

**Lisbon Binding Workshop
Workshop on Binding Theory and
Invariants in Anaphoric Relations
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Workshop Notes**

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Contents

Preface iii

Contributors v

Co-reference by association. Georgian reflexives in subject function in special contexts 1
Nino Amiridze

Can local domain reshuffling be an alternative to exemption? 7
António Branco

On binding domains 13
Martin Everaert

Where are restrictions on binding encoded? – Pronominal features, the theory of chains and verb classes 17
Volker Gast

Syntactic and semantic conditions on reflexive binding in Norwegian 19
Lars Hellan

Event structure and binding 25
Ekaterina Lyutikova
Sergei Tatevosov

Phases and local binding domains in English 31
Réjean Canac Marquis

Semantic composition in reflexivization 37
Tohru Noguchi

What are binding principles constraints on? 43
Carl Pollard

Binding conditions: how are they derived? 47
Eric Reuland

Binding in picture noun phrases: implications for binding theory 53
Jeffrey T. Runner
Elsi Kaiser

Verifying binding constraints for anaphor resolution 59
Roland Stuckardt

Preface

The *Workshop on Binding Theory and Invariants in Anaphoric Relations* took place in Lisbon, at the Faculty of Sciences of the University of Lisbon, in 22 August, 2005. The program committee has selected 12 papers for presentation.

The present workshop booklet contains the extended abstracts of the presentations. The contributions are in alphabetic order by the first author.

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Co-Reference by Association. Georgian Reflexives in Subject Function in Special Contexts

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Georgian has a complex anaphoric phrase with the grammaticalized body-part *tav-* “head” as its head and a possessive pronoun as its determiner. The literal translation of the whole expression is “one’s head”. However, it no more means a body-part in reflexive constructions (Shanidze, 1973), (Harris, 1981). The reflexive phrase has to be bound in a local domain necessarily by a c-commanding antecedent and can never be used as a long-distance anaphor (1) or in logophoric contexts (2).

- (1) *ilia_i pikrobs, rom gia-s_j*
Ilia.NOM he.thinks that Gia-DAT
sjera, kaxa-s_k surs,
he.believes Kakha-DAT he.wants
bakar-is_l zma-m_m akos
Bakar-GEN brother-ERG he.praises.SUBJ
*tavis-i tav-i_{*i/*j/*k/*l/m}*
self’s-NOM self-NOM
 “*Ilia_i thinks that Gia_j believes [that] Kakha_k*
wants [that] Bakar_l’s brother_m praises
*himself_{*i/*j/*k/*l/m}”*
- (2) **šen-i tav-is msgavs-i*
your.SG-NOM self-GEN alike-NOM
xalx-is-tvis dikṭator-s qoveltvis
people-GEN-for dictator-DAT always
moežebneba ert-i
it.can.be.searched.by.him/her one-NOM
saḡan-i
prison.cell-NOM
 “For people like yourself the dictator always has a prison cell”

However, the reflexive phrase may also perform

an exceptional behaviour – it can be marked by ERG case marker and function as a subject argument.¹ Asatiani’s original examples of ergative-marked reflexive phrases involve causative verbs where the subject argument is given as a reflexive phrase (3). According to Amiridze and Everaert (2000), also transitive verbs can take the ergative-marked reflexive phrase as an argument but on a non-agentive reading (4). Amiridze (2003) discusses the same phenomenon with the so-called object experiencer verbs allowing their subject argument to be a reflexive (5).

- (3) (Asatiani, 1982, p. 86)
- tavis-ma tav-ma gaakṭebina*
self’s-ERG self-ERG she.made.her.do.it
nino-s es
nino-DAT this.NOM
 “(Something in) Nino_i’s personality made her_i do this”
- (4) (Amiridze and Everaert, 2000)
- tavis-ma tav-ma ixсна*
self’s-ERG self-ERG (s)he.saved.him/her
prezident-i
president-NOM

¹It should be noted that subject arguments can be not only ergative-marked. Verbs of different verb classes have different alignment in different TMA Series (see, for instance, (Anderson, 1984), (Aronson, 1994), (Boeder, 1989), (Hewitt, 1995), (Kvatchadze, 1996), (Shanidze, 1973) among others). For instance, transitive verbs have the subject argument marked by ERG in TMA Series II, by NOM in TMA Series I and by DAT in TMA Series III. Thus, the examples of subject reflexives (or subject reciprocals) are not only those marked by ERG (cf. 3, 4, 5) but also those marked by NOM (cf. 9a) or DAT.

“It was his/her own positive personal properties, and/or his/her past achievements, etc., that saved the president”

(5) (Amiridze, 2003)

[tavis-ma_i tav-ma_j]_j gaaoca
self's-ERG self-ERG he.surprised.him
[kac-i]_i
man-NOM

“The man got surprised because of something related to himself”

According to the Principle A of the standard Binding Theory (Chomsky, 1981), anaphors have to be bound in a local domain by an antecedent c-commanding them. From the Binding Theory perspective the examples 3, 4 and 5 are problematic since there the reflexive phrases do not have a c-commanding antecedent. Cross-linguistically there are languages having anaphors without a c-commanding antecedent, qualified as logophors. However, the absence of a c-commanding antecedent does not make the reflexive phrase *tavis-ma tav-ma* in 3, 4 or 5 a logophor with an antecedent in the possible previous discourse. In fact the only NP (*nino-s* in 3, *prezident-i* in 4 or *kac-i* in 5) on which the interpretation of the reflexive phrase depends is in the same local domain as the reflexive.

There are some other languages too allowing reflexives to occupy a subject position under certain conditions. For instance, Everaert (2001) observes that the Georgian reflexive phrase *tavis- tav-* is structurally very similar to the Greek anaphor *o eaftos tu* (as described in (Iatridou, 1988) and (Anagnostopoulou and Everaert, 1999)) which is also able to appear as a subject (6):

(6) (Anagnostopoulou and Everaert, 1999)

[O eaftos_j tu_i]_j ton provlimatizi [ton
The self his CL.ACC puzzle.3SG the
Petro]_i
Peter.ACC

“Himself puzzles Peter”

Both in Greek (6) and in Georgian (5) only the possessor within the reflexive NP has an agreement relation with the postcedent. Everaert (2001) and

Everaert (2003) claim that precisely because of such structure of the anaphor Georgian allows a locally bound “subject” anaphor. In 5 the predicate is both reflexive and reflexive-marked satisfying Binding conditions A and B of the Reflexivity Theory (Reinhart and Reuland, 1993); and because of its internal structure (the two co-indexed elements *tavis-* and *kac-* in 5 do not form an A-chain) the reflexive is able to escape Chain Formation violation.

However, as argued in (Amiridze, 2003) and (Amiridze, 2004), if only the structure of an anaphor matters (enabling to escape the Chain Formation) then (i) the anaphor has to be grammatical in subject position in Georgian with any verb but it is not (7), (ii) it is not clear why reciprocals, having a different structure² than reflexives (8), are allowed as subjects (9a).

- (7) *tavis-ma tav-ma galanẓγa
self's-ERG self-ERG he.cursed.him
kac-i
man-NOM
Himself cursed the man

- (8) a. ertmanet- < ert+man+ert-
one+ERG+one-
“each other”
b. ertimeore- < ert+i+meore-
one+NOM+second-
“each other”

- (9) a. ertmanet-i amxiarulebt
REC-NOM it.makes.them.cheerful
bavšv-eb-s
child-PL-DAT
“Something in each other makes the children cheerful” (i.e., their behavior, the way they look, etc.) (non-agentive reading)
b. bavšv-eb-i ertmanet-s
child-PL-NOM REC-DAT
amxiaruleben
they.make.them.cheerful
“The children make each other cheerful” (i.e., by performing, telling, etc.)

²Georgian reciprocals are not derived from any body-part (8), neither they form a possessive construction as it is in the case of the Georgian reflexive phrase *tavis- tav-*.

(agentive reading)

Amiridze (2004) argues that there is more than only the internal structure of anaphors and the related anaphoric properties responsible for the existence of subject anaphors. Amiridze (2004) suggests to take into account the semantic/thematic properties of those verbs and verb readings which allow ergative-marked reflexive phrases as their subject.

In the cases described so far in the literature the ergative-marked reflexive phrases refer to a property, an aspect, something related to or associated with the referent of their postcedent (3, 4, 5). Additionally, reciprocals which are also able to appear as a subject of object experiencer verbs (9a) and which are not derived from any body-part (cf. 8) are also interpreted as a property or aspect or something related to and associated with the referent of their postcedent. The examples 4 and 9a illustrate that reflexives and reciprocals as subjects of transitive verbs on the non-agentive reading cannot refer to an agent but can only be understood as a theme/cause, having an experiencer rather than a theme as a postcedent.³ In fact, only the verbs taking a theme/cause as a subject allow reflexives and reciprocals as subjects (cf. the ungrammatical 10a with an experiencer as a subject, the ungrammatical 7 with an agent as a subject, as well as the glosses of 3, 4, 5 and 9a illustrating the subject reflexive or reciprocal to refer to a theme/cause rather than an agent):

(10) (Amiridze, 2003)

- a. *tavis tav-s uqvars
self's self-DAT he.loves.him
ivane
Ivane.NOM
Himself loves Ivane

³The phenomenon of turning a transitive into a psych verb on the stative reading is discussed in (Bouchard, 1995) and (Arad, 1998). According to Arad (1998), agentive verbs can have a psych interpretation if the subject cannot be construed as agentive (*This joke really killed the audience; An idea hit Mary*). Bouchard (1995) observes that any verb can be interpreted as a psych verb if (a) the verb has one animate argument which will be interpreted as an experiencer (necessary but non-sufficient requirement), (b) the external argument is incapable of physical action. Cf. also (Pesetsky, 1995) where experiencer-object predicates are treated as causative constructions.

- b. ivane-s uqvars tavis-i
Ivane-DAT he.loves.him self's-NOM
tav-i
self-NOM
“Ivane loves himself”

Note that with non-agentive psychological predicates such as object experiencer verbs as well as with transitives or causatives on their non-agentive reading the subject is not an *individual* but of the type of *properties of individuals* (Partee and Rooth, 1983).

Amiridze (2004) argues that the exceptional syntactic behaviour of Georgian anaphors follows from their semantics. In addition to the type of *individuals*, Georgian anaphors are also of the type of *properties of individuals* which is responsible for their ability to appear in the subject position of object experiencer verbs and transitives (on a non-agentive reading) where only NPs of the type of *properties of individuals* can surface.

This paper presents the cases where it is not necessary for the referent of the reflexive to be an aspect of the referent of its postcedent but a representation such as a TV image (11), a recorded voice (12), a close associate or someone closely resembling, for instance, a twin sibling (13). These are contexts with identity splits, or those reflecting dream/unreal worlds, associations. In these special, representational, contexts the transitive verbs taking an ergative reflexive phrase as an argument do have an agentive reading.

(11) (TV-image context)

- televizor-is ekran-i-dan [tavis-ma
TV-GEN screen-INST-from self's-ERG
tav-ma] damoṡvra
self-ERG (s)he.instructed.him/her
paṛi-is lider-i
party-GEN leader-NOM

Lit.: From the TV screen himself.ERG instructed party leader.NOM

The context: The leader of the party was watching his own speech on the TV and was instructed by himself as an ordinary TV viewer would have been instructed by a party leader.

(12) (Voice recording context)

xširad ucnaur-i gržnoba
 often strange-NOM feeling.NOM
 mičndeba, roca [čem-i-ve
 it.appears.to.me when my-NOM-FOC
 tav-i] meubneba, ris šemdeg
 self-NOM (s)he.tells.me what.GEN after
 ra unda gavaḱeto
 what should I.do.SUBJ

[“Sometimes I dial my home number and leave a list of instructions for myself on the voice mail in order to listen to them when returned back home and remind myself what still has to be done for the next day.] I often get a strange feeling when [I hear my own voice and realize that it is] myself [who] tells me what has to be done and in which order.”

(13) (Twin context)

mašin ḱi martla vipikre, rom
 then PART really I.thought that
 mesizmreboda, rogor
 I.was.dreaming.about.it how
 ḱocnida [tavis-i tav-i]
 she.was.kissing.her self’s-NOM self-NOM
 natia-s
 Natia-DAT

[An amazed viewer: “I came out and got amazed. Natia has turned into two persons. They stood and talked to each other. Finally they also kissed each other.] It was only then when I really thought that I was dreaming how Natia was being kissed by her(own)self”

In the TV image context in 11 the referent of the postcedent, the full NP *paṛti-is lider-i*, refers to a certain individual while the ergative marked subject reflexive phrase refers only to one part of his/her personality. This example can also be viewed as representational – the person affected by his/her own TV-image. However, irrespective of how the referent of the postcedent is qualified—as affected by one of the aspects of his/her personality or by his/her TV image—it gets affected as an ordinary patient (cf. 11 vs. 14):

- (14) prezident-ma damoḟvra
 preident-ERG (s)he.instructed.him/her
 paṛti-is lider-i
 party-GEN leader-NOM
 “The president instructed the party leader”

Example 12 illustrates a context in which a recorded voice of a person helps him/her to recall the schedule for the next day. In this particular example a voice recording is a representation of that person affecting him/her just as an ordinary agent affects an addressee (cf. 12 vs. 15):

- (15) [čem-i-ve xelkveit-i]
 my-NOM-FOC subordinate-NOM
 meubneba...
 (s)he.tells.me
 “My own subordinate tells me...”

Example 13 illustrates a twin context where the referent of the reflexive phrase is not an aspect or image of the referent of the postcedent as it is in 11, 12 but it is a completely different personality closely resembling the referent of the postcedent. In 13 the reflexive phrase refers to the twin of the referent of the postcedent NP *natia-s*. It is as human and as agentive as the referent of the full NP *deda* in 16:

- (16) deda ḱocnida natia-s
 mother.NOM she.was.kissing.her Natia-dat
 “The mother was kissing Natia”

In these contexts the Georgian reflexive phrases refer to an image or a close associate which is not necessarily [-human]/[-animate] at all but can perform agentive behavior and act as an agent. In 11 and 12 the TV image of the party leader and the voice recording are in no way agentive. However, the referent of the postcedent gets affected by the images as an ordinary patient (cf. 11 vs. 14) or as an ordinary addressee (12 vs. 15). As for the twin context in 13, not only the referent of the postcedent gets affected as an ordinary patient (13 vs. 16) but also the referent of the reflexive phrase — the twin — performs an agentive behavior. One might call these cases non-anaphoric. However, Jackendoff (1992) shows that reflexive pronouns may be interpreted as referring to a representation of their antecedents and not only strictly identical to their antecedents.

Therefore, the reflexive phrase in Georgian is used in (i) canonical reflexive situation when the referents of the full NP and the reflexive are identical (1); (ii) when the referent of the reflexive is a part(s)/aspect(s)/property/properties of the referent of the full NP (3, 4, 5); (iii) when there is a further departure from the canonical case—when the referent of the reflexive is a representation, some kind of image or someone closely resembling the referent of the full NP (11, 12, 13). Thus, the reflexive phrase in the special contexts is a co-reference marker between the arguments whose referents are associated with each other by some property. Since Georgian reflexives diachronically come from the body-part *tav* “head”, we could argue that the grammaticalization of the body-part into a co-reference marker has followed by the grammaticalization into a marker of the *co-reference by association*.

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Can Local Domain Reshuffling be an Alternative to Exemption?

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1 Background

An important step forward in the research on the grammatical invariants in anaphoric relations was the realization that reflexives occurring at the beginning of their corresponding o-command hierarchy (let's call such positions o-bottom positions) are exempt from behaving in accordance with the corresponding binding principle. The notion of exemption was a key contribution of Pollard and Sag (1992, 1994), developed mostly on the basis of data concerning short-distance reflexives, ruled by Principle A. Later, Branco and Marrafa (1999) and Branco (2000) showed that exemption in o-bottom positions extends also to long-distance reflexives, ruled by Principle Z. Accordingly, long-distance reflexives, resp. short-distance reflexives, are exempt when in the beginning of their o-command hierarchy, resp. of their local o-command hierarchy.

An interesting question that called for further research since then is whether o-bottom reflexives, while being exempt from the discipline of its binding principle, might still display any substantial grammatical regularity with respect to their admissible antecedents: In short, whether some other binding invariant might still come into play for reflexives exempt from the anaphoric discipline captured by their binding principles.

