen by the French National Research Agency (ANR) as part of the "Investissements d'Avenir" program (reference: ANR-10-LABX-0083).

[1]Other phenomena that exhibit the very same general properties include polyfunctionality, where identical forms express different function (Spencer and Stump, 2013; Ackerman and Bonami, inpress), variable placement, where one exponent realising one property set occurs in different linear positions depending on the morphosyntactic context (Stump, 1993; Crysmann and Bonami, 2016); and exuberant exponence, where some property is marked over and over again by the same forms (Harris, 2009; Crysmann, 2014).

appropriate analyses of the Estonian and Swahili data that demonstrate precisely that feature of the framework.

2 Data

2.1 Estonian

Noun declension in Estonian has served as the primary piece of evidence to argue that form-function correspondences are better understood in holistic terms, that is, established in terms of relations between fully inflected words, rather than in atomistic terms, involving the combination of sub-word units (Blevins, 2005, 2006; Blevins et al., 2016).

	NOKK 'beak'	
	SG	PL
NOM	nokk	nokad
GEN	noka	nokkade
PART	nokka	nokkasid

	ÕPIK 'workbook'	
	SG	PL
NOM	õpik	õpikud
GEN	õpiku	õpikute
PART	õpikut	õpikuid

	SEMINAR 'seminar'	
	SG	PL
NOM	seminar	seminarid
GEN	seminari	seminaride
PART	seminari	seminarisid

Table 1: Partial paradigms exemplifying three Estonian noun declensions (core cases; Blevins, 2005)

As illustrated in Table 1, morphological marking of number (SG/PL) and core cases (NOM/GEN/PART) clearly provides distinct forms for all six paradigm cells (modulo syncretism between two cell in the SEMINAR class), but the individual devices used to express the distinctions do not align well with the functional distinctions they are supposed to express. On the side of pure exponence, we find several devices: presence vs. absence of an inflection class-specific theme vowel (*-a/-u/-i*), which segregates the nominative singular from all other forms, suffixation of case/number markers, which is sometimes identical across inflection classes (e.g. NOM.PL *-d*), and sometimes not (e.g. GEN.PL *-d/-t*). Similarly, while one might be tempted to further decompose e.g. the genitive plural marker *-de/-te* there is no constant plural form or corresponding singular form on which this decomposition could be modelled.

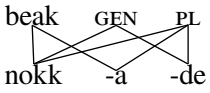

Figure 1: *m*:*n* relations in Estonian

Finally, the NOKK class displays an alternation between geminated and non-geminated stems, which witnesses an alignment with case that is the exact opposite in the singular and the plural. As summarised by the diagram in Figure 1 for *nokk-a-de* 'beak.GEN.PL', although words can readily be segmented into morphs, no morph exclusively expresses a single property, and conversely, no property is exclusively expressed by a single morph.

Thus, while individual formal devices can clearly be identified, association with

function must be established at a level that involves combinations of forms. For Estonian, a holistic, or constructional (Gurevich, 2006) view appears therefore inevitable.

2.2 Swahili

In contrast to Estonian core cases, which are encoded in a highly opaque fashion, Swahili is much more transparent, thereby being compatible with an atomistic view that associates function more directly with individual exponents that serve to express them. However, if a holistic view can shed light on systems like Estonian that are not fully amenable to an atomistic analysis, one might wonder whether a more elegant model of morphology might not be arrived at by generalising all form/function relations to the level of the morphological word. Such an approach has been pursued, e.g. by Koenig (1999) who has proposed an essentially word-based constructional analysis of (part of) the Swahili position class system.

The phenomenon of parallel exponence, however, resists such a mode of analysis. Swahili verbs can inflect for both subject and object agreement, inserting exponents into different templatic slots (1). As these examples illustrate, in many cases, position, rather than shape, disambiguates which grammatical function is coded.

(1) a. ni-ta-wa-penda
1SG-FUT-3PL-like
'I will like them.'

b. wa-ta-ni-penda
3PL-FUT-1SG-like
'They will like me.'

While choice of morphosyntactic properties, and therefore, forms, are independent for both functions, it is clear from Table 2 that pairings of form and function draw largely on the same inventories. As a result, an analysis that wants to capture

PER	GEN	SUBJECT		OBJECT	
		SG	PL	SG	PL
1		ni	tu	ni	tu
2		u	m	ku	wa
3	M/WA	a	wa	m	wa
	M/MI	u	i	u	i
	KI/VI	ki	vi	ki	vi
	JI/MA	li	ya	li	ya
	N/N	i	zi	i	zi
	U	u	—	u	—
	U/N	u	zi	u	zi
	KU	ku	—	ku	—

Table 2: Swahili person markers (Stump, 1993)

this generalisation must permit the reuse of the same morphological resources for different purposes within the same word, which necessitates reifying correspondences between shapes and partial morphosyntactic description—precisely what a holistic approach avoids doing.

2.3 Discussion: atomistic vs. holistic approaches to morphology

To summarise our presentation of the basic data, we can conclude that a credible morphological theory must afford ways to accommodate both atomistic and holistic analyses within the same formal system, rather than enforce one view or the other. Before we present such a theory, it is worth being more precise about the opposition between atomistic and holistic views, and showing how it connects to other metatheoretical distinctions.

For simplicity let us limit our attention to systems that are agglutinative enough that a segmentation of words into individual morphs is feasible and consensual. Given such a system, a purely atomistic view of exponence licenses/introduces/describes each morph through a separate mechanism, be it a morphemic lexical entry, a rule of exponence, or some other device. This contrasts with a purely holistic view, whereby constellations of co-occurring exponents are licensed/introduced/described simultaneously by a single mechanism, be it a rule, a schema, a construction, or some other device, like analogy.

It should be clear that, for many systems, both views may lead to a reasonable enough analysis. Sometimes an atomistic view will look more elegant because it allows for a more economical description, the distribution of exponents being largely orthogonal; sometimes a holistic view will look more elegant because there are many interdependencies between the distribution of exponents. In that sense, the two systems showcased above are extremes where one or the other view seems particularly unfit because it fails to capture some important generalization. It should also be clear that the distinction we are making is at least in part indifferent to the canonicity of exponence. Zero and cumulative (a.k.a. fused) exponence do not speak in favor of either view, as they do not create dependencies between the distribution of morphs. Widespread extended (a.k.a. multiple) and overlapping exponence are often used to argue in favor of a holistic view, although modern realisational approaches have developed means of dealing with such situations in an atomistic fashion, notably through the mechanism of rule blocks (Anderson, 1992; Stump, 2001), which localizes exponence strategies to a single set of paradigmatic alternatives. What is remarkable about Estonian declension is the combination of overlapping exponence and morphomic distribution (Aronoff, 1994), which leads to a situation where no insight is gained by describing the distribution of exponents individually.

The distinction we are making, we argue, is not reducible to one of the prevalent existing distinctions between morphological frameworks. It is separate from Stump's (2001) celebrated bi-dimensional opposition between lexical vs. inferential and incremental vs. realisational approaches: arguably, all the frameworks described by Stump, and more generally all morphological frameworks in the generative tradition, are committed to an atomistic view of inflection, although they differ vividly in the way they implement such a view.[2] In this they contrast with so-called 'word-based' (Ford et al., 1997; Blevins, 2006, 2013) or 'construction-based' (Gurevich, 2006; Booij, 2010; Harris, 2012) approaches.

We contend that our distinction does not reduce either to Blevins's (2006) con-

[2] Technically, Paradigm Function Morphology (Stump, 2001, 2016; Bonami and Stump, 2016) could accomodate holistic analyses through dedicated statements of the paradigm function appealing simultaneously to individual exponents in multiple rule blocks. But to the best of our knowledge such analyses have never been entertained, and it remains to be seen whether this can be done in an insightful fashion without appealing to some mechanism of underspecification that the framework is lacking.

trast between *constructive* and *abstractive* approaches. A constructive approach takes abstract morphological objects (morphemes, stems, lexemes, rules, etc.) as primitives from which surface words are derived, whereas an abstractive approach takes words as primitives from which other morphological entities may (but need not) be abstracted. Although most constructive approaches happen to presuppose an atomistic view, it is not incoherent to entertain holistic analyses within a constructive approach. In fact, the framework of Information-based Morphology that we will present in the next section is compatible with a constructive interpretation, but can accomodate fully holistic analyses, as we will see.

Let us finally note that the framework of HPSG is itself compatible with both atomistic and holistic views. The vast majority of extant proposals presuppose an atomistic view, independently of whether they implement an Item and Arrangement (Emerson and Copestake, 2015), Item and Process (Koenig, 1999; Sag, 2012), or Realisational approach (Erjavec, 1994; Crysmann, 2003; Bonami and Boyé, 2006; Crysmann and Bonami, 2012); for most authors this is related to the assumption that inflection, like derivation, operates on the basis of cascades of recursive rules. Notable exceptions are Krieger et al.'s (1993) early paradigm-based approach, and the analysis of Swahili conjugation entertained by Koenig (1999, 170–173). It is only with the advent of Information-based Morphology (Bonami and Crysmann, 2013; Crysmann and Bonami, 2016), where a single rule of exponence may introduce a discontinuous sequence of morphs, that holistic analyses have become a realistic large scale possibility.

3 Information-based Morphology

In this section, we shall present the basic architecture of Information-based Morphology (IbM), an inferential-realisational theory of inflection (cf. Stump, 2001) that is couched entirely within typed feature logic, as assumed in HPSG (Pollard and Sag, 1987, 1994). In IbM, realisation rules embody partial generalisations over words, where each rule may pair *m* morphosyntactic properties with *n* morphs that serve to express them. IbM is a morphous theory (Crysmann and Bonami, 2016), i.e. exponents are described as structured morphs, combining descriptions of shape (=phonology) and position class. As a consequence, individual rules can introduce multiple morphs, in different, even discontinuous positions. By means of multiple inheritance hierarchies of rule types, commonalities between rules are abstracted out: in essence, every piece of information can be underspecified, including shape, position, number of exponents, morphosyntactic properties, etc.

In contrast to other realisational theories, such as Paradigm Function Morphology (Stump, 2001) or A-morphous Morphology (Anderson, 1992), IbM does away with procedural concepts such as ordered rule blocks. Moreover, rules in IbM are non-recursive, reflecting the fact that inflectional paradigms in general constitute finite domains. Owing to the absence of rule blocks, IbM embraces a strong notion of Panini's Principle or the Elsewhere Condition which is couched purely in terms of informational content (=subsumption) and therefore applies in a global fashion.

3.1 Inflectional rules as partial abstraction over words

From the viewpoint of inflectional morphology, words can be regarded as associations between a phonological shape (PH) and a morphosyntactic property set (MS), the latter including, of course, lexemic information. This correspondence can be described in a maximally holistic fashion, as shown in Figure 2. Throughout this section, we shall use German (circumfixal) passive/past participle (*ppp*) formation, as witnessed by *ge-setz-t* 'put', for illustration.

$$\begin{bmatrix} \text{PH} & \textit{<gesetzt>} \\ \text{MS} & \left\{ \begin{bmatrix} \text{LID} & \textit{setzen} \end{bmatrix}, \begin{bmatrix} \text{TMA} & \textit{ppp} \end{bmatrix} \right\} \end{bmatrix}$$

Figure 2: Holistic word-level association between form (PH) and function (MS)

Since words in inflectional languages typically consist of multiple segmentable parts, realisational models provide means to index position within a word: while in AM and PFM ordered rule blocks perform this function, IbM uses a set of morphs (MPH) in order to explicitly represent exponence. Having both morphosyntactic properties and exponents represented as sets, standard issues in inflectional morphology are straightforwardly captured: cumulative exponence corresponds to the expression of *m* properties by 1 morph, whereas extended (or multiple) exponence corresponds to 1 property being expressed by *n* morphs. Overlapping exponence finally represents the general case of *m* properties being realised by *n* exponents. Figure 3 illustrates the word-level $m : n$ correspondence of lexemic and inflectional properties to the multiple morphs that realise it. By means of simple underspecification, i.e. partial description, one can easily abstract out realisation of the past participle property, arriving at a description of circumfixal realisation.

Word:

$$\begin{bmatrix} \text{PH} & \textit{<gesetzt>} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \textit{<ge>} \\ \text{PC} & \textit{-1} \end{bmatrix}, \begin{bmatrix} \text{PH} & \textit{<setz>} \\ \text{PC} & \textit{0} \end{bmatrix}, \begin{bmatrix} \text{PH} & \textit{<t>} \\ \text{PC} & \textit{1} \end{bmatrix} \right\} \\ \text{MS} & \left\{ \begin{bmatrix} \text{LID} & \textit{setzen} \end{bmatrix}, \begin{bmatrix} \text{TMA} & \textit{ppp} \end{bmatrix} \right\} \end{bmatrix}$$

Abstraction of circumfixation ($1 : n$):

$$\begin{bmatrix} \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \textit{<ge>} \\ \text{PC} & \textit{-1} \end{bmatrix}, \begin{bmatrix} \text{PH} & \textit{<t>} \\ \text{PC} & \textit{1} \end{bmatrix}, \ldots \right\} \\ \text{MS} & \left\{ \begin{bmatrix} \text{TMA} & \textit{ppp} \end{bmatrix}, \ldots \right\} \end{bmatrix}$$

Figure 3: Structured association of form (MPH) and function (MS)

Direct word-based description, however, does not easily capture situations where the same association between form and content is used more than once in the same word, as we have seen in the case of Swahili (Stump, 1993; Crysmann and Bonami, 2016). Similar problems arise in the case of exuberant exponence, as witnessed by Batsbi (Harris, 2009; Crysmann, 2014). By way of introducing a level of R(EALISATION) R(ULES), reuse of resources becomes possible. Rather than expressing the relation between form and function directly on the word level, IbM assumes that a word's description includes a specification of which rules license the realisation between form and content, as shown in Figure 4.

Realisation rules (members of set RR) pair a set of morphological properties to be expressed, the morphology under discussion (MUD) with a set of morphs that re-

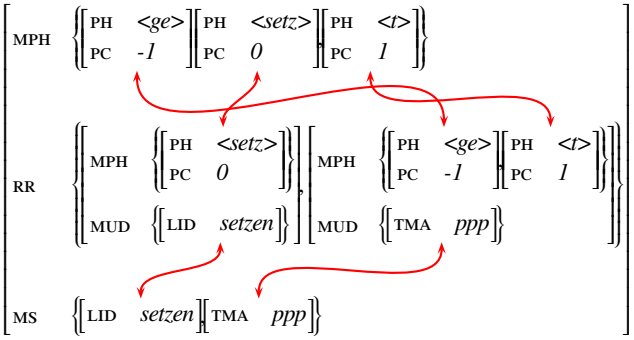

Figure 4: Association of form and function mediated by rule

alise them (MPH). A simple principle of morphological well-formedness (Figure 5) ensures that the properties expressed by rules add up to the word's property set and that the rules' MPH sets add up to that of the word, thereby ensuring a notion of 'Total Accountability' (Hockett, 1947) without relying on a $1 : 1$ correspondence between form and content.

$$word \rightarrow \begin{bmatrix} \text{MPH} & \boxed{e_1} \cup \ldots \cup \boxed{e_n} \\ \text{RR} & \left\{ \begin{bmatrix} \text{MPH} & \boxed{e_1} \\ \text{MUD} & \boxed{m_1} \\ \text{MS} & \boxed{0} \end{bmatrix}, \ldots, \begin{bmatrix} \text{MPH} & \boxed{e_n} \\ \text{MUD} & \boxed{m_n} \\ \text{MS} & \boxed{0} \end{bmatrix} \right\} \\ \text{MS} & \boxed{m_1} \uplus \ldots \uplus \boxed{m_n} \end{bmatrix}$$

Figure 5: Morphological well-formedness

Realisation rules conceived like this essentially constitute partial abstractions over words, stating that some collection of morphs jointly expresses a collection of morphosyntactic properties. In the example in Figure 4, we find that realisation rules thus conceived implement the $m : n$ nature of inflectional morphology at the most basic level: while permitting the representation of classical morphemes as $1 : 1$ correspondences, this is but one option. The circumfixal rule for past participal inflection directly captures the $1 : n$ nature of extended exponence.

3.2 Levels of abstraction

The fact that IbM, in contrast to PFM or AM, recognises $m : n$ relations between form and function at the most basic level of organisation, i.e. realisation rules, means that morphological generalisations can be expressed in a single place, namely simply as abstractions over rules. Rules in IbM are represented as typed feature structures organised in an inheritance hierarchy, such that properties common to leaf types can be abstracted out into more general supertypes. This vertical abstraction is illustrated in Figure 6. Using again German past participles as an example, the commonalities that regular circumfixal *ge-...-t* (as in *gesetzt* 'put') shares with subregular *ge-...-en* (as

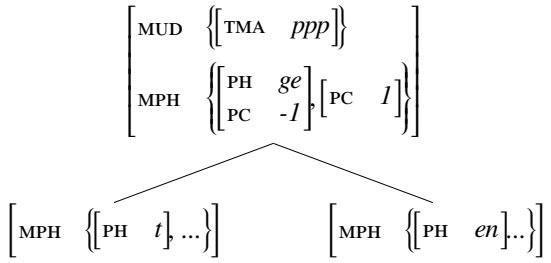

Figure 6: Vertical abstraction by inheritance

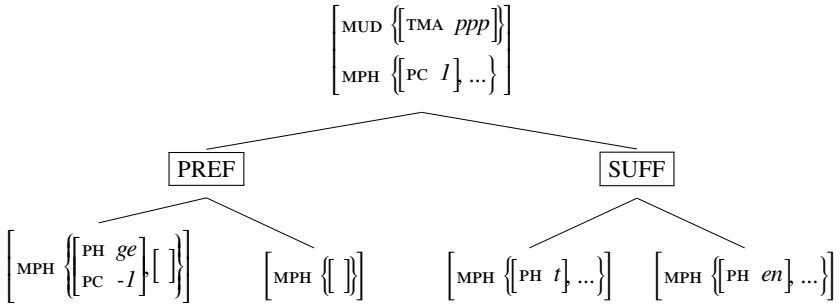

Figure 7: Horizontal abstraction by dynamic cross-classification

in *geschrieben* 'written') can be generalised as the properties of a rule supertype from which the more specific leaves inherit. Note that essentially all information except choice of suffixal shape is associated with the supertype. This includes the shared morphotactics of the suffix.

In addition to vertical abstraction by means of standard monotonic inheritance hierarchies, IbM draws on Online Type Construction (Koenig and Jurafsky, 1994): using dynamic cross-classification, leaf types from one dimension can be distributed over the leaf types of another dimension. This type of horizontal abstractions permits modelling of systematic alternations, as illustrated once more with German past participle formation:

(2) a. **ge**-setz-**t** 'set/put'
b. über-setz-**t** 'translated'
c. **ge**-schrieb-**en** 'written'
d. über-schrieb-**en** 'overwritten'

In the more complete set of past participle formations shown in (2), we find alternation not only between choice of suffix shape (*-t* vs. *-en*), but also between presence vs. absence of the prefixal part (*ge-*).

Figure 7 shows how Online Type Construction enables us to generalise these patterns in a straightforward way: while the common supertype still captures properties true of all four different realisations, namely the property to be expressed and the fact that it involves at least a suffix, concrete prefixal and suffixal realisation patterns are segregated into dimension of their own (indicated by PREF and SUFF).

Systematic cross-classification (under unification) of types in PREF with those in SUFF yields the set of wellformed rule instances, e.g. distributing the left rule type in PREF over the types in SUFF yields the rules for *ge-setz-t* and *ge-schrieb-en*, whereas distributing the right type in PREF gives us the rules for *über-setz-t* and *über-schrieb-en*, which are characterised by the absence of the participial prefix.

3.3 The atomistic/holistic divide in IbM

An interesting feature of the formal device of underspecification is that it is largely agnostic as to the distinction between what Blevins (2006) calls a *constructive* view of morphology, where words are derived from minimal elements, and what he calls an *abstractive* view, where words are taken as prior, and entities such as stems and affixes, to the extent that they are useful analytic devices, are higher-level abstractions over words.[3] Nodes in the inheritance hierarchy are nothing more than generalisations on the distribution of recurrent partials, i.e. useful abstractions from surface word-sized Saussurean signs. Because inheritance is monotonic — there are no defaults, unlike what happens in Network Morphology (Brown and Hippisley, 2012) and Construction Morphology (Booij, 2010)) —, the hierarchy can be seen both from a top-down point of view, as a way of encoding optimally constraints on exponence, and from a bottom-up point of view, as an explicit representation of relations of similarity and difference between words.

From the constructive point of view, it is important that the full hierarchy can be deduced from a partial hierarchy through the use of online type construction (Koenig, 1999): this means that only those realisation rules that include some constraint not inherited from supertypes need to be explicitly listed, rather than inferred from the shape of the system, by means of systematic intersection of leaf types from each dimension (boxed). Such inferrable types are indicated by dashed lines, as shown in Figure 8. From an abstractive point of view, on the other hand, the leaf types in the hierarchy are ontologically prior, as they constitute the directly observable associations between content and form.

The fact that rule inheritance hierarchies can be interpreted either in constructive or abstractive terms makes it very natural to accomodate both atomistic and holistic analyses within the same framework, as we will see in the next section.

4 Analysis

We now turn to the analysis of Swahili and Estonian, which, as we noted before, mark two extreme points on the atomistic vs. holistic cline.

[3] Blevins introduces the notion of an abstractive approach in the context of the study of the implicative structure of paradigms (Wurzel, 1984), arguing that segmentation is of little help to study that structure. Most work claiming the label 'abstractive' pursues the same agenda (e.g. Ackerman and Malouf 2013; Bonami and Beniamine 2016; Sims 2015). We contend however that the idea of an abstractive approach to morphology applies beyond the domain of implicative structure, and is relevant even for the analysis of agglutinative systems where segmentation is not disputed.

4.1 Swahili

The analysis in this subsection essentially rehearses the proposal in Crysmann and Bonami (2016), mainly serving the purpose of contrasting the advantages of an atomistic analysis of this system, compared to the holistic approach required by Estonian.

By way of illustration, Figure 8 provides a partial description of parallel exponence.

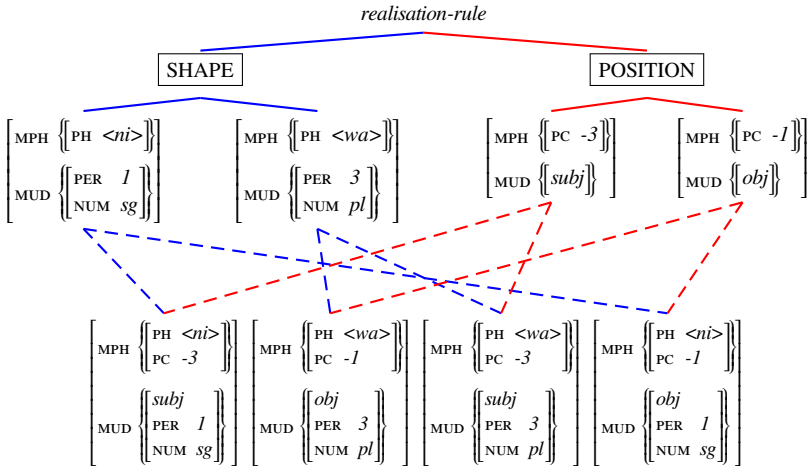

Figure 8: Rule type hierarchy for Swahili parallel position classes (Crysmann and Bonami, 2016)

Types in the SHAPE dimension on the left pair shapes (phonology of morphs) with person, number and gender properties, whereas the two types in the POSITION dimension specify position class information for subject vs. object agreement. Systematic intersection of leaf types (one each from either dimension) yields the fully expanded set of rules, effectively distributing positional marking of grammatical function over the exponents. In order to derive a morphologically wellformed, fully inflected word, every element of the morphological property set must be realised by some realisation rule, i.e. each member of the property set must be "consumed" by some MUD element of exactly one rule. As a result, rule type hierarchies constitute a repository of recipes that can be referred to more than once, e.g. for subject and object agreement.

4.2 Estonian

As we have seen in the discussion in section 2.1, association between form and function cannot be easily broken down to any specific exponents, but generally has to take into consideration combinations of stem alternation, theme vowels, and suffixation. I.e. it is only the specific combination of these marking devices that identifies any specific cell in the paradigm. Thus, rather than organising the hierarchy of realisation rule types in terms of morphosyntactic properties, we shall primarily partition it in terms of marking strategies, identifying three cross-classifying dimensions for stem

selection, theme vowel selection and suffixation, as depicted in Figure 9. In the interest of readability, we represent the overall type hierarchy without the type constraints associated to the nodes. See the sub-hierarchies below for full detail.

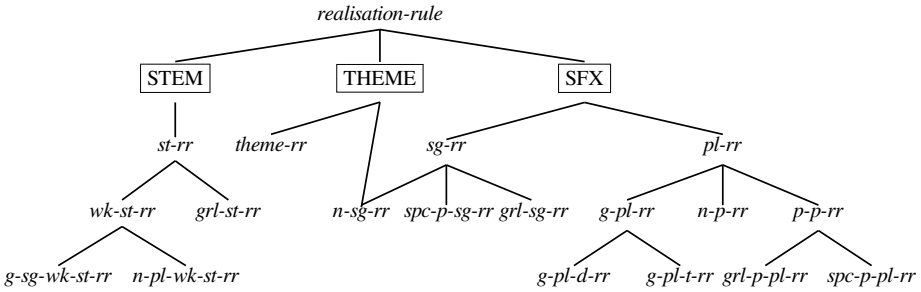

Figure 9: Hierarchy of rule types for Estonian

4.2.1 Suffixation

Probably the most straightforward observation regarding the Estonian data is that inflection in the plural uniformly involves suffixation, whereas in the singular it only sporadically does so. Moreover, plural inflection uniformly features a theme vowel. Taking stem selection into account, plural forms are thus tri-morphic, a generalisation captured by the top-most plural rule type *pl-rr* in Figure 10, which pairs the morphosyntactic property with a constraint on the number and position class indices of the exponents. Subtypes of *pl-rr* then constrain the shape of the exponents by case. In the case of the genitive and partitive, leaf types expand the partial shape descriptions, depending on inflection class.

In the singular, by contrast, we find much more morphotactic variation: while most singular forms are bi-morphic (*grl-sg-rr*), consisting of a stem and a theme vowel only, nominative singular is systematically monomorphic (*n-sg-rr*), featuring a bare stem. Quite idiosyncratic is the marking for partitive singular in the *õpik*-class, which is tri-morphic, involving the suffix *-t*.

As a consequence of this heterogeneity, the type *sg-rr* is largely underspecified. Its subtypes enumerate the three patterns, providing a general bi-morphic pattern (*grl-sg-rr*), which merely specifies morphotactics, a monomorphic pattern for the nominative (*n-sg-rr*), and the exceptional pattern for the partitive *õpik*-class. Note that Panini's Principle will force the use of the two more specific patterns where appropriate, owing to the fact that the description of MUD in *grl-sg-rr* unilaterally subsumes those in either *n-sg-rr* or *spc-p-sg-rr*.

4.2.2 Theme vowel selection

We have so far assumed without further discussion that inflection class information is represented as part of the morphosyntactic property set. Indeed, being lexemic in nature, this information is best tied to the equally lexemic specification of stem alternants. Since inflection class not only governs allomorphic alternation of inflection markers, but also systematically determines the shape of theme vowel, we represent

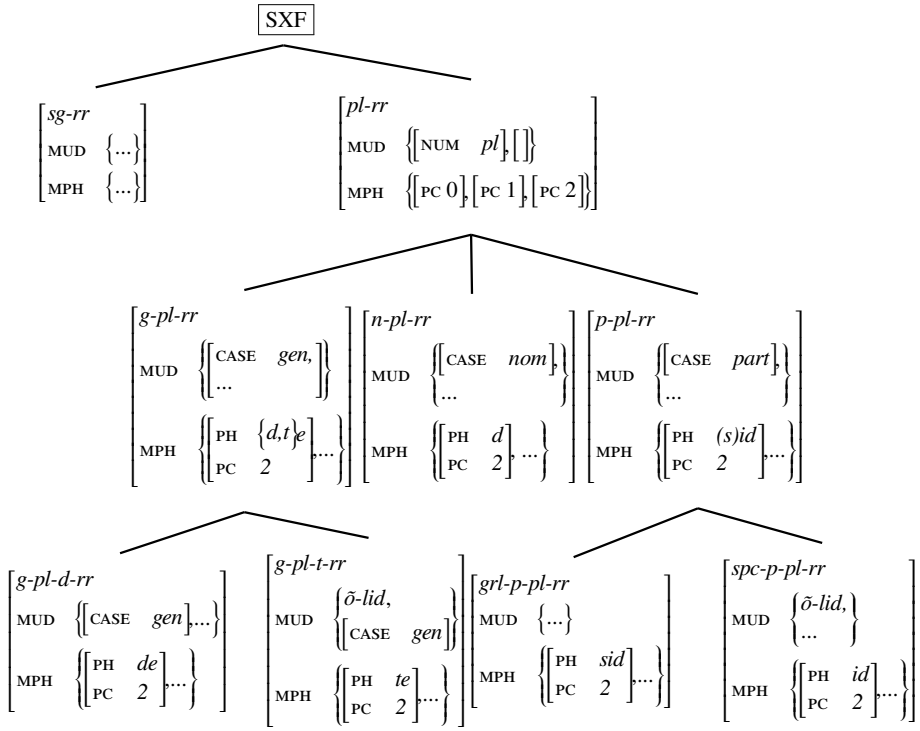

Figure 10: Sub-hierarchy of suffixation rule types for Estonian (plural)

Estonian inflection classes by means of a hierarchy of typed feature structures, as shown in Figure 12.

While every *lid* (=lexemic identity) has a ST(EM) value and a theme vowel specification as appropriate features, subtypes of *lid* determine the exact nature of that vowel. Nouns of class *n-lid* (e.g. *nokk*) display an alternation between a strong stem and an alternate weak stem. Therefore, we declare this type as having an additional appropriate feature WK-ST, to host the specification of the alternate weak stem.

The standard theme selectional rule (*theme-rr*) simply targets the TH feature of the *lid* and inserts its value as the phonology of a morph in position 1. Note that this theme selection rule is very similar to stem selection rules, which also typically just pick up some lexemically specified phonology and insert it in a morphotactic position.

The reason why we use a special rule to insert the theme vowel, rather than making it a property of the stem's phonology is two-fold: first, its form is highly systematic, and second, the presence vs. absence of the theme vowel helps to mark an inflectional contrast. While generally there is an overt theme vowel, the nominative singular of all three paradigms is always a bare stem, devoid of both inflectional suffixes and the theme vowel. The rule type *n-sg-rr* captures this case, restricting the MPH set to be monomorphic (=bare stem). Note again that this rule type will preempt by virtue of Panini's Principle the use of the general *theme-rr*, due to the fact that the latter properly subsumes the former in its MUD description.

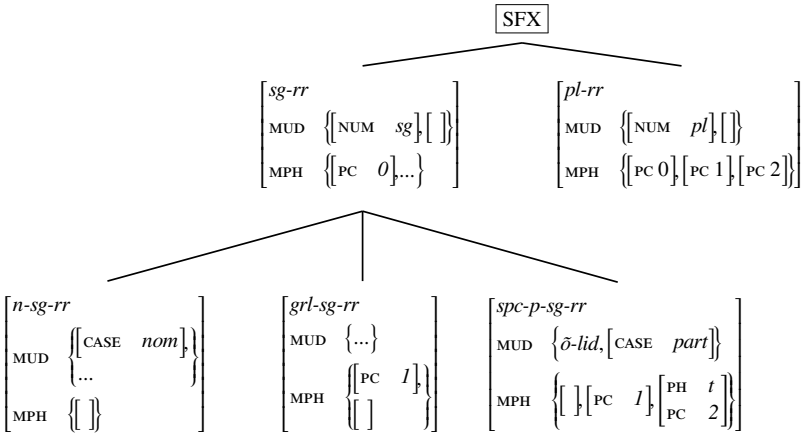

Figure 11: Sub-hierarchy of suffixation rule types for Estonian (singular)

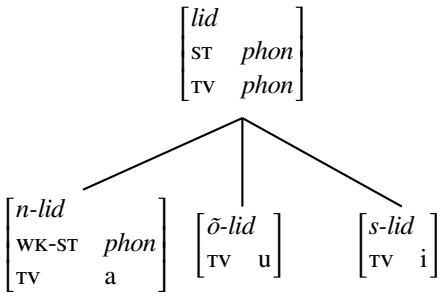

Figure 12: Hierarchy of *lid* types for Estonian

4.2.3 Stem selection

The last piece of inflection we need to address is stem selection: as depicted in Figure 14, the major split in the stem selection rules concerns the generic rule type *grl-st-rr* vs. the subtree under *wk-st-rr*.

While the general stem selection *grl-st-rr* picks out the ST feature and inserts it as a morph in position 0, its sister type *wk-st-rr* selects the alternate weak stem instead, restricting application to *nokk*-type nouns (*n-lid*). The two subtypes of *wk-st-rr* further restrict the applicability of this rule by means of enumerating the paradigm cells to which this alternate stem selection rule can be applied. Since Paninian competition is defined over leaf types (see Crysmann and Bonami, 2016; Crysmann, 2017),[4] application of the general stem selection rule is only preempted in two cells of *nokk*-class nouns, i.e. the nominative plural and the genitive singular. Thus, the general rule takes care not only of *õpik*-class and *seminar*-class nouns, but it also fills most of the cells of *nokk*-class nouns, thereby acting as a true default.

[4]More precisely, Panini's principle regulates competition between rules. Since IbM builds on Online Type Construction (Koenig and Jurafsky, 1994), rule instances (as opposed to types) must be maximally specific types w.r.t. all dimensions, i.e. Paninian competition is computed amongst leaf types of the fully expanded type hierarchy (cf. Crysmann, 2003). This distinction, while important in the general case, happens to be immaterial here, so it is sufficient to consider leaf types within each dimension separately.

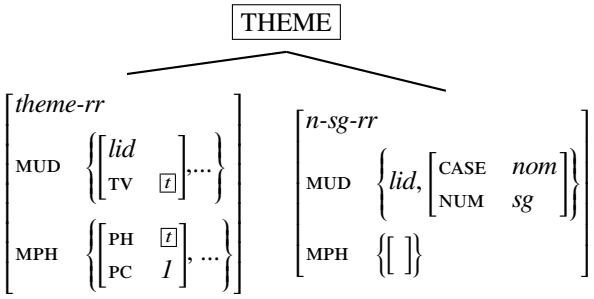

Figure 13: Theme rule type

4.2.4 Putting things together

We have argued that the system of Estonian core cases calls for a holistic approach and we have suggested that IbM is capable to do that, while at the same time its system of typed feature structure inheritance, and in particular Koenig/Jurafsky-style dynamic cross-classification will permit to squeeze out partial generalisations. So far, we have focussed on the latter aspect, laying out the organisation of partial description by means of rule types organised into the three dimension for stem selection (STEM), theme vowel selection (THEME), and suffixation (SFX). We shall now show how the constraints in the three dimensions interact to derive some interesting cases.

To start with, let us consider some tri-morphic plural, e.g. the nominative plural of *nokk*. Given the type hierarchy of rule types in Figure 9, any well-formed inflectional rule needs to inherit from exactly one leaf type in each of the three dimensions, as dictated by Online Type Construction (Koenig and Jurafsky, 1994). The inflectional rule suitable to derive this cell can be inferred by means of unifying the types *n-pl-rr* (from SFX), *theme-rr* (THEME), and *n-pl-wk-st-rr* (from STEM), yielding the fully expanded rule in (3) deriving *nokad*.

(3) *theme-rr* & *n-p-rr* & *n-pl-wk-sg-rr* ≡

$$\begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \textit{n-lid} & \\ \text{WK-ST} & \boxed{s} \\ \text{TH} & \boxed{t} \end{bmatrix}, \begin{bmatrix} \text{CASE} & \textit{nom} \\ \text{NUM} & \textit{pl} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \boxed{s} \\ \text{PC} & 0 \end{bmatrix}, \begin{bmatrix} \text{PH} & \boxed{t} \\ \text{PC} & 1 \end{bmatrix}, \begin{bmatrix} \text{PH} & d \\ \text{PC} & 2 \end{bmatrix} \right\} \end{bmatrix}$$

Intersection of e.g. the genitive plural rule type *g-pl-d-rr* with THEME and STEM types will only yield successful unification with *theme-rr* and *grl-st-rr*, deriving e.g. *nokkade* and *seminaride*, i.e. any instance where the standard stem is selected. The expanded rule is given in (4).

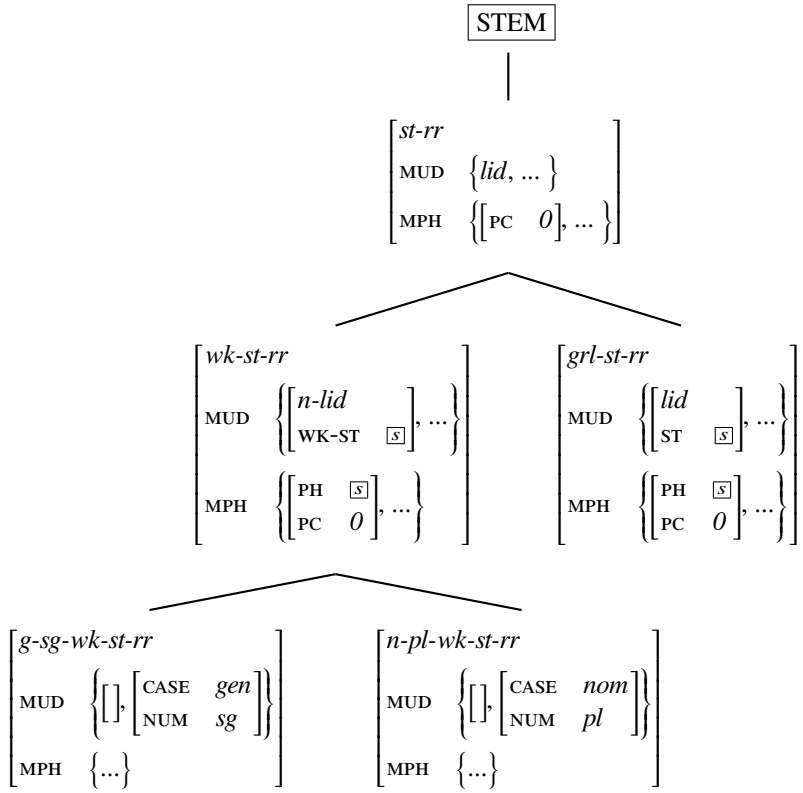

Figure 14: Hierarchy of stem selection rule types for Estonian

$$\text{(4)}\quad \textit{theme-rr} \;\&\; \textit{grl-pl-d-rr} \;\&\; \textit{grl-st-rr} \equiv \begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \text{ST} & \boxed{s} \\ \text{TH} & \boxed{t} \end{bmatrix}, \begin{bmatrix} \text{CASE} & \textit{gen} \\ \text{NUM} & \textit{pl} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \boxed{s} \\ \text{PC} & 0 \end{bmatrix}, \begin{bmatrix} \text{PH} & \boxed{t} \\ \text{PC} & 1 \end{bmatrix}, \begin{bmatrix} \text{PH} & \textit{de} \\ \text{PC} & 2 \end{bmatrix} \right\} \end{bmatrix}$$

Turning to singular patterns, let us consider the partitive, as witnessed by *nokka*, *õpikut* and *seminari*. Intersection of leaf types yields two solutions compatible with the partitive, both of which inherit from the general theme and stem selection rule types. The variation lies with the singular SFX rules: choosing the more general type *grl-sg-rr* yields the expanded bi-morphic singular rule in (5) for e.g. *nokka* and *seminari*, whereas choice of *spc-sg-rr* yields the class-specific tri-morphic rule for the partitive singular *õpikut*, as given in (6).

$$\text{(5)}\quad \textit{theme-rr} \;\&\; \textit{grl-sg-rr} \;\&\; \textit{grl-st-rr} \equiv \begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \text{ST} & \boxed{s} \\ \text{TH} & \boxed{t} \end{bmatrix}, \begin{bmatrix} \text{NUM} & \textit{sg} \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \boxed{s} \\ \text{PC} & 0 \end{bmatrix}, \begin{bmatrix} \text{PH} & \boxed{t} \\ \text{PC} & 1 \end{bmatrix} \right\} \end{bmatrix}$$

(6) *theme-rr* & *spc-sg-rr* & *grl-st-rr* ≡

$$\begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \tilde{o}\text{-}lid & \\ \text{ST} & \boxed{s} \\ \text{TH} & \boxed{t} \end{bmatrix}, \begin{bmatrix} \text{CASE} & part \\ \text{NUM} & sg \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \boxed{s} \\ \text{PC} & 0 \end{bmatrix}, \begin{bmatrix} \text{PH} & \boxed{t} \\ \text{PC} & 1 \end{bmatrix}, \begin{bmatrix} \text{PH} & t \\ \text{PC} & 2 \end{bmatrix} \right\} \end{bmatrix}$$

Finally, we shall look at the nominative singular (*nokk, õpik, seminar*). Choosing a leaf type from each dimension, we get the result in (7), i.e. intersection of the general stem selection rule type with *n-sg-rr*, a rule type that is linked to both the THEME and the SFX dimensions, thereby trivially satisfying Online Type construction with respect to these dimensions. them.

(7) *n-sg-rr* & *grl-st-rr* ≡

$$\begin{bmatrix} \text{MUD} & \left\{ \begin{bmatrix} \text{ST} & \boxed{s} \\ \text{TH} & phon \end{bmatrix}, \begin{bmatrix} \text{CASE} & nom \\ \text{NUM} & sg \end{bmatrix} \right\} \\ \text{MPH} & \left\{ \begin{bmatrix} \text{PH} & \boxed{s} \\ \text{PC} & 0 \end{bmatrix} \right\} \end{bmatrix}$$

One may wonder what the result would be, if we had chosen instead the unification of *grl-st-rr* with the general theme (*theme-rr*) and singular suffixation (*grl-sg-rr*) rule types, which is indeed the description given in (5). In fact, this description per se happens to be compatible with the nominative singular. However, since (5) is in Paninian competition with the more specific rule in (7), its application will be preempted.[5]

Having seen how the proposed IbM theory of Estonian derives specific patterns, is is worth taking stock of what has been achieved: the approach we have taken is obviously holistic in that stem selection, theme selection and suffix selection recipes can only jointly pair function and form. The holistic nature of Estonian core cases is also revealed by the fact that the top-down organisation of the hierarchy is more form-driven, than content-driven. And we shall not forget that Paninian competition plays a crucial role in fixing specific form-function correspondences based on paradigmatic contrast, which must count as a systemic property as well. Despite all that it is clear that even seemingly opaque systems can be meaningfully decomposed in a theory that derives realisation rules from underspecified partial descriptions organised in a hierarchy of typed feature structures.

5 Conclusion

In this paper we have shown how Information-based Morphology can accomodate inflection systems lying at extreme ends of a gradient of morphological opacity by deploying either atomistic or holistic analyses.

[5] In IbM, preemption is performed by a closure operation on leaf types, enriching the more general description with the complement of the specific description. See Crysmann and Bonami (2016) and Crysmann (2017) for details.

The crucial contrast between the two proposed analyses is that rules for Swahili express 1 : 1 relations between morphs and partial property sets, while rules for Estonian express globally a word-level *m*:*n* relation between a sequence of exponents and a property set. We contend that these are necessary features of adequate analyses of these two systems. In the case of Swahili, no word-level constraint can capture the fact that the same affixes play double duty as subject and object markers — hence the word-level analysis proposed by Koenig (1999) is sub-optimal, and abstraction of realisation rules of sub-word relevance is crucial. At the other end of the spectrum, in Estonian, simultaneous introduction of all morphs is the formal rendering of the idea of 'gestalt exponence' (Blevins et al., 2016) — words are segmentable, but content is attributed to combinations of morphs rather than individual morphs. Note that adopting such a 'gestalt' view in no way precludes identifying generalisations across words where they are relevant. For instance, the fact that plural marking is always manifested at the right edge of the word in the Estonian dataset is captured by a general type linking the expression of plural to position 2 without constraining its shape. In this sense the approach is close in spirit to Berkeley Construction Grammar, where generalisations hold at variable levels of granularity.

Although these two analyses purposefully showcase (sub)systems that constitute polar opposites, nothing in the formal setup we assume entails that a system may contain only word-level or only morph-level rules: indeed, outside the domain of core cases, Finno-Ugric Estonian is rather of the agglutinative type. This opens up the possibility of capturing appropriately diverse combinations of opaque and transparent corners of an inflection systems, and hence helps provide a formally sound typological characterisation of exponence systems, rather than assume a 'one size fits all' view of morphological modeling that masks diversity. In particular, it is notable that the framework allows for the definition of a classical morpheme — a 1 : 1 association between a morph and a property set — where it is useful, without forcing its universal adoption, even in the analysis of the same system. In contrast to morpheme-based theories, this 1 : 1 relation does not enjoy any special formal status compared to *m* : *n*: it just happens to have a very simple and straightforward specification. Likewise, fully holistic analyses can and should be used when appropriate, but this does not preclude the explicit formulation of partial generalizations on the distribution of exponents.

It is worth noting that the ability to address the whole spectrum of morphological opacity is intimately tied to two central design features of Information-based Morphology: the recognition of positionally-indexed morphs, and the use of monotonous multiple inheritance hierarchies of rules of exponence. These design properties constitute on of the central innovations of IbM, and set it apart both from previous HPSG approaches to inflection and from other inferential-realisational frameworks. Although they were initially introduced to address the conceptually separate issue of variable morphotactics, these two ingredients are key to allowing a view of exponence as a partially underspecified description of *m* : *n* relations between form and content, within which atomistic and holistic views of the world turn out to be compatible with each other.

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Yucatecan Control and Lexical Categories in SBCG

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Abstract

This paper explores the conundrum posed by two different control constructions in Yucatec Maya, a Mayan language spoken by around 800,000 speakers in the Yucatán Peninsula and northern Belize. Basic syntactic structure of the language is introduced, and a general SBCG treatment of control in YM is presented, alongside with an example of motion verbs as control matrices. The unruly case of intransitive subjunctive control, where the controllee appears with an unexpected status (incompletive) and without set-A morphology, is discussed and a proposal to treat it as nominalization is evaluated. The nominalization proposal is rejected based on the following grounds: (1) nominalization tends to attract definitive morphology, which is absent from intransitive subjunctive control constructions, (2) nominalization does not truly explain the lack of set-A morphology if one desires to provide a unified account of set-A morphemes, (3) verbs bereft of otherwise expected set-A morphemes have an independent motivation in the form of agent focus constructions.

1 Introduction

Yucatec Maya has two different types of control construction, in this paper referred to as *incompletive control* and *subjunctive control*, which differ in status marking on the embedded verb. Most generally, *control* is a construction where the understood subject of a given verb is determined by some other expression in the sentence. *Status* is a traditional term employed in Mayanist literature for verbal suffixes whose choice is subject to the aspect, mood and transitivity of the verb.[1]

(1) In k'àat in ts'íib-t-∅-∅ le kàarta-o'.
A1SG wish A1SG write-APP-SBJ-B3 DEF letter-D2
"I want to write the letter." (lit. "To write the letter is my wish.")

(2) Táan in bin-∅ in ts'íib-t-ik-∅ kàarta-o'ob.
PROG A1SG going-INC A1SG write-APP-INC-B3 letter-B3PL
"I am going (around while) writing letters."

Here, sentence (1) demonstrates a construction where the embedded verb *ts'íibt* takes on subjunctive status.[2] Subjunctive status is required by desiderative verbs as the above *k'àat*, motion verbs and verbs such as "learn," "know" or "fear."

[1] Abbreviations for glosses: 1: first person, 2: second person, 3: third person, A: set A, APP: applicative voice, B: set B, CAUS: causative voice, CPL: completive status, D2: distal clitic, DEF: definite article, IMP: imperfective AM marker, INC: incompletive status, ONGL: onglide, PL: plural, PREP: preposition, PROG: progressive AM marker, PRV: perfective AM marker, REC: recent past AM marker, REL: relational, SBJ: subjunctive status, SG: singular, TERM: terminative AM marker, TOP: topic.

[2] In this case, the subjunctive status is morphologically empty, but that does not have to be the case. Status morphology is really quite complex and sensitive to voice, transitivity and type of verb. Table 1, adapted from AnderBois and Armstrong (unpublished manuscript), gives status suffixes for active verbs.

	TRANSITIVE	INTRANSITIVE
INC	. . . -*ik*	. . . -V*l*, -∅
SBJ	. . . -*ej*, . . . -∅	. . . -V*k*, . . . -*ak*
CPL	. . . -*aj*	. . . -*aj*, . . . -∅

Table 1: Status morphology

Sentence (2) demonstrates an incompletive control construction where the verb is explicitly marked with the suffix *-ik*. Other matrix clauses selecting for incompletive complements include motion verbs and verbs such as "begin," "remind" or "remember." The meaning of motion verb control differs depending on the status: the subjunctive status indicates a purpose while the incompletive indicates simultaneity (AnderBois & Armstrong, unpublished). Notice the overt agreement between the matrix clause and the embedded clause, both expressly marked for 1st person singular in (1) and in (2).

The main preoccupation of this paper will be understanding and accounting for an unexpected property of subjunctive control. While incompletive control easily generalizes from transitive verbs to intransitive ones, subjunctive control is not as well-behaved. In fact, the most obvious approach to generating the subjunctive control with intransitive verbs (i.e. one employing intransitive verbs with subjunctive morphology) is ungrammatical (3). The proper intransitive equivalent to (1) is expressed via an *incompletive* verb stripped of the appropriate agreement marking, discussed later in the paper.

(3) *J tàal-∅-en wen-ek-en.
PRV come-CPL-B1SG sleep-SBJ-B1SG
"I came to sleep."

The relevant data and observations will come primarily from AnderBois and Armstrong (unpublished manuscript, henceforth A&A), but I will deviate in my analysis of intransitive subjunctive control. To formalize the relevant facts about the language, I will avail myself of Sign Based Construction Grammar (henceforth SBCG), a framework in the spirit of and incorporating insights from both Berkley Construction Grammar and Head Driven Phrase Construction Grammar (Boas & Sag, 2012). In this way, I will try to show that SBCG's elasticity allows for a simpler analysis which eschews artificial, from a language internal perspective, divisions.

1.1 Sentence Structure

Yucatec Maya is head-marking language. Its word order is traditionally classified as underlyingly VOS.[3] That can be most easily observed in sentences with stative predicates (predicative nouns and adjectives).