A thorough scrutiny of this issue faced certain initial methodological obstacles among which is the fact that the distribution of reflexives in the most studied language, English, is restricted by its non-nominative case marking, which hampers the testing and observation of their anaphoric behavior in exempt sentential Subject positions. Moreover, the data available for exempt reflexives in English picture NPs and nominal predication structures in general seemed, in turn, to indicate that the possi-

ble factors impinging on the anaphoric capacity of o-bottom reflexives to be more of a soft, discourse-based character (Zribi-Hertz, 1989; Golde, 1999), than of the hard, grammatical nature of binding principles.

2 Goal

Against this background, my goal in this presentation is to explore data contributing new insights concerning this issue. By fully exploring the account briefly hinted at in Branco (2005), I argue that the data presented below are better interpreted and explained as supporting the view that o-bottom reflexives may obey a hard, grammatical anaphoric discipline. In more concrete terms, my claim is that, for at least some languages, it is possible that their o-bottom reflexives are not exempt but keep being ruled by their corresponding binding principle. This generalization can be held provided that a very simple hypothesis is entertained: For such reflexives, in the bottom of their obliqueness hierarchy, the relevant local domain reshuffles to include the o-commanders in the selectional domain immediately upstairs, that is the selectional domain which immediately dominates the selectional domain in whose o-bottom position the reflexive occurs.

3 Approach

Most of the data to be discussed here concerns Portuguese, in particular, its null anaphor occurring in sentential Subject positions (termed as little pro in some grammar frameworks). At the end of this abstract, these data is contrasted with data concerning German *sich*.

Null Subjects in Portuguese, and in other so-called pro-drop languages, have been the focus of

intensive discussion. My focus here, however, is not on the possible correlations between these null anaphors and agreement, nor on the discussion of the possible factors allowing their occurrence. My interest here is rather on the much less discussed issue of its anaphoric behavior.

In the present abstract I use just a few contrasts supporting the gist of the argument. Full paradigmatic contrasts and correlations will be discussed at length in the full paper.

4 Data

In Portuguese, null anaphors occur in Subject positions (represented by the symbol \emptyset in the examples below), that is in o-bottom positions for the purpose of binding theory effects. As shown in (1), they may pick an antecedent outside its local domain:

- (1) O Pedro_i pensa que \emptyset_i será convidado para a festa.
 the Pedro_i thinks that \emptyset_i will_{be} invited to the party
Pedro thinks that he will be invited to the party.
- (2) O Pedro_i pensa que ele_i será convidado para a festa.
 the Pedro_i thinks that he_i will_{be} invited to the party
Pedro thinks that he will be invited to the party.

In this respect, it displays an anaphoric behavior similar to the behavior of overt pronouns, as can be seen from the comparison between (1) and (2). Nevertheless, this seems to be the only feature apparently shared with pronominals. When going through the basic criteria to ascertain that an anaphor is a reflexive, they are met by this null anaphor.

First, the null anaphor obeys a locality restriction, but not of the usual kind:

- (3) A Maria_i pensa [que a Rita_j me disse [que $\emptyset_{*i/j}$ será convidada para a festa.
 the Maria_i thinks that the Rita_j me told that $\emptyset_{*i/j}$ will_{be} invited to the party.
*Maria_i thinks that Rita_j told me that she_{*i/j} will be invited to the party.*
- (4) * O Pedro descreveu a Maria_i ao amigo de que \emptyset_i gosta.
 the Pedro described the Maria_i to_{the} friend of which \emptyset_i likes
Pedro described Maria_i to the friend that she_i likes.

In (3), *a Rita* can be an antecedent of the null anaphor, but *a Maria* cannot. While *a Rita* is inside the local domain circumscribed by the verb that immediately selects the clause where the null anaphor is, *a Maria* is outside that local domain.

In (4), the null anaphor is in the Subject position of the relative clause (the pied piping of the preposition *de*, subcategorized for by the verb *gostar*, hampers this to be alternatively interpreted as a Subject relative as well). It cannot have *a Maria* as antecedent, which lies outside the local (nominal) domain immediately upstairs.

Contrasts like the above, indicating that their admissible antecedents are in the local domain immediately upstairs can be multiplied at ease in different syntactic structures (more data and details will be provided in the presentation).

Second, like what happens to reflexives, recesses in the geometry of grammatical representation are opaque to the anaphoric capacity of the null anaphors, even if they are inside of arguments in the local domain upstairs:

- (5) * [A namorada do Pedro_i] disse que \emptyset_i será convidado para a festa.
 [the girlfriend of_{the} Pedro_i] said that \emptyset_i will_{be} invited to the party
Pedro_i's girlfriend said that he_i will be invited to the party.

Third, reflexives follow a directionality constraint in as much as their admissible antecedents cannot not command them, as exemplified below:

- (6) a. O Pedro descreveu a Maria_i a si própria_i
 the Pedro described the Maria_i to SI PRÓPRIA_i
Pedro described Maria_i to herself_i.
- b. * O Pedro descreveu(-se a) si própria_i à Maria_i.
 the Pedro described(-SE to) SI PRÓPRIA_i to the Maria_i
Pedro described herself_i to Maria_i.

Likewise, admissible antecedents of null anaphor o-command it:

- (7) O Pedro informou a Maria_i de que Ø_i será convidada para a festa.
 the Pedro informed the Maria_i of that Ø_i will_{be} invited to the party
Pedro informed Maria_i that she_i will be invited to the party.

But, they cannot not o-command them (the grammaticality of (8)b. dissolves possible doubts about semantic acceptability here):

- (8) a. * O Pedro_i combinou com a Maria_j que Ø_j vai telefonar-lhe_i antes da festa.
 the Pedro planned with the Maria_i that Ø_i goes to call-him_j before of the party
Pedro_j planned with Maria_i for her_i to call him_j before the party.
- b. O Pedro_i combinou com a Maria_j que ela_j vai telefonar-lhe_i antes da festa.
 the Pedro_i planned with the Maria_j that she_i goes to call-him_j before of the party
Pedro_j planned with Maria_i for her_i to call him_j before the party.

Fourth, long-distance reflexives tend to be slightly less resistant to split antecedents than their cousin short-distance reflexives:

- (9) a. * O Pedro_i descreveu a Maria_j a si próprios_{i+j}.
 the Pedro described the Maria to SI PRÓPRIOS_{i+j}
Pedro_i described Maria_j to themselves_{i+j}.
- b. ? O Pedro_i descreveu a Maria_j a eles próprios_{i+j}.
 the Pedro_i described the Maria_j to ELES PRÓPRIOS_{i+j}
Pedro_i described Maria_j to themselves_{i+j}.

With respect to split antecedents, the null anaphor seems to go along more with long-distance reflexives than with short-distance ones:

- (10) ? O Pedro_i informou a Maria_j de que Ø_{i+j} serão convidados para a festa.
 the Pedro_i informed the Maria_j of that Ø_{i+j} will_{be} invited to the party
Pedro informed Maria_i that they_{i+j} will be invited to the party.

Finally, what happens when no local domain reshuffling is available? That is, when no upstairs selectional domain exists? The null anaphor accepts extra-sentential antecedents:

- (11) A: O que é que o Pedro_i fez ontem?
 B: Ø_i Foi ao cinema.
 A: What did Pedro_i do yesterday?
 B: He_i went to the movies.

This is in line with what is observed for the long-distance reflexive *ele próprio* (Branco and Marrafa, 1999; Branco, 2000) — note that short-distance reflexive *si próprio* does not occur in nominative positions, so it cannot be checked exactly about this.

5 Analysis

The empirical evidence worked out above can be straightforwardly explained if one simply assumes that:

- (i) The Portuguese null anaphor is a (null) short-distance reflexive (which due to reasons α-

thogonal to its anaphoric capacity, occurs in Subject position);

(ii) Given it occurs in o-bottom positions, if it is not in the matrix clause, its local domain is reshuffled to include the o-commanders in the selectional domain upstairs that immediately dominates the selection domain where it directly occurs.

6 Further evidence

This analysis call to be further explored into several directions. The most critical ones are certainly concerned with how it possibly extends:

(i) to other languages;

(ii) to reflexives of a more "usual" kind:

Overt reflexives that may occur in non Subject positions as well.

Data suggesting that local domain reshuffling happens in other languages with overt reflexives in non Subject position seem to be obtained with examples involving the German short-distance, overt reflexive *sich*.

First, when in an o-bottom position (which however is not a clausal Subject position), admissible antecedents for *sich* can be found only in the immediately upstairs local domain (Tibor Kiss, p.c.):

- (12) Gernot_i dachte, [dass Hans_j dem Ulrich
[ein Bild von sich_{*i/j} überreichte.

Gernot_i thought that [Hans_j the Ulrich [a picture of SICH_{*i/j} gave

*Gernot_i thought that Hans_j gave Ulrich a picture of himself_{*i/j}.*

Second, even in a reshuffled local domain, directionality of anaphoric binding for reflexives is complied with, as a non o-commander in the domain immediately upstairs is not an admissible antecedent (Tibor Kiss (2001):(8)a):

- (13) * Ich überreichte dem Ulrich_i ein Buch über sich_i.

I gave the Ulrich a book about SICH_i

I gave Ulrich_i a book about himself_i.

Third, even in a reshuffled local domain, recesses in grammatical geometry are opaque to the anaphoric capacity of *sich*, as a nominal inside an

o-commanding nominal is not an admissible antecedent for it (Manfred Sailer, p.c.):

- (14) * Jan dachte, [dass die Mutter von Hans_j dem Carl [ein Bild von sich_j überreichte.

Jan thought [that the mother of Hans_j the Carl [a picture of SICH_i gave

Jan thought that Hans'_j mother gave Ulrich a picture of himself_i.

Accordingly, the above data on the German *sich* seem to fall into place with just the simple hypothesis that its local domain can be reshuffled when it occurs in o-bottom positions of embedded predication domains. In our view, this is an improvement with respect to the approach proposed in Kiss (2001), as it dispenses with an extra notion of o-binding (e.g. minimal o-binding), with a revised version of Principle A (Kiss (2001):(31)) — which turns out to be somewhat sloppy and to break the symmetry with Principle B —, and with the setting of parameter values in a complex parameter space (2x3) for which most combinations of values are supported by very sparse data in the literature or are not empirically attested at all.

7 Discussion

Let us then get back to the question in the title of this presentation: "Can Local Domain Reshuffling be an Alternative to Exemption?". The answer seems to be positive, in our view. The data worked out above strongly support the tenet that, though in o-bottom positions, reflexives turn out not to be exempt from their corresponding anaphoric binding discipline (in Portuguese and German, at least) when a reshuffling of their local domains is possible. The result of such reshuffling is that, for such reflexives, in the bottom of their obliqueness hierarchy, the relevant local domain reshuffles to include the o-commanders in the selectional domain immediately upstairs, that is the selectional domain which immediately dominates the selectional domain in whose o-bottom position the reflexive occurs (if such upstairs domain exists, of course).

Another point is also worth noting with respect to the Portuguese data brought to light here. The main focus of this presentation is on the claim that there may be local domain reshuffling for reflex-

ives. But in the process of arguing for this hypothesis, other very important result popped out as well, and deserve to be underlined: The Portuguese "null pronoun" is not a pronoun after all (Mateus *et al.*, 2003, p.823) but rather a (null) short-distance reflexive.

8 Outlook

As the observations supporting the result that Portuguese null Subjects are short-distance reflexives are likely to hold also with respect to null Subject in other languages, it may be a major contribution to eventually show that the long studied null anaphor, typically licensed by strong verbal morphology and also known as little *pro* in some grammar frameworks, is not a pronoun.

Another interesting thread of discussion that could not be addressed within the limits of this abstract is the one that leads to the tenet that also English *himself* may display local domain reshuffling instead of plain exempt behavior when an upstairs domain exist for such reshuffling to be viable. Following the data discussed in Pollard and Sag (1994), and specially taking into account their remarks in footnote 18, p.266, developed from some Zribi-Hertz (1989) examples, my tentative approach in this respect is to entertain that in some (British?) varieties of English, such alternative reshuffling may however not be available.

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On Binding Domains

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1 Introduction

Mainstream generative accounts (Chomsky 1981; Pollard & Sag 1994; Bresnan 2002, and Reinhart & Reuland 1993) sketch a very clear, but simple, picture of anaphoric dependencies. Binding in the syntactic sense of the word is primarily limited to the predication domain, formulated as in (1,2), the Binding Theory (BT):¹

- (1) a. An anaphor is bound in its Governing Category
b. A locally o-commanded anaphor (ana) must be locally o-bound
c. A nuclear (reflexive) pronoun must be bound in the minimal nucleus that contains it
- (2) a. A pronominal is free in its Governing Category
b. A personal pronoun (ppro) must be locally o-free
c. A nonnuclear pronoun must be free in the minimal nucleus that contains it.

‘Reflexives’ are subject to condition (1), i.e. they are referentially dependent upon an NP (cf. 3a), and the antecedent must be found within a certain domain (cf. 3b).

- (3) a. **John*’s plans failed *himself*
b. **John* thinks that Mary hates *himself*

‘Pronominals’ obey condition (2), which states the reverse from (1): whatever the reference of the

pronoun may be, it is not able to take a co-argument for an antecedent.

In almost all generative accounts there seems to be general agreement on the following properties being encoded in BT:

- (i) Reflexivization is local.
- (ii) A distinction must be drawn between two types of anaphoric element: anaphors (= reflexives and reciprocals) and pronouns.
- (iii) Any anaphoric dependency that is non-local is either exceptional, marked or does not fall under BT proper. In other words, anaphor resolution (as it is used in the literature on discourse) is outside the scope of BT.

In this paper I want to explore reasons for replacing BT based on (i) the the anaphor-pronoun dichotomy and (ii) reference to one unique domain restricting syntactic anaphoric dependencies (cf 1-2), for one allowing more domains which restrict/define anaphoric dependencies. This will, thus, have consequences for the partitioning of anaphoric elements, presupposing more types of ‘anaphors/pronouns’ than standard BT offers us, and, consequently more binding principles.

2 Cross-linguistic variation in admissibility of antecedents for anaphors

Standard binding theories (cf. Reuland & Everaert 2001, Everaert 2003 for an overview) describe recurrent patterns in the various languages of the world. Examples (4a) from Finnish, (4b) from Sakha and (4c) from Spanish show that in many languages reflexives and pronominals are, indeed, in complimentary distribution:

¹ Limiting myself to ‘condition A/B’, following Reinhart (1983).

- (4) a. *Pekka näki itsensä/*hänet*
 ‘Pekka saw himself/him’
 b. *Misha bejetin/*kinini tapyyr*
 Misha himself/him loves
 ‘Misha loves himself/him’
 c. *Juan se/*lo admira*
 ‘Juan admires himself/him’

The examples in (5), from Italian, Dutch, Russian, and Icelandic, respectively, show that, in addition, reflexives must be locally bound, while and pronominals cannot be locally bound:

- (5) a. *Gianni pensava che Maria *si/lo ammirasse*
 ‘Gianni thought that Maria admired him’
 b. *Jan vroeg mij voor *zich/hem te werken*
 Jan asked me for himself/him to work
 ‘John asked me to work for him’
 c. *Vanja думаet čto Maša uvažает *sebjä/ ego*
 ‘Vanja thinks that Maša admires him’
 d. *Jón veit að María elskar *sig/hann*
 John knows that Maria loves-IND
 himself/ him
 ‘John knows that Maria loves him’

This is a recurrent pattern, but, clearly, not without exceptions. Quite early on it was noted that, cross-linguistically, there were many anaphors with antecedents essentially beyond the regular domain (Thráinsson 1976, Reis 1976, Inoue 1976, Yang 1983, Harbert 1983, and many others since). The examples in (6), Norwegian, Japanese and Icelandic, respectively, illustrate this:

- (6) a. *Jon bad oss hjelpe seg*
 ‘John asked us to help him’
 b. *Bill-wa John-ga zibun-o seme-ta to omot-ta*
 Bill John himself blamed that thought
 ‘Bill thought that John blamed him’
 c. *Jón segir að Péturi raki sig á hverjum degi*
 ‘John says that Peter shaves him every day’

Often such cases are discussed under the heading of Long Distance Binding (Koster & Reuland 1991; Cole, Hermon & Huang 2001).

3 Domains

In the Principles and Parameters theory (including Reflexivity), Lexical-Functional Grammar, Head-Phrase Structure Grammar, Binding Theory is focused on syntactic binding, basically limiting binding to the predication domain. Reflexives are there for reference in the domain of the clause, i.e. (7a). In all binding theories with the exception of Reflexivity, there is room for debate whether (7b) could still be taken as a possible domain for binding. But for all binding theories mentioned, reference outside the sentence, i.e. (7c,d) is forbidden ground for reflexives (cf. Kang 1988 for discussion). For the domain of discourse, we exclusively have elements called pronouns, and the binding conditions have nothing to say about anaphoric dependencies in this domain.

- (7) For y = reflexive, x = antecedent of y:
 a. (complex) predicate/clause
[CP/IP...X...Y.]
 b. sentence
 [CP.....X...[CP.....Y...]]
 c. discourse
 [CP.....X...] [CP.....] [CP....Y...]
 d. deixis
 [CP.....Y....]
X.....

Is there a reason to assume that anaphora are partitioned this way? In other words, is there reason to assume that we need more than the simple anaphor (for 7a) – pronoun (for 7b,c,d) distinction of BT? Given a sentence grammar - discourse grammar distinction it would make sense, because the only distinction that is relevant for sentence grammar is the distinction between (7a) and (7b). However, if we look at what defines an element as an anaphor it is not straightforward that the anaphoric dependencies in (7a) and (7b) would be morpho-syntactically encoded differently from those in (7c) and (7d). It is not evident that a definition of anaphors rooted in Chomsky (1986) and Keenan (1988) according to which anaphors are referentially defective NPs predicts that reflexives could, for instance, never be taken as discourse anaphora (7c). Only if reflexive anaphors were necessarily interpreted as bound variables, subject to a c-command/o-command/syntactic rank restriction, the predicted discourse restrictions on reflexive anaphors

would follow naturally from whatever explains the (un)grammaticality of the examples in (8):

- (8) a. *Every ex-husband* feared that *he* would be neglected
 b. *Because she hated *every ex-husband*, Mary would certainly tell Zelda why she left *him*
 c. **Every ex-husband* feared that I would be neglected. *He* ...

In other words, we generally simply assume that the preferred domain for a ‘reflexive’ is (7a). There is no a priori reason that this should be the case, but most languages (like Dutch, Spanish, Russian, etc.) mentioned above offer us this as the primary distinction.

In a sense, English is rather atypical, because its ‘reflexive’ can be used in all domains. That is, it is often used in more structural configurations than we might consider calling reflexive environments:

- (9) a. Predicate:
 Mary thinks that [*John* saw *himself*]
 b. Sentence:
 And that was exactly it, *he* thought. [*He* really didn’t care too much [what happened to *himself*]]
 c. Discourse:
 [Whom *he* [=Philip] was supposed to be fooling, *he* couldn’t imagine]. [Not the twins, surely, because Désirée, in the terrifying way of progressive American parents, believed in treating children like adults] and [had undoubtedly explained to them the precise nature of her relationship with *himself*].
 d. Deixis:
 There were five tourists in the room apart from *myself*

With the fourfold distinction given in (7), we could, in principle, expect a language to make the following partitioning, giving every domain its unique identifiable anaphoric element:

- (10) a. reflexive_A for (7a)
 b. reflexive_B for (7b)
 c. pronoun_A for (7c)
 d. pronoun_B for (7d)

As far as I can tell there is no language that offers us this picture - four different forms - but there are many languages that offer a partitioning of anaphoric elements that seem to conform to (10).

All languages seem to have a reflexive_A type. Compare (6a) to (11):

- (11) **Jon* bad oss hjelpe seg selv
 ‘John asked us to help himself’

Similarly, all language seems to have morpho-syntactically encode indexicals like *I*, *we*, the pronoun_B type.

Languages like Tamil (Annamalai 2000), Roumenian (Sevcenco 2004), Fon (Kinyalolo 1993) seem to have a reflexive_B anaphoric element whose distribution is defined as in (7b) (in some cases with, in some case without logophoricity/point of view requirements).

- (11) *kumaar* *umaa* *tanne* tiTTunaaNNu
 Kumar Uma self-acc scold-pst-agr-that
 sonnaan
 say-pst-agr
 ‘Kumar said that Uma scolded him’

Logophoric systems are, generally, also defined by the domain given in (7b). The case of Mupun (Frajyngier 1997) illustrates this:

- (12) a. *wu/wa/mo* sat nθ ta ɖi/ɖe/ɖu
 he/she/they say COMP stop he/she/they
 ɖ ee n-jos
 stay prep-Jos
 ‘He/she/they_i said that he/she/they_i stopped over in Jos’
 b. *wu/wa/mo* sat nθ *wu/wa/mo*
 he/she/they say COMP he/she/they
 ta ɖ ee n-jos
 stop stay prep-Jos
 ‘He/she/they_i said that he/she/they_i stopped over in Jos’

Finally, Tamil might offers a case where the distinction between (7b) and (7c) is relevant. Tamil makes a difference between proximate and obviative pronouns, *avan* and *ivan* respectively. The differences/similarities between the proxi-

mate/obviative pronouns becomes clear in (13-14). (13) shows that both pronouns can be used deictically, but that for sentence internal reference (cf. 14) *ivan*, the proximate element, is excluded:

- (13) a. *ivan en* tapi
(this)-he I(OBL) brother
'He is my brother'
b. *avan en* tapi
(that)-he I(OBL) brother
'He is my brother'
- (14) a. *kumaar va-nt-aal naan avan-ɬam*
colluv-een
Kumar come-cond I he-loc say-fu-1s
'If Kumar comes I will tell him'
b. **kumaar va-nt-aal naan ivan-iɬam* colluv-een
Kumar come-cond I he-loc say-fu-1s
'If Kumar comes I will tell him'

The fourth person pronouns in Mabaan as described in Andersen (1999) might offer another example.

4 Conclusion

This paper will present evidence for making a finer distinction of anaphoric elements (than the anaphor-pronoun dichotomy of the binding theory), and will discuss the consequences this will have for a proper formulation of the binding principles.

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Where are restrictions on binding encoded? – Pronominal features, the theory of chains and verb classes.

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1 Introduction

In the traditional Binding Theory as proposed by Chomsky (1981, 1982, 1986) anaphoric elements are regarded as being specified for syntactic features like $[\pm \text{anaphor}]$ in the lexicon which determine their ‘Binding Domain’ and, hence, their distribution. In other words, restrictions on the use of anaphors are regarded as a lexical property of anaphors. This approach has been criticized as a mere description of the facts, and as having no explanatory force (e.g. Reuland 2001, Kiparsky 2002). The assumption that ‘anaphors are bound within their governing category’ is trivial, given that anaphors are defined as elements that are ‘bound within their governing category’. Moreover, there is the empirical problem that the traditional Binding Theory simply cannot account for the distribution of anaphors in English, let alone the anaphors of other languages.

2 The ‘revised’ Binding Theory

In view of the manifold problems of Chomsky’s Binding Theory, Reinhart & Reuland (1993) have proposed to account for the distribution of anaphors by distinguishing between two different aspects of the distribution of SELF-anaphors: first, these anaphors are markers of reflexivity, which is associated with their SELF-component (e.g., *zelf* in Dutch *zichzelf*); and second, their pronominal component (*zich*) is referentially dependent and must be (syntactically) bound by an appropriate antecedent. This ‘modular’ approach considerably broadens the range of empirical coverage of the theory, and moreover allows Reinhart & Reuland

to relate the distribution of anaphors to restrictions on movement, since the binding of traces seems to obey locality restrictions similar to those determining the binding of anaphors (whereas the distribution of reflexive-marking SELF-elements is determined by semantic principles). Thus, restrictions on binding are regarded as a property of the ‘computational system’, rather than the anaphors themselves. They consequently have a much more general status than in Chomsky’s framework, which is certainly attractive from a theoretical point of view.

3 Verbs with a dual argument structure

There is, however, one aspect of Reinhart & Reuland’s theory that is not fully convincing. The theory predicts that SE-anaphors like Dutch *zich* should not be able to occur in the object position of reflexive predicates. But, as is well known, there are verbs like *wassen* ‘to wash’ or *scheren* ‘to shave’ that do allow (reflexive) *zich* in their direct object position (*Jan wast zich* ‘Jan washes SE’). Reinhart & Reuland assume that such verbs have a dual argument structure, i.e. they come in two variants, one of them inherently reflexive, and the other non-reflexive. This assumption, however, is challenged by examples like the following, which shows that *zich* can be coordinated with non-reflexive objects:

- (1) [Peter en zijn zoon Jim hadden de hele ochtend buiten in de modder gespeeld. Toen ze weer thuis kwamen, wou Jim met zijn vader meteen in de kamer gaan spelen, maar...]
Peter waste *zich* en *zijn zoon* eerst grondig.
‘Peter first washed SE and his son thoroughly’

4 Binding Theory and verb classes

In this paper I will argue that the assumption of a dual argument structure for verbs like *wassen* can be dispensed with if we assume that restrictions on binding are sensitive to syntactic features of the verbal environment. Specific verbs ([+OD]-VERBS) syntactically bar their objects from being bound by the local subject (e.g. *haten* ‘hate’), while other verbs ([−OD]-verbs) do not obey such restrictions (*wassen*, *scheren*). Consequently, I argue that restrictions on binding are also a function of syntactic features of verbs ([±OD]). The relevant rules will be shown to interact systematically with other grammatical conditions, for instance featural and morphological economy. The interaction between those factors will be implemented using the framework of Optimality Theory. I will argue that the following types of constraints need to be assumed if one aims to fully account for the distribution of anaphors, at the same time capturing cross-linguistic variation (cf. Kiparsky 2002 for a similar approach): (i) economy constraints, which are a function of the evaluative system (FEATURAL ECONOMY and MORPHOLOGICAL ECONOMY); (ii) syntactic features of anaphors, which determine their degree of referential (in)dependence, and a constraint which ensures that anaphors are bound within their designated binding domain (BINDING DOMAIN); and (iii) the syntactic (verbal) feature [±OD] mentioned above, as well as a constraint which prohibits the local binding of an object pronominal in the context of a [+OD]-verb (*OTHER-DIRECTED BINDING). The system to be presented in this talk will be shown to be applicable to all Germanic languages, and variation will be accounted for by re-ranking some of the relevant constraints. For example, the German facts will be shown to be compatible with the model if we assume that the constraint of *OTHER-DIRECTED BINDING is here ranked very low. The rankings of some Germanic languages are given in (2):

- (2) a. BINDING DOM. > *OTHER-DIRECTED
BINDING > FEAT. ECONOMY > MORPH.
ECONOMY
(Dutch, Engl., Scand., Frisian, Afrikaans)
b. BINDING DOM. > FEAT. ECONOMY >
MORPH. ECONOMY > *OTHER-DIRECTED
BINDING
(German)

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Syntactic and semantic conditions on reflexive binding in Norwegian

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Abstract

Based on phenomena involving Norwegian reflexives, the paper calls into question the common assumption that a reflexive anaphor and its antecedent are semantically represented with the same referential index. Phenomena discussed include a predication constraint on reflexives and resultatives, and a key issue is how to refer simultaneously to syntactic and semantic aspects of a given constituent.

1 Introduction

Reflexive constructions in the Scandinavian languages are known to obey a number of interacting constraints, involving, in the order of increased semantic impact: linear order; c-command; finite clausal domains; co-argumenthood; predication (the factor of the anaphor being contained in a phrasal unit predicated of the binder); thematic role hierarchy; logophoricity.

HPSG is a framework aimed at enabling the integration of many levels of representation in a unified analysis, and the present paper explores some issues that arise in so doing, based on Norwegian. The analytic proposals are related to an implemented grammar of Norwegian developed within the LKB system and using the 'HPSG Grammar Matrix' (cf. Flickinger and Bender 2003), and details of concretization will reflect this relation; however, the points to be made are not restricted to this particular framework. Moreover, reflexives not yet being integrated in the grammar in question, the discussion to follow is a largely theoretical one.

2 General background

Like the other Scandinavian languages, Norwegian has two monomorphemic words that are inherently reflexive, in Norwegian taking the forms *selv* 'self', and *seg*, with the genitival form *sin*. *Seg* and

sin are 3rd person forms, functioning like personal pronouns and possessive adjectives, and in 1st and 2nd person coinciding in form with their non-reflexive counterparts. *Selv* is a constant form. These words may occur by themselves, but may also combine, in 3rd person as *seg selv*. The first four items listed in Fig 1 below are the NP type items to be called *reflexives*. For convenience, the words mentioned, when regarded as sub-NP items, may be referred to as *reflexive elements*, each word representing the '+' variant of a binary feature, as indicated:

Fig 1.

NP	NP	NP	NP	NP
Refl-I +	Refl-I +	Refl-I +	Refl-I -	Refl-I -
Refl-II -	Refl-II -	Refl-II +	Refl-II +	Refl-II -
	Poss +			
<i>seg</i>	<i>sin</i>	<i>seg selv</i>	<i>ham selv</i>	<i>ham</i>
'him-/herself'	'his-/her own'	'him-/herself'	'himself'	'him'

These reflexive elements are associated with different conditions for wellformedness. The conditions associated with *selv* are fairly similar to those holding for English *self*, and will not concern us here. The conditions associated with *seg* and *sin* (the elements marked 'Refl-I +') are those where the Scandinavian languages constitute an interesting paradigm, displaying all of the semantic factors mentioned above and in addition strong 'long distance' effects. For general introductions to these conditions, see. e.g., Hellan 1988 for Mainland Scandinavian. We will illustrate most of these constraints at relevant places in the discussion.

3 The Predication Condition

Crucial to reflexives composed with the elements *seg/sin* is the following condition:

- (1) Predication Condition on *seg/sin*:
A reflexive *R* composed with the elements *seg/sin* has to be contained in a phrasal constituent understood as *predicated* of the binder of *R*.

This condition is distinct from a 'subject' condition, in that it licenses a construction like (2a), where the binder is syntactically an object; it is still distinct from a condition of 'any c-commanding item being licensed as binder', since it does not license (2b):

- (2) a. Vi gjorde ham glad i **seg** selv
 we made him fond of himself
 b. ?*Vi fratok ham pengene **sine**
 we took his money from him

We now consider how to implement (1).

Arguably, adjectives like *glad* in (2a) are not valence defined for a subject, but they do have a semantic representation of a 'logical subject', something which in the Matrix grammars is entered as an ARG1 of the item. With (2a) interpreted as 'we caused that he became fond of himself', 'he' is what would fill the role as ARG1, and hence ARG1 would be a candidate for being what the predication condition selects as a binder. Also verbs have an ARG1, often corresponding to their subject; however, in passive constructions, the ARG1 systematically is not what is expressed as subject, still, also subjects in passive sentences can bind a reflexive, as in (3):

- (3) Jon ble skutt av naboen **sin**
 Jon was shot by his neighbor

Relative to a verbal predicate, we thus in general want the 'surface' subject as the binder. In the framework in question, a common denominator for these options is XARG: for a verbal lexeme, this is the participant expressed by the (surface) subject, and for non-verbal lexemes, it is identical to its ARG1. Using these terms, thus, the Predication Condition will require, for any reflexive *R* composed with *seg/sin*, that its binder have a status as XARG. Other conditions will delimit this XARG such that the constituent it represents precedes *R*, c-commands *R*, and is in the same tensed clause domain as *R*. Schematically, we may (in line with, e.g., Branco 2001) think of the resolution of an anaphor in analogy to the 'slash' mechanism for wh-gaps: the occurrence of an anaphor is accompanied by the introduction of a list of 'pending anaphors', and a construction is licensed only if this list is emptied. 'Cancelling out' of an item on

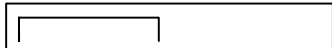
the list is done during phrasal build-up, on phrasal combination with an NP that meets relevant conditions (including agreement, and otherwise conditions such as those mentioned here, however implemented).