(4) Maks-∅ in k'àaba.
Maks-B3SG A1 name
"My name is Maks."

(5) Polok-∅ le wakax-o'.
fat-B3SG DEF cow-D2
"The cow is fat."

Clauses with active verbs, however, are more syntactically complex. As shown in (1) and (2), such sentences begin with one of multiple words indicating aspectual or modal information, known in the Mayanist literature as Aspect-Mood markers (AM markers). The ones introduced so far include PROG "progressive" and PRV "perfective." Their presence is not generally considered to be a counterexample to the posited VOS word order. Adapting insights from Bohnemeyer (2002), I analyze AM markers as stative predicates and VP phrases as their arguments. The meaning of PROG can be thus approximated as "is ongoing" and the meaning of PRV as "has happened." Sentence (6) could be then thought of as "your watching of a cow is ongoing," instead of its typical translation.[4] (Notice the similarities between the categories of non-predicative nouns and active verbs under this analysis.)

(6) Tàan a w-il-ik-∅ wakax.
PROG A2 ONGL-watch-INC-B3 cow
"You are watching a cow."

	SINGULAR	PLURAL
1ST	. . . *-en*	. . . *-o'on*
2ND	. . . *-ech*	. . . *-e'ex*
3RD	. . . *-∅*	. . . *-o'ob*

Table 2: Set-B morphology

Morphemes glossed with A and B need to be noted here, too. The glosses stand for *set-A* and *set-B*, respectively, items of traditional terminology in Mayanist literature used for two sets of agreement morphemes. Set-A, broadly understood as

[3] For alternative approaches positing SVO as underlying, see Durbin and Ojeda (1978), and Gutiérrez-Bravo and Fronte y Madera (2010).

[4] While common (cf. Bohnemeyer (2002) and Armstrong (2009)), this analysis is by no means uncontroversial. The other school of though analyzes the AM marker, the verb, and all the intervening morphemes as one polysynthetic-style verb, e.g. AnderBois & Armstrong (unpublished).

ergative-genitive, cross-references subjects of transitive verbs, subjects of incompletive intransitive verbs and possessors of nouns. Set-B, broadly understood as absolutive, cross-references subjects of stative predicates (nouns and adjectives), objects of transitive verbs, and subjects of intransitive verbs marked for subjunctive or completive status.[5] Tables 2 and 3 have been adapted from Lehmann (2002).

Set-B morphemes are typically considered to be clitics in transformational literature (Grinevald & Peake, 2012). Adapting HPSG-esque approaches to clitics, such as the one espoused in Miller and Sag (1995), I recast them simply as inflectional morphology (Miller & Sag, 1995).

	SINGULAR	PLURAL
1ST	*in (w-)...*	*k ...* *in (w-)...-o'on*
2ND	*a (w-)...*	*a (w-)...-e'ex*
3RD	*u (y-)...*	*u (y-)...-o'ob*

Table 3: Set-A morphology

Singular set-A morphemes are traditionally considered to be prefixes. I have decided to split them (in agreement with practical orthography) into separate lexical items and prefixes.[6] Similarly, I analyze plural set-A as a combination of separate lexical items and circumfixes, where the left-hand side of the circumfix is an onglide (attached to the stem only if it begins with a vowel),[7] while its right-hand side is essentially identical to set-B suffixes.[8]

Arguments of the verb (normally following it) are frequently dropped due to a robust head-marking system. First and second person arguments are unambiguous while third person arguments are usually specified via topicalization or simply understood from the context. For the sake of exposition, this paper will deal mostly with sentences where verbal arguments are not overtly expressed.

[5]Labels *set-A* and *set-B* have been used, because *ergative* and *absolutive* do not quite reflect the exact nature of Yucatecan agreement morphemes For example, in the incompletive status, *set-A* reflects *nominative* and *set-B – accusative*.

[6]The strongest motivation for this comes from a desire to unify the treatment of verbal and nominal usages of set-A, which, unfortunately, cannot be explicitly discussed here.

[7]Certain alienable nouns might resist an oglide (Lehmann, 2002).

[8]That is an interesting patten, indicative of a historical reanalysis. It is still in progress in the dialects where *k ...* is being replaced with *in (w)-...-o'on* by analogy with the rest of the paradigm (Lehmann, 2002).

1.2 Status Markers

Main status markers are: *completive*, *incompletive* and *subjunctive*, the first one having a considerably more restricted distribution.[9] Despite their labels, evocative of aspectual information, their semantic import is frequently negligible.[10] In most constructions, the status of the verb is strictly governed by an AM marker, so its meaning, whatever it be, is subsumed under the AM marker's much stronger semantics.

(7) Táan in páan-ik-∅ u y-okom-al.
PROG A1SG dig.out-INC-B3SG A3 ONGL-pillar-REL
"I am digging out (holes) for the pillars." (Bohnemeyer, 2002, E447)

The presence of the status suffix in (7) is, in a way, semantically redundant, since the progressive aspect marker already has an "incompletive" sense. Other times, the "meaning" of the status suffix is entirely contradicted by the AM marker.

(8) Ts'o'ok a took-ik-en ti' le kim-il-o'.
TERM A2 wrest-INC-B1SG PREP DEF die-NML-D2.
"You have wrested me from death."
(AnderBois & Armstrong, unpublished, 73a)

In (8), the terminative AM marker *ts'o'ok* does not conflict with the incompletive status. To the contrary, it demands it and overrides its meaning.

Consider the interactions between AM markers, status and morphosyntactic alignment:

(9) Ts'o'ok [in na'ak-s-ik-ech].
TERM A1SG ascend-CAUS-INC-B2SG
"I finished lifting you up." (lit. "I finished making you go up.")
(AnderBois & Armstrong, unpublished)

(10) Ts'o'ok [in na'ak-al].
TERM A1SG ascend-INC
"I finished going up." (AnderBois & Armstrong, unpublished)

(11) Sáam [in na'ak-s-∅-ech].
REC A1SG ascend-CAUS-SBJ-B2SG
"I lifted you up a while ago." (lit. "I made you go up a while ago.")
(AnderBois & Armstrong, unpublished)

[9]There is also the *extrafocal* status, a vestige of the old morphological paradigm for marking certain focal constructions. In modern YM, focus is realized primarily through syntactic (morphologically simpler) means and the extrafocal status is retained only in constructions of manner focus (in certain dialects, also temporal focus) (Bohnemeyer, 2002).

[10]While there are good—historical and synchronic—explanations for those names (for example, subjunctive appears in subordinate clauses with irrealis semantics), they ought not be conflated with the Europeanist understanding of corresponding aspects (Bohnemeyer, 2002).

(12) Sáam [na'ak-ak-en].
REC ascend-SBJ-B1SG
"I went up a while ago." (AnderBois & Armstrong, unpublished)

In both transitive sentences (9, 11), set-A marking corresponds to the agent and set-B to the patient. In the incompletive intransitive example (10), set-A corresponds to the subject, while set-B is lacking,[11] which results from the nominative-accusative alignment of the incompletive status. The subjunctive intransitive sentence (12), on the other hand, displays no set-A and the subject is marked by set-B, as expected due to its ergative-absolutive nature.

2 Control Constructions

As has been hinted at in in Section 1, only three of the VPs[12] presented in (9-12) (delimited by brackets) are suitable controllees. The relevant generalization which captures this observation is that for a VP to be suitable controllee, its needs set-A agreement. This notion can be formalized by adding *control-lexeme* to the hierarchy of lexemes with the following restrictions:

$$\textit{control-lexeme} \Rightarrow \left[\text{SYN} \quad \left[\text{ARG-ST} \quad \left\langle \ldots \text{ /VP}\left[\text{AGR-A} \quad \textit{agr-cat}\right] \right\rangle\right]\right]$$

Figure 1: *control-lexeme*

The above feature structure states simply that the set-A agreement (AGR-A) of the last member of the lexeme's ARGUMENT-STRUCTURE (ARG-ST) list is supposed to be *agr-cat*, as opposed to *none*. That excludes the subjunctive intransitive, exactly that member of the valence-status paradigm which does not employ set-A marking (cf. Table 4).

	INC	SBJ
TRNS	✓	✓
INTR	✓	✗

Table 4: Presence of Set-A morphology

The ARG-ST corresponds to the "Accessibility Hierarchy" of (Keenan & Comrie, 1977). Its first member corresponds to the subject, second to the direct object, third to the indirect object, and so on. The order of elements is based on the universally observed principles pertaining to argument extractions and relativization, and

[11] Notice the different between a lacking set-B in 10 and zero-marking set-B in (9). The difference is theoretical, but significant in other parts of the grammar.

[12] The abbreviation VP is used here to refer to Yucatec Maya-style VPs. That is: the verb with with all its arguments, but excluding the AM marker.

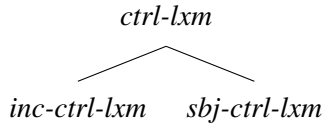

Figure 2: *control-lexeme* hierarchy

does *not* correspond to a particular language's basic word order. In case of Yucatec Maya, the word order can differ quite substantially. That is handled by Argument Realization Principle and linearization constraints, none of which can be discussed here for space considerations (Reape, 1994).

Now, *control-lexeme* bifurcates further into *incompletive-control-lexeme* and *subjunctive-control-lexeme*, as illustrated by Figure 2. To account for the former is easy enough:

$$\textit{incompletive-control-lexeme} \Rightarrow \left[\textsc{syn} \quad \left[\textsc{agr-st} \quad \left\langle \ldots \left[\textsc{status} \quad \textit{inc}\right] \right\rangle\right]\right]$$

Figure 3: *incompletive-control-lexeme*

The only novelty introduced here is the restriction imposed on the STATUS of the controllee, which now—unsurprisingly—is said to be *incompletive*. The matter with arguments of subjunctive control is somewhat more complicated.

As already stated, subjunctive intransitive VPs do not make good controllees. But language is not helpless; when intransitives are involved, subjunctive control semantics are expressed through other means. That is, the regularity of the paradigm is broken as incompletive "overrides" subjunctive. Consider the following, perhaps somewhat pragmatically awkward, sentences:

(13) J tàal-∅-en [in na'ak-s-ik-ech].
PRV come-CPL-B1SG A1SG ascend-CAUS-INC-B2SG
"I came (while) lifting you up."

(14) J tàal-∅-en [in na'ak-al].
PRV come-CPL-B1SG A1SG ascend-INC
"I came (while) ascending."

(15) J tàal-∅-en [in na'ak-s-∅-ech].
PRV come-CPL-B1SG A1SG ascend-CAUS-SBJ-B2SG
"I came to lift you up."

(16) *J tàal-∅-en [na'ak-ak-en].
PRV come-CPL-B1SG ascend-SBJ-B1SG
intended: "I came to ascend."

(17) J tàal-∅-en [na'ak-al].
PRV come-CPL-B1SG ascend-INC
"I came to ascend."

Motion verbs were used, because only they can participate both in subjunctive and incompletive control constructions. Incompletive controllees have manner readings (13-14), while subjunctive ones are motion-*cum*-purpose (15). The intended meaning of the ungrammatical (16) can be expressed with incompletive, as exemplified by (17). Yet, the most surprising feature of Yucatecan subjunctive control is the fact that the incompletive verbs appear in those situations without set-A morphology. Conspicuously, the morphological change does not result in a semantic one—the undergoer of "ascending" is still the speaker. This is even more clear in an example cited by A&A:

(18) In k'áat xook-∅.
A1SG wish study-INC
"I want to study." (AnderBois & Armstrong, unpublished, 39)

(18) has only the listed meaning and it cannot mean "I want studying" or "I want for studying to occur." That indicates the semantics associated with set-A are still present, even though it is not overtly expressed. In transformation-based framework, that is typically viewed as deletion under the identity with a preceding morpheme (Bohnemeyer, 2002). (Notice the identity has to be loosely defined. In (17), for example, the identity pertains only to ϕ-features, since the matching morpheme is set-B.) Here, the same goal is achieved by splitting set-A into two separate features: trilean SET-A,[13] indicating whether the phase has combined or will combine with a set-A morpheme, and AGR-A, which denotes the agreement features of the set-A morpheme. (Correspondingly, AGR-B contains contains information about the agreement of set-B morphology.)

From the featural perspective, Yucatecan subjunctive control has an essentially disjunctive character. Its arguments can be headed by one of two verb types:

$$\textit{tr-sbj-controllee-v} \Rightarrow \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{SET-A} & + \\ \text{ARG-B} & \textit{agr-cat} \\ \text{STATUS} & \textit{sbj} \end{bmatrix} \end{bmatrix}$$

Figure 4: *transitive-subjunctive-controllee-verb*

[13]The reasons for using a trilean, rather than boolean, value will not be discussed here at length, but let it be known it is motivated mostly by an attempt to make sure verbs combine with their set-A morphemes before they combine with their arguments. That order is motivated by semantic considerations as well as the fact it is traditionally takes to be part of verbal inflectional morphology.

$$\textit{intr-sbj-controllee-v} \Rightarrow \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{SET-A} & 0 \\ \text{AGR-B} & \textit{none} \\ \text{STATUS} & \textit{inc} \end{bmatrix} \end{bmatrix}$$

Figure 5: *intransitive-subjunctive-controllee-verb*

The first one, *transitive-subjunctive-con-trollee-verb*, has combined with a set-A marker (indicated by [SET-A +]) and is, as its name suggests, subjunctive. Its transitivity is guaranteed by requiring that ARG-B also be *agr-cat* (only transitive verbs have both set-A and set-B agreement). The second one, *intransitive-subjunctive-controllee-verb*, has not and will not combine with a set-A marker ([SET-A 0]) and is—yes, you guessed it—incompletive. [AGR-B *none*] ensures it is intransitive. Both types are subtypes of *verb*, and even more immediately of *subjunctive-controllee-verb*. The relevant part of the hierarchy is shown in Figure 6.

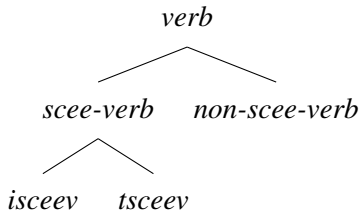

Figure 6: *verb* hierarchy

It is now clear how to notate the appropriate restrictions on the subjunctive controllee. (The abbreviation *scee* stands for *subjunctive-controllee*.)

$$\textit{subjunctive-control-lexeme} \Rightarrow \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{AGR-ST} & \left\langle \ldots \begin{bmatrix} \textit{scee-verb} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Figure 7: *subjunctive-control-lexeme*

And all that is left is to establish which agreement features are shared among which arguments. That property depends on the particular lexeme and requires splitting *control-lexeme* into even more subtypes. Here, we will look only at *control-motion-lexeme*. Set-B agreement of its first argument (its subject) is identified with set-A agreement of the second argument (the controllee).[14]

The agreement of nouns and pronouns falls into the category of AGR-B. Consider (13) again. The first argument of *tàal-∅-en* is the unexpressed pronoun *tèen*

[14]In fact, motions verbs should probably be though to have three arguments, one of them corresponding to the direction. The feature structure has been simplified here for the purpose of exposition.

$$\textit{control-motion-verb-lexeme} \Rightarrow \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{ARG-ST} & \left\langle \begin{bmatrix} \text{AGR-B} & \boxed{1} \end{bmatrix}, \begin{bmatrix} \text{AGR-A} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Figure 8: *control-motion-verb-lexeme*

("I" or "me") lexically specified as [AGR-B *1sg*]. Its second argument, *in na'ak-s-ik-ech*, is obviously [AGR-A *1sg*], which adheres to the above specification.

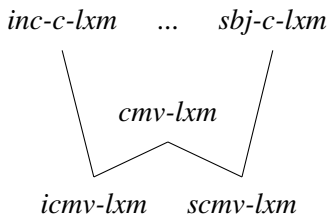

Figure 9: *control-motion-verb-lexeme* hierarchy

Control-motion-verb-lexeme (cmv-lxm) can take either incompletive or subjunctive control arguments, which motivates its split into two further subtypes: *subjunctive-control-motion-verb-lexeme (scmv-lxm)* and *incompletive-control-motion-verb-lexeme (icmv-lxm).* Those lexemes inherit from *subjunctive-control-lexeme (sbj-c-lxm)* and *incompletive-control-lexeme (inc-c-lxm)*, respectively, which means they need not be specified any further; the inheritance hierarchy ensures each verb will take only the right type of complements. Since motion verbs can generally take subjunctive or incompletive controllees, they are underspecified at the level of the lexicon. Thus, the lexical entry specifying syntactic nature of a verb like *tàal* can be as minimal as the one displayed below. As all non-maximal types are quired to resolve a maximal type, *cmv-lxm* eventually resolves to *scmv-lxm* or *icmv-lxm*.

$$\begin{bmatrix} \textit{cmv-lxm} & \\ \text{FORM} & \text{<tàal>} \end{bmatrix}$$

Figure 10: Lexeme *tàal*

3 Discussion

Many of the data points and suggestions for analysis presented in this paper are drawn from AnderBois & Armstrong (unpublished). Their work is in large a reaction to Coon (2013), who argues that all control construction in Ch'ol (a closely related Mayan language) are nominalizations. Space considerations preclude me from reviewing her argument in detail. One of its core aspects relies on observing that the distributions of NPs and VPs in Ch'ol largely overlap. For example, the Ch'ol progressive AM marker can select for NPs, too, which is not the case in Yucatec Maya:

(19) Choñkol-∅ ja'al.
PROG-B3SG rain
"It is raining." (lit. "Rain is happening.")
(AnderBois & Armstrong, unpublished, 15a, Ch'ol)

(20) *Tàan cháak.
PROG rain.
intended: "It is raining."
(AnderBois & Armstrong, unpublished, 15b, Yucatec Maya)

Other facts relevant for Ch'ol control derive then from a number of independently motivated principles. A&A argues, convincingly one must admit, that while Coon's account might be correct for Ch'ol, differences between the two languages make it irrelevant for Yucatec Maya. Nonetheless, they are still willing to entertain the claim that intransitive subjunctive control derives its usual properties from its nominal nature. That, I believe, is incorrect.

An observation crucial for A&A's account is that all major Yucatecan verb classes use the same morphology for nominalizations as they do for incompletive status. Consider one of their examples:

(21) Yaan k'iin-e' le áalkab-∅-o' jach toop-∅.
exists day-TOP DEF run-INC(?)/NML-D2 really hard-B3SG
"Sometimes, running is very difficult."
(AnderBois & Armstrong, unpublished, 70a)

(22) In k'áat áalkab-∅.
A1SG wish run-INC/NML(?)
"I want to run." (AnderBois & Armstrong, unpublished, 70b)

While the cue is truly telling, one must notice the nominalization and incompletive status are not morphologically identical; nominalizations are accompanied by the determiner *le* and a distal clitic (here, a D2). A great deal of nominalizations found in corpora seem to follow this pattern. Whether incompletive forms without determiners are grammatical at all (under the nominal reading) is not really clear. An informant asked for a judgment on (23) (intended to be a clear nominalization yet devoid of definite morphology) agreed it was grammatical but also

noticed it would be most natural when giving advice. That hints at its irrealis, and thus probably verbal, semantics. (For comparison consider English "reading is good" vs "it is good to read.") Little to none is understood about verbal complements without set-A/set-B morphology, but were that interpretation correct, the status of nominalization as necessarily definite would remain unchallenged and a verbal interpretation of intransitive subjunctive control would gain a strong piece of evidence in its favor.

(23) Uts-∅ xook-∅.
good-B3GS study-INC/NML
"It is good to study." / "Studying is good." (?)

On the other hand, when asked to repeat (23), the informant would sometimes utter (24) instead, adding a distal clitic at the end of the clause. The exact distribution of distal clitics in YM is poorly understood, but it is generally agreed that its presence is governed by specific lexical items (Lehmann, 2002). One such item is the determiner *le*, which necessitates a clitic such as *-o'* (D2). Other items, such as the nominal set-A (i.e. set-A in its possessive usage), allow for clitics but do not demand them. The case of (24) is surprising inasmuch as there seem to be no morpheme justifying the presence of *o'*. One possibly explanation is that nominalizations themselves allow for it too, perhaps as a clarification of the nominal nature of ambiguous incompletive morphology. Since incompletive status in subjunctive control constructions does not seem to allow for distal clitics, the above data cast a shadow on the attempts to interpret intransitive subjunctive control as nominalizations.

(24) Uts-∅ xook-∅-o'.
good-B3GS study-INC/NML-D2
"It is good to study." / "Studying is good." (?)

An even graver objection to the nominalization proposal stems from a lack of good reasons to believe intransitive subjunctive control should really lack set-A morphology. As has been mentioned, set-A and set-B are quite indifferent about the category of the head they attach to. Consider the following phrases, where set-A has ergative and possessive interpretations:

(25) in w-il-ik
A1SG ONGL-watch-INC
"I watch" / "my watching"

(26) in wakax
A1SG cow
"my cow"

The ambiguity can be even more radical when set-B is involved. In addition to its verb-restricted usages, noun phrases with suffixed with *-o'ob* can have a predicative and plural readings:

(27) wakax-o'ob
cow-B3SG
"they are cows (a cow)" / "cows"

A&A justify their proposal by considering verbal set-A and set-B as part of inflectional verbal morphology, and thus disidentify it from nominal (e.g. possessive) set morphology.[15] But that division seems more than just a tad artificial. In fact, it is not clear to me if that any such division should really be drawn. First, set-A and set-B are syntactically and morphologically *identical* in their nominal and verbal usages. Since the overlap is complete, it is difficult to relegate it to a historical accident, irrelevant for synchronic analysis. Second, the distribution facts between nominal and verbal set morphology are strikingly parallel. For example, just as there exist verbs that necessitate the set-A morphology (the transitives and incompletive intransitives), so do nouns.[16] Third, it is difficult to draw a clear semantic boundary between the two of them. The following example from Armstrong (2009) is a case in point:

(28) Uts-∅ t-in t'aan in ts'u'uts'-ik-∅ chamal.
good-B3SG PREP-A1SG speech A1SG smoke-INC-B3SG cigarette
"I like smoking cigarettes." (Armstrong, 2009, 36)

Even though the typical translation is as indicated above, it is hard to resist the impression it could be more literally translated as "my smoking of cigarettes is good in my speech," with *ts'u'uts'-ik-∅* "smoking" interpreted in a more nominal fashion and *in* in a possessive one. Examples like that are plentiful—it is enough to recall that all sentences involving AM markers can be interpreted as stative predications over nominals.

Now, that is not to say there is no difference between Yucatecan nouns and verbs. Even though that distinction in Mayan languages is not as fundamental as, let's say, in Indo-European, they constitute two discreet categories; the recurring noun *wakax* "cow" could never be used as an active verb, at least not without undergoing some derivational morphology first. But the examples given here demonstrate quite clearly that this distinction does not translate into a distinction between nominal and verbal set morphology, at least not on syntactic grounds.

[15] verbatim: "If our claim is on the right track that in the above examples the status morphology is actually a realization of n^0 rather than v^0, the absence of agreement is straightforwardly accounted for. Since v^0 is the locus of all agreement in verbs, we don't expect to see Set A or Set B in these examples" (AnderBois & Armstrong, unpublished, p. 32).

[16] The *inalienable* nouns, as Lehmann refers to them, form a large class of YM nouns that require an explicit possessor expressed though set-A morphology. For an extensive description of the possessive phrases, see Lehmann (2002).

If a unified account of two speciously disparate phenomena can be done, it should. In SBCG, that is in fact possible. Set-A is treated as separate words which combine with nouns and verbs, depending on the verb status or nominal subcategory. Set-B is treated as inflectional morphology handled by one function applicable to verbs as well as referential and predicative nouns.

Last but not least, there is an independently motivated reason to allow for verbs bereft of set-A. Such verbs are the cornerstone of agent focus constructions, one of the most studied topics in Mayan syntax and morphology.

(29) K-u w-il-ik-∅ polok wakax Maruch.
IMP-A1SG ONGL-watch-INC-B3SG fat cow Mary
"Mary is watching a fat cow."

(30) Maruch il-ik-∅ polok wakax.
Mary watch-INC-B3SG fat cow
"MARY is watching a fat cow." / "It is Mary who is watching a fat cow."

In essence, the construction is characterized by the fronting of a transitive verb's agent and the removal of an associated AM marker alongside with the set-A morpheme. Even though the quirks of agent focus are very different from subjunctive control, agent focus points at a precedence in Yucatecan grammar of verbs without the otherwise expected set-A. Interestingly, it has been suggested that this way of marking agent focus emerged in Yucatec Maya to disambiguate between agent and patient focus after all morphology associated with agent focus was lost (Norcliffe, 2009a). Were that true, one could look at intransitive subjunctive control in a similar way—here too it is set-A whose presence or lack disambiguates between two otherwise identical constructions.

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An incremental approach to gapping and conjunction reduction

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Abstract

In this paper I present an incremental approach to gapping and conjunction reduction where it is assumed that the first sentence in these constructions is fully parsed before the second sentence with the elided verb is parsed. I will show that the two phenomena can be given a uniform analysis by letting the construction type of the first conjunct be carried over to the second conjunct. This construction type imposes constraints on the arguments that the second conjunct can have. The difference between gapping and conjunction reduction is captured by the already existing constructions for sentence and VP coordination. The analysis is implemented in an HPSG grammar of Norwegian.