The status as XARG is stated in the SYNSEM specification of the head of the predicate phrase, in the feature path (4a), where the instance of *ref-ind* is the same as the inherent *ref-ind* of the NP, entered in the sign of this NP as in (4b):

- (4) a. SYNSEM.LOCAL.CONT.HOOK.XARG *ref-ind*
 b. SYNSEM.LOCAL.CONT.HOOK.INDEX *ref-ind*

The idea is thus that a candidate binder NP, specified as in (4b), can be assigned a binder status only if its *ref-ind* is identical to the *ref-ind* hosted in the predicate as in (4a). This presupposes a general one-to-one correspondence between NP tokens in a sentence and ref-indices representing the NPs in the semantic representation. In the standard procedures of assigning semantic representations to sentences, this is indeed obeyed, but in one situation one normally opens for an exception, namely in the representation of an anaphor and its binder: traditionally, also in HPSG (cf. Pollard and Sag 1994), these are assumed to share ref-index. How will this affect the implementation of the Predication Condition just outlined, given the possibility that one ref-index can now correspond to two or more token-distinct NPs?

To the meaning assigned to a reflexive, it generally wouldn't matter too much if it is associated with the ref-index of the 'wrong' NP, as long as this NP is indeed coreferential with the 'right' NP. However, somewhat subtle situations can arise where we need to access an index under a one-to-one correspondence assumption. Consider the contrast in (5), where in (5a), the lines indicate licensing relations that are per se acceptable:

- (5) 
 a. *Jon hørte seg selv snakke om seg
 Jon heard himself talk about himself
 b. Jon hørte seg selv snakke om seg selv
 Jon heard himself talk about himself

Underlying this contrast seems to be a constraint to the effect that if two reflexives are licensed as

bound by the same NP, but are arguments of different predicates, then for the second of the reflexives it must also be verified that it is licensed as bound by the first of the reflexives. In (5a), *seg* indeed cannot be bound by *seg selv*, due to a 'long distance' requirement inherent in *seg* as a full NP; this constraint thus will succeed in eliminating (5a). However, in checking if *seg selv* in (5a) is an eligible binder of *seg*, one of the conditions to be checked is the Predication Condition. Here it is crucial that it is the potential XARG status (relative to *snakke*) of *seg selv* we are checking, and not that of *Jon*. But if these have the same referential index, there is no way of guaranteeing this.

Although a bit contrived, the example is suggestive of the desirability of assigning a reflexive and its binder distinct indices. The same conclusion will next be shown to suggest itself from a different line of reasoning.

4 Directionals and resultatives

The contrast in (6) can be accounted for under the assumption that in (a), *ut av haven sin* ('out of his garden') is in a sense predicated of *Jon*, whereas in (b), *inne i haven sin/hans* ('inside of his garden') is predicated of the kicking event as such, and not of *Jon*.

- (6) a. Vi sparket Jon ut av haven **sin**
 we kicked Jon out of his garden
 b. Vi sparket Jon inne i haven ***sin**/ hans
 we kicked Jon inside of his garden

In (a), thus, *Jon* follows the trajectory expressed by 'out of his garden', and ends up in a state describable as 'Jon be outside of his garden'. Hence *Jon* here fulfills the Predication Condition holding of *sin*, validating the binding constellation in (a), whereas in (b), this condition is violated as far as a binding relation between *Jon* and the PP containing *sin* is concerned.

Accepting this diagnosis, its general consequence is that directionals will have as their 'logical subject', or ARG1, the *mover* of the directional act, and not the act/event as such. While (6) motivates this for directionals qualifying a syntactic object, it will be reasonable to generalize this to hold of directionals qualifying a subject as well. We thereby come down to the general position of, e.g., Jackendoff 1990, as opposed to, e.g., Kracht

2002. According to this position, adapted for the current notation, the relevant part of the semantic representation of (7a) will be as in (7b) (using a simplified view of Minimal Recursion Semantic (MRS; cf. Copestake et al. 2003) representations, and selecting only two elementary predications (EPs) from among those constituting the full representation of (7a)):

- (7) a. John ran out
 b. $\langle \dots \left[\begin{array}{c} \text{run} - v - \text{rel} \\ \text{ARG1 } x4 \end{array} \right], \left[\begin{array}{c} \text{out} - a - \text{rel} \\ \text{ARG1 } x4 \end{array} \right] \dots \rangle$

Turning to a further Norwegian contrast, (8a) will likewise have (7b) as its semantic representation, but a question is how to represent (8b):

- (8) a. Jon løp ut
 Jon ran out
 b. Jon løp seg ut
 Jon ran REFL out
 'Jon ran himself out'

The interpretation of (8b) is one of *causation*, where the range of outcomes is not restricted to be a situation arising at the end of a path, as it is in (8a). For instance, 'out' in (8b) can be understood relative to a prison, if *Jon*, for his good running, gets an early release as premium, or to a team, when he runs so badly that he doesn't qualify for the team. We may refer to the resultativity expressed in this constellation as a *disconnected result*, as opposed to a *connected result* in (8a). Given this difference in interpretation, we obviously will not want to assign (8a) and (8b) identical semantic representations. Conceivably, the representation of (8b) could still *include* (7b), but have different supplementing specifications than (8a) would have, for instance as follows:

- (9) $\dots \left[\begin{array}{c} \text{run} - v - \text{rel} \\ \text{LBL } h1 \\ \text{ARG1 } x4 \end{array} \right], \left[\begin{array}{c} \text{out} - a - \text{rel} \\ \text{LBL } h4 \\ \text{ARG1 } x4 \end{array} \right], \left[\begin{array}{c} \text{cause} - \text{discon} - \\ \text{nectedly} - \text{rel} \\ \text{ARG1 } h1 \\ \text{ARG2 } h4 \end{array} \right] \dots$

(9) would amount to assigning the reflexive *seg* in (8b) the same variable as its binder (*Jon* in both cases in (8) being associated with the variable *x4*), and this will be the moot point in associating (8a,b)

with (7b) and (9), respectively. Given that the coindexation of the ARG1s in (7b) and (9) per se is ambiguous between representing a plain end-of-path directional reading and a disconnected result reading, a pertinent question would be how, e.g., a *generation* algorithm applying to these representations would know when to generate a reflexive and when not. The only cue, based on the present discussion, would be assessing whether an EP like the third EP in (9) is present or not. Although perhaps technically feasible, this would seem potentially cumbersome, especially if further situations like this have to be taken into account. The alternative sketched in (10) may then recommend itself as cleaner, with the last EP as crucial:

$$(10) \quad \left[\begin{array}{c} \text{run} - \text{v} - \text{rel} \\ \text{LBL h1} \\ \text{ARG1 x4} \end{array} \right], \left[\begin{array}{c} \text{out} - \text{a} - \text{rel} \\ \text{LBL h4} \\ \text{ARG1 x8} \end{array} \right], \\ \left[\begin{array}{c} \text{cause} - \text{discon} - \\ \text{nectedly} - \text{rel} \\ \text{ARG1 h1} \\ \text{ARG2 h4} \end{array} \right], \left[\begin{array}{c} \text{coreferential} - \text{rel} \\ \text{ARG1 x4} \\ \text{ARG2 x8} \end{array} \right] \dots$$

The principle here will be that all distinct x-type variables are realized through a nominal expression. An EP like the last one in (10) licenses one of the two expressions (the one realizing *x4*, or the one realizing *x8*) to be a reflexive; rules of the grammar determine which option is ultimately chosen.

A discussion about generation as such is beyond the scope of the present article, but even from a theoretical perspective, the considerations will seem parallel to those made, now pertaining to perspicuity of differentiation between representations. Consideration of contrasts like the one in (8) thus again lead us to the position of differential indexing of reflexive and binder.

5 The role of ARG-ST

Manning and Sag (1998) propose ARG-ST as the appropriate construct for imposing binding conditions: this is a list, relative to each predicate expressed, of those of its arguments that are syntactically realized, ordered according to an 'obliqueness command' hierarchy. Wechsler and

Arka (1998) apply the proposal partly to the Norwegian data rendered in (11) (from Hellan 1988):

- (11) a. Barnet ble fratatt **sine** foreldre
 MALEFACTIVE THEME
 b. *Barnet ble fratatt **sine** foreldre
 THEME MALEFACTIVE

Critical to the binding seems to be that the binder of *sine* - viz. *barnet* - has a higher thematic role than the NP *sine foreldre*. If such information is included in what counts as o-command, as Wechsler suggests, then reference to ARG-ST could be relevant, under the assumption that a binder should generally precede the bindee on the ARG-ST list.

We suggested above that anaphora resolution be defined over the full phrase structure tree; in view of 'long distance' anaphora like in (12), for instance,

- (12) Jon ba meg snakke om **seg**
 Jon asked me to talk about him

it is clear that the domain to be inspected for the assessment of a binding relation is generally too large to be accommodated in the argument list related to a single predicate - the same is seen in the case of *barnet* and *sine foreldre* in (11): they themselves are mutually ordered, and thus on the same list, whereas *sine* is on a separate ARG-ST list, viz. the one tied to 'parents' (or perhaps 'possess'). The intuition that the grammaticality status of the examples in (11) is partly regulated by the thematic roles of the NPs involved, is still something we may want to reflect in the analysis. Let us define the *largest container (LC)* of an anaphor *A* relative to a putative binder *B* as the largest phrasal unit containing *A* and functioning as a co-argument of *B*. A principle governing (11) is then as follows:

- (13) For a binder *B* and a reflexive *A*, *B* must have a higher role than the LC of *A*.

Computing the LC of *A* would be done using the list algorithm suggested earlier, and cancellation would apply to the phrase with status as LC and be dependent of satisfaction of the principle just stated.

If one assumes an approach like this, that may well mean employing ARG-ST after all, as

the 'instrument' through which one assesses whether an item has a 'higher role' than another. More precisely, in assessing cancellability, the satisfaction of (13) will require some way of inspecting the predicate of which *B* and the LC of *A* are arguments. The display presented by this predicate, where one would be able to directly see how the arguments interrelate, could in principle be either its semantic representation (at the lower path in (14)), or its ARG-ST. In the former case, the Predication Condition and (13) jointly access the following AVM part of the sign of the predicate (where thematic role information could in principle be supplied for the arguments):

(14)

$$\left[\text{SYNSEM} \left[\begin{array}{l} \text{LOCAL.CONT.HOOK.XARG ref - ind} \\ \text{LKEYS.KEYREL} \left[\begin{array}{l} \text{ARG1 ref - ind} \\ \text{ARG2 ref - ind} \\ \text{ARG3 ref - ind} \end{array} \right] \end{array} \right] \right]$$

In the latter case, if the ARG-ST of the predicate is accessed for the purpose of (13), one might also consider situating *XARG* relative to ARG-ST: presumably, this should be always the first item on the ARG-ST list, and the Predication Condition would amount to a requirement that relative to the predicative phrase built up (still assuming the cancellation approach suggested), a candidate binder *B* should be eligible as being chosen for first position on the ARG-ST of the head of that predicate phrase.

We may notice that since items on ARG-ST are syntactic tokens, the latter approach might circumvent the reasons adduced in section 3 for assigning distinct ref-ind's to binder and anaphor. What is unclear about the approach, however, is whether adjectives and prepositions can be generally assumed to project their *XARG* onto ARG-ST: exactly since items on ARG-ST are syntactic tokens, and adjectives and prepositions do not canonically select for syntactic tokens as subjects, this may count against implementing the Predication Condition through the use of ARG-ST. In return, if the path `SYNSEM.LKEYS.KEYREL` is chosen for assessing the status of the co-arguments relevant for the satisfaction of (13), then this will provide one more occasion where one may need a

one-to-one correspondence between NP tokens and ref-ind's, and thus one more consideration in favor of the proposal that a reflexive and its binder have distinct indices.

6 Conclusion

It is unclear how far ARG-ST (cf. section 5) can be employed to formalize the Predication Condition (cf. section 3), and that makes inspection of semantic specifications like (14) of the predicates involved the more likely procedure. This creates the scenario potentially favoring distinct indices for reflexives and binders (sections 3 and 4). While the empirical generalizations presented here pertain to Norwegian, the tentative conclusions are of a general nature.

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Event structure and binding

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Abstract

In this paper, we analyze data from Karachay-Balkar (Altaic, Turkic) that are problematic for most current theories of binding. We argue that the notion of event, defined syntactically, is necessary for delimiting a binding domain of a certain class of anaphoric expressions in Karachay-Balkar.

1 Problem

(1)-(3) demonstrate the basic distribution of two anaphoric expressions in Karachay-Balkar, *kesi-kesi-* and *ol/a-*:

- (1)

<i>madina_i</i>	<i>kesi-kesi-n_i</i>	<i>mahta-di.</i>
M.	self-self-ACC	praise-PST.3SG

‘Madina praised herself.’
- (2)

<i>madina_i</i>	<i>a-ni*_{i,j}</i>	<i>mahta-di.</i>
M.	that-ACC	praise-PST.3SG

‘Madina praised him/her/it || *herself.’
- (3)

<i>ustaz_i</i>	<i>madina-ka_j</i>	[<i>PRO_j</i>
teacher	M.-DAT	
<i>kesi-kesi-n*_{i,j}</i>	<i>mahta-rka</i>]	<i>qoj-du.</i>
self-self-ACC	praise-INF	let-PST.3SG

‘The teacher let Madina praise herself || *him.’

(1)-(3) show that *kesi-kesi-* is obligatorily bound by its clausemate subject, while *ol/a-* is free within its clause.

Given (1)-(3), a natural analysis in terms of standard Binding Theory (Chomsky 1981, 1986) would be that *kesi-kesi-* is [+ anaphor, - pronominal], *ol/a-* is [-anaphor, + pronominal], while the binding domain for both contains an anaphoric expression, its governor, and a clausal subject. In unification-based theories, e.g. in

HPSG (Sag, Wasow 1999), *kesi-kesi-* can be conceived of as bearing a HEAD feature [ANA +], *ol/a-* can be assigned [ANA -]; [ANA +] NPs are, and [ANA -] NPs are not coindexed with an outranking argument within ARG-ST.

However, these analyses are challenged if the distribution of anaphoric expressions within clauses headed by causative verbs is taken into account.

A peculiarity of causative constructions can be seen through an additional constraint on binding that emerges within clauses where three arguments are licensed.

First, consider a clause in which the VP is headed by a non-derived verb:

- (4)

<i>ustaz_i</i>	<i>madina-ka_j</i>	<i>a-ni*_{i,j,k}</i>
teacher	M.-DAT	that-GEN
<i>üsünden</i>	<i>sor-du.</i>	
about	ask-PST.3SG	

‘The teacher asked Madina about *himself || *herself || him/her/it.’
- (5)

<i>ustaz_i</i>	<i>madina-ka_j</i>	<i>kesi-kesi-ni*_{i,j}</i>
teacher	M.-DAT	self-self-GEN
<i>üsünden</i>	<i>sor-du.</i>	
about	ask-PST.3SG	

‘The teacher asked Madina about himself || *herself.’

(4) shows that *ol/a-* cannot be bound not only by its subject, but also by any other c-commanding DP within its clause. That means that *ol/a-* cannot be conceived of as an instance of anti-subject oriented anaphor, in terms of (Richards 1997). In (5), the subject ‘teacher’, but not (indirect) object ‘Madina’ can be an antecedent for *kesi-kesi-*. This pronoun is therefore subject-oriented. Whatever motivation for this constraint is (see Lasnik and Hendrick 2003, Dalrymple 1993, Manzini and Wexler 1987 for different accounts), clauses containing three arguments provide a suitable diagnostic for distinguishing between two types of

causatives that differ with respect to the possible range of anaphoric relations.

In (6), exemplifying the first type, the same anaphoric relations as in the non-causative sentence (5) are available:

- (6) $ustaz_i$ $madina-ka_j$ $kesi-kese-n_{i,*j}$
 teacher M.-DAT self-self-ACC
 $es-i-nde$ $tut-tur-du$.
 memory-3-LOC hold-CAUS-PST.3SG
 ‘The teacher reminded Madina about himself.’

In contrast, (7) containing an apparently similar causative verb form exhibits a completely different range of interpretations: *kesi-kese-* in (7) can be bound by both arguments.

- (7) $ustaz_i$ $madina-ka_j$ $kesi-kese-n_{i,j}$
 teacher M.-DAT self-self-ACC
 $mahta-t-di$.
 praise-CAUS-PST.3SG
 ‘The teacher made Madina praise him/herself.’

The fullest spectrum of binding phenomena emerges in (8)-(9): these examples demonstrate that two types of causatives contrast as to the range of interpretations of *ol/a-*, too:

- (8) $ustaz_i$ $madina-ka_j$ $a-ni_{i,*j,k}$
 teacher M.-DAT that-ACC
 $es-i-nde$ $tut-tur-du$.
 memory-3-LOC hold-CAUS-PST.3SG
 ‘The teacher_i reminded Madina_j about him/her_k.’
- (9) $ustaz_i$ $madina-ka_j$ $a-ni_{i,*j,k}$
 teacher M.-DAT that-ACC
 $mahta-t-di$.
 praise-CAUS-PST.3SG
 ‘The teacher_i made Madina_j praise him_{i,k}/*herself_j.’

The contrast between (5) and (7), as well as the contrast between (4) and (9) can be accounted for if one assumes, with (Mohan 1988), (Alsina 1993), (Andrews and Manning 1993), (Manning 1996a,b), that binding is to be defined at the level of a-structure, that causative verbs have a nested argument structure, and that both causer and causee count as a-subjects. These assumptions allow the subject-oriented *kesi-kese-* to be bound by either causer or causee. The obviation condition on a pronominal lower object, observed in (9), would be, then, that it can’t be bound by its a-subject.

However, this analysis fails to predict the distribution of *kesi-kese-* and *ol/a-* in (6) and (8). The

causative *esinde tut-tur* in (6) and (8) pattern with the non-derived *sor-* in (5) and (4), but differs from the causative *mahta-t* in (7) and (9) with respect to binding properties. We have to explain, therefore, why *mahta-t*-type causatives and *esinde tut-tur*-type causatives contrast as to whether the reflexive can be bound by the causee, and the pronominal can be coreferential to the causer.

2 Analysis

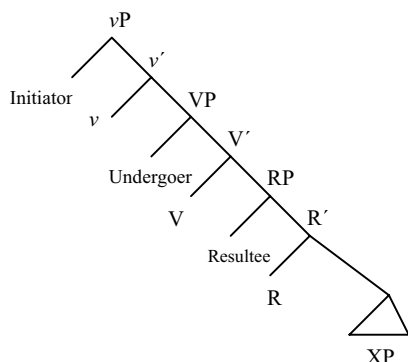
In solving the puzzle outlined above, we take two steps. First, we will show that *mahta-t*-type causatives (hereafter, following (Travis 2000), *S-syntax causatives*) and *esinde tut-tur*-type causatives (hereafter, *L-syntax causatives*) differ in their event structure and propose syntactic analysis that captures this difference. Secondly, we will show that variation in the distribution of anaphoric expressions can be reduced to the proposed event-structure distinction and hence accounted for.

Following (Travis 2000) and (Ramchand 2003, *to appear*), we assume a syntactic notion of event. More specifically, we take an event to be minimally a VP and maximally a νP , assuming a Larsonian-style VP-shell structure. Syntactic events, then, are sensitive to lexical information, so that the verb ‘die’, for example, only projects the VP whereas the verb ‘kill’ projects the VP embedded under νP (see Ramchand 2003 for details). Semantically, both ν and V (as well as Resultative Phrase, embedded under VP, which is not relevant for the present discussion) contribute subeventual structure that combines to yield the semantic representation of the whole event. Each subeventual component introduces a corresponding participant of the event that bears a particular thematic relation to the event argument of a verb. In particular, ν is associated with the causing subevent and the Initiator of the whole event, sitting in Spec, νP , whereas Spec, VP introduces the Undergoer of the whole event (=a participant of the process subevent associated with V), as represented in (10).

After (Travis 2000), (Baker 1996), and (Pylkänen 2002) we assume that in languages with morphological causatives the causative morpheme sits in ν and attaches to a host via the head movement. Given this νP architecture, phrases headed by *esinde tut-* ‘remember’ and

esinde tut-tur- ‘cause to remember’ are analyzed as in (11)-(12).

(10)



- (11) [vP madina ata-si-n
 M. father-3-ACC
es-i-nde tut]-tu.
memory-3-LOC hold-PST.3SG
‘Madina remembered her father.’
- (12) [vP ustaz_i [vP madina-ka ata-si-n
 teacher M.-DAT father-3-ACC
es-i-nde tut]-tur]-du.
memory-3-LOC hold-CAUS-PST.3SG
‘The teacher reminded Madina about her father.’

When a causative morpheme attaches to the stem which projects a vP itself, the inner vP is embedded under the outer vP headed by the causative morpheme:

- (13) [vP madina [vP ata-si-n mahta]]-di.
 M. father-3-ACC praise-PST.3SG
‘Madina praised her father.’
- (14) [vP ustaz [vP madina-ka [vP ata-si-n
 teacher M.-DAT father-3-ACC
mahta]]-t]-di.
praise-CAUS-PST.3SG
‘The teacher made Madina praise her father.’

Thus, the difference between two types of causatives (which is traditionally captured as manipulative vs. directive (Shibatani 1976), contact vs. distant, immediate vs. mediated (Kulikov 2001), causer-controlled vs. causee-controlled (Wierzbicka 1988, Shibatani 2000)) can be accounted for in terms of syntactically represented event structure. Following (Travis 2000), we assume that vP delimits syntactically the traditional semantic notion of event: what counts as a

single event can be maximally represented as a vP in the syntax. (Furthermore, Travis claims that a special projection, Event Phrase, is located above every vP providing an explicit boundary for a single event. In Karachay-Balkar, however, we have not found any morphosyntactic evidence supporting EPs.) A direct consequence of this analysis is that projecting two vPs, as in (14), results in the interpretation involving two events.

Therefore, (12) and (14) differ in their event structure: the former contains a single vP hence refers to one event, whereas the latter involves two vPs and two events. In Karachay-Balkar, this difference has a bulk of syntactic manifestations.

First, adverbials that adjoin to vPs, e.g. time-span adverbials like ‘in two hours’, measure adverbials like ‘for two hours’, rate adverbials like ‘quickly’ yield ambiguity with S-syntax causatives, but not with L-syntax causatives (see (15)-(16)). Secondly, the negation and the question particle produce scope ambiguity with S-syntax causatives, but not with L-syntax causatives (see (17)-(18) with the negation). Third, whereas L-syntax causatives in (19) exhibit lexical integrity with respect to ellipsis, S-syntax causatives in (20) do not.

- (15) ustaz eki minut-ka / eki minut / terk
 teacher 2 minute-DAT / 2 minute / quickly
 madina-ka ata-si-n es-i-nde
 M.-DAT father-3-ACC memory-3-LOC
 tut-tur-du.
 hold-CAUS-PST.3SG
 1. ‘The teacher reminded Madina about her father in 2 minutes / for 2 minutes / quickly.’
 *2. ‘What the teacher did in 2 minutes / for 2 minutes/quickly was make Madina remember her father.’
 *3. ‘What the teacher did was make Madina remember her father in 2 minutes / for 2 minutes /quickly.’
- (16) ustaz eki minut-ka / eki minut / terk
 teacher 2 minute-DAT / 2 minute / quickly
 madina-ka ata-si-n
 M.-DAT father-3-ACC
 mahta-t-di.
 praise-CAUS-PST.3SG
 *1. ‘The teacher made Madina praise her father {the sum of causing event and

praising event occurred in 2 minutes/quickly/ lasted for 2 minutes}.’

2. ‘What the teacher did in 2 minutes / for 2 minutes / quickly was make Madina praise her father.’

3. ‘What the teacher did was make Madina praise her father in 2 minutes / for 2 minutes / quickly.’

- (17) *ustaz madina-ka ata-si-n*
 teacher M.-DAT father-3-ACC
es-i-nde tut-tur-ma-di.
 memory-3-LOC hold-CAUS-NEG-PST.3SG
 ‘The teacher did not remind Madina about her father {both causing and caused subevents are in the scope of negation}.’

- (18) *ustaz madina-ka ata-si-n*
 teacher M.-DAT father-3-ACC
mahta-t-ma-di.
 praise-CAUS-NEG-PST.3SG
 1. ‘The teacher did not make Madina praise her father {does not entail that Madina does not praise her father; only a causing subevent is in the scope of negation}.’

2. ‘The teacher made Madina not praise her father {only a caused subevent is in the scope of negation}.’

- (19) *ustaz madina-ka ata-si-n*
 teacher M.-DAT father-3-ACC
es-i-nde tut-tur-du,
 memory-3-LOC hold-CAUS-PST.3SG
ana-si-na wa kerik e-di.
 mother-3-DAT CONJ need AUX-PST.3SG
 ‘The teacher reminded Madina about her father, whereas her mother had to do it {^{OK} to remind, * to remember}.’

- (20) *ustaz madina-ka ata-si-n*
 teacher M.-DAT father-3-ACC
mahta-t-di, ana-si-na
 praise-CAUS-PST.3SG mother-3-DAT
wa kerik e-di.
 CONJ need AUX-PST.3SG

‘The teacher made Madina praise her father, whereas her mother had to do it {^{OK} to make Madina praise, ^{OK} to praise}.’

Given these facts, the generalization is straightforward: structures involving two events allow various morphosyntactic processes to target each of these events separately.

Turning now to the distribution of anaphoric expressions, we argue that binding restrictions on *kesi-kesi-* and *ol/a-* have to be formulated in

terms of syntactically represented event structure which is independently motivated for Karachay-Balkar.

First, we account for the binding properties of *ol/a-*. For *ol/a-*, the obviation condition observed in (2), (4), (8), and (9) is that it must be free in its event. This condition enforces disjoint reference between *ol/a-* and any c-commanding DP located within the same event (2), (4), (8) (that is, within the ‘closest’ *vP* projection) but does not prevent *ol/a-* from being coreferential to the c-commanding DP located in the other (upper) event, as in (9). The analysis in terms of event structure, therefore, correctly predicts that binding possibilities available for *ol/a-* must be different for L-syntax causatives and S-syntax causatives, and moreover, that L-syntax causatives must pattern with non-derived three-place predicates, as in (4).

Secondly, we suggest that taking into account event structure is necessary for explaining the distribution of *kesi-kesi-* as well. More specifically, defining binding in terms of event structure accounts for why *kesi-kesi-*, despite its subject orientedness, can be bound by the causee in (7). Assume, for the moment, that binding condition on *kesi-kesi-* can be formulated as follows: *kesi-kesi-* must be bound in its IP. (This standard binding domain (cf. Lasnik and Hendrick 2003) traces back to the “clausemate restriction” proposed by Postal (1974)). Clausemate restriction predicts, correctly, that *kesi-kesi-* must be bound within the minimal IP containing it (see (1), (3), (5), (6) and (7)). But it does not determine what c-commanding DP can, and what cannot be an antecedent of *kesi-kesi-* within that IP, in particular, it does not explain why only a subject of IP can bind *kesi-kesi-* in (1), (3), (5), (6), whereas in (7) this option is available for both subject of IP (i.e. the causer) and the causee. Note that what makes (1), (3), (5), (6) different from (7) is exactly the event structure: the former contains a single event, while the latter consists of two. We propose, therefore, that subject-orientedness must be defined in terms of events: a possible binder is not the subject of IP, but the subject of the event. Defining, then, a subject of the event as a DP sitting in the Spec of the highest verbal projection within a single event, accounts for binding phenomena observed in (1), (3), (5), (6) vs. (7).

Since the former sentences contain only one event (that is, a single *vP* in (1), (3), (6) and a single *VP* in (5)), there is only one possible binder, a subject of that event. In contrast, in (7) two events (= two *vPs*) are projected, so a subject of either event can be an antecedent of *kesi-kesi*.

3 Summary of results

In this paper, data from a less studied language have been taken into account that are problematic for the current theories of binding. We observed that in Karachay-Balkar L-syntax causatives and S-syntax causatives differ with respect to binding options available for two anaphoric expressions, *kesi-kesi*- and *ol/a*-. We found, then, further syntactic manifestations of L-syntax / S-syntax distinction. We proposed that this distinction can be subsumed under the notion of event, defined syntactically as a projection containing maximally a *vP*, with L-syntax causatives representing a single event, and S-syntax causatives involving two events. Finally, an event-based analysis of anaphoric expressions in Karachay-Balkar has been developed that accounts for their different binding properties within L-syntactic and S-syntactic configurations.

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Phases and Local Binding Domains in English

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Abstract

This paper develops an analysis that relates the existence of local binding domains of reflexives and pronouns to the incremental interpretation of syntactic derivations (Chomsky 2000, 2001), emphasizing the role of the Conceptual/Intentional interface (i.e. bare output conditions) in shaping general principles of grammars. A significant development of the Minimalist framework is the idea that derivations operate through phases or multiple spell outs (Uriageraka 1999, Chomsky 2000, 2001). A key goal of phase theory is to reduce the strict cyclicity of derivations, and related locality effects of movement, to interface (bare output) conditions and economy conditions. In this paper I propose that incremental interpretation can be extended to capture a different type of locality: local binding domains effects of conditions A and B of Chomsky's (1981, 1986) Binding Theory. The proposal also provides a new perspective on the core contrasts between A-chain and A-bar chain w.r.t. binding and scope reconstruction effects as well as "online" binding (so-called Barss' sentences). The paper is developed in two sections: The first section discusses the nature phases and argues that Case partitions phase domains; the second section develops the analysis of phases as local binding domains.

1 Case as Phase

For Chomsky (2001, 2001), a phase is a syntactic object defined as a domain for cyclic interpretation. While Chomsky identifies vP and CP as phases, other categories have been identified as phases in the literature: DPs (Adger 2003); ApplP (McGinnis 2004); M-Domains and N-domains for morphology (DiSciullo 2003). A core proposal of this paper is that uninterpretable feature checking, Case in particular, defines a phase domain and makes DPs, AgrPs (or AspectP or ApplP), PPs and TPs potential phases. The basic argument for this proposal relies on systematic mirroring properties of A-chains and A-bar w.r.t. binding and scope reconstruction effects, as summarized in (1):

- (1) Mirroring properties of A-Chains and A-bar chains w.r.t reconstruction:

A-chains

Feed A-Binding:

John_i seems to himself [t_i to be happy]

No Binding Reconstruction:

[That John_i was asleep]_j seems to him_i [t_j to be correct]

*himself_i seems to him_i to t_i be intelligent

No Scope reconstruction:

[no one]_i is certain t_i to solve the problem
(#narrow scope)

No WCO effect:

Who_i seems to his_i mother [t_i to be intelligent]

A-bar chains

Do not feed A-Binding:

*Who_i does [each other_i's supporters] like t_i

Binding Reconstruction:

*[Which portrait of John_i]_j does he_i prefer t_j
[Which picture of himself] does Mary think
John likes t_i

Scope Reconstruction:

This man, some picture of whom everyone
know... (narrow scope)

WCO effect:

?*Who_i does [his_i supporters] like t_i

These properties have been widely discussed in the literature, more recently in Chomsky (1995) and Lasnik (2003), but no single explanation seem able to capture the striking mirroring behavior that A-chains and A-bar chains have w.r.t. various binding and scope reconstruction phenomena. However what most (argument) A-bar and A-chains do share is a common interface point: Case. Case is an uninterpretable feature in minimalist terms, which implies it has to be deleted prior to spell out at the C/I interface. Assuming that all binding necessarily occurs at C/I interface, this in turn implies that prior to the point of Case checking, a DP is semantically “inactive” w.r.t. binding and scope. Since Case must be deleted prior to spell out, the point at which Case is checked therefore defines the minimal point at which a phase can occur without crashing:

(2) Case (feature) checking allows phase spell out and therefore defines potential phase domains.

If correct, this proposal readily captures the mirroring properties of A-Chain and A-bar chains w.r.t. binding and scope. As shown in (1), only heads of A-chains can feed argument binding and avoid WCO and anti-reconstruction effects, as only the head of an A-chain is active at the C/I interface. In turn, only A-bar chain traces (copies) allow reconstruction, as traces of A-chain are semantically inactive prior to spell out. Scope reconstruction effects, which parallel binding

reconstruction effects according to Lasnik (2003), are captured along similar lines.

In sum, if Case-checking (or agreement) is a trigger point for phase spell out, syntactic categories corresponding to case-checking points should all be potential phases: DPs (Adger 2003), ApplP (McGinnis 2004) and I now propose, AgrPs, TPs and PPs. Notice that AgroP really is an extended projection of V and therefore, virtually corresponding to the vP phase of Chomsky (2001). The crucial difference being that Case is the defining notion for that phase.