1 Introduction

Gapping and conjunction reduction are two out of more phenomena referred to as non-constituent coordination (NCC) in the literature. They pose a challenge to lexicalist approaches given the fact that the main verb of the second conjunct in these constructions is elided. The examples in (1)–(3) are taken from Sag et al. (1985). Example (1) shows the prototypical gapping construction with a transitive sentence in the first conjunct, and two arguments, but no verb, in the second conjunct. Example (2) demonstrates the fact that the gap may consist of a chain of control verbs. Example (3) demonstrates the conjunction reduction construction, where also the subject of the second conjunct is missing.

(1) Kim likes Sandy, and Lee Leslie.

(2) Pat wanted to try to go to Berne, and Chris { to try to go to Rome. / to go to Rome. / to Rome. }

(3) Kim gave a dollar to Bobbie and a dime to Jean.

1.1 Gapping in Norwegian

Gapping is possible with a range of constructions in Norwegian. In this section, I will present some of the constructions that have been considered in the implementation of the HPSG grammar Norsyg.

The constituents in a gapping construction may be a subject and an adverbial (see (4a)), and the adverbial may also come first, as shown in (4b).

(4) a. Jeg **kom** i går og du i dag.
I arrived yesterday and you today
'I arrived yesterday and you today.'

†I would like to thank three anonymous reviewers and the audience at the HPSG 2017 conference in Lexington, Kentucky, for very useful comments and suggestions. In particular, I would like to thank Mark Steedman for his comments on an early version of this paper.

b. I går **kom** jeg og i dag du.
In yesterday arrived I and today you
'Yesterday, I arrived, and today, you.'

In (5), two elements are gapped, the finite verb *tar* ('takes') and the particle *with* ('med'). The particle cannot appear in the gapping construction.

(5) Jeg **tar med** mat, og du (*med) drikke.
I bring with food and you with drink
'I will bring food, and you drinks.'

In (6), the reflexive verb *ønske seg* 'wish for' is gapped . The reflexive cannot appear in the gapping construction.

(6) Jeg **ønsker meg** fisk, og du (*deg) steik.
I wish REFL fish and you REFL roast
'I want fish, and you roast.'

In (7), the reflexive particle verb *se seg ut* 'pick out' is gapped. Neither the reflexive nor the particle can appear in the gapping construction.

(7) Jeg **ser meg ut** en fisk og du (*deg) (*ut) en steik.
I see REFL out a fish and you REFL out a roast
'I pick out a fish and you a roast.'

In transitive idiomatic expressions, all the idiomatic words are elided in the second conjunct (see (8)). It is not possible to elide just parts of the idiom.

(8) Jeg **brakte på bane** isen, og du (*på) (*bane) sjokoladen.
I brought on track ice-DEF and you on track chocolate-DEF
'I brought up the ice cream, and you the chocolate.'

Verbs with selected prepositions, however, behave slightly different. If a verb has a selected preposition, the gapping construction is very odd if it does not have the preposition, as shown in (9a). However, when the gapping construction contains the selected preposition, as in (9b), it is much better.

(9) a. ?? Jeg **hører på** Jon, og du Marit.
I listen to Jon and you Marit
'I listen to Jon, and you Marit.'
b. Jeg **hører** på Jon, og du på Marit.
I listen to Jon and you to Marit
'I listen to Jon, and you (listen) to Marit.'

It is possible to have gapping with ditransitive verbs, as shown in (10a). We then get three constituents in the second conjunct. It is also possible to have two arguments and an adverb in a gapping construction, as shown in (10b).

(10) a. Per **serverte** meg fisk, og Kari deg steik.
Per served me fish and Kari you roast
'Per served me fish, and Kari you roast.'

b. Jeg **spiste** fisk i går og du steik i dag.
I ate fish yesterday and you roast today
'I ate fish yesterday and you (ate) roast today.'

We can also have gapping when a verb is passivized, as shown in (11a). Then both the passive auxiliary and the main verb are elided in the second conjunct. If there is an expletive pronoun, this is also elided, as shown in (11b).

(11) a. Jeg **ble servert** fisk, og du steik.
I was served fish and you roast
'I was served fish, and you roast.'

b. I går **ble det servert** fisk og i dag steik.
yesterday was it served fish and today roast
'Yesterday, fish was served, and today roast (was served).'

1.2 Conjunction reduction in Norwegian

The examples we have looked at so far have been examples of gapping in sentence coordinations. (12a) and (12b) illustrate that it is possible to have gapping in cases where the topic is shared. In (12a) the two conjuncts share the subject. In the literature this is called conjunction reduction. I argue that (10a) and (12a) are examples of the same phenomenon, only that in (10a), we have sentence coordination and in (12b), we have coordination of sentences with a shared topic. As with other coordinations where the topic is shared, (12b) shows that it is also possible to let an adjunct be shared in gapping constructions (*i går* 'yesterday'). I will show in Section 3.4 that no extra machinery is needed in order to account for gapping in coordinations where the topic is shared once the rules for vp coordination (or coordination with a shared topic) and gapping are in place.

(12) a. Per **serverte** meg fisk og deg steik.
Per served me fish and you roast
'Per served me fish, and you roast.'

b. I dag **ble** jeg **servert** fisk og du steik.
Today was I served fish and you roast
'Today I was served fish, and you roast.'

2 Conjunction reduction and gapping in CCG and HPSG

2.1 CCG

In Steedman (2000), conjunction reduction is analyzed as the coordination of two equal constituents. As shown in Figure 1,[1] the formalism allows for type raising of noun phrases, where indirect objects are type raised as the category $TV\backslash DTV$, and direct objects are type raised as the category $VP\backslash TV$. The categories of the type raised indirect objects and direct objects are combined by backward composition in both conjuncts, resulting in the two categories $VP\backslash DTV$, which are readily conjoined.

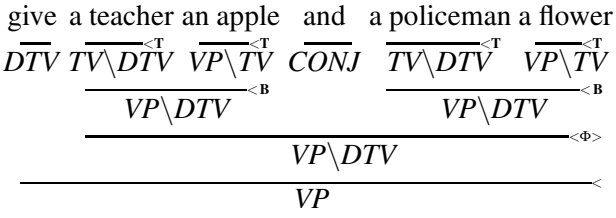

Figure 1: CCG analysis of conjunction reduction

The analysis of gapping includes the notion of *category decomposition* (Steedman, 2000, 190) or *inverse backward application* (Steedman, 2017), which is a powerful mechanism where a category is decomposed into constituents. This decomposition has to be in conformity with the grammar, and, in case of coordination, the rightmost revealed constituent has to be of the same category as the right conjunct.

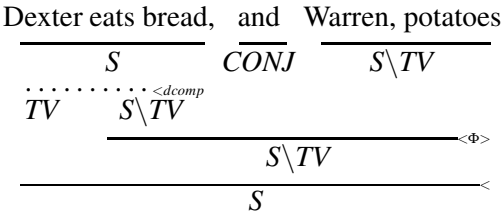

Figure 2: CCG analysis of gapping

As we can see in Figure 2,[2] the sentence of the first conjunct of a gapping construction is decomposed into two categories, TV and $S\backslash TV$. (See the dotted line.) This makes it possible to coordinate two constituents, $S\backslash TV$ and $S\backslash TV$, before the resulting $S\backslash TV$ combines with the "virtual" TV constituent.

The mechanisms used to achieve coordintation of equal constituents, type raising and category decomposition, are powerful, and they must be carefully con-

[1] From Steedman (2000, 46)

[2] Figure 2 is a simplified version of (62) in Steedman (2000, 190).

strained in order not to let the grammar create unwanted or unnecessary constituents.

2.2 HPSG

In the HPSG theory, Immediate Dominance schemata allows a grammar writer to specify constraints on a phrase and its immediate daughters without specifying the order of the daughters (Pollard & Sag, 1994). This makes it possible to account for free word order phenomena, but it is restricted to the immediate daughters of a phrase. In order to handle phenomena where the constituents involved are not immediate daughters of the same phrase, like discontinuous constituents and non-constituent coordination, the feature DOM(ain) has been introduced, where the linear order of the phonological items that a phrase consists of, is represented (Reape, 1994). The elements on the DOM list may be arranged in an order that is not reflected in the derivation tree. This separation of the order of phonological items from the constituent structure is referred to as linarization. Most approaches to non-constituent coordination makes use of the linearization approach (Kathol, 1995; Beavers & Sag, 2004; Chaves, 2005; Crysmann, 2008). The use of DOM to handle linearization phenomena is powerful, and although relational constraints may be added to the grammar in order to impose restrictions on the order of the phonological items, it may put a heavy burden on the parser if it is not porperly constrained.

The distinction between phonological representation and constituent structure assumed in the linearization approach is not available in grammars written within the DELPH-IN network, like the ERG (Flickinger, 2000) and JACY (Siegel et al., 2016). These grammars use regular phrase structure rules where the phonology is simply concatenated, and constituents are reflected in the derivation tree. This is efficient, but it poses a challenge to phenomena like non-constituent coordination since the valence information of the verb in the first conjunct is not accessible at the point where the coordination happens (the valence requirements have been canceled off), and even if they were, there is no dummy verb in the second conjunct that can get these requirements.

3 An incremental approach

In this section, I will present an alternative, incremental approach, which makes use of regular phrase structure rules, like the DELPH-IN grammars just discussed, but which has in common with the linarization approach that the derivation tree is separated from the constituent structure (although in a different way). The constituent structure is reflected by the entering and popping of structure onto a STACK (Haugereid & Morey, 2012).

3.1 Incremental parsing and constituent structure

The approach assumes that parsing is done incrementally, that is, word by word. The parse tree of the transitive sentence in (13) is given in Figure 3.

(13) Gutten spiser fisk.
boy-DEF eats fish
'The boy eats fish.'

The tree consists of unary and binary branching trees, and it is completely left-branching. In the bottom left corner is a start symbol, and all the words of the sentence attach to this symbol from the right, one by one. At the top of the tree is a unary *force* rule.

The grammar mainly has three types of rules:

1. Embedding structures – rules that initiate the processing a constituent
2. Adjunction structures – rules that continue the processing of an initiated constituent
3. Popping structures – rules that end the processing of a constituent

The tree in Figure 3 has two embedding structures, one for the subject *gutten* and one for the object *fisk*. The embedding structures put the parsing of the matrix constituent (the main clause) on hold while the embedded constituents (the NPs) are parsed. This is done by means of a feature STACK. An element with selected features of the matrix constituent (in Figure 3 represented by the HEAD feature) is added to the STACK whenever a new phrasal constituent is initiated. Since the NPs in Figure 3 only consist of one word, popping rules apply directly after the embedding rules, retrieving the features from the STACK. The rule that attaches the verb *spiser* ('eats') is an example of an *adjunction structure*. These rules attach words to the current constituent.

A standard assumption in Scandinavian syntax since Diderichsen (1946) is that the constituent appearing before the finite verb in a main clause is topicalized. This also holds if the constituent is the subject. In the incremental approach, extraction is done by means of a unary extraction rule, which enters a feature structure on the SLASH list of its daughter, and a filler rule, which realizes the element on the SLASH list. The extraction rule applies in the "canonical position" of the constituent, and in a main clause, the canonical position of the subject is the position after the finite verb. This is illustrated in Figure 3, where the rule *extr-arg1-struc* enters a feature structure onto the SLASH list of the daughter. The filler rule *embedding-filler-struc* unifies the feature structure on the SLASH list with the second daughter *gutten*. Since it is an embedding rule, selected features of the filled-in constituent (here represented by the HEAD feature) are unified with those of the mother.

The constituent tree in Figure 4 is derived from the parse tree in Figure 3. Here we can see that there are two embedded structures (the two NPs) and that the verb is not embedded in any phrase.

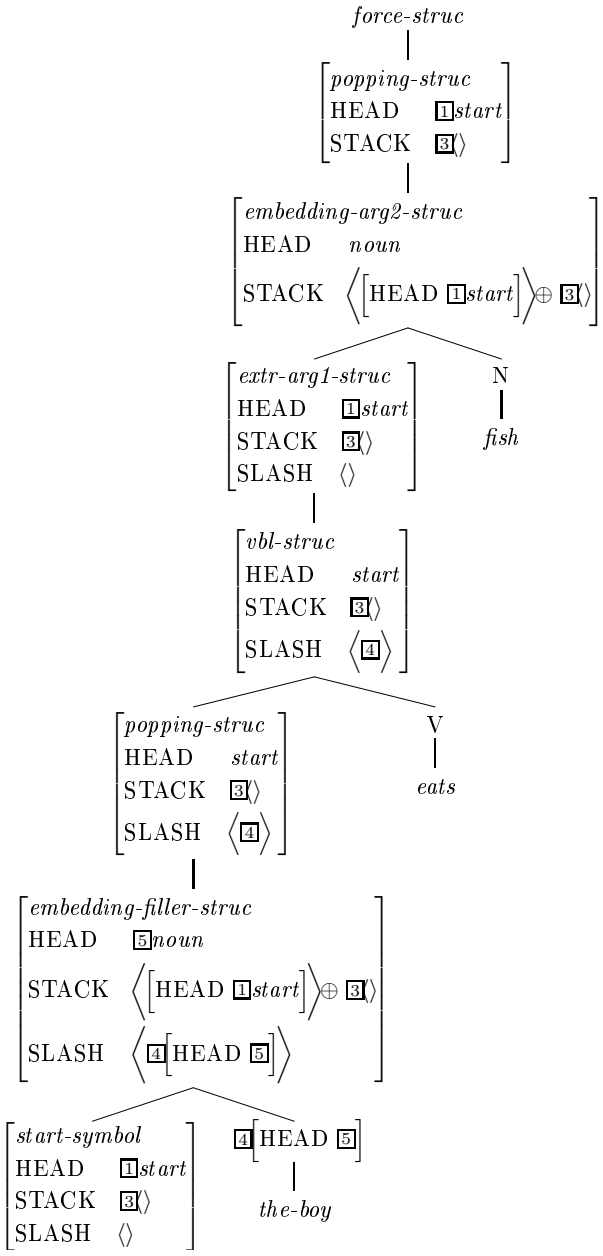

Figure 3: Parse tree of a transitive sentence

3.2 A constructionalist approach to argument structure

As mentioned, the derivation tree in the incremental approach is assumed to consist of binary and unary phrase structure rules where the binary rules have a word as their second daughter. A simplified representation of the transitive clause in Figure 3 is given in Figure 5.

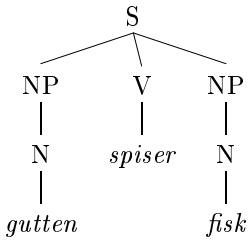

Figure 4: Constituent tree of a transitive sentence

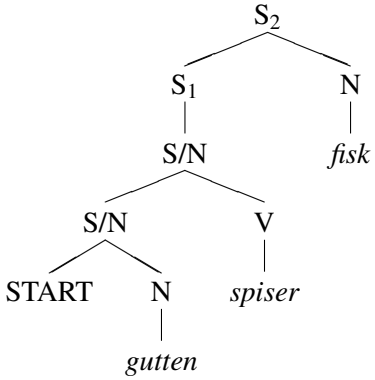

Figure 5: Simplified derivation tree of the transitive sentence *Gutten spiser fisk* ('The boy eats fish')

There are two things worth mentioning in connection to the tree in Figure 5. First, it is assumed that the topic of a main clause is extracted from its canonical position, as shown in Section 3.1.[3]

Second, valence requirements are handled by means of types (Haugereid, 2009, 2015). The verb *spiser* ('eats') is listed in the lexicon with an underspecified construction type *spise_prd*. This type is a part of a hierarchy of valence types that constrain which constellations of arguments the verb is allowed to appear with. A small part of this type hierarchy is illustrated in Figure 6. It shows that a verb with the type *spise_prd* is compatible with a transitive frame (*_spise_12_rel*) and an intransitive frame (*_spise_1_rel*).

The phrase at the top of the derivation of a clause is constrained to have negative valence types (*arg1–*, *arg2–*, *arg3–*, and *arg4–*), as shown in (14). As one goes down the tree, valence rules switch these types from negative in the mother to positive in the (first) daughter. This is spelled out in Figure 7. The types *arg1–* and *arg2–* are switched to *arg1+* and *arg2+* by the two valence rules (*embedding-arg2-struc* and *extr-arg1-struc*). At the bottom of the tree, the construction type of the verb, which is the PRED value of its KEYREL (*spise_prd*) is unified with the four

[3]Note that the use of '/' in the tree shows that there is an extracted element, and it must not be confused with the use of the slashes ('/' and '\') in CCG, even though the meaning is related.

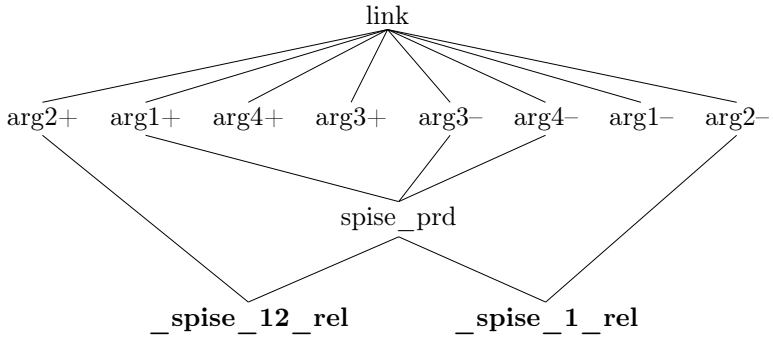

Figure 6: Type hierarchy of valence types

valence types *arg1+*, *arg2+*, *arg3–*, and *arg4–*, as shown in (15). This unification is allowed by the type hierarchy (the types *spise_prd*, *arg1+*, *arg2+*, *arg3–*, and *arg4–* have a common subtype), and yields the construction type *_spise_12_rel*, which also serves as the predicate of the relation introduced by the verb.

(14)
$$\begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{CMP1}|\text{LINK} & \textit{arg1–} \\ \text{CMP2}|\text{LINK} & \textit{arg2–} \\ \text{CMP3}|\text{LINK} & \textit{arg3–} \\ \text{CMP4}|\text{LINK} & \textit{arg4–} \end{bmatrix} \end{bmatrix}$$

(15)
$$\begin{bmatrix} \textit{START} & \\ \text{VAL} & \begin{bmatrix} \text{CMP1}|\text{LINK} & \boxed{0} \\ \text{CMP2}|\text{LINK} & \boxed{0} \\ \text{CMP3}|\text{LINK} & \boxed{0} \\ \text{CMP4}|\text{LINK} & \boxed{0} \end{bmatrix} \\ \text{KEYREL}|\text{PRED} & \boxed{0} \\ \text{SLASH} & \langle\rangle \end{bmatrix}$$

3.3 Incremental parsing and coordination

An obvious challenge for the incremental approach is coordination. In HPSG, coordination of full constituents is straightforward, at least as long as the constituents are of the same category. It is the regular coordination rule that holds: XP ⇒ XP Conj XP. Whether the coordinated constituent is a sentence, a VP or an NP, coordination is assumed to be captured by the same rule. In an incremental approach, however, one is forced to start building the second constituent on top of the first, as shown in Figure 8. This means that the rules involved in coordination of full constituents no longer is the combination of two equal constituents. Rather, they mark the end of one constituent and the beginning of a new constituent. This is illustrated in Figure 8 where the rule that adds the coordinator, also marks the be-

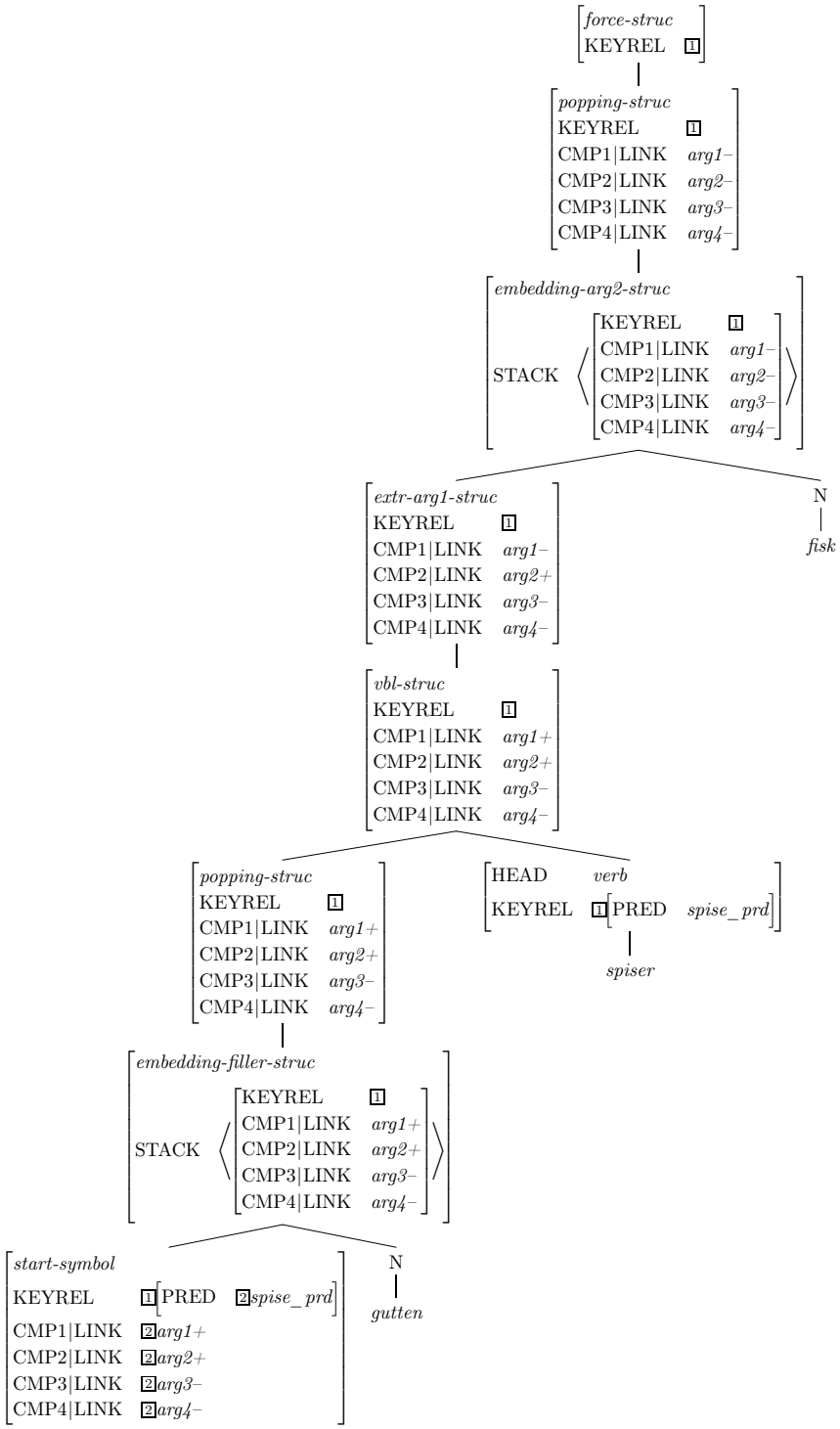

Figure 7: Valence types of a transitive sentence

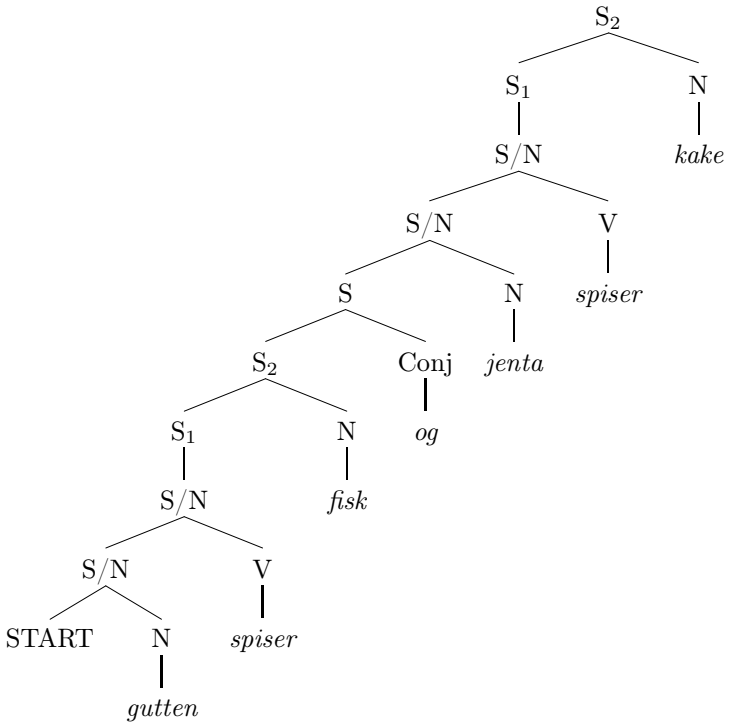

Figure 8: Derivation tree of two coordinated transitive sentences

ginning of a new clause. In practice, the mother of the coordinator has the same constraints as *START* (see (15)).

In order to account for coordination of main clauses and VPs, the hierarchy of phrase types in Figure 9 is created. Most of the constraints of the two types of coordination rules (*conj-s-struc* and *conj-top-struc*) are captured in a supertype *conj-struc*. *conj-struc* takes as its first daughter a structure that has realized all its arguments, that is, the valence types are all negative. The second daughter is a conjunction item, which can be either a conjunction or a comma, in case there are more than two conjuncts. The mother unifies the valence types of the sentence that is to be built next. The type links the two conjuncts with a conjunction relation that in entered onto the C(onstructional)-CONT RELS list. *conj-struc* is underspecified with regard to whether there is an element on the SLASH list or not.

The value of the SLASH list is specified on the two subtypes, *conj-s-struc* and *conj-top-struc*. The type *conj-s-struc* has an empty SLASH list. This means that it has the same status as *START* (see 15), and it initiates the building of a new sentence.

The second subtype, *conj-top-struc*, has an element on the SLASH list which is the topic. This gives it the status of a structure where the topic is realized, but where it is yet to be extracted. The topic of the first daughter is also the topic of the mother, which means that the two sentences will share topic. This accounts for

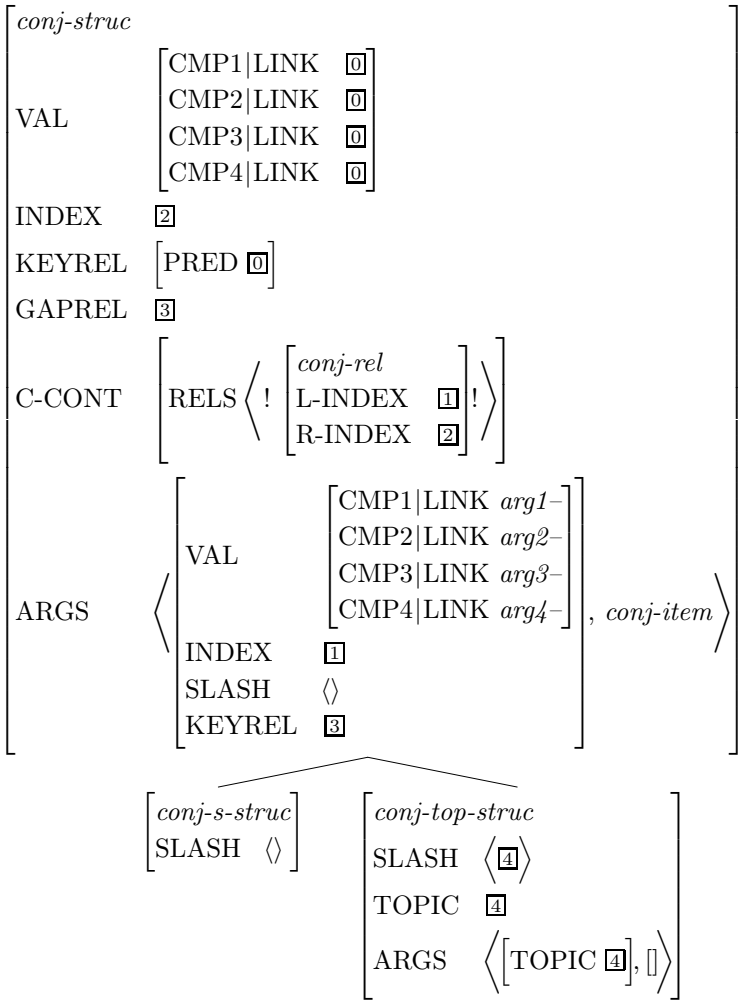

Figure 9: Hierarchy of coordination rules

VP coordination, where the shared topic is the subject, but also similar kinds of coordination where the shared topic is an object or an adjunct.

3.4 Analysis of gapping

In order to account for the gapping phenomena presented in Section 1, I introduce a set of unary rules corresponding to the rules that attach verbs, particles, reflexives and idiomatic words. The rule for eliding verbs is given in Figure 10. It takes as its only daughter a structure that requires a verb (the VBL value is *synsem*), and gives a new structure where there is no longer a verb requirement (the VBL value is *anti-synsem*). In addition, the value of GAPREL of the daughter is unified with the KEYREL. As shown in Figure 9, the GAPREL has as value the KEYREL relation of the first conjunct in a conjunction. This relation is the relation contributed by the

main verb. This ensures that the gapping construction has the same relation (and syntactic construction) as the first conjunct.

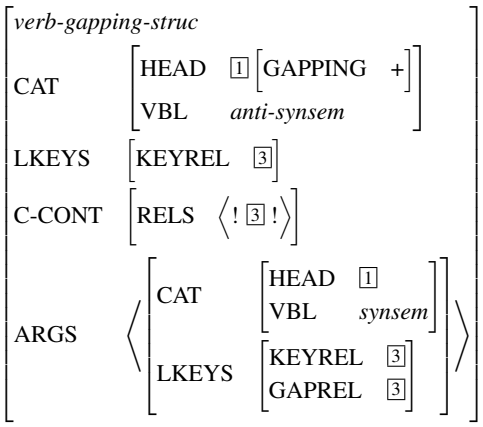

Figure 10: Type for elided verbs

The incremental design where verbs are treated as a kind of obligatory adjuncts, makes an account of gapping constructions relatively straightforward. Since the contribution of a (main) verb in a regular main clause is to contribute a type which constrains what kinds of constructions it can appear in, the only addition needed is to make the construction type available in the gapping construction. As shown in Figure 10, this type comes from the GAPREL feature. In this way the gapping rule substitutes the verb. The construction type carried over from the first conjunct guarantees that the valence rules that apply in the first conjunct also apply in the second conjunct.

Figure 11 shows how a gapped conjunct is analyzed. The rule *conj-s-struc* unifies the KEYREL value of its first daughter with its GAPREL value. Further up the tree, the unary rule *verb-gapping-struc* unifies the GAPREL value with the KEYREL. In this way, the construction type of the first conjunct also becomes the construction type of the second conjunct.[4]

The implemented grammar produces the MRS given in Figure 13 for a sentence with a gapping construction.[5,6] Note that the predicate *_spise_12* appears twice. This is a result of the unification of the construction type of the first conjunct with the construction type of the second conjunct.

3.5 Analysis of conjunction reduction

The examples of conjunction reduction (see (12a) and (12b)) are accounted for by the combination of the *conj-top-struc* rule and the *verb-gapping-struc* rule. The

[4]The embedding and popping rules as well as the features CMP3 and CMP4 are in Figure 11 omitted for expository reasons.

[5]The MRS display is made by Michael Goodman: https://github.com/goodmami/demophin.

[6]The grammar currently labels the last event as the top relation. This should rather be the conjunction relation *_og_c*, and will be fixed in a future version of the grammar.

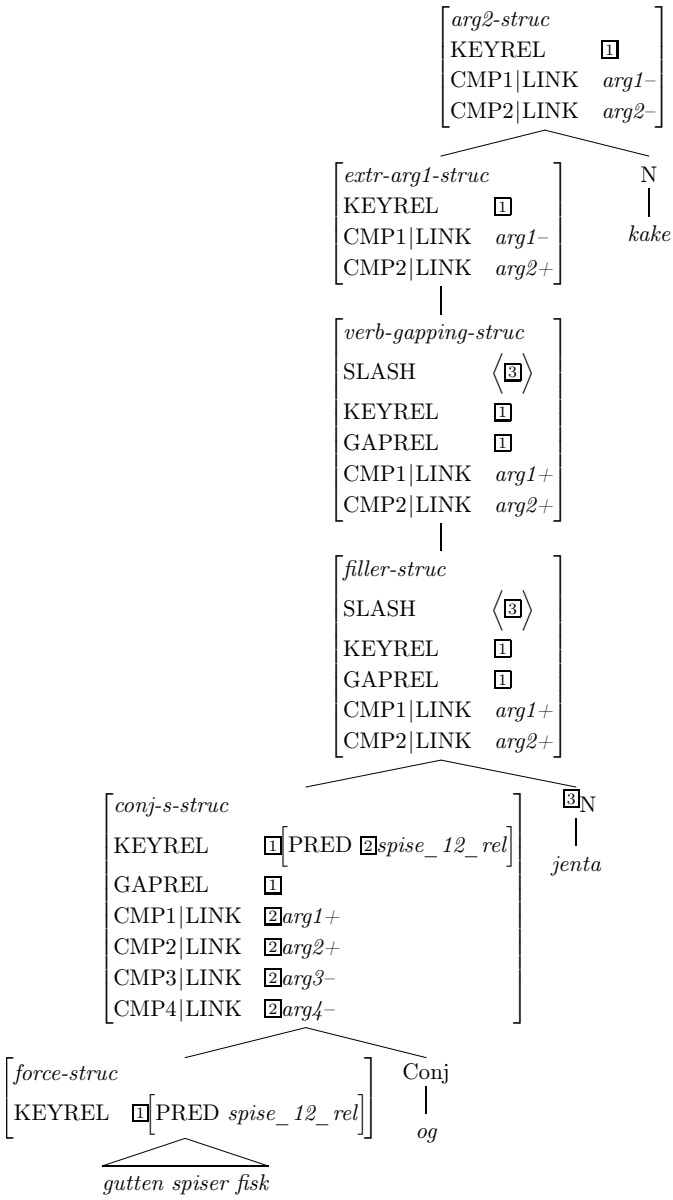

Figure 11: Analysis of gapping in *Gutten spiser fisk, og jenta kake* 'The boy eats fish, and the girl cake.'

conj-top-struc rule takes a full clause as its first daughter and creates a structure with an element on the SLASH list that is unified with the TOPIC of the input clause. This is illustrated in Figure 12.[7] The difference from the gapping example discussed in Section 3.4 is that it is the *conj-top-struc* rule that is used. The grammar

[7]The embedding and popping rules as well as the feature CMP4 are in Figure 12 omitted for expository reasons.

produces the MRS given in Figure 14 for a sentence with a conjunction reduction construction.

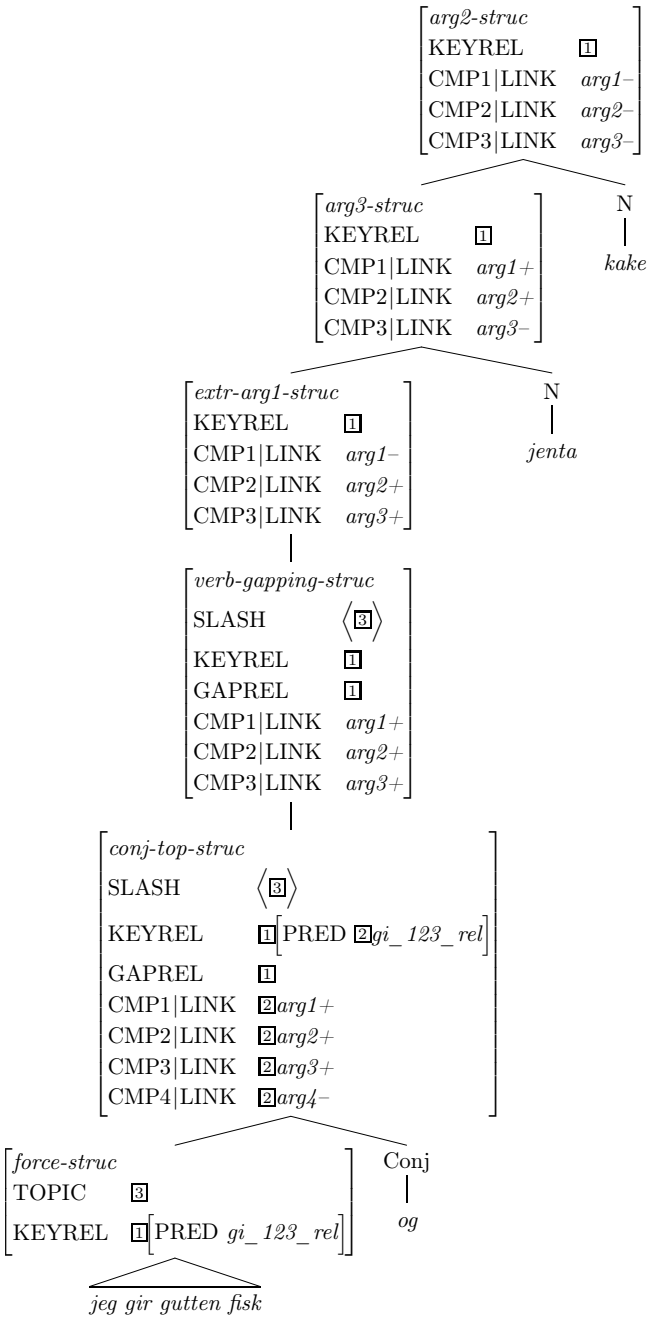

Figure 12: Analysis of conjunction reduction in *Jeg gir gutten fisk, og jenta kake* 'I give the boy fish, and the girl cake.'

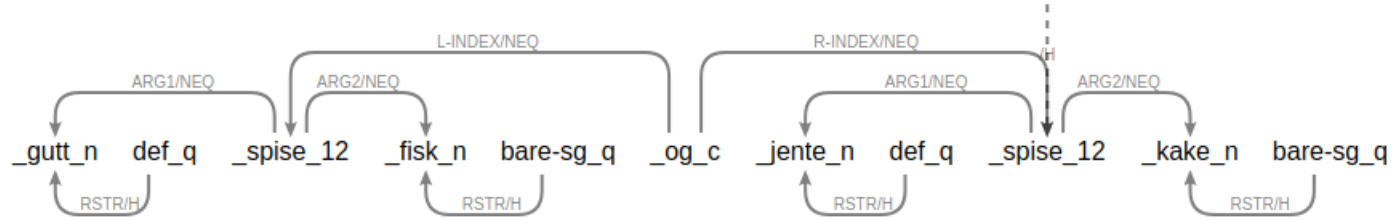

Figure 13: MRS of *Gutten spiser fisk, og jenta kake* 'The boy eats fish, and the girl cake.'

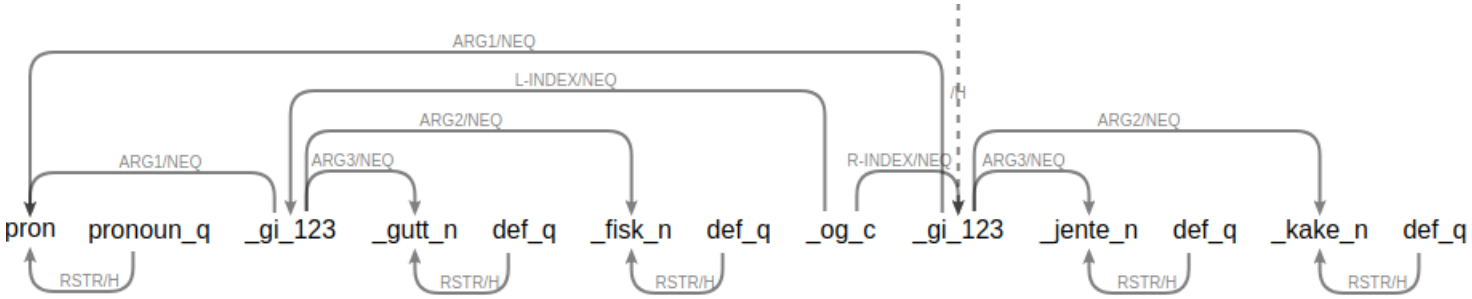

Figure 14: MRS of *Jeg gir gutten fisk, og jenta kake* 'I give the boy fish, and the girl cake.'

4 Discussion

4.1 Forward gapping and backward gapping

This paper has presented an analysis of gapping and conjunction reduction for Norwegian, which is an SVO language, like English. According to Ross (1970), gapping operates forward in SVO languages (see (16). However, in Japanese, which is a VSO language, the verb appears in the last conjunct in gapping constructions, and not the first (Ross, 1970). This phenomenon is referred to as backward gapping (see (17)).

(16) a. SVO + SVO + SVO + ... + SVO ⇒
b. SVO + SO + SO + ... + SO

(17) a. SOV + SOV + SOV + ... + SOV ⇒
b. SO + SO + SO + ... + SOV

The grammar presented in this paper is designed in such a way that a clause in principle can be parsed without a verb. The argument structure is assumed to originate from the syntactic rules, and the verb is treated as a kind of obligatory modifier. If there is no verb, the parse will result in an underspecified type which only reflects the argument structure of the clause, but not the predicate of the main verb. (Not having a verb will of course increase the search space, but it will be manageable. Still, it should probably be combined with some kind of statistical ”guesser”.)

I would assume for a head final language like Japanese, that the mechanism I describe in Section 3.2 would be ”turned around”, so that the unification of the valence types and the predicate of the main verb would happen at the top of the tree, rather than at the bottom. And the gapping rule would get its constraints from the opposite direction, from ”above” rather than ”below”. This would account for backward gapping.

It would be possible to design the grammar in such a way that it was just like English, with SVO word order, but with backward gapping. However, if I assume that the mechanism involving valence types and the passing of the predicate type is reversed, it would exclude backward gapping for a language like English.

4.2 Coverage

The analysis of gapping and conjunction reduction presented in this paper is far from exhaustive. However, it accounts for a number of challenging phenomena that proves hard to account for within standard lexicalist approaches without resorting to powerful mechanisms that may lead to drastic decreases in parser efficiency.

All the sentences in Sections 1.1 and 1.2 are accounted for, and most of the analyses have been implemented in the Norwegian HPSG grammar Norsyg. This

includes analyses of sentences with transitive and ditransitive verbs (see (10)), particle verbs (see (5)), verbs with selected prepositions (see (9)), sentences with non-subject topics and passive sentences (see (11)). Also analysis of gapping with multiple conjuncts, like in *John ate fish, Mary beef, and Sandy chicken* is implemented. There are ongoing experiments to also include analyses of sentences with reflexive verbs (see (6) and (7)) and VP idioms (see (8)). Some preliminary tests have been done to check the impact that the inclusion of the analysis has on parser efficiency. A test on 333 test sentences shows an increase of processing effort of 46%. The increase was mainly due to one sentence.

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Against Split Morphology

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Abstract

In this paper I present data from several Niger Congo languages, illustrating how the paradigms which make up the noun class systems of these languages are problematic to analyze within traditional morphosyntactic frameworks. I outline possible solutions to this problem, and argue for the introduction of an exemplar-based Word and Paradigm (Blevins 2006) approach to morphology within SBCG. I then outline the consequences of this approach for the structure of the SBCG lexicon.

1 Introduction

The Niger-Congo family is perhaps most well known for the distinctive noun class systems which can be found in many of its languages. Although there is considerable diversity to be found within the family itself, comparative research on noun classes has revealed something of a distinctive "Niger-Congo type" of noun class. The features of this type make Niger-Congo noun classes quite different from familiar gender and number systems of the Indo-European family. In particular, I argue that there is little evidence to accept the traditional dichotomy of inflectional and derivational morphological processes referred to as "split-morphology."

The remainder of this paper will proceed as follows. Section 2 reviews the assumptions commonly made in morphological theory. Section 3 illustrates the properties typical of Niger-Congo noun class systems. Sections 4 and 5 examine in more detail two features of Niger-Congo noun class systems which are particularly problematic for a split morphological analysis. Section 6 reviews two modern approaches to paradigmatic structure in morphological theory. Finally, Section 7 outlines the formal analysis proposed for Niger-Congo noun class systems.

2 Assumptions of (Split-)Morphological Theory

Most morphological theory, including that which is currently employed within Sign-Based Construction Grammar (Sag, 2012), often differentiates between inflectional and derivational processes. This division is referred to as "split morphology" by Bauer (1997). In SBCG, this distinction is explicitly represented in the hierarchy of construct(ion) types, as shown here:

[†]I would like to thank the anonymous reviewers for their helpful comments on this paper. I would also like to thank Rui Chaves and Jeff Good for their comments on previous versions of this paper. Lastly, I would like to thank the participants of the conference for the stimulating discussion.

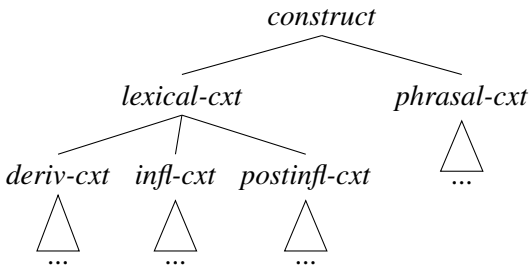

Figure 1: SBCG Construct Types

This traditional division of inflection and derivation has been defined and supported by a number of different criteria, outlined in Stump (2005) and adapted here:

1. Derivation can change part-of-speech class, while inflection cannot
2. Inflection applies to a category without exception; derivation applies sporadically
3. Inflection is semantically regular; derivation is frequently less than fully semantically regular
4. Inflection is syntactically determined; derivation is not
5. Derivational processes apply before inflectional processes

A central assumption of split morphology is the distinction between word and lexeme. Inflectional constructions are said to create words from a lexeme, whereas derivational constructions are said to create new lexemes from old ones. Booij (2012, 5) bases this distinction on what is referred to as an "intuitive difference" between the relationship between words such as *walks* and *walking* on the one hand and *tax* and *taxable* on the other.

This distinction between word and lexeme is also assumed in SBCG, and is represented in the type signatures of the *infl-cxt* and *deriv-cxt*:

(1) Split Morphology in SBCG (Sag, 2012):

$$\textit{infl-cxt} \Rightarrow \begin{bmatrix} \text{MTR} & \textit{word} \\ \text{DTR} & \textit{list(lexeme)} \end{bmatrix}$$

$$\textit{deriv-cxt} \Rightarrow \begin{bmatrix} \text{MTR} & \textit{lexeme} \\ \text{DTR} & \textit{list(lex-sign)} \end{bmatrix}$$

A final assumption made in most morphological theory is that a theory which is able to describe more language types is superior to one which describes fewer

language types. Here, however, this assumption will not be made, since a an aspect of the morphological theory may be motivated by data from one language, but not for another. Here I assume that languages which present different morphological systems may call for substantially different types of analyses.

3 Typology of Niger-Congo Noun Class Systems

Although noun classes can certainly be found outside of the Niger-Congo family, there are a set of properties common in Niger-Congo noun class languages which give the appearance of distinctive type. These properties, outlined by Kießling (2013, 44-45), are listed below.

1. All nouns are assigned to a limited set of noun classes
2. All nouns control, by virtue of their assignment to a class, a system of concordial agreement which penetrates vast sections of the morphosyntax
3. Class assignment is governed by semantic principles so that classes could be described as semantic networks, but not necessarily synchronically active/cognitively real (Dingemanse, 2006, 22-23)
4. Most noun classes form singular-plural pairs or genders

To illustrate these properties please consider the noun class system of Otoro, a Kordofanian language (Stevenson, 2009), outlined below.

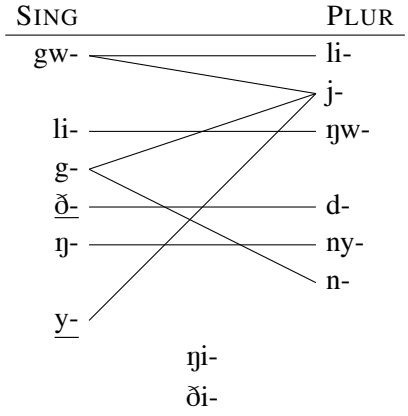

Figure 2: Otoro Noun Class System

GEN	SING	PLUR	GLOSS
gw-/li-	gwiji	liji	‘person’
gw-/j-	gwaʈe	jaʈe	‘tree’
g-/j-	gilöð	jilöð	‘hoe’
ð-/j-	ðimu	jimu	‘scorpion’

Table 1: Example Otoro Paradigms

The diagram in Figure 2 represents the noun class system of Otoro using a format common to Niger-Congo linguistics. As is often the case in Niger-Congo noun class systems, there are classes which participate in multiple ‘genders’, such as *gw-*, *j-*, and *g-*, which form pairs with multiple classes, and *ð-* and *y-*, which participate in single and double class genders, (indicated here by the underlining of the noun class marker). Class markers in the bottom center are never paired. Unpaired classes are typically found to contain mass nouns, abstracts, and liquids in Niger-Congo languages.

A characteristic of many noun class languages of the Niger-Congo family is that number is present semantically, but is not an active morphosyntactic feature (Welmers, 1973). In Indo-European, there exist patterns, such as subject-verb agreement, which are sensitive to number, but not gender. In Niger-Congo, however, systems are often found where there exist no constructions which are sensitive to number distinct from the feature of noun class.

4 Number as a ‘derivational’ process

Lumun (Smits, 2011) represents a particularly irregular number system. It is schematized below:

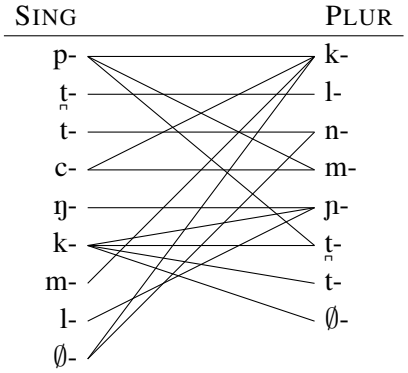

Figure 3: Lumun Noun Class System

It is obvious from the diagram that the minor irregularities seen in the Otoro

noun class system above are far more widespread in Lumun. Note also that many of the noun class markers are phonologically identical to another marking the opposite number category.

Noun class markers have three possible functions in the noun class system: to mark a noun as singular, to mark a noun as plural, or to serve as the class marker of a one-class noun. Inspection of the Lumun noun class system shows that a majority of noun class markers performs all three of these functions in the system.