2 Phases and Binding Conditions A/B

Generative grammar has recorded some attempts at unifying local domains for binding and movement, starting as early as Bouchard (1981) and Aoun (1982). While subsequent and standardly accepted accounts have not pursued that direction (Chomsky 1985, Reinhart and Reuland (R&R) 1993, among others), there is a legitimate appeal to this possibility from a theoretical standpoint. If indeed phases are the source of locality and strict cyclicity of movement, then finding that other local properties of grammar are exploiting the same fundamental architectural design would provide significant support for the notion and the nature of phases. In turn, it would make the system much more efficient and economical, as domains would basically emerge from similar sources.

In this second section, an analysis of the nature of local binding domains for reflexives and pronouns is developed based on the proposal of Case Phase. If this approach is correct, local binding domains essentially reflect the accessibility of antecedents within a phase at the C/I Interface. Assuming on the one hand that DPs are semantically inert before being spelled out at the C/I interface and, on the other hand, that a reflexive (by opposition to a pronominal) is an element morphologically marked to be bound as it enters the C/I interface, then reflexive binding indicates that an anaphora has been spelled out in the same “accessible phase(s)”, as its antecedent. In other

words, “local binding domains” correspond to “accessible phase domains”.

Assuming along Chomsky (2001) that grammatical operations can span over at most two phases (The Impenetrability Condition in (3)), I propose that Binding Conditions A and B can be stated as (4a,b):

(3) Phases Impenetrability Condition
(Chomsky 2001)

The domain H is not accessible to operations at ZP; only H and its edges are accessible to such operations.

$[_{ZP} Z \dots [_{HP} \alpha [H YP]]]$

(4)a. Condition A:

A reflexive anaphor must be bound in its accessible phases

b. Condition B

A pronoun must be free in its accessible phase

According to (3), “accessible phases” can span at most two phases. For instance, if α is at the edge of a phase HP, it is accessible to any element in the next phase up, namely ZP. Applied to binding relations, the local binding domain of reflexives would correspond to that “window” of accessible phases at spell out. A basic example is shown in (5) for a “reflexive predicate”.

- (5) Legend: (= phase
~~John~~ = trace/copy
 John = spelled out point

$([_{TP}[_{John_i}]([_{AgroP}himself_i[_{VP}John_i \text{ likes } himself_i]]]]$

TP and AgroP are the Case phases in this structure (I am assuming, contra Chomsky 2001, that accusative case is checked in spec of AgroP, i.e. covert movement applies on the mapping to C/I). *John* becomes “semantically active” only at TP phase, i.e. after nominative Case is checked on T. *himself* in Spec of AgroP is also active and has *John* in Spec TP as antecedent. As *himself* sits at the edge of

phase AgroP, *John* is contained and accessible in the next phase, TP. In sum two “accessible phases”, as defined by PIC, correspond to the Binding domain for reflexive and the non-binding domain of pronouns in English.

The analysis extends directly to (6) ECM construction and (7)-(8) small clauses.

(6) ECM : parallel to transitive verbs

- a. $([_{TP}[_{John_i}]([_{AgroP} himself_i [_{VP}John_i \text{ likes } himself_i]]]]$
 b. $([_{TP}[_{John_i}]([_{AgroP} himself_i [_{VP}John \text{ believes } [_{TP} himself_i \text{ to have won}]]]]]$

Small Clauses

(7) (R&R:688)

Lucie_i heard [*Max* praise *her_i/*herself_i*]

$[_{TP}Lucie ([_{AgroP} Max_i [_{VP} heard[_{SC} ([_{Agro} herself [_{VP} Max \text{ praise } herself_i]]]]]]]$

(8) (R&R:688)

Lucie heard [*Max_i* praise **him_i/herself_i*]

$[_{TP}Lucie ([_{AgroP} Max_i [_{VP} heard[_{SC} ([_{Agro} himself_i [_{VP} Max \text{ praise } himself_i]]]]]]]$

The analysis also extends to the subtle discrepancies noted by Reuland and Reinhart between argument PPs in (9) and adjunct PPs in (10), where the complementary distribution between pronouns and reflexive seems to collapse, but only with the latter.

(9) Argument PPs (R&R:661)

- a. Max speaks with himself/*him
 b. Lucy’s joke about herself/*her

(10) Predicate and adjunct PPs (R&R:664)

- a. Max saw a gun near himself/him
 b. Lucy counted five tourists in the room apart herself/her

To capture these contrasts, we may assume that the P head of PPs marks Case and therefore, PP may be a phase. However, since no feature checking or agreement applies with PPs, they may be identified as “weak” phases, which imply that they do not count as phases for PIC. Further, argument PPs have their theta-role assigned by the verb and must

arguably be spelled out along with the verb for interpretation. These assumptions yield the correct results: argument PPs will always require a reflexive if bound by a co-argument, either a subject in (11) or object in (12).

(11) Max speaks with himself

$([_{TP}[Max_i] [_{VP} Max \text{ speaks } [_{PP} \text{with himself}_i]]])$

(12) (R&R: 686)

Lucie explained Max_i to himself_i/*him_i

$([_{TP}[Lucie] ([_{AgrP} Max_i [_{AgrP} [_{VP} Lucie \text{ explained } [Max_i] [_{PP} \text{to himself}_i/*him_i]]]])]$

In contrast, adjunct PPs are not dependent on the verb for theta role assignment of their DP complement, which open the possibility that they may or not spell out in the same phase as the verb. In the spirit of Lebeaux (1988) and Uriagareka (1999) for phase theory, PP adjuncts are merged “independently” of the main predicate/argument structure, through generalized transformations. This predicts that two structures are possible for adjunct PPs, depending on whether the PPs is merged at the edge or at the domain of an AgrP phase. If PP merges at AgrP’s edge, it escapes AgrP phase and spells out at TP phase. In such case, a reflexive is required as shown in (13). If however PP spells out in AgrP’s domain, the reflexive is out and pronoun is in, as in (14).

(13) $([_{TP}[John_i] [_{AgrP} a \text{ gun } [_{AgrP} [_{VP} John_i \text{ saw } a \text{ gun}_i] [_{PP} \text{near himself}_i]]]])$

(14) $([_{TP}[John_i] ([_{AgrP} a \text{ gun } [_{AgrP} [_{VP} John_i \text{ saw } a \text{ gun}_i] [_{PP} \text{near him}_i]]]])]$

This analysis further makes the prediction that if an antecedent is in the same phase despite the adjunct PP merging to AgrP, a reflexive is required. And indeed, such is the case when the antecedent is an object argument as in (15).

(15) (R&R:668)

John rolls the carpet_i over *it_i/itself_i (cf. *Max rolled the carpet over him/himself*)

a. $([_{TP}[John_i] ([_{AgrP} the \text{ carpet } [_{AgrP} [_{VP} John_i \text{ rolls } the \text{ carpet}_i] [_{PP} \text{over itself}_i]]]])]$

b. $([_{TP}[John_i] [_{AgrP} the \text{ carpet } [_{AgrP} [_{VP} John_i \text{ rolls } the \text{ carpet}_i] [_{PP} \text{over itself}_i]]]])$

The analysis also directly captures reflexive subjects of *for*-clause:

(16) John wanted for himself to be happy

$([_{TP}[John_i] [_{VP} John_i \text{ wanted}] [_{CP} \text{for } [_{TP} \text{himself}_i/*him_i \text{ to be happy}]]])$

According to the standard analyses, *for* is a prepositional complementizer assigning structural case to the subject of the infinitive (Kayne 1981, Chomsky 1981). Since *for* is prepositional, CP only creates a weak phase and the main TP is the strong phase containing *himself* and its antecedent, *John*. The choice of the reflexive over the pronoun follows directly.

The paper will further discuss double object and dative shift constructions as well as reflexives in DPs. Further extension of the analysis also include Barrs’ cases of “online binding”, such as (17) and (18), which are analyzed as delayed spell out of weak PP phases, similar to the adjunct PP cases and in the spirit of generalized transformations (Lebeaux 1988, Uriagareka 1999).

(17)

- a. *himself_i seems to him_i to t_i be intelligent
- b. [each other’s supporters]_i frightened the candidates t_i

(18)

- a. John_j wonders [which pictures of himself_j]_i Mary likes t_i
- b. *John_i wonders if Mary likes [a picture of himself_i]

As time permits, some advantages of our proposal over standard analyses that capitalize on binding domains or “reflexive predicates” (e.g. Reuland and Reinhart’s 1993) will be discussed.

Conclusion

This paper proposes to extend the analysis of

derivation by phases (Chomsky 2001), which captures locality and cyclicity effects on movement, to reflexive-binding domains. Arguing that phases are partitioned on the basis of uninterpretable features such as Case, I proposed that local binding domain contrasts between reflexives and pronouns in English result from an economy/efficiency of grammar in resolving early ambiguity, reducing look ahead and/or backtracking. The choice of a reflexive is dictated by whether or not the antecedent is located in the same accessible phase at the C/I interface.

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Semantic Composition in Reflexivization

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1 Background

The work by Kamp (1981) and Heim (1982) has shown that definite and indefinite NPs in languages like English are interpreted as variables whose domain is restricted by the semantic content of the common noun. Chung and Ladusaw (2004) (= C&L) propose an alternative and argue that indefinite NPs compose with a predicate in two different ways, i.e. via the nonsaturating mode of “Restrict” or the saturating mode of “Specify.” Thus, the property-denoting expression *dog* in (1) composes directly with the predicate *feed* as a restrictive modifier, giving rise to an existential reading as in (2) (via the application of λ -conversion and existential closure), or it undergoes type-shifting and composes with the predicate as an argument of type *e*, giving rise to a specific reading as in (3) (via the application of a choice function in the sense of Reinhart, 1997 and Winter, 1997).

- (1) John fed a dog.
- (2) $\lambda y \lambda x [\text{feed}'(y)(x) \wedge \text{dog}'(y)] (\text{John}')$
 $\Rightarrow \exists y [\text{feed}'(y)(\text{John}') \wedge \text{dog}'(y)]$
- (3) $\exists f [\text{feed}'(f(\text{dog}'))(\text{John}')]$
 (i.e. there is a choice function *f* such that the dog it picks is fed by John.)

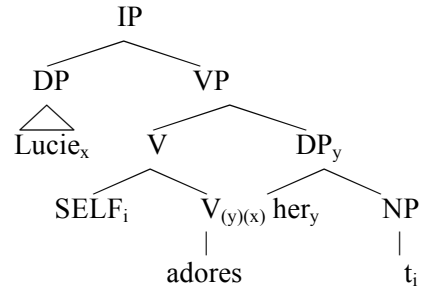
2 Proposal

Although C&L’s discussion focuses on the interpretation of common nouns (i.e. one-place predicates), there is no a priori reason to impose such a limitation on the two modes of semantic composition. The purpose of this paper is in fact to extend C&L’s analysis to two-place predicates and to explore consequences of their proposal in the domain of reflexive anaphora, which, as Pica

(1987) and Keenan (1988) have shown, involves a relational item *self*. The basic claim I would like to develop is that the mode of composition Restrict is possible only with the item *self* in the object position and that the other occurrences (including those where the reflexive stays within the object DP) combine with a predicate via the mode of Specify. One of the major consequences of this proposal is that Condition A is rendered entirely superfluous.

Specifically, the proposal consists of the following claims. First, the “self” part of SELF anaphors incorporates into the verb at LF (4) (cf. Reinhart and Reuland (= R&R), 1991; Safir, 1996; Anagnostopoulou and Everaert, 1999; Reuland 2001) and composes with the predicate via the mode of Restrict, imposing an identity condition on the latter (5).

- (4) a. Lucie adores herself.
- b.



- (5) $\lambda y \lambda x [\text{VERB}'(y)(x) \wedge y = x]$
- (4a) will be interpreted as in (6).
- (6) $\lambda y \lambda x [\text{VERB}'(y)(x) \wedge y = x](\text{her}')(\text{Lucie}')$
 $\Rightarrow \text{adore}'(\text{her}')(\text{Lucie}') \wedge \text{her}' = \text{Lucie}'$

Second, the Condition A effect follows because it is NPs rather than DPs that denote properties (cf. Stowell, 1987; Longobardi, 1994) and the “self” part needs to escape from the DP layer to behave as a restrictive modifier, thereby reducing the lo-

cality effect of reflexives to the locality condition on head movement.

Third, if SELF incorporation does not apply and the “self” expression stays in situ, then the entire DP composes with the predicate via the mode of Specify, giving rise to a specific reading, which I argue subsumes focus anaphors and logophors (7).

- (7) a. John likes himSELF.
b. John believes that he himself is in danger.
(cf. Bickerton, 1987; Baker, 1995)

Thus, while focus anaphors are associated with a referent in the predetermined set of discourse entities, the logophor is an anaphoric expression whose referent selection is governed by the speaker’s perspective, awareness, and so on, thereby reducing the essentially extra-grammatical nature of logophoricity to the workings of the choice function. The oft-noted tension between grammatical principles and pragmatic factors in reflexive anaphora can therefore be reconciled and understood in terms of the conditions on the application of Restrict/Specify.

3□ Restrict

The composition of the “self” morpheme with a predicate via Restrict is essentially a semantic operation and is independent of syntactic binding, and this opens up the possibility that coargument reflexive anaphora is made available *without* coindexing, unlike the assumption to the contrary held by many researchers of this topic. That this is indeed the case is shown by the following facts.

3.1 Reflexivity and Coreference

Despite the fact that personal pronouns are known not to enter into variable binding in a language like Japanese, they can enter into reflexive anaphora.

- (8) a. *Daremo_i-ga kare_i-no titioya-o
everyone-NOM he-GEN father
sonkeisiteiru. (**kare* as a bound variable)
respect
‘Everyone respects his father.’
b. John-ga kare-zisin-o sonkeisiteiru.
John-NOM he-self-ACC respect
(*kare* as a coreferential pronoun)
‘John respects himself.’
(cf. *Daremo_i-ga kare-zisin_i-o
sonkeisiteiru. ‘Everyone respects himself.’)

This follows from our proposal because *John* and *kare* ‘he’ in (8b) are arguments of the same predicate that has the identity restriction as a result of SELF incorporation at LF (9).

- (9) a. John-ga [DP [NP [DP kare] [N t_i]]]-o
zisin_i-sonkeisiteiru.
b. $\lambda y \lambda x$ [respect’(y)(x) \wedge y = x]
(him’)(John’)
=> respect’(him’)(John’) \wedge him’ = John’

The fact that proper names can occur in the same syntactic environment (10) corroborates the claim, as does the fact that the same effect is observed in Malayalam (11) (cf. Jayaseelan, 1996).

- (10) Yamada-ga Yamada-zisin-o
Yamada-NOM Yamada-self-ACC
hihan-si-ta.
criticism-do-PAST
‘Yamada criticized Yamada himself.’
(11) raaman raaman-e tanne weRuttu.
Raman Raman-ACC self hated
‘Raman hated Raman himself.’

This result has an important implication for a theory of reflexive anaphora in that it suggests that reflexivity is independent of binding and is not incompatible with coreference, an unexpected result under R&R’s (1993) analysis where reflexivity needs to be insured by coindexed arguments. The definitions of the notions of “reflexive-marking” and “reflexive” together with R&R’s version of Condition A are given in (12).

- (12) a. A predicate (formed of P) is *reflexive-marked* iff either P is lexically reflexive or one of P’s arguments is a SELF anaphor.
b. A predicate is *reflexive* iff two of its arguments are coindexed.
c. Condition A: A reflexive-marked syntactic predicate is reflexive.

Note that the following contrast indicates that *Yamada-zisin* ‘Yamada himself’ in (10) should count as a SELF anaphor in R&R’s classification of anaphoric expressions.

- (13) a. Tanaka-ga [Yamada-ga
Tanaka-NOM Yamada-NOM
Yamada-zisin-o hihan-si-ta-to]
Yamada-self-ACC criticism-do-PAST-C
omot-ta.
think-PAST
‘Tanaka thought that Yamada criticized Yamada himself.’
b. *Yamada-ga [Tanaka-ga
Yamada-NOM Tanaka-NOM
Yamada-zisin-o hihan-si-ta-to]
Yamada-self-ACC criticism-do-PAST-C

omot-ta.
 think-PAST
 ‘Yamada thought that Tanaka criticized
 Yamada himself.’