NCM	SING NCM	PLUR NCM	SINGLE NCM
p-	✓		✓
t̪-	✓	✓	✓
t-	✓	✓	✓
c-	✓		✓
k-	✓	✓	✓
m-	✓		✓
n-		✓	✓
ŋ-	✓		✓
ɲ-		✓	
l-	✓	✓	✓
∅-	✓	✓	✓

Table 2: Lumun Noun Class Markers and their 'Genders'

When these facts are combined with the already noted observation that a singular noun class marker can pair with multiple plural noun class markers (and vice versa), the result is that any given noun class marker is capable of functioning as a marker of many different genders. The most extreme example of this is the noun class marker *k-*, whose genders are listed below:

GEN	SING	PLUR	GLOSS
k-/∅-	kʊmmʊk	ʊmmʊk	'pot/pots'
k-/t̪-	kupú	t̪upú	'peice of k.o wood/k.o wood'
k-/t-	kua	tua	'strand of hair/hair'
k-/ɲ-	kʊkkʊ́	ɲʊkkʊ́	'groundnut/ groundnuts'
p-/k-	pɪra	kɪra	'tree/forest'
c-/k-	cít	kít	'eye/eyes'
∅-/k-	ɪkɛ	kɪkɛ	'giraffe/giraffes'
k-	kəɽɛt		'abusive language'

Table 3: The nine 'genders' of class marker *k-*

This noun class marker participates in nine different genders. Looking at the system as a whole, there are no less than twenty-six genders from only eleven

phonologically distinct noun class markers. Furthermore, the number distinctions in these genders are not semantically regular. Rather than just straightforward singular and plural meaning, many of these noun class markers bear the functions of singulative and collective as well.

Due to this degree of irregularity, Smits argues that number marking in Lumun should be considered a derivational rather than inflectional process. This analysis follows a similar analysis of the noun class system of Swahili by Schadeberg (2001), where it was shown that the noun class system bore more of the properties typical of derivational morphology than those of inflectional morphology. As a consequence of each noun class marker being affixed by a derivational process, the noun class system does *not* involve genders.

The analyses of Smits and Schadeberg have the advantage of eliminating the vast accidental homophony that a gender-based analysis would require in the noun class markers. In addition, the treatment of class rather than gender/number as the base of the system follows the observation by Welmers (1973) that number does not seem to be an active morphosyntactic category.

However, the feature of class is active in the agreement of many nominal dependents, not only in the marking of number on nouns themselves. Agreement is generally considered the inflectional category *par excellence*. The analyses of Smits and Schadeberg would consequently treat class marking as derivational within the nominal domain, but as inflectional within the domain of agreement targets. This type of asymetry is undesirable, and I propose that a superior analysis involves the abandonment of the inflection/derivation assumption for morphological systems such as these.

5 Paradigm Networks

Paradigm networks such as the following can be found throughout the Niger-Congo family (Hepburn-Gray, 2016).

NC Paradigm	*-dooma* 'kaba'	*-taat* 'annona'
si-/mun-	'kaba tree'	'annona tree'
bu-/i-/di-	'kaba fruit'	'annona fruit'
ja-	'leaves of the kaba tree'	'leaves of the annona tree'

Table 4: Botanical Paradigm Network in Baïnounk (Cobbinah, 2013, 319)

In this botanical paradigm network roots referring to specific tree species enter into different noun class paradigms depending on what part of the plant is being referenced. One paradigm refers to the tree itself, a second refers to the fruit of the tree, and a third refers to the leaves of that tree. A second type of paradigm network is shown below.

Class	Acipu	Karishen	Kadonho	Hausa	Gloss
8	*c-cípù*	*∅-rísìnô*	*d-dípó*	k-kɔ́gɔ́	Person
2	*à-cípù*	*ò-rísìnô*	*ò-dípó*	ò-kɔ́gɔ́	People
1		*kò-rísìnô*	*kò-dípó*		Town/Area
6	*cì-cípù*	*tì-rísìnô*	*tì-dípó*	tì-kɔ́gɔ́	Language

Table 5: Ethnic Group Paradigm in Cicipu (McGill, 2007, 61)

This data from Cicipu, a Kainji language, is an example of an ethnic group paradigm network. Here, a root referring to a certain ethnicity can be associated with different paradigms to create different "words", whether this word is referring to a person of this ethnic group, the language spoken by this group, or the area inhabited by this group.

The principle problem of class networks such as these for formal models of morphosyntax is that there is no principled way to identify which of these nouns should correspond the base lexeme from which the other words are derived. A possible solution would involve a separate lexeme, from which all of these words are derived. The problem with this analysis, however, is that this lexeme would somehow have to be barred from entering into any inflectional construction, since none of the above words could correspond to this lexeme without first undergoing a derivational construction.

Koenig (1999, 150) discusses a related example in English, where there appears to be a lexeme which undergoes a mandatory derivational process. This example involves the sets *regress/regressive/regression* vs. **agress/agressive/agression*. The absence of the verb *agress* is explained as a missing root, which is only constructionally introduced in the *agressive/agression* constructions. However, it is not a root that is missing, but rather a fully inflected word which occupies the verb cell in a derivational paradigm.

6 Paradigms in Morphological Theory

With respect to the modeling of paradigmatic knowledge, Stump & Finkel (2013) distinguish between the canonical extremes of the PURE WORD-AND-PARADIGM MORPHOLOGY (PWPM) hypothesis and the PURE EXPONENCE-BASED MORPHOLOGY (PEM) hypothesis. These hypotheses differ with respect to the way two features are represented: inflectional class membership and morphological rules. These differences are represented in the following table.

CRITERION	PWPM	PEM
IC membership	represented by means of a set of lexically listed principal parts	represented by means of a diacritic+one or more stems
Rules	implicative rules formulated in terms of realized cells	rules of exponence formulated in terms of stems

Table 6: Differences between the PWPM and PEM hypotheses (Stump & Finkel, 2013, 265)

Stump and Finkel argue that the first distinction, between the representation of inflectional class with principal parts or with diacritics, is a false one. They proceed to use diacritics in their formalism.

As for rules, Stump and Finkel propose a hybrid model in which rules of exponence are the primary method of representing inflectional relations and implicative rules of referral are used to represent syncretism between paradigm cells. The choice of rules of exponence as primary is based primarily on stem variation in Sanskrit. Here, however, it is assumed that the diversity of morphological systems can correspond to a diversity in types of morphological representation, rules of exponence are not motivated for the Niger-Congo languages discussed so far.

What Stump and Finkel refer to as "the obvious advantage of compactness" (Stump & Finkel, 2013, 266) of the *diacritic+stem* approach is less obvious for these Niger Congo languages. A inflection class diacritic is certainly compact in languages with large inflectional paradigms, but for these Niger Congo languages the paradigm diacritic only specifies two cells, both of which can already be specified by a single morphosyntactic feature (CLASS).

Furthermore, the introduction of paradigm diacritics would be akin to introducing the notion of gender to these languages. As was mentioned above, Schadeberg (2001) and Smits (2011) argue that 'gender-based' analyses are inappropriate for Niger-Congo languages such as Swahili and Lumun. The following section will illustrate the alternate analysis proposed here.

7 Formalism

Based on the issues proposed in the previous sections, I propose here a WORD AND PARADIGM (Blevins, 2006) model of morphology for these Niger-Congo languages. In the theory proposed here, a lexeme is *not* a type of sign. A "lexeme" is simply the knowledge that a set of words is paradigmatically related, as well as whatever information is shared among these words. This captures the notion of the 'abstractive' lexemes introduced in Blevins (2006), where notions such as stems and lexemes have no status within the model, but rather are abstractions over sets

of fully inflected word forms.

The type hierarchy of construction types I propose for Niger-Congo noun class morphology is presented in Figure 4 below. The paradigm cells of principle parts are fully stored in the lexicon. Forms of other paradigm cells, be they 'inflectional' or 'derivational' paradigms, are generated via an analogical construction (*an-cxt*). Compound constructions (*comp-cxt*) are the only morphological construction type which remains distinct from the analogical constructions, since they necessarily include multiple words, and therefore represent a hybrid construction between word and phrase.

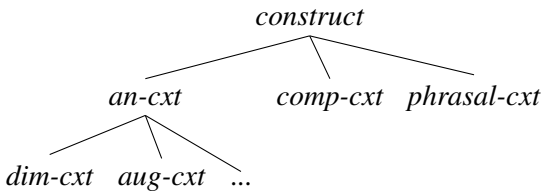

Figure 4: Construct Types

For the representation of morphological information related to a word, I adapt the following type signature of the *head* feature from Koenig (1999).

(2) Head Feature Type Signature:

$$head \Rightarrow \begin{bmatrix} \text{LXM} & \textit{lex-prop} \\ \mu\text{-FEAT(URES)} & \mu\textit{-prop} \end{bmatrix}$$

Information shared between word forms of a lexeme is represented in the LXM attribute. Information that is particular to a specific paradigm cell (or proper subset of paradigm cells) is represented within the attribute μ-FEAT.

The following is the type signature for the sign type *word* of a noun in a Niger-Congo noun class language. The value of the LXM attribute is a valule matrix containing a label (LBL and a semantic frame (FRAME). The LBL feature is shared between all words associated with a single lexeme. Reducing the notion of a lexeme to this feature is meant to mirror the 'abstractive' sense of lexeme taken from Blevins (2006). The value of the FRAME attribute is a semantic frame representing whatever semantics are common to all the words of a lexeme.

(3) Type Signature of Sign type *word*:

$$\begin{bmatrix} \textit{word} & & \\ \text{MORSYN} \mid \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{LXM} & \begin{bmatrix} \text{LBL} & \textit{lxm-lbl} \\ \text{FRAME} & \boxed{1} \end{bmatrix} \\ \mu\text{-FEAT} & \begin{bmatrix} \text{CLASS} & \textit{class} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{FRAMES} & \boxed{1} \oplus L \end{bmatrix} \end{bmatrix}$$

The only morphological feature necessary for nouns in these languages is CLASS, following the analysis of Schadeberg (2001) in which noun class pairs are not treated as genders, and therefore number is only present as a semantic feature. Here *L* represents the (possibly empty) set of semantic frames which may be associated with a particular paradigm cell.

The figure in (4) illustrates the type signature of the analogical construction. Different types of *an-cxt* take the principle part of a lexeme, and associate the morphosyntactic features of the desired paradigm cell with the new word. The phonology of the word is determined by a function, which takes as input the phonology of the principle part and the features of the new paradigm cell. This function contains the 'implicative rules' of the PURE WORD AND PARADIGM MORPHOLOGY approach, which generates a proportional analogy with the corresponding exemplar paradigm. The exact nature of this phonological function will not be addressed here.

(4) Type Signature of *an-cxt*:

$$\textit{ana-cxt} \Rightarrow \begin{bmatrix} \text{MTR} & \begin{bmatrix} \textit{word} & \\ \text{PHON} & \langle \text{F}(\boxed{1},\boxed{2}) \rangle \\ \text{CAT} & \begin{bmatrix} \text{LXM} & \boxed{3} \\ \mu\text{-FEAT} & \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \begin{bmatrix} \textit{word} & \\ \text{PHON} & \boxed{1} \\ \text{CAT} & \begin{bmatrix} \text{LXM} & \boxed{3} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

An example of an analogical construction is presented below in (5). This construction illustrates the construction for the *bu-* class of the Baïnounk botanical paradigm network. The daughter of this construction is any word with a frame corresponding to a tree species. The mother of this construction is a word for the fruit of this tree species with the corresponding *class* feature.

(5) The 'fruit' construction of the botanical paradigm network:

$$\textit{bu-cxt} \Rightarrow \begin{bmatrix} \text{MTR} & \begin{bmatrix} \text{PHON} & \langle \text{F}(\boxed{1},\boxed{2}) \rangle \\ \text{CAT} & \begin{bmatrix} \mu\text{-FEAT} & \boxed{2}\begin{bmatrix} \text{CLASS} & \textit{bu} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{FRAMES} & \begin{bmatrix} \textit{fruit-frame} \\ \text{INDEX} & i \\ \text{TREE-SPEC} & j \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{CAT} \mid \text{HEAD} & \begin{bmatrix} \text{LXM} \mid \text{FRAME} & \begin{bmatrix} \text{TREE-SPEC} & j \end{bmatrix} \\ \mu\text{-FEAT} & \begin{bmatrix} \text{CLASS} & si \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

8 Conclusion

This paper has analyzed noun class systems of various Niger-Congo languages. These systems exhibit properties which make them quite different from gender systems of familiar Indo-European languages. The argument was made that the these differences where substantial enough to result in morphological systems where the typical distinction between inflectional and derivational morphological processes is unmotivated. Furthermore it was argued that these systems are most economically modeled using a Word and Paradigm model of morphology. Finally, a formalism incorporating this Word and Paradigm approach into Sign-Based Construction Grammar was briefly sketched. There is plenty of room for further work which will more fully flesh out the formalism, especially the exact nature of the implicative rules and phonological functions which generate non-exemplar word forms.

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Partial Inversion in English

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This study concerns the representation within SBCG (Sag 2012, Sag et al. 2012, Michaelis 2012) of five English constructions that combine special grammatical form with a special discourse pragmatics.[1] The **grammatical features** include agreement between an intransitive verb and an argument that appears in what is usually thought of as direct object position. While the postverbal nominal argument has certain subject properties (in particular, controlling verb agreement), the preverbal argument has others (including undergoing raising and occupying pre-verbal position). We refer to this 'split' in subject properties as *partial inversion*. The **discourse-pragmatic** features are presentational illocutionary force and a postverbal focused argument. The constructions are:

- Presentational-*there*: *The earth was now dry, and there grew a tree in the middle of the earth.*
- Deictic Inversion (DI): *Here comes the bus.*
- Existential-*there*: *There's a big problem here.*
- Presentational Inversion (PI): *On the porch stood marble pillars.*
- Reversed Specificational-*be*: *The only thing we've taken back recently are plants.* (Corbett, 2006, 63-64)

Although some of these constructions have been treated extensively in the literature (especially PI and Existential-*there*), to our knowledge no previous analyses have attempted to account for both the formal and interpretational similarities among all five, or the details of their formal and interpretive differences. Our observations, based on web attestations of the relevant patterns, include the following:

1. The post-verbal, focal NP cannot be characterized as having a particular (structural or inherent) case; both nominative and accusative variants are attested.
2. DI is an aspectually sensitive construction, yielding progressive construals of simple-tense dynamic verbs (e.g., *Here came the waitress*).
3. Some of the maximal constructions specify verbal and adverbial LID values, while others do not.
4. The 'setting' argument of PI is not as constrained as it is typically said to be: it need not fill the discourse-pragmatic role of topic (*pace* Webelhuth 2011 *inter alia*), it need not be a location (Postal 2004) and it need not be a PP

[1]The paper abstracted here is available at https://www.researchgate.net/publication/303874961_Partial_Inversion_in_English, and can be cited as: Kay, Paul and Laura A. Michaelis. 2017. Partial Inversion in English. Unpublished ms., Stanford University and University of Colorado Boulder.

(contra Postal 2004), but it might be appropriately characterized in notional terms, as a reference point or 'origo' (cf. Partee & Borschev 2008's notion of 'perspectival center').

5. As also noticed by Salzmann (2013), the 'setting' argument of PI need not be a selected argument of the verb (pace Bresnan 1994); this is shown by attested tokens like (5a-b):

   a And there, in the midst of the swirl, was smiling Sam Waksal—a reedy, charming bachelor biotech entrepreneur.

   b From the mast flapped the banner of King Aurelius and of Braime.

6. The argument-realization properties associated with PI are found in a variety of structural configurations: Raising, Cleft, Nonsubject *Wh*-interrogative and Auxiliary Initial (including *do*-support contexts, *pace* Bruening 2010); this is shown by attested tokens like (6a-b):

   a Out of the woodwork during their show seemed to emerge all of these really big meat-head type guys and they started moshing hard. (raising)

   b Did out of this impasse come existentialism, a belief that man could define his temperament and impose meaning on the world? (polar interrogative)

Observations (4-5) suggest that PI is not, as some analysts (including Bresnan 1994) have contended, a kind of topicalization (filler-gap) structure: the fact that PI permits verbs, like *smile* and *flap* in (5a-b), that assign no locative argument damages the case for topicalization, since in such examples there is no gap within the clause to share f-structure attributes with the pre-clausal oblique expression. Observation (6) suggests that the PI pattern is a fact of argument structure rather than phrase structure. Accordingly, we see the partial-inversion pattern as the product of a lexical derivation. No phrasal construction is required to license any of the examples that is not also required to license clauses exhibiting canonical subjects and canonical agreement. Thus, for example, the PI sentence *Down came the rain* is analyzed as a Subject-Predicate construct whose head daughter is the Head-Complement construct *came the rain*.

To account for the unity among the five cases, we propose a type hierarchy in which each pattern of partial inversion inherits syntactic and discourse-pragmatic constraints from a non-maximal type, the **Split Subject (SS) construct type**. As a derivational construction, SS licenses a unary branching structure, that is, a mother with a unique daughter. Constructions of this kind implement the concept of lexical rule (Müller & Wechsler 2014). The single daughter of SS is of the type *intransitive-verb-lexeme*. The mother is of the type *split-subject-intransitive-verb-lexeme*. Unselected 'setting' arguments are readily accommodated by this analysis: to rely on a derivational construction as the licensor of PI lexemes is in fact to anticipate a valence mismatch between the two lexemes mediated by the rule. The

verbs and verb classes permitted in each partial-inversion pattern are represented in the mother's FRAMES set, where semantic frames, like syntactic patterns, also participate in the type hierarchy (Davis & Koenig 2000).

In the mother of a SS construct, the agreement trigger is not the XARG; it is an internal argument that is identified with the XARG of the daughter. In creating an external argument that is not the agreement trigger, SS effectively splits canonical subject properties between the 'new' and 'old' XARGs. Since in each case the preverbal, non-agreeing constituent appears in subject position in a simple declarative clause, this analysis contrasts with many approaches to PI (e.g., Bresnan 1994, Postal 2004, Kim 2003, Bruening 2010), which analyze the preverbal constituent of PI as occupying a filler position in an extraction structure. One virtue of our approach is that it permits us to separate the XARG role from that of agreement trigger. While agreement features are included in referential indices (as per Pollard & Sag 1994, CH2), subject behaviors like raising and control of a tag subject are a function of XARG status—a status occupied, e.g., by the 'setting' argument in PI.

This account also decouples partial inversion from the 'setting subject' phenomenon; it applies as well to those cases in which the preverbal, non-agreeing constituent is a non-oblique nominal expression (i.e. predications with *Reversed Specificational-be*). In so doing, it captures agreement variability—attestation of both canonical and 'backwards agreement' patterns in specificational clauses, the latter being licensed by a split-subject derivational construction.

Unlike the lexical rules that modulate between usual valence patterns, we find that lexical rules involved in marked phenomena like partial inversion tend to produce derived lexical items with properties not usually found in listemes, for example, an external argument that does not control agreement. This should not be surprising, since such facts define the marked phenomena that call for a lexical analysis in the first place.

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The Syntax of the *not only ... but also ...* Construction

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Abstract

This paper investigates the syntax of the English *not only . . . but also . . .* construction, focusing on the linearization possibilities of *not only*. Based on novel corpus data, I argue that the *not only . . . but also . . .* construction exhibits different properties from the *not . . . but . . .* construction or the adverbial *only*. I propose that a linearization-based account, along with coordinate ellipsis, can explain the various linearization possibilities of *not only*. I also propose that the construction as a whole is a subtype of the *correlative-coord-ph*, which is a novel subtype of the *coord-ph*. Finally, I argue that subject-auxiliary inversion triggered by the clause-initial *not only* is a new subtype of the *negative-inversion-ph*.

1 Introduction

The *not only . . . but also . . .* construction in (1) consists of two "correlative" elements, first of which is introduced by *not only*, and the latter by *but also*.

(1) John invited *not only* Mary, *but also* Lucy.

This construction exhibits many interesting properties, in that it is a rather special type of coordination, and also in the distribution of *not only*. Moreover, *not only* can trigger subject-auxiliary inversion in the clause-initial position, as in the bold-faced part in (2).

(2) *Not only* **did John** invite Mary, *but also* Lucy.

Surprisingly, however, there are not many syntactic accounts of this construction.

This paper examines the abovementioned special properties of the *not only . . . but also . . .* construction and argues that this construction is different from the apparently very similar *not . . . but . . .* construction. In section 2, I outline the basic data that previous studies discuss, focusing on the fact that they subsume the *not only . . . but also . . .* construction and the *not . . . but . . .* construction under a single construction. In sections 3 and 4, I provide novel data from corpus to show that the *not only . . . but also . . .* construction and the *not . . . but . . .* construction are indeed different. In section 3, I show that the floating positions of *not only* in the *not only . . . but also . . .* construction are freer than those of *not* in the *not . . . but . . .* construction. In section 4, I present subject-auxiliary inversion facts to show that the *not only . . . but also . . .* construction is clearly distinct from either the *not . . . but . . .* construction or from *only*-inversion.

In section 5, I provide an adequate analysis of such facts within the framework

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of Head-Phrase Structure Grammar. I propose that the construction as a whole is a subtype of the *correlative-coord-ph*, which is a novel subtype of the *coord-ph*. The free linearization possibilities of *not only* are explained via a licensing construction that enables shuffling of *not only* within the conjunct, a linear precedence (LP) rule that orders *not only* before the focused element, and coordinate ellipsis. Finally, subject-auxiliary inversion triggered by the clause-initial *not only* is analyzed as a subtype of the *negative-inversion-ph*. Here, I propose a novel subtype: *negative-conjunction-ph*.

2 Previous analyses: *not only . . . but also . . .* and *not . . . but . . .*

There are not many studies on the *not only . . . but also . . .* construction. Bianchi and Zamparelli (2004) dub (pseudo-)coordinations of two correlates "edge coordinations" and discuss English and Italian data such as *non . . . ma . . . /not . . . but . . .* in (3), *non solo . . . ma anche . . . /not only . . . but also . . .* in (4), *prima . . . poi . . . /first . . . then . . .* in (5), and *ora . . . ora . . .* in (6).

(3) a. Gianni mi ha comprato *non* quest'auto, *ma* quella.
b. John bought me *not* this car, *but* that one.

(4) a. Gianni ha invitato alla festa *non solo* Maria, *ma anche* Lucia.
b. John invited to the party *not only* Mary, *but also* Lucy.

(5) a. Ho venduto *prima* l'auto, *poi* la pelliccia.
b. *First* I sold my car, *then* my fur coat.

(6) a. Gianni invita *ora* Maria, *ora* Lucia.
b. Gianni invites *now* Mary *now* Lucy.

They analyze edge coordinations as in (7), with ellipsis in the second conjunct.

(7) a. Gianni ha invitato alla festa non solo Maria, ma ~~(lui) ha invitato alla festa~~ anche Lucia.
b. John invited to the party not only Mary, but ~~(he) invited to the party~~ also Lucy.

In showing that edge coordinations show four different word order patterns, Bianchi and Zamparelli (2004) and Gallego (2005) discuss the following set of data. In the adjacent orders in (8), the whole coordinate structure forms a continuous string, either in the clause-final (8a) or clause-initial (8b) position. In the non-adjacent orders in (9), the coordination forms a discontinuous string. In (9a), *not* and the first correlate are not adjacent to each other, and in (9b), the first and the second correlate are discontinuous.

(8) Adjacent orders
   a. He invited *not (only) Mary*, *but (also) Lucy*. (adjacent final)
   b. *Not (only) MARY*, *but (also) LUCY* he decided to invite. (adjacent initial)

(9) Non-adjacent orders
   a. I did*n't invite (only) Mary*, *but (also) Lucy*. (non-adjacent final)
   b. *Not (only) Mary* did I invite, *but (also) Lucy*. (non-adjacent initial)

In these studies, *only* and *also* are treated as optional adverbials, and thus, the *not only* ... *but also* ... construction is subsumed with the *not* ... *but* ... construction. They actually refer to it as the *not (only)* ... *but (also)* ... construction. However, these studies are limited in that they do not discuss the full range of data. For example, they only discuss data in which the correlates are DPs (*not only* DP *but also* DP). In the following sections, I present data not discussed in previous studies (Bianchi & Zamparelli 2004; Gallego 2005) such as various positional ("floating") possibilities of *not only*, mainly to argue that the *not only* ... *but also* ... construction and the *not* ... *but* ... construction are indeed different.

3 Positional Possibilities of *not only*

This section discusses the various word order possibilities in the *not only* ... *but also* ... construction, with regards to the various positional possibilities of *not only*. *Not only* can appear in positions not directly adjacent to the focused constituent. For example, it can appear at a position higher than its "original" position, as in (10). Sentences in (10) are from the Corpus of Contemporary American English. In each example, the correlates are underlined.

(10) *Not only* too high cases
   a. Note that you can use this tool **not only** to upgrade Windows 7 or Windows 8.1 PCs, **but also** Windows 10 PCs. (COCA 2015 MAG PCWorld)
   b. And that was **not only** for people he knew were allies and friends, **but also** people who were in... (COCA 2011 MAG NatlParks)
   c. ...usually in the mountain foothills that are the prime winter range **not only** for mule deer **but also** elk. (COCA 1997 MAG FieldStream)
   d. As a professional golfer, he became an international celebrity, known **not only** for his accomplishments on the golf course, **but** his extravagant lifestyle. (COCA 1997 MAG GolfMag)
   e. Yet somehow I managed **not only** to rope myself into a ski trip, **but** a ski trip with my boss. (COCA 2015 FIC Bk:SlayedOnSlopes)
   f. I was able **not only** to cross the street **but** make it down Fruit Street to Mass General. (COCA 2015 FIC FantasySciFi)

Not only can also appear at a position lower than its "original" position, as in (11).