However, proper names cannot be coindexed and hence cannot enter into binding (cf. Reinhart, 1983; Grodzinsky and Reinhart, 1993); thus, the predicates in (10) and (11) cannot be reflexive under R&R’s account even if they are reflexive-marked. If we assume that reflexivity is strictly a semantic notion, as in our proposal, this problem does not arise.

3.2 Lexical Reflexivity

The claim that SELF incorporation is involved in coargument reflexive anaphora is supported by the fact that predicates in Japanese can be overtly SELF-marked (14).

- (14) John-ga [_{DP} [_{NP} [_{DP} kare] [_N t_i]]]-o
 John-NOM he-ACC
 ziko_i-hihan-si-ta.
 self-criticism-do-PAST
 ‘John criticized himself.’

The generalization that obtains from (14) as well as (8b) and (10) in 3.1 is the following:

- (15) *Ziko*- reflexivizes a predicate overtly, whereas *zisin* does so covertly.

This generalization is captured naturally in our analysis since the behavior of “self” morpheme as a predicate modifier is uniformly captured at the level of LF, i.e. as a result of SELF incorporation, which in turn triggers the application of Restrict.

In fact, there is yet another type of reflexive morpheme *zi-* in Japanese that *lexically* incorporates into a predicate (16) and can become part of a compound (17).

- (16) *zi-ei* ‘self-defense,’ *zi-metu* ‘self-destruction,’
zi-satu ‘suicide,’ *zi-ti* ‘self-government’
 (17) [_N [_V [_N *zi*] [_V *ei*]] [_N *tai*]]
 ‘self-defense forces’

Since pronominal forms are not in general allowed word-internally (cf. Postal, 1969) and the nominal head cannot provide an argument which the argument of *zi-* can be identified with ((17) does not mean ‘forces’ own self-defense,’ but rather ‘forces for *anyone*’s self-defense’), there is no way for *zi*-anaphora to be resolved by coindexing (say, by a covert pronoun).

The same remark applies to *self*-compounds in English (18).

- (18) a. John sent a self-addressed envelope.
 b. John’s actions are self-destructive.

(Chomsky, 1970)

Note that the behavior of *zi-* in Japanese and *self*- in English poses another problem for R&R (as well as for the binding-theoretic approach to *self*-compounds in Sproat, 1985 and Lieber, 1992). The predicate *addressed* in (18a), for example, is not “reflexive” in the sense of R&R (for the same reason that *ei* ‘defense’ in (17) is not) even though it is reflexive-marked by *self-*: thus, a *self-addressed envelope* does not mean ‘an envelope that is addressed to itself.’ This problem does not arise in our framework: *self-* is simply a predicate that imposes an identity condition on the predicate to which it incorporates. The non-saturating mode of composition Restrict yields a composed predicate with open argument positions.

- (19) $\lambda y \lambda z \exists x [\text{address}'(y)(z)(x) \wedge z = x \wedge \text{envelope}'(y)]$

This results in the correct interpretation, i.e. the set of envelopes such that someone addresses those envelopes to himself. Since this is strictly a semantic operation, it does not matter whether a SELF-marked predicate is reflexive in the sense of R&R. Thus, although one might wonder if *John* in (18) serves as a possible antecedent for *self-*, this cannot be the case, as is confirmed by the fact that there does not have to be an overt antecedent for *self-*.

- (20) Self-addressed envelopes are barred by law from the mails. (Chomsky, 1970)

An interesting corollary of this discussion is that, although Postal (1969) regards *self*-compounds as exceptions to “anaphoric islands,” they do not have to be treated as such under the current proposal: *self* is a predicative expression which does not bear reference by itself.

4 Specify

Turning now to the other mode of composition Specify, I argue that this basically represents the elsewhere case in reflexive anaphora: Specify applies in cases where Restrict is blocked. While C&L have shown that the distribution of two indefinite articles in Maori, *he* and *tētahi*, is explained in these terms, I will show that this holds true of reflexive anaphora as well.

4.1 Null Objects in Japanese

The null object in Japanese is interpreted either non-anaphorically (21a) or anaphorically (21b), the difference being captured in terms of which mode

(21) a. Kare-ZIsin-ga [DP pro]
he-self-NOM
shookai-si-ta.
introduction-do-PAST
'He himself introduced him/her.'
b. Kare-ga [DP [DP pro] t_i]
he-NOM
ziko_i-shookai-si-ta.
self-introduction-do-PAST
'He introduced himself.'

(22) John-ga [zibun-zisin-ga tensai-da-to]
John-NOM SE-self-NOM genius-COP-C
sinzite-iru.
believe-Pres
'John believes that he is a genius.'

4.2 Ellipsis in English

(23) a. John defends himself better than Peter.
(Sells, Zaenen, and Zec, 1987)
b. John's self-defense is better than Peter's.

In (23b), the application of Restrict is the only possibility, since the predicate is overtly SELF-marked. When the composed predicate is copied onto the gap, the sloppy reading arises as the only possible interpretation. In addition to this possibil-

$$(24) \lambda x \exists f [\text{defend}'(f(\text{himself}'))(x)]$$

4.3 ECM Subjects

(25) John believes himself to be intelligent.

Although this restriction in the interpretation of ECM subjects may not be immediately apparent, the following data suggest that this approach is on the right track.

- (26) a. John showed hostility. (John's hostility)
b. John showed hostility to be immoral.
(anyone's hostility)

In fact, this discrepancy in interpretation applies to gerunds and infinitival clauses as well.

- (27) a. We considered going abroad.
b. We considered going abroad to be important.
- (28) a. I don't want to flagellate myself in public.
b. I don't want to flagellate oneself in public becomes standard practice in this monastery. (Aoun and Lightfoot, 1984)

This analysis is further supported by the data involving body-part NPs. While (29a) is ambiguous with the body-part NP interpreted either in al-

ienably or alienably, the latter possibility is not available in (29b).

(29) a. John opened his eyes.

b. Mary batted her/*his eyes. (Safir, 1996)

The ambiguity in (29a) results from the availability of both Restrict and Specify, with the added assumption that body-part nouns are characteristically associated with an identity condition when they compose with a certain predicate. Although this association is optional in cases like (29a), the optionality disappears in (29b). The application of Specify thus creates a pragmatically incoherent situation in (29b). Our analysis now predicts that the object in (29a) but not in (29b) can be moved to the subject position in ECM clauses, and this is borne out by the following contrast.

(30) a. Mary expected her eye to be opened.

b. *Mary expected her eye to be batted.

(Safir, 1995)

Thus, the oft-noted parallelism between reflexives and body-part nouns (cf. Faltz, 1977; Pica, 1987; Safir, 1996) is captured.

5. Control

Our discussion of bare nouns, gerunds, and infinitival clauses in 4.3 can be naturally extended to control phenomena. I will argue that control can be divided into two cases—those where Restrict applies and those where it does not, and that the former results in obligatory control, whereas the latter results in optional control.

(31) a. John wanted [PRO to shave himself/*oneself].

b. John asked Bill [PRO to shave himself/*oneself].

(32) a. [PRO to behave himself/oneself in public] would help Bill.

b. Mary knows that [PRO to behave herself/himself in public] would help Bill.

c. John asked [how [PRO to behave himself/oneself]].

Unlike in reflexive anaphora, it is not very likely for the complement clause in (31) to undergo LF incorporation (although this may be an option in a language where restructuring is productive). Chierchia (1984; 1989), however, argued that obligatory control complements denote properties rather than propositions, and I argue that such clauses compose directly (i.e. without incorporation) with a control predicate via Restrict. Thus, unlike in reflexive anaphora, the property-denoting complement clause does not have to escape from an outer functional layer to compose with a matrix

predicate. If an infinitival clause is in a position where such a composition is blocked (e.g. in a non-object position as in (32a,b) or in a position shielded from an outer functional layer as in (32c)), then the composition via Restrict is no longer available, yielding an optional control structure.

6. Conclusion

The semantic mechanism proposed by C&L for indefinite NPs turns out to have a wider application than suggested and a wider range of anaphora facts now falls into place, without resorting to Condition A, a welcome result in view of the general nature of the mechanism of semantic composition. It has turned out that while the application of Restrict is severely restricted in terms of grammatical principles, the application of Specify basically represents the elsewhere case where pragmatic factors as well as grammatical principles converge to yield apparently disparate phenomena.

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What are Binding Principles Constraints on?

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1 Background

As formulated by Chomsky (1986), binding theory (hereafter BT) constrained **indexings**, which were taken to be assignments of **indices** to the NPs in a phrase. What an index was was irrelevant; what mattered was that they partitioned all the NPs in a phrase into equivalence classes. Phrases, in turn, were taken to be trees of the familiar kind and the binding constraints themselves were couched in terms of tree-configurational notions such as **government**, **chain**, and **maximal projection**. In the early 1990's, numerous studies (Everaert, 1991; Hellan, 1991; Pollard and Sag, 1992; Pollard and Sag, 1994; Reinhart and Reuland, 1991; Reinhart and Reuland, 1993) converged on the view that a wide range of facts at odds with Chomsky's BT became explicable if the binding constraints were reformulated in terms of the argument structures of the predicates rather than tree configurations. Additionally, many of these same investigators and others (Sells, 1987; Zribi-Hertz, 1989; Xue et al., 1994; Baker, 1995; Pollard and Xue, 1998; Pollard and Xue, 2001; Golde, 1999; Runner et al., 2002) recognized that a distinction had to be drawn between (1) referentially dependent elements subject to syntactically characterizable constraints on their (linguistic) antecedents, and (2) other (often homophonous) elements exempt from such constraints but subject instead to other interpretive constraints couched in terms of such discoursal/information-structural notions as logophoricity, discourse prominence, and contrastiveness. Following a common usage in the HPSG community, we will limit the term "BT" to constraints of

the first kind, and speak of elements subject to the second kind of constraint as **exempt** from BT. The principal question we will address is this: *What does it mean to say that a candidate structure does (not) satisfy BT?* Our discussion will be couched in HPSG terms, but we believe the concerns to be raised to have wider applicability. (However, if some frameworks are free from these concerns, that will be of interest.)

2 Binding Theory in GB and HPSG

As reformulated in HPSG, the first two BT principles require that (A) any r-pronoun (reflexive or reciprocal) be co-indexed with a less oblique nondummy coargument *if there is one*, and (B) any p-pronoun (ordinary definite pronoun) *not* be coindexed with a less oblique nondummy coargument. Obviously, these formulations (and their empirical consequences) are quite different from Chomsky's; see (Pollard and Sag, 1992; Pollard and Sag, 1994) for discussion. But there are also some striking similarities between the two versions of BT, including the following: (1) in a candidate structure being considered with respect to BT-compatibility, each nondummy NP has associated with it something called its index. (2) The structures contain substructures (either subtrees or sub-feature-structures) corresponding not just to overt NPs but also to controllers (PRO), null pronouns (pro), gaps (*variables* in the GB sense), and raised NPs (NP-trace). (3) "Actual" controlling, raised, or wh-moved constituents (fillers in HPSG, non-null heads of \bar{A} -chains in GB) are coindexed with the corresponding "abstract" elements (PRO, pro, variable, or NP-trace in

GB, an ARGSTRUC element in HPSG). (4) In cases where a quantified NP (hereafter, QNP) semantically binds a pronoun or reflexive (in the sense that in a standard logical translation, the logical determiner of the QNP logically binds two logical variable instances, one from the QNP itself and one from the pronoun/reflexive), the QNP and the pronoun/reflexive are coindexed; and this holds true even if the QNP does not o-command/c-command the pronoun/reflexive (e.g. *the first dollar he ever earned is the most treasured possession of many a successful entrepreneur; somebody in every little midwestern town hates it*). (5) Coreference need not occasion coindexing, e.g. [pointing to Black Bart] *He's the man that shot Liberty Valance*. (6) Certain r-pronouns/anaphors are required to bear the same index as certain other NPs. (7) Certain pronouns/pronominals are required to bear distinct indices from certain other NPs.

It is striking that two theories formulated within frameworks that differ so dramatically in terms of their methodological assumptions and theoretical primitives should agree on so much. So striking, in fact, that one might well suspect they are two theories about the same thing. But what is that same thing that the two BTs are about? Perhaps this is not such an interesting question in the case of GB, since it is arguably not a currently employed framework; but in the case of HPSG the question is not so readily dismissed. To see why, we need to take a closer look at indices in HPSG.

3 Indices in HPSG

As reformulated in HPSG (Pollard and Sag, 1992; Pollard and Sag, 1994), indices are not just integers (or other unique identifiers) assigned to NP nodes in trees as they are in GB. Rather, for each nondummy NP (or nonpredicative PP), irrespective of its feature-structure type (*sign*, *synsem*, or *local*), there is a feature path terminating with *CONTENT|RESTIND|INDEX* leading to a substructure of type *index*, which in turn bears a set of features usually called *agreement* features (usually, *PERSON*, *NUMBER*, *GENDER*). This is the case no matter whether the index-bearing element is a QNP (e.g. *every boy*), a name (e.g. *Kim*), a pronoun/reflexive, or one of the “abstract” ARGSTRUC

elements that does not correspond directly to a realized sign.

Let us consider some of the cases. (1) In the case of a QNP, the index occurs in the feature-structural representation of the logical quantifier in the position corresponding to that of the first x in $\forall x(\text{boy}'(x))$ in a restricted-quantification logical representation. (2) For a name, the index is playing a role in the *CONTENT* value essentially like the one that would be played by a logical constant (say, in a translation into intensional logic). (3) For a bound pronoun, reflexive, “*pro*”, “*PRO*”, or “*wh*-trace”, the index is playing a role analogous to the one that would be played by an occurrence of a logical variable in an argument position of a predicate in a logical translation. (4) And for a deictic or logophoric pronoun, the index is playing a role analogous to that of a logical parameter/indeterminate (i.e. a free variable whose reference is fixed by the utterance context). What is problematic here is that in the kind of semantics that 1990's-style HPSG *CONTENT* values are supposed to be modelling (i.e. west-coast-style situation semantics), there no one kind of thing that corresponds to all these different kinds of occurrences of indices.

Now it might be argued that none of this matters because scarcely anybody actually does situation semantics anymore anyway; even in the HPSG community, the Pollard-Sag situation-semantics-inspired *CONTENT* values have mostly been superseded, following (Richter, 2000; Richter and Sailer, 1999) by *CONTENT* values that are essentially feature-structural encodings of terms of higher-order logic (usually Ty2). Unfortunately, this does not make it any easier to say just what exactly indices are supposed to be. If *CONTENT* values are just encodings of Ty2 formulas, this means that the index of a name is a constant; the index of a deictic pronoun is a free variable; the index of a pronoun whose antecedent is a QNP is a bound variable; the index of a direct-object reflexive where the subject is a name is the same constant as that corresponding to the subject; and the index of a QNP is . . . what?

This last case is especially problematic, because in a logical translation of of a sentence containing a QNP, where the variable corresponding to the QNP occurs (and indeed, *whether* it occurs) depends on essentially stylistic decisions about the form of the translation. For example, consider the sentence *ev-*

ery boy runs. For precisely which of the imaginable ways of translating this sentence into Ty2 is the feature-structure encoding of that translation the “real” CONTENT value of *every boy runs*? Is it *every'(boy')(run')*, which contains no variable occurrences at all? Or is it perhaps the familiar first-order reduction $\forall x(\text{boy}'(x) \rightarrow \text{run}'(x))$? Or, as Quine might have had it, $\lambda x \top = \lambda x(\text{boy}'(x) \rightarrow \text{walk}'(x))$? Given the conventional wisdom that lambda-terms are dispensable—only the denotation in a model, which is invariant under term equivalence, is supposed to matter—it shouldn’t make any difference. But for the HPSG binding theory to work, it is crucial that the indices, whatever they are, be located at the ends of precisely the right paths in the feature structures, so that we can know exactly where to look for the substructures on whose token-(non)identity the entire BT hinges.

Of course one can require that the (feature-structure encodings of) lambda terms corresponding to CONTENT values of nondummy NPs and non-predicative PPs be written in precisely the right style to guarantee that the right subterm always shows up in the encoding at the end of such-and-such a path; but then it seems evident that there is no natural class of empirical phenomena that BT is constraining; instead one is essentially deciding in advance which kinds of sentences one wants ruled in (or out) by BT and then cooking the representations to ensure that those cases are covered. To put it another way, in the world of real phenomena, there is no such thing as the index of a noun phrase. (We believe this to be a noncontroversial assertion.) So what are we to make of a theory whose predictive power is based on whether or not two given NPs in an utterance have the same index?

4 Conclusion

Here is a more concrete way to express what the difficulty is. Consider these sentences:

4. Every man claims he shaves himself. [where each man is making a claim about himself]

5. Every man tries to shave himself.
6. Every man seems to shave himself.
7. Who do you think shaves himself?
8. This is the man who I claimed shaves himself.

If we admit, however reluctantly, that there are no such things as indices, what options are there for expressing how the interpretations of these sentences are constrained in terms of a common empirical generalization?

This abstract was written from an HPSG perspective, but we think it is a general, as-yet unresolved problem for grammatical theory in general. For example, to their credit, type-logical grammarians seem not have walked into the trap of positing indices and then theorizing about them as if they were actual things that one could **have** a theory about. On the other hand, we are also unaware of any type-logical account that would make sentences (1)-(8) above into instances of a common generalization.

Thus, the question we want to put up for discussion is: what are BT constraints constraints **on**?

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Binding Conditions: How are they Derived?

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1 Introduction

In this talk I will address the status of the binding conditions within the overall structure of the grammar. I will argue that apart from the notion of binding itself the grammar need (and hence, should) not contain statements specific to binding. Furthermore, I will argue that at least one principle of language derives from a property that holds of mental computations in general (if so, this leads to many further questions). I will adopt the definition of binding in (1) (Reinhart 2000):

- (1) A-binding (logical-syntax based definition)¹
 α A-binds β iff α is the sister of a λ -predicate whose operator binds β

I will focus on binding conditions A and B, and discuss how they can be derived from general properties of the grammatical system. This involves investigating binding possibilities of elements in terms of:

- A) their intrinsic feature content (only features that are independently motivated, such as *person*, *number*, *gender*, etc., not: +/- anaphor, +/- pronominal, etc.)
- B) their internal structure (pronoun, additional morphemes)
- C) the interaction of these elements with the linguistic environment (semantic and syntactic) as it is driven by their features.

2 Condition B: Why must reflexivity be licensed?

The starting point is the question of what is wrong with "brute force reflexivization" (=coargument binding without additional licensing). I will show that the core

cases of condition B can be derived from (2) as a general property of computational systems:

- (2) **IDI=Inability to Distinguish Indistinguishables.**

The IDI is not specific to language, hence the investigation of condition B leads us "beyond explanatory adequacy" (Chomsky 2004).

Consider the general structure in (3a), instantiated in (3b) and (3c), where *zich* is a SE-anaphor.

- (3) a. *DP V Pronoun*
b. **Jan* haat *zich* (Dutch)
John hates SE
c. **Jan* hatet *him* (Frisian)

By assumption V is a 2-place predicate that has to assign different theta-roles to subject and object. Hence, two different grammatical objects are required to bear the theta-roles (theta-criterion). Translating pronouns as variables together with the definition of binding yields:

- (4) $DP \lambda x [x V x]$

(4) contains two tokens of the variable x . The claim is that due to IDI the computational system cannot read them as two objects. Two tokens of the same element can only be distinguished if they qualify as different occurrences (Chomsky 1995: an occurrence of x is the expression containing x minus x). The tools for keeping track are *order* and *hierarchy*. But, order is a PF property and not available at the C-I interface. Purely syntactic hierarchy is broken down by the interpretive procedures at the C-I interface (eliminating X' and equivalents). Translating *DP V pronoun* at the C-I interface involves the steps in (5):

- (5) $[_{VP} x \underset{1}{[_{V'} V x]}] \rightarrow ([_{VP} V \underset{2}{x}] \rightarrow \underset{3}{*[_{VP} V x]})$

¹ *Logical syntax* is a regimented representation of linguistic structure at the conceptual-intentional (C-I) interface that results from the translation/interpretation procedures applying to expressions of narrow syntax.

The second step with the two tokens of x in " x x " is virtual (hence put in brackets). With the breakdown of structure, and the absence of order, stage 2 has no status in the computation. Hence, eliminating V' leads directly to stage 3. Since one theta-role cannot be assigned in stage 3 (or two roles are assigned to the same argument) it leads to a theta-violation. Thus the prohibition of "brute force" reflexivization is derived.

The issue is how to obtain a reflexive interpretation while avoiding "brute force reflexivization. There are two options: i) make the argument structure compatible with this effect of IDI \rightarrow apply a lexical or syntactic reduction operation on the argument structure, licensing valence reduction; ii) keep the two arguments formally distinct by protecting a variable.

2.1 Valence reduction

Reinhart (2002) and Reinhart and Siloni (to appear) develop a theory of operations on argument structure. Among these operations are Passive, Middle formation, (De)causativization and *Reflexivization*. The latter operation reduces the valence of the verb, and bundles the theta-roles. In many languages, however, verb classes exist that resist reflexivization by valence-reduction. With such verbs reflexivity must be licensed by protecting the variable.

2.2. Protecting a variable.

As will be argued, any embedding of the second argument in a structure that is preserved under translation into logical syntax will do to keep the arguments distinct. I use the term *reflexive-licenser* (or briefly licenser) to refer to the morphological elements that are used to achieve this. The general structure is illustrated in (7a) and (7b), a particular instance is *zelf* in *Jan bewondert zichzelf* 'John admires himself':

- (7) a. $DP\ V\ [Pronoun\ Morph]$
b. $DP\ \lambda x\ [V(x, [x\ M])]$

The freedom of the choice and interpretation of M are limited by conditions of use: (7b) should be useable to express a reflexive relation. Thus, if M is interpreted as yielding some function of x , use restricts what are admissible values. This is stated in (8) (Reuland 2001):

- (8) $DP\ (\lambda x\ V(x, f(x)))$
Condition: $\|f(x)\|$ is sufficiently close to $\|x\|$ to stand proxy for $\|x\|$

3 Enforcing reflexivity: Condition A

Some reflexive licensers enforce reflexivity (for instance, English SELF). This is standardly reflected in

condition A as a property of SELF-anaphors. The question is why reflexive licensers would have this property. It does not follow from their role in protecting the variable. Moreover other licensers of reflexivity don't have this property. This is illustrated by the contrast between English and Malayalam in (10), which does not require local binding of the licenser (Jayaseelan 1998):²

- (10) a. raaman_i tan-ne_i *(tanne) sneehikunnu
Raman SE-acc self loves
Raman loves him*(self)
b. raaman_i wicaariccu [penkuttikal tan-ne_i tanne sneehikkunnu enn@]
Raman thought girls SE-acc self love Comp
'Raman thought that the girls love *himself*'
c. *Raman_i thought that the girls love himself_i

Locality is not an absolute property of *self*, even in English, witness the contrast in (11) extensively discussed by Pollard and Sag (1992, 1994), Reinhart and Reuland (1991, 1993) and many authors cited there.

- (11) a. *Max_i expected the queen to invite himself_i for a drink
b. Max_i expected the queen to invite Mary and himself_i for a drink
c. Max_i expected the queen to invite no one but himself_i for a drink

When the SELF-anaphor is not a syntactic argument of the predicate it does not have to be interpreted as a reflexivizer, but if it is it must. Suppose that in English reflexivization by SELF takes place by covert adjunction of SELF to the predicate as in (12).

- (12) a. $DP\ \dots\ [V]\ [_{DP}\ PRON\ [SELF]]$
b. $DP\ \dots\ [SELF\ V]\ [_{DP}\ PRON\ [e]]$

If so, the contrast in (11) follows from restrictions on movement. Assuming that there is no intrinsic property of *himself* that forces it to be bound, or of SELF that forces it to be moved, the well-formedness of (11b,c) also follows. But the question is why it has to move if it can as in (11a) where the result is illformed. The explanation should not be specific for SELF, since in languages with body-party reflexives reflexivizing may also be enforced (e.g. in Georgian, see Amiridze in prep). There are a number of possible scenario's for the obligation to reflexivize of which I mention two: i. a lexical semantics-based scenario; ii. an inalienable possession-based scenario. Both allow us to derive instances of condition A without any assumption that is specific to binding. Yet, unlike in the case of condition

² Cole, Hermon and Tjung (2004) discuss the anaphor *awake dheen* in *Peranakan Javanese* which has similar properties.

By some properties of grammar will be involved that are specific to language. But first some remarks on how the computational and interpretive systems interact.

With Chomsky (1995, and subsequent work) I assume that Merge, as the basic operation for forming complex expressions, comes in two forms: Set-merge and Pair-merge. Set-merge reflects predicate-argument relations, Pair-merge yields adjunction structures, and is interpreted as modification. A canonical way of interpreting modification structures is by *intersection*. Chomsky (2001) posits *interpretation by intersection* as the mechanism of choice for adjunction (pair-merge) in general. This general mechanism is also found where we don't have a typical modification relation. For instance, De Hoop (1992) argues that bare plural objects in Dutch (and other languages) should be interpreted by an incorporation mechanism. The syntactic mechanism expressing incorporation is head-adjunction. Interpretation as intersection will play a key role in the interpretation of SELF-marking. For reasons of space I will limit myself to the Inalienable Possession model (IP model).

3.1 Introducing the IP model

According to Pica (1987, 1991) "inalienable possession" constructions provide a model for complex reflexives (see Everaert 2004 for further discussion). But so far no full implementation has been put forward, and there are complications that require attention. Some typical IP constructions do indeed share with reflexives "obligatoriness of binding". So, we have *John craned his neck*, *Everyone craned his neck*, but not **I craned his neck*. However, many cases are idiomatic (to varying degrees); and in non-idiomatic cases, the obligation appears to cease. Compare (13)-(15):

- (13) a. John raised his eyebrows
b. *I raised his eyebrows
- (14) a. John sprained his ankle
b. *(?)I sprained his ankle.
- (15) a. During the fight, John twisted his ankle
b. During the fight, I twisted his ankle

Yet, there is a contrast between (15a) and (15b): under the IP-reading *twist* is not agentive: John is an experiencer rather than an agent in (15a) and (14a). Also, (15a) means that John sustained an injury, contrary to (15b).³ So, in these cases the IP and the non-IP versions of the predicate are not identical. Also compare (16a) and (16b):

- (16) a. John proffered his hand
b. John proffered his bottle

John is an agent in some sense in both cases, but there is a significant difference: (16a) does not express a relation between "independent objects". In (16b) John performs a transaction on a bottle, whereas in (16a) John does not perform a transaction on a hand. The transaction can be completed in (16b) by transferring possession of the bottle, but not in (16a) (unless, of course, by severing the hand, but this gives us again the bottle-case). This contrast will help us find an effective characterization of true IP. Note, that it is not the case that in the structure DP V [_{IP} Poss NP], Poss is always obligatorily bound by DP. This is illustrated by the examples in (17):

- (17) a. John_i hit his_{i,j} knee (no bias)
b. John_i hated his_{i,j} face (no bias)
c. John_i hated his_{i,j} body (slight bias, but:)
d. I hated his_i body (fine)
e. John_i hated his_j guts (somebody else)

Such facts indicate that deriving the binding obligation of *complex anaphors* from an IP type strategy requires at least some additional assumption. What (16) shows is that the inalienably possessed element is not referential in the way canonical arguments are.⁴ If so, the following scenario applies, again leading to a derivation based on covert *adjunction/incorporation*.

Starting point is the structure in (18) (with BP instead of SELF)

- (18) a. DP [V] [_{DP} PRON [BP]]
b. DP [BP V] [_{DP} PRON [e]]

The assumptions and steps that are needed for a blind, automatic syntactic procedure are sketched in the next section.

3.2 Implementation

i. BP has minimal semantic content. *Empirical assumption about the lexical semantics of BP.* **Comment:** No specific assumption about the BP's semantics is involved.

ii. Elements whose semantic content is under a certain threshold are –R(eferential) *Empirical assumption about the relation between semantic properties and interpretation.* **Comment:** It remains to develop a theory of thresholds. We must assume that the –R property can be read off the lexical representation.

iii. –R Arguments (may) (covertly) adjoin to the predicate (incorporate) in order to saturate a the-

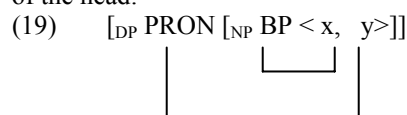
³ As pointed out by Alexis Dimitriadis (personal communication).

⁴ Such a use of the notion of referentiality glosses over important issues, but for current purposes it will do.

matic role. Empirical assumption about argument licensing

iv. BP-movement can only be to the nearest c-commanding predicate. Follows from the general theory of movement. **Comment:** A blind syntactic process.

v. BP is a relational noun. Empirical assumption about the lexical semantics of BP. **Comment:** Assume the following general internal structure for body-part expressions, where the variables stand for theta-positions of the head:



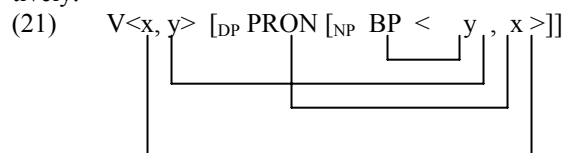
x bears the referential role in the sense of Zwarts (1993). Thus, BP(x) in (19) defines the set expression, the set of objects that stand in the "body-of" relation to y .

The inalienable possession reading of "body-of" is intrinsically linked to its relational character. Cases of "alienable" use of inalienably possessible elements (the "severed hand") must involve lexical reduction (in the sense of Reinhart (2002). Thus, *hand*, *foot*, etc. have dual, but rule-related entries. The *body-of*-relation is restricted to pairs such that x is the inalienable body of y , excluding other types of "possession". As a next step, y is linked to an argument, as in *the body of John*.

vi. The relation expressed by BP composes/intersects with the relation expressed by the verb that BP adjoins to. General property of the interpretation of adjunction **Comment:** Composing $R_1 < x, y >$ and $R_2 < x, y >$ leads to an expression $R_1 \oplus R_2 < x, y >$. Assume that for some verb V , x stands for the external role and y for the internal role. In the case of BP the variable of the set expression stands for the internal role; PRON receives the external role. If V composes with BP in the structure of (20) the internal role of V and the internal role of BP will match just as the external role of V and the external role of BP.



vii. Obligatory binding obtains. Consequence of previous steps **Comment:** Binding follows from composition/intersection enforcing the choice of identical variables for internal and external positions respectively.



The derivation maps (22a) via (22b) (head movement/adjunction + composition/intersection) to the logical syntax representation (22c) where x_{DP} stands for the

variable resulting from Quantifier Raising the subject, f_N for the function interpreting the Bodypart expression, and x_{his} for the variable resulting from translating *his* (for perspicuity's sake the internal argument linking has been left implicit) and (22d) with the flat resulting structure assumed for Logical Syntax:

- (22) a. $[_{DP} [_{V} [_{his} N]]]$
 b. $[_{DP} [_{N-V} [_{his} (N)]]]$
 c. $[_{DP} (\lambda x [_{x_{DP}} [||N \oplus V|| f_N (x_{his})]])]$
 d. $[_{DP} (\lambda x [||N \oplus V|| (x, f(x))])]$

Thus, the IP model combines protection, the obligation of binding and a formal binding relation in logical syntax. This shows how condition A can be derived for this class of reflexives.

4 By way of conclusion

Principles of grammar may reflect general properties of computation, as in the case of condition B. Cross-linguistic variation in condition A will depend on grammatical and lexical factors determining the possibility and necessity of incorporation.

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Binding in Picture Noun Phrases: Implications for Binding Theory

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1 Introduction

This paper investigates the binding of pronouns and reflexives in “picture” noun phrases, and focuses on data showing that reflexives and pronouns are not in complementary distribution in picture NPs with possessors. In particular, we discuss data showing that whereas reflexives can take either the possessor or the subject of the sentence as antecedent, pronouns are restricted to any antecedent other than the possessor phrase. We argue that this asymmetry can be straightforwardly explained if we assume that (1) the possessor of a picture NP is not part of the head noun’s argument structure and (2) Binding