(11) *Not only* too low cases

a. It makes a huge difference to **not only** the students **but** to us as teachers because it took a weight off of us as to how we can supply our kids with the things that they need to be successful in school. (COCA 2015 SPOK NBC)

b. they are here to poke and prod and asphyxiate me with the obligation to not only understand, to **not only** come to grips, **but also** to stand up there and explain... and in this case, explain what? (COCA 2015 FIC WarLitArts)

c. So definitely, my view of **not only** my parents, **but** of myself, has changed from, you know, having this son and my two daughters, too. (COCA 2014 SPOK NPR)

d. It is reasonable to suggest that the higher transmission risk that is clearly associated with such horses is a consequence of **not only** increased viral load **but also** of the illness itself. (COCA 2014 ACAD EmergingInfectious)

Such "floating" possibilities of *not only* are strongly reminiscent of those of *not* in the *not* ... *but* ... construction. Examples in (12)-(13) are from Song (2012).

(12) *Not* too high cases

a. America's expectation lies **not** in its successes **but** its failures.

b. She seems to have a political heart aching **not** for forgiveness **but** position.

c. He removed a folded piece of paper from his pocket and rattled off a series of numbers that made clear how he wanted the election to be seen: **not** as a squeaker **but** a rout.

d. ... and sat with him till one o'clock in the morning — **not** drinking wine, **but** tea and talking metaphysics and morality.

e. And you learn a good lesson in **not** to trust anyone **but** yourself.

f. I come **not** to bring peace **but** a sword.

g. ... you have to **not** look at age **but** the situation.

(13) *Not* too low cases

a. ...Andrea Dornbracht, the managing director of Dornbracht, a German faucet company, reportedly declared that the future was in **not** just selling products **but** in selling rituals.

b. Recently, publishers have starting to wring revenue out of their traffic by selling **not** ads, **but** by selling data about the people trolling their sites.

c. This may sound like an odd notion to a publisher, but you can achieve the most success by **not** selling your book, **but** by selling the benefits potential customers will get from your book's content.

d. Your role in working with your prospect is to sell **not** your product or service, **but** to sell yourself by finding out what it is your prospect really wants.

e. An option is to **not** sell the embargoed quantities to other foreign markets, i.e. to C, **but** to sell domestically.

f. ...his boss told him to **not** come into the office for the next week **but** to come by the boss's house every night so the two men could talk.

g. That's the persecution, a mentality that tells us to buy **not** because we need, **but** to buy for the prestige of owning something bigger and more shiny than our neighbor's.

On a closer examination, however, the floating positions of *not only* and *not* are actually different. (14) shows possible positions of *not* in the *not* ... *but* ... construction, and (15) shows possible positions of *not only* in the *not only* ... *but also* ... construction.

(14) Positions of *not* in the *not* ... *but* ... construction
Joe succeeded ⟨**not**⟩ by ⟨$^{?}$**not**⟩ selling ⟨***not**⟩ books ⟨***not**⟩, but by buying shoes. (Song 2012, p. 54)

(15) Positions of *not only* in the *not only* ... *but also* ... construction
⟨**not only** (with subj-aux inversion)⟩ Joe succeeded ⟨**not only**⟩ by ⟨**not only**⟩ selling ⟨**not only**⟩ books ⟨* **not only**⟩, but (also) by selling shoes.

The contrast between (14) and (15) shows that *not* is more restricted in its positional possibilities than *not only*. The shaded positions in (15) are ungrammatical in (14). This is the main reason why the *not only* ... *but also* ... construction and the *not* ... *but* ... construction are different. Actually, the positions of *not only* are rather similar to either in disjunction constructions, which exhibits rather free linear possibilities (Hofmeister 2010), as in (16)-(19).

(16) ⟨Either⟩ Thomas ⟨either⟩ will ⟨either⟩ write ⟨either⟩ a mystery or he'll write a romance.

(17) ⟨Either⟩ You'll ⟨either⟩ need to ⟨either⟩ bring ⟨either⟩ a passport or a birth certificate.

(18) ⟨Either⟩ Congress ⟨either⟩ will ⟨either⟩ pass the legislation or lose our confidence.

(19) ⟨Either⟩ You ⟨either⟩ can ⟨either⟩ have ⟨either⟩ tea ⟨either⟩ from ⟨either⟩ China or from Tibet.

Particularly interesting is that unlike in the *not* ... *but* ... construction, *not only* (like *either*) can appear at the clause-initial position, in which case subject-auxiliary inversion is obligatorily triggered. Such inversion phenomena will be further described in the following section.

4 Negative Inversion

When *not only* appears at the clause-initial position, subject-auxiliary inversion is obligatorily triggered, as in (20) and (21). Sentences in (21) are from corpus.

(20) **Not only** did Joe succeed by selling books, but by buying books.

(21) a. **Not only** was Stephens estranged from his English wife, he also had memorable confrontations with several notable women. (COCA 2015 ACAD GeorgiaHisQ)

b. **Not only** are high rates of teacher turnover disruptive to students and the school, teachers with low organizational commitment often reduce their job performance before they quit. (COCA 2014 ACAD AmericanSecondary)

c. **Not only** does the bridge attract tourists and playful dog owners; it also intrigues scientists. (COCA 2013 MAG NaturalHist)

d. **Not only** does SanDisk's $50 digital music player have twice the storage of the 2 GB Apple iPod shuffle, it has a 1.1-inch color display for viewing album track titles and art work. (COCA 2013 MAG SatEvenPost)

e. **Not only** were Django's mom and dad gone forever; the Django who lived in Beverly Hills was gone too. (COCA 2012 FIC Bk:LittleGirlGone)

f. **Not only** does QOOQ ($399) teach you how to cook, it is designed–unlike any other tablet–to be spill- and slip-proof so it can withstand anything (literally) you throw at it. (COCA 2012 MAG USAToday)

g. **Not only** did Bonnie's life shift, her school made Annual Yearly Progress for special education students, which Bonnie's teacher attributes to her sequential focus on the WM list. (COCA 2012 ACAD ReadingTeacher)

Both 1) clause-initial position of the conjunction and 2) subject-auxiliary inversion are clearly impossible in the *not* ... *but* ... construction, as can be seen from the ungrammaticality of the sentences in (22).

(22) a. *__Not__ did Joe succeed by selling books, but by buying shoes.

b. *__Not__ was Joe stupid, but lazy.

Note, also, that (23) should be clearly distinguished from the "floating" cases of *not only* or *not* because in (23), the whole constituent (*not (only)* along with the focused constituent, e.g. *not (only) in its success*) is fronted.

(23) [*Not (only)* in its success] does America's expectation lie but its failures.

One may intuitively think that the subject-auxiliary inversion triggered by clause-initial *not only* simply follows from properties of *only*-inversion (Huddleston & Pullum 2002[1]). Although *only*-inversion has not been discussed much in the literature, many scholars (e.g. Haegeman 1995; Maekawa 2012) analyze *only* as a weak negator, and therefore *only*-inversion in (24) as a negative inversion phenomenon.

(24) a. *Only* his mother will he obey.
b. *Only* on Sundays do they eat with their children.

However, the ungrammaticality of the sentences in (25) shows that *only*-inversion and *not only*-inversion cannot be treated as the same phenomena because *only* by itself cannot float to the clause-initial position.

(25) a. **Only* did Joe succeed by selling books.
b. **Only* was Joe stupid.

Therefore, I propose that the "floating very high" possibility of *not only* is an idiosyncratic property of the *not only* ... *but also* ... construction, which is exhibited neither in the *not* ... *but* ... construction nor with *only*.

5 Analysis

5.1 A new subtype of the *coord-ph*: *correlative-coord-ph*

I analyze the whole *not only* ... *but also* ... construction as a coordination structure, in which each conjunct is marked by a conjunction, similar to Mouret's (2004) analysis of French conjunction doubling (*et* 'and' ... *et* 'and' ..., *soit* 'either' ... *soit* 'or'). First, the constraints imposed on *coord-ph* are shown in (26).

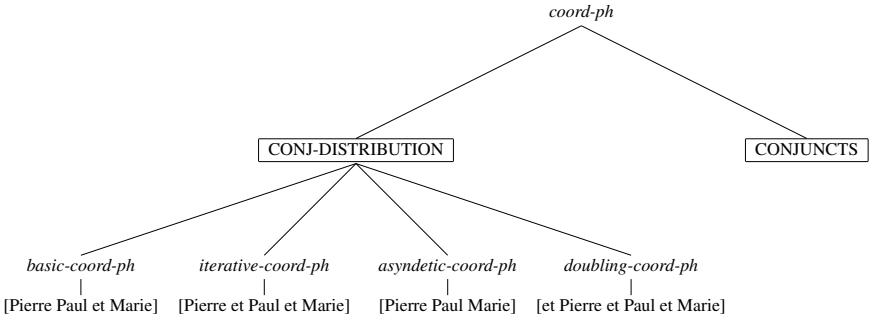
(26) *coord-ph* →

$$\begin{bmatrix} \text{CONJ} & \textit{null} \\ \text{HEAD} & \boxed{1} \\ \text{VALENCE} & \boxed{2} \\ \text{SLASH} & \boxed{3} \\ \text{NON-HD-DTRS} & \left\langle \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{VALENCE} & \boxed{2} \\ \text{SLASH} & \boxed{3} \end{bmatrix}, ..., \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{VALENCE} & \boxed{2} \\ \text{SLASH} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

[1]Huddleston and Pullum (2002) note that "the location of *not only* simply reflects the range of positions available to focusing adverbs like *only*. (p. 1314)"

Mouret (2004) cross-classifies (French) coordinations according to the distribution of conjunctions as in (27).

(27) Mouret's (2004) cross-classification of (French) coordinations



Constraints imposed on each of these subtypes are in (28).

(28) a. *basic-coord-ph* →
$\left[\text{ NON-HD-DTRS } \textit{nelist}([\text{CONJ } \boxed{1}\textit{null}]) \oplus \langle[\text{CONJ } \textit{et} \vee \textit{ou}]\rangle \right]$

b. *iterative-coord-ph* →
$\left[\text{ NON-HD-DTRS } \langle[\text{CONJ } \textit{null}]\rangle \oplus \textit{nelist}([\text{CONJ } \boxed{1}\textit{et} \vee \textit{ou} \vee \textit{ni}_1]) \right]$

c. *asyndetic-coord-ph* →
$$\left[\begin{array}{ll} \text{CONTENT} & \left[\begin{array}{l}\textit{et-reln}\\ \text{ARGS } \{i, ..., n\}\end{array}\right] \\ \text{NON-HD-DTRS} & \langle\left[\begin{array}{ll}\text{CONJ} & \boxed{1}\textit{null}\\ \text{INDEX} & i\end{array}\right], ..., \left[\begin{array}{ll}\text{CONJ} & \boxed{1}\textit{null}\\ \text{INDEX} & n\end{array}\right]\rangle \end{array}\right]$$

d. *doubling-coord-ph* →
$$\left[\begin{array}{ll} \text{DOUBLING} & \boxed{1}\textit{et} \vee \textit{ou} \vee \textit{ni}_2 \vee \textit{soit} \\ \text{NON-HD-DTRS} & \langle[\text{CONJ } \boxed{1}], ... , [\text{CONJ } \boxed{1}]\rangle \end{array}\right]$$

I suggest that, at least for English, we need a new subtype of the *coord-ph* to account for correlative coordination structures such as *not only . . . but also . . .*: *correlative-coord-ph*. I assume that other types of "edge coordinations" such as *first . . . then . . .* can be explained via this phrase type as well. In (29) are constraints put on this subtype.

(29) *correlative-coord-ph* →
$\left[\text{ NON-HD-DTRS } /\textit{nelist}([\text{CONJ } \boxed{1}]) \oplus [\text{CONJ } \boxed{2}] \right]$

I propose that *not only but also-ph* ((30)) is a subtype of the *correlative-coord-ph*.

(30) *not only but also-ph* →
$\left[\text{ NON-HD-DTRS } \textit{nelist}([\text{CONJ } \textit{not only}]) \oplus ([\text{CONJ } \textit{but also} \vee \textit{but} \vee \textit{also}]) \right]$

The above constraint in (30) can adequately account for the following facts. First, conjuncts headed by *not only* can appear multiple times, as in (31).

(31) they are here to poke and prod and asphyxiate me with the obligation to **not only** understand, to **not only** come to grips, but also to stand up there and explain... and in this case, explain what? (COCA 2015 FIC WarLitArts)

Also, the second conjunct is optional, as can be seen in (32).

(32) a. There he kept his vegetable garden huge, but **not only** for the purpose of feeding everyone living at Monticello and his many visitors. Rather it was an experimental garden, with 330 cultivars representing 99 species of vegetables and herbs, tried out over his 50-some years of gardening and always with the goal of finding the few best among each species. (COCA 2015 MAG Horticulture)

b. What the new study shows is how evenly numbers are dropping for fish species across the spectrum, for the whole marine ecosystem, and **not only** for a handful of commercially fished species. (COCA 2015 NEWS OrangeCR)

Moreover, the second conjunct's CONJ value can either be *but also*, *but*, or *also*. In (33), the second conjunct is headed by *but*, and in (34), by *also*.

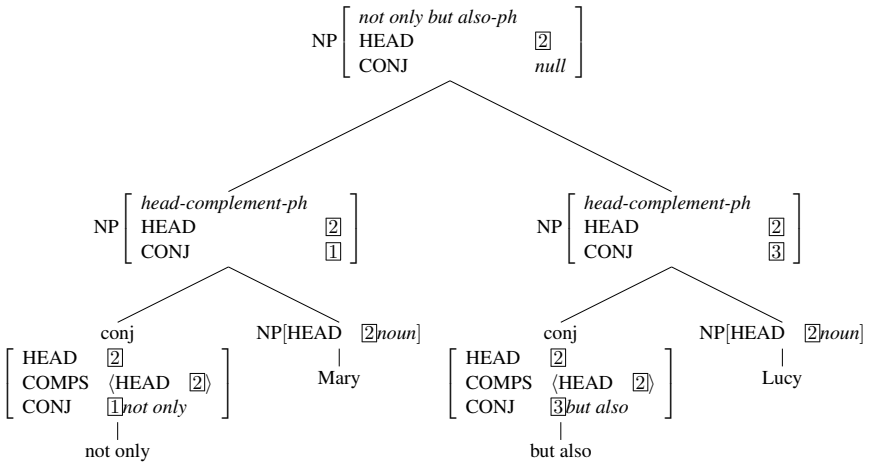
(33) a. Driver's Ed programs are enforced **not only** to educate, **but** to give supervised experience to teens so that they have a chance of getting to school and back without getting hit–or hitting something or someone. (COCA 2015 MAG USAToday)

b. This article examines qualitative evaluations of three works of young adult literature that are **not only** textually complex as defined by authors of the CCSS, **but** appropriate and engaging for adolescent identity and development. (COCA 2015 ACAD JAdolAdultLiteracy)

(34) Play is **not only** for children, it is **also** important for adults. (COCA 2014 ACAD StudiesInEducation)

In (35), the structure of *not only Mary but also Lucy* is shown.

(35) *not only Mary but also Lucy*



5.2 Linearization of *not only*

In sections 3 and 4, the various "floating" positions of *not only* in the *not only* ... *but also* ... construction were shown. In this section, I explain these facts via a licensing construction that enables shuffling of *not only* within the conjunct, a linear precedence (LP) rule that orders *not only* before the focused element, and coordinate ellipsis.

This analysis is an extension of Hofmeister's (2010) linearization analysis of *either* in disjunction structures. In section 3, I mentioned that the distributional possibilities of *not only* are very much like those of *either* in *either* ... *or* ... constructions.

5.2.1 *Not only* floating too low

Hofmeister accounts for "floating low" cases of *either* through a licensing construction that allows shuffling of *either* within the first disjunct. I extend this analysis to *not only* phrases as well. In (36) are the constraints on the *not only-ph*.

(36) *not-only-ph* →

$$\left[\begin{array}{ll} \text{MOTHER} & \left[\begin{array}{ll} \text{CONJ} & \textit{not only} \\ \text{HEAD} & \boxed{2} \\ \text{DOM} & \langle [\text{DOM} \quad \delta_1 \circ \delta_2] \rangle \end{array}\right] \\ \text{DTRS} & \left\langle \left[\begin{array}{ll} \text{PHON} & \langle \text{not only} \rangle \\ \text{CONJ} & \textit{not only} \\ \text{SYN}|\text{VAL} & \text{COMPS} \langle \boxed{1} \rangle \\ \text{HEAD} & \boxed{2} \\ \text{DOM} & \delta_2 \end{array}\right], \boxed{1} \left[\begin{array}{ll} \text{HEAD} & \boxed{2} \\ \text{DOM} & \delta_1 \end{array}\right] \right\rangle \end{array}\right]$$

The following linear precedence (LP) rule in (37) ensures that *not only* always precedes the focused element in the left conjunct, thereby blocking ungrammatical

phrases like (38).

(37) $\begin{bmatrix} \text{PHON} & \langle [\textit{not only}] \rangle \\ \text{CONJ} & \textit{not only} \end{bmatrix} < [\text{INFO-STRUCT} \quad [\text{FOC} \quad \textit{δne-list}]]$

(38) *by selling books not only

(39) shows how the licensing construction for combining *not only* with its complement and the linear precedence rule work.

(39) *Not only* floating too low

$$\begin{bmatrix} \text{DOM} & \langle [\langle [\text{not only}] \rangle \circ \langle [\text{by}], [\text{selling}], [\text{books}] \rangle] \rangle \end{bmatrix}$$

$$\begin{bmatrix} \text{PHON} & \langle \textit{not only} \rangle \\ \text{DOM} & \langle [\text{not only}] \rangle \\ \text{SYN} & \textit{conj} \end{bmatrix} \quad \begin{bmatrix} \text{PHON} & \langle \textit{by, selling, books} \rangle \\ \text{DOM} & \langle [\text{by}], [\text{selling}], [\text{books}] \rangle \\ \text{INFO-STRUCT|FOCUS} & \langle \boxed{1} [\text{books}] \rangle \end{bmatrix}$$

The possible linear orders resulting from (39) and the LP rule (37) are as desired ((40)).

(40) ⟨**not only**⟩ by ⟨**not only**⟩ selling ⟨**not only**⟩ books ⟨***not only**⟩

5.2.2 *Not only* floating too high

Hofmeister assumes that *either* always attaches at the left edge of the disjunction. He argues that in apparent *either* "too high" cases, coordinate ellipsis occurs in the second disjunct. When coordinates combine, shared material at the beginning of non-initial coordinates can be elided, as in (41) and (42).

(41) You'll either [need to bring a passport] or [~~need to bring~~ a birth certificate].

(42) Either [Congress will pass the legislation] or [~~Congress will~~ lose our confidence].

I assume the same for the *not only* … *but also* … construction. *Not only* always attaches at the left edge of the second conjunct, without actual "floating". Shared material at the non-initial conjunct(s) may undergo deletion, as in (43), resulting in what seems like upward floating of *not only* (which is, in fact, only an illusion).

(43) a. You can use this tool not only [to upgrade Windows 7 or Windows 8.1 PCs], but also [~~to upgrade~~ Windows 10 PCs].

b. I was able not only [to cross the street] but [~~to~~ make it down Fruit Street to Mass General].

c. He is known not only [for his accomplishments on the golf course], but [~~for~~ his extravagant lifestyle.

Note that such an ellipsis analysis is also in line with the minimalist analyses of Bianchi & Zamparelli (2004) and of Gallego (2005), although the details differ.

5.3 Negative Inversion

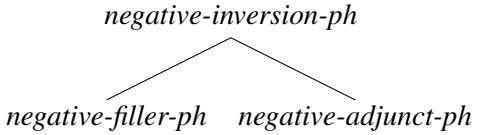
I suggest that the subject-auxiliary inversion that occurs when *not only* floats to the clause-initial position is a negative inversion phenomenon. Maekawa (2012) provides a detailed analysis of negative inversions within the HPSG framework. In (44) are constraints imposed on Maekawa's (2012) *negative-inversion-ph*.

(44)
$$\left[\begin{array}{ll} \text{SUBJ} & \langle\rangle \\ \text{SLASH} & \{(\boxed{3}[\text{NEG} \quad -])\} \\ \text{HD-DTR} & \langle \left[\begin{array}{ll} \textit{word} & \\ \text{INV} & + \\ \text{AUX} & + \\ \text{SUBJ} & \langle\boxed{1}\text{NP}\rangle \\ \text{COMPS} & \langle\boxed{2}\text{VP[SLASH} \quad \{(\boxed{3}),...\}]\rangle \end{array}\right] \rangle \\ \text{NON-HD-DTRS} & \langle[\text{NEG} \quad +],\boxed{1},\boxed{2}\rangle \end{array}\right]$$

The feature INVERTED (INV) has + values for verbs heading inverted phrases (Ginzburg and Sag 2000), and auxiliaries that head inverted constructions are specified as [AUX +]. The SLASH feature specification accommodates the fact that negative inversion constructions may have a non-negative dislocated element.

In Maekawa (2012), it is assumed that there are at least two subtypes of the *negative-inversion-ph*: *negative-filler-ph* and *negative-adjunct-ph*, as in (45).

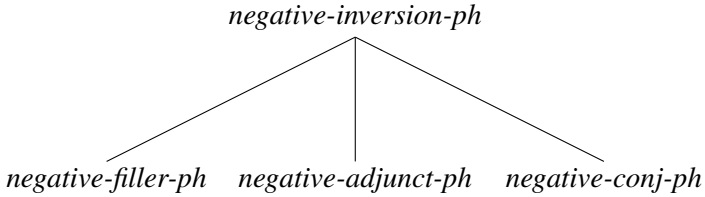
(45) Constructional hierarchy of the *negative-inversion-ph* (Maekawa 2012)



However, neither of these phrase types can adequately account for the behavior of the *not only* ... *but also* ... construction because *not only* in the *not only* ... *but also* ... construction is neither a filler constituent nor an adjunct. Clause-initial *not only* is not a dislocated element because (as was explained in the previous subsection,) *not only* in seemingly "too high" positions are actually not dislocated. Rather, they always attach to the leftmost position of the conjunct, and the apparent "floating high" phenomenon is an illusion due to ellipsis in the second conjunct. Neither is clause-initial *not only* an adjunct, because I analyzed *not only*-phrases as a subtype of the *head-complement phrase* in section 5.1 (see (35)).

Therefore, I propose that there is a third subtype of the *negative-inversion-ph*: *negative-conj-ph*. Now, there would be three subtypes of the *negative-inversion-ph*, as in (46).

(46) Constructional hierarchy of the *negative-inversion-ph* (modified)



I also modify constraints imposed on *negative-inversion-ph*, as in (47).

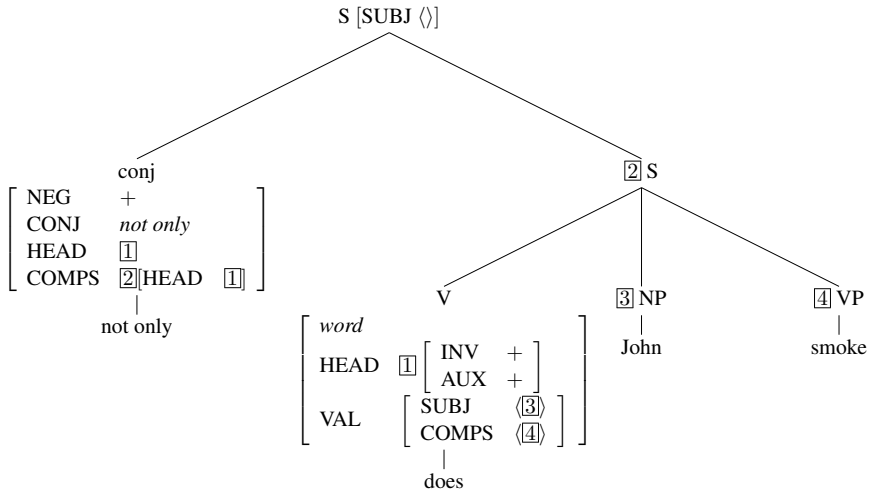
(47)
$$\begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SLASH} & \{(\boxed{3}[\text{NEG} \quad -])\} \\ \text{HD-DTR} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{INV} & + \\ \text{AUX} & + \end{bmatrix} \\ \text{VAL} & / \begin{bmatrix} \text{SUBJ} & \langle\boxed{1}\text{NP}\rangle \\ \text{COMPS} & \langle\boxed{2}\text{VP[SLASH} \quad \{(\boxed{3}),...\}]\rangle \end{bmatrix} \end{bmatrix} \\ \text{NON-HD-DTRS} & /\langle[\text{NEG} \quad +],\boxed{1},\boxed{2}\rangle \end{bmatrix}$$

In (48) are constraints imposed on the new phrase type. Here, the head daughter is the negative conjunction (e.g. *not only*), which takes as its complement the entire following clause. The complement clause of the conjunct is headed by the inverted verb.

(48) *negative-conj-ph* →
$$\begin{bmatrix} \text{HD-DTR} & \textit{conj} \begin{bmatrix} \text{NEG} & + \\ \text{CONJ} & \neg\, \textit{null} \\ \text{HEAD} & \boxed{1} \\ \text{COMPS} & \boxed{2}[\text{HEAD} \quad \boxed{1}] \end{bmatrix} \\ \text{NON-HD-DTRS} & \boxed{2}\text{S} \begin{bmatrix} \text{HD-DTR} & \begin{bmatrix} \textit{word} & \\ \text{INV} & + \\ \text{AUX} & + \\ \text{SUBJ} & \langle\boxed{3}\text{NP}\rangle \\ \text{COMPS} & \langle\boxed{4}\text{VP[SLASH} \quad \{(\boxed{5}),...\}]\rangle \end{bmatrix} \\ \text{NON-HD-DTRS} & \langle\boxed{3},\boxed{4}\rangle \end{bmatrix} \end{bmatrix}$$

The tree in (49) shows the structure for the first conjunct in *Not only does John smoke, but he also drinks*.

(49) *Not only does John smoke*, but he also drinks.



This new subtype—*negative-conj-ph*—can possibly account for other subject-auxiliary inversion phenomena with an initial negative conjunction such as *nor*. For example, the italicized second conjunct headed by *nor* in (50) can be analyzed in the same manner as in (49).

(50) John does not drink, *nor does he smoke*.

6 Conclusion

In this study, the syntactic properties of the *not only* ... *but also* ... construction were examined and analyzed. This is an idiosyncratic construction which differs from the *not* ... *but* ... construction in that the position of *not only* is freer than the position of *not*. Also, *not only*, but not *not* or *only*, triggers negative inversion in the clause-initial position. Therefore, the *not only* ... *but also* ... construction should be treated as a construction separate from *not* ... *but* ... or *only*.

Specifically, I analyzed the *not only* ... *but also* ... construction as a new subtype of the *coord-ph*: *correlative-coord-ph*, in which each conjunct is headed by a conjunction. Within the first conjunct headed by *not only*, shuffling of *not only* is possible in the word order domain, as long as it precedes the focused element. And the second conjunct headed by *but also* can undergo deletion of shared materials. When *not only* in the first conjunct appears in the clause-initial position, negative inversion occurs. I analyze this as a new subtype of *negative-inversion-ph*: *negative-conj-ph*.

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English prepositional numeral constructions

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Abstract

This paper discusses the syntactic properties of 'prepositional numeral constructions (PNCs)' in English, which is exemplified by *about 250 babies* and *over 16,000 animals*. In PNCs a preposition is followed by a numeral. Previous analyses have claimed that the preposition and the numeral make a prepositional phrase in PNCs, but we argue that this is not a satisfactory approach. In HPSG there are some possible analyses that might be proposed, but there are reasons for supposing that the best analysis is one in which the preposition is a functor, a non-head selecting a numeral head.

1 Introduction

This paper discusses the syntactic properties of 'prepositional numeral constructions' (Corver & Zwarts (2006); henceforth PNCs) in English.[1] PNCs involve a preposition, a numeral and a noun. Typical examples are in (1), cited from BNC-BYU.[2]

(1) a. about 250 babies
    b. around 300 performances
    c. over 16,000 animals
    d. under 300 pupils

(1a), for example, has a preposition *about*, a numeral *250* and a noun *babies*.

This paper focuses on the syntactic properties of PNCs. We will look at some important data first, and then we will see how HPSG can deal with them.

2 Basic Data

The following two pieces of evidence show that PNCs are NPs. First, PNCs can involve a determiner like normal NPs. (2a) and (2b) are from BNC-BYU and (2c) from COCA[3].

(2) a. *the* around 2,800 delegates
    b. *the* over three hundred entries

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[1]For semantics, see Nouwen (2010) and Corver & Zwarts (2006).

[2]Davies (2004–)

[3]Davies (2008–)

c. *these* about 7,000 protesters

In (2a) and (2b) the PNCs contain determiner *the* and in (2c) the PNC contains plural determiner *these*.

Second, PNCs can be an antecedent of a pronoun.

(3) a. There were **about thirty men** and *they* had two prisoners.
(BYU-BNC: FRX W_fict_prose)

b. In each one of these tanks, we have **around 500 silversides** and *they* are very torpedo-shaped.
(COCA: 2006 SPOK NPR_ATCW)

In the examples in (3) the PNC *about thirty men* (3a) and *around 500 silversides* (3b) are the antecedents of pronoun *they*.

The following data show that the noun following the numeral is the head of a PNC. When a PNC is a subject, the number agreement with the verb depends on the grammatical number of that noun: (4a) has singular agreement because *year* is singular, and (4b) has plural agreement because *years* is plural.

(4) a. [Over one *week*] has/*have passed.

b. [Over three *weeks*] have/*has passed.

In (4a) the subject is *over one week* and the verb is *has*. It has singular agreement because *week* is the head and it is singular. In (4b) the subject is *over three weeks* and the verb is *have*. It has plural agreement because the head is *weeks* which is plural.

The pre-numeral element in PNCs is a preposition although it might look like an adverb, like *approximately* and *roughly* in (5b).

(5) a. *around/about* eighty books

b. *approximately/roughly* eighty books.

In (5a) *around* and *about* might look like *approximately* and *roughly* in (5b), because they are all in the same, pre-numeral position, and they are also similar in meaning. The pre-numeral element in PNCs, however, behaves like a normal spatial preposition in that it can be modified by *somewhere* (Corver & Zwarts 2006:822). (6) is an example of a spatial preposition and *somewhere*.

(6) (...) the Thames will break through **somewhere** *around* Poplar High Street (...). (BNC-BYU: HW8 W_fict_prose)

In (6) the spatial preposition *around* is modified by *somewhere*.

The examples in (7) illustrate PNCs modified by *somewhere*.

(7) a. We've bought (**somewhere**) *around* fifteen books.
(Kayne 2010:48)

b. (⋯) there was **somewhere** *over* one meter of ice melting at this particular site in the ensuing year.
(COCA: 2001 SPOK NPR_Science)

c. (...) **somewhere** *under* 748 people are struggling specifically with food.
(http://socialismoryourmoneyback.blogspot.jp/2014/02/uk-now-face-real-hunger-problem.html)

In (7a), for example, the PNC *around fifteen books* is modified by *somewhere* in the same way as the spatial preposition in (6).

As (8) shows, adverbs *approximately* and *roughly* do not allow modification by *somewhere*.

(8) ***somewhere** *approximately/roughly* eighty books

Thus, the initial element of PNCs allows modification by *somewhere*. We can conculde, then, that they are prepositions, not adverbs.

The fact that a complex preposition can appear before the numeral also indicates that the prenumeral element is not an adverb (Corver & Zwarts 2006:823-4).

(9) a. *from* ten *to* fifteen judges
b. *in excess of* ninety delegates
c. *up to* twenty minutes (Huddleston & Pullum 2002:357)

The examples in (9) have complex prepositions like *in excess of* or *up to*, and they are clearly not adverbs. As one would expect, they can be modified by *somewhere*.

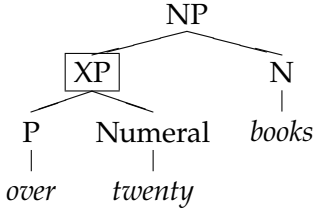
(10) a. **somewhere** *from* 500,000 *to* 650,000 people
(http://www.memphismagazine.com/December-2006/The-Return-of-the-Spanish-Lady-pt-II/)

b. **somewhere** *in excess of* 50 scuds
(COCA: 1991 SPOK ABC_Nightline)

c. **somewhere** *up to* 100,000 people
(http://www.huffingtonpost.ca/glen-pearson/sudan-independece_b_873072.html)

The above points indicate that a PNC has something like the following structure.

(11)



(11) shows that a preposition and a numeral combines to make a constituent, and that constituent combines with a noun.

The following example shows that this is a right analysis.

(12) a. [over thirty] but [under fifty] students
b. [over thirty] but [not more than forty] students[4]

In the examples in (12) *over thirty* is conjoined with another prenominal phrase *under fifty* and *not more than forty*, respectively. These examples show that *over thirty* makes a constituent.

What is the prenominal constituent (XP in (11)), then? A possible analysis might be that it is a PP, composed of a prepositional head and a numeral as its complement. In the next section we will see that there are some objections to this analysis.

3 PP analysis of the prenominal phrase

Aarts (2011) states that the prenominal constituent is a PP.

(13) [$_{NP}$ [$_{PP}$ over twenty] Iranians] (Aarts 2011:119)

In (13) *over twenty* is a constituent and it is a PP. Corver & Zwarts (2006) also argue that the prenominal constituent is a PP. They claim that the N and the prenominal phrase are merged inside the NP and make a small clause. The prepositional numeral then moves up to Spec NumP for checking its cardinality feature with the Num head.

(14) [$_{NumP}$ [$_{PP}$ around 20]$_i$ [$_{Num'}$ NUM [$_{NP}$ children t$_i$]]]
(Corver & Zwarts 2006:828)

However, the PP analysis of the prenominal element is not without problems. First, unlike a normal PP, it is in the prenominal position. (15) shows that the normal PP *on the desk* should be in the postnominal position.

(15) a. *[on the desk] books[5]
b. books [on the desk]

However, PNCs should be in the prenomial position, not postnominal position.

(16) a. [over thirty] books

[4]Bob Borsley, p.c.

[5]The italicised phrases in the following examples are PPs, but we follow Sadler & Arnold (1994:189) in assuming that they are the result of some word formation process.

(i) an *on board* entertainment console

(ii) an *up-to-the-minute* new report (Sadler & Arnold 1994:189)

b. *books [over thirty]

(16a) shows that *over thirty* should be in the prenominal position. This indicates that *over thirty* is different from a normal PP, which should be postominal.

The second problem is related to the following generalisation: modifiers with complements are systematically excluded from the prenominal position in English (Sadler & Arnold 1994:190).

(17) a. a child [grateful [for the present]]
b. *a [grateful [for the present]] child (Sadler & Arnold 1994:189)

In (17a), *grateful for the present* is a modifier for *child*, and it is in the postnominal position because *grateful* is a head and *for the present* is its complement. (17b) shows that *grateful for the present* cannot be a prenominal modifier: it contains a complement. If the prenominal element in a PNC was a PP, it would pose a serious challenge for the above generalization because a PP contains a complement and it should be excluded from the prenominal position.

It seems, then, that the PP analysis of the prenominal element of PNCs is unsatisfactory.

4 The prenominal phrase is a numeral

In this section we will see some pieces of evidence that the prenominal phrase of PNCs is headed by the numeral, not the preposition. First, it occurs in the prenominal position like normal numerals.

(18) a. [thirty] books
b. *books [thirty]

(19) a. [over thirty] books
b. *books [over thirty]

The examples in (18) shows that *thirty* should be in the prenominal position, and (19) shows that *over thirty* should be in the prenominal position too. They show that *over thirty* behaves in the same way as *thirty* in terms of positioning.

Second, it can appear in the position which is typically filled by a numeral. In the noun phrase constructions in (20) the head noun is plural but it has an indefinite article, and there are an adjective and a numeral between them. In (20a) for example, the head noun is *years*, which is plural, but it has an indefinite article. Between the indefinite article and the head noun there are an adjective (*amazing*) and a numeral (*fifty*).

(20) a. an amazing [fifty] years

b. a negligible [ten] people
c. an estimated [100] men
d. an additional [100] jobs

It is possible to say that the prenominal position of these constructions is a position for numerals. This numeral position can be filled by a combination of a preposition and a numeral, as illustrated by the following examples.

(21) a. an amazing [over fifty] years
b. a negligible [under ten] people
c. an estimated [around 10,000] students
d. an additional [about 100] jobs

In (21a), for example, *over fifty* fills the same position as *fifty* in (20). This means that the combination of a preposition and a numeral functions as a kind of numeral, and that means the numeral heads the combination.

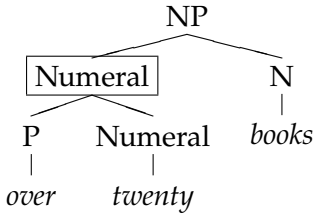
Third, the prenominal phrase involving *one* can function as a determiner, like the numeral *one*.

(22) a. *(one) year
b. *(around one) year

In (22a) *year* is a singular countable noun, and it is ungrammatical if it does not have a determiner *one*. In (22b) *around one* functions as a determiner, exactly like *one*. This means that *around one* works exactly like *one*, which means *one* is the head.

The above pieces of data show that the prenominal phrase of a PNC behaves like a numeral. This means that the numeral heads the prenominal phrase. What we want is roughly structures like (23).

(23)



(23) shows the combination of a preposition and a numeral functions as a numeral.

5 HPSG Analyses

It is important to note that only a limited variety of prepositions can appear in PNCs. With their spatial meaning, the pairs of prepositions in (24) are almost interchangeable.

(24) a. The water came up *above*/*over* our knees. (Swan 2005:3)
b. I'd like to travel *around*/*round* the world. (*ibid.*:50)
c. Look in the cupboard *below*/*under* the sink. (*ibid.*:85)

With their spatial meaning, *above* and *over* in (24a), *around* and *round* in (24b) and *below* and *under* in (24c) have almost the same meaning, and they are interchangeable in these sentences.

However, only one of each pair is available in PNCs.

(25) a. She had *over*/**above* thirty pairs of shoes. (Sinclair 2004:5)
b. He owns *around*/**round* 200 acres. (*ibid.*:39)
c. There were *under*/**below* twenty people at the lecture. (Swan 2005:86)

The examples in (25) show that *over*, *around* and *under* can be used in PNCs but *above*, *round* and *below* cannot.

These pieces of data show that we need a framework which provides representations detailed enough to grammatically differentiate *over*, *around* and *under* from *above*, *round* and *below*, respectively, and to capture the idiosyncratic properties of the former type of prepositions. HPSG is such a framework.

The lexical description of a normal preposition which takes a noun as its complement is something like the following.

(26) $\begin{bmatrix} \textsc{head} & \textit{preposition} \\ \textsc{comps} & \langle \begin{bmatrix} \textsc{head} & \textit{noun} \end{bmatrix} \rangle \end{bmatrix}$

(26) says that normal prepositions take a noun as their complement. It is clear that the prepositions in PNCs have quite different properties from those of normal prepositions. They do not form a prepositional phrase with the following numeral. Rather, the numeral functions as a head and the phrase behaves as a numeral.

In the rest of this section we will look at three possible HPSG analyses of the prepositions in English PNCs. The first and second analyses appear to be unsatisfactory, but the third seems to give a satisfactory account of the facts.

5.1 Weak head analysis 1

We will first consider an analysis in which PNCs in English are treated in the same way as the similar constructions in Polish. Przepiórkowski (2013) analyses the Polish preposition *po* in examples like (27) as a weak head .

(27) W pokojach będą po dwa fotele. [Polish]
in rooms be-FUT.PL DISTR two-NOM.PL armchair-NOM.PL

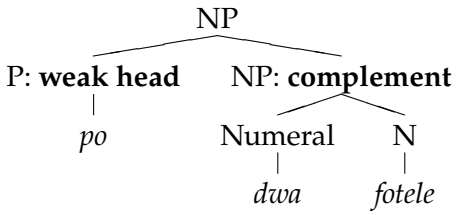
'There will be two armchairs in each room.'

(Przepiórkowski 2013:166)

The word *po* is a preposition encoding distance distributivity: it 'attaches to the noun phrase denoting the distributed quantity and looks elsewhere in the sentence for the set to distribute over' (Przepiórkowski 2013:162). I in (27) the preposition is followed by numeral *dwa* 'two', and the numeral in turn is followed by noun *fotele* 'armchair'. The resulting phrase looks really like an English PNC. In this sentence this phrase functions as a subject: it is nominative and induces plural agreement with the verb.

Przepiórkowski (2013) claims that *po* in (27) is a weak head (Tseng 2002, Abeillé et al. 2006) taking *dwa fotele* 'two armchairs' as its complement. This produces a right branching structure like the following schematic representation.

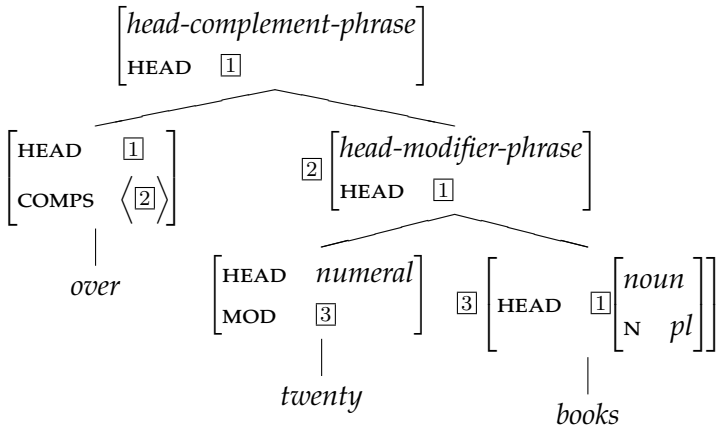
(28)



A weak head inherits most of syntactic and semantic properties of its complement and those properties are passed on to the phrasal level. This propagation of information from non-heads to phrases can account for the fact that the prepositional phrase can act as a nominative noun phrase and induces plural agreement with the verb: *po* inherits the grammatical case and number of the complement NP and passes them onto the mother node.

An analysis of PNC prepositions in English as a weak head would produce structures like (29). As there is no clear evidence that English numerals head noun phrases, it is assumed that numeral *twenty* is a modifier, making a head-modifier phrase with the head noun *books*. As a value of a HEAD feature, the information about number (indicated as a value of NUMBER (N)) is inherited from *books* to *twenty books*. The weak head preposition *over* takes *twenty books* as its complement and the information about the number is inherited to *over* as part of the HEAD value. That information is propagated to the top node, and the whole phrase can behave like a plural noun phrase.

(29)

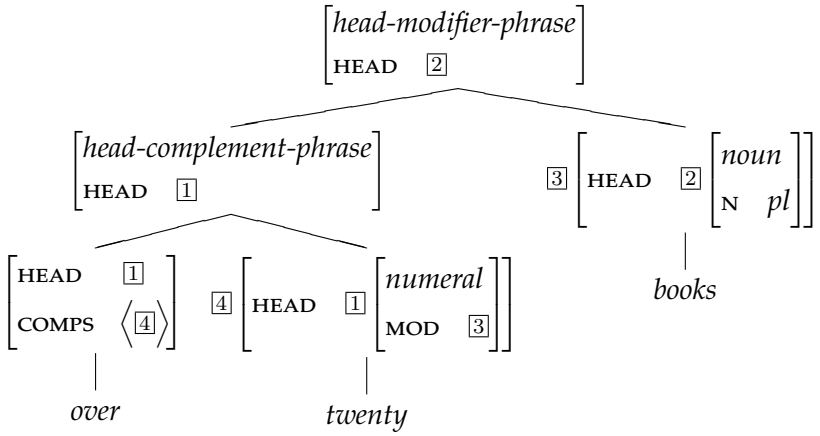


It seems that Przepiórkowski's (2013) analysis works for the Polish data, but the examples observed in section 1 pose a problem for analysing English PNCs along these lines. In that section we claimed that the PNC is an NP with a left branching structure, in which the head noun is preceded by a combination of the preposition and the numeral, as described in (23). In the weak head analysis 1 the PNC is an NP, but it is headed by a (weak head) preposition which takes a combination of the numeral and the noun as its complement. This analysis produces a right branching structure and is incompatible with our conclusion about the constituent structure of PNCs (23).

5.2 Weak head analysis 2

One might argue for an analysis in which the weak head preposition takes a numeral as its complement and the resulting phrase combines with the head noun. This analysis would produce structures like (23).

(30)



In (30) the weak head *over* takes *twenty* as its complement. As a weak head *over* inherits the value of HEAD feature of its complement. This allows the

phrase *over twenty* to have the same MOD value as *twenty* and combination with *books* is possible.

However, there is an objection to this analysis. As discussed in section 3 modifiers with complements are systematically excluded from the prenominal position in English. In (30), however, *over twenty* containing a complement *twenty* is a modifier of *books*. Thus, this structure is incompatible with the generalisation.

We conclude, then, that the approaches employing weak heads are unsatisfactory.

5.3 Functor analysis

We will turn to an analysis which we think provides a satisfactory analysis of the data. In this analysis prenominal elemensts, such as adjectives and determiners, are uniformly treated as 'functors' (Van Eynde 2006, 2007, Allegranza 1998). Functors are non-heads which select heads. The combination of the functor and its head (called 'head-functor phrase') is subject to the following constraint (Van Eynde 2006:164).

(31) *head-functor-phrase*

$$\rightarrow \begin{bmatrix} \textsc{daughters} & \langle \left[\textsc{sel} \quad \boxed{1}\right], \boxed{2}\left[\textsc{synsem} \quad \boxed{1}\right]\rangle \\ \textsc{head-daughter} & \boxed{2} \end{bmatrix}$$

Constraint (31) states that in a phrase of type *head-functor-phrase* the non-head daughter selects the head daughter. The selection is indicated as the value of the SELECT (SEL) feature.

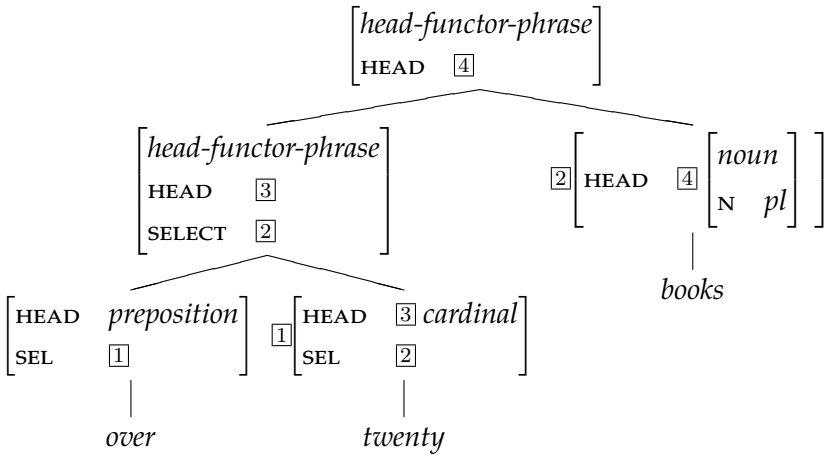
With these assumptions the lexical description of prepositions in PNCs is something like the following.

(32) $$\begin{bmatrix} \textsc{head} & \textit{preposition} \\ \textsc{sel} & \left[\textsc{head} \quad \textit{cardinal}\right] \end{bmatrix}$$

(32) states that prepositions in PNCs select a cardinal numeral. It is a sort of functor, which selects a head.

The internal structure of PNCs can be analysed as in (33).

(33)



The preposition *over* combines with *twenty* to form a head-functor phrase, utilising the SELECT specification (1). The head daughter's SELECT value is propagated to the mother node (2). The phrase *over twenty* combines with the head noun *books* to form another head-functor phrase, utilizing the SELECT value 2 inherited from *twenty*. The head daughter's HEAD value is the same as that of the mother node (3, 4 and 5).

In (33) *over twenty* has the same HEAD value as *twenty*, and it works as a numeral. The NP *over twenty books* has the same HEAD value as *books*. As a result, *over twenty books* behaves as a plural noun in the same way as *books*.

The functor analysis can handle the problems we noted with the previous analyses in section 3. First, this analysis can produce left branching structures, which we argued to be a right analysis. Second, the combinations of the preposition and the numeral are not PPs but phrases headed by the numeral so it is natural that they occur in the prenominal position in the same way as bare numerals. Finally, the numeral in the PNCs is not a complement of the preposition so it does not contradict the generalisation that prenominal modifiers do not take a complement.

The functor anaysis is more satisfactory than the weak head analyses because it can accommodate all the data observed in section 1 and does not contradict the generalisation that prenominal modifiers do not take a complement.

6 Further data

In section 4 we argued for the claim that in PNCs the combination of a preposition and a numeral functions as a numeral. This might lead one to wonder why the following phrases are bad.[6]

(34) a. *over over twenty books

[6]I would like to thank Emily Bender and Dan Flickinger for bringing these problems to my attention.

b. *a hundred over twenty

In (34) *over* combines with *over twenty*, which in our analysis should behave syntactically like normal numerals like *twenty* in (35).

(35) a. over [twenty] books
b. a hundred [twenty]

It appears that numerals and PNC prepositions should not combine with a numeral which has already been combined with a preposition. To capture this constraint, we introduce the MARKING (MRK) feature and argue that the MRK value of PNC prepositions is *pnc*. We assume that in a head-functor phrase the MRK value is inherited from the functor daughter to the phrase (Van Eynde 2006, 2007). The above constraint can be accommodated if we specify that numerals and PNC prepositions do not combine with an element which has *pnc* as its MRK value.

Thus, the lexical description of a PNC preposition in (32) should be modified as in the following.

(36)
$$\begin{bmatrix} \textsc{head} & \textit{preposition} \\ \textsc{sel} & \begin{bmatrix} \textsc{head} & \textit{cardinal} \\ \textsc{mrk} & \neg\, \textit{pnc} \end{bmatrix} \\ \textsc{mrk} & \textit{pnc} \end{bmatrix}$$

(36) states that prepositions of PNCs have *pnc* as its MRK value and select a cardinal numeral which does not have *pnc* as its MRK value.

7 Conclusion

We provided a detailed description of English PNCs and especially of the prepositions employed in the constructions. We then considered how PNCs should be analysed within the framework of HPSG. We looked at three different analyses: two in terms of weak heads and one in terms of functor daughter, and showed that the funtor analysis provides a satisfactory account of the data. We employed only existing and independently motivated theoretical apparatus.

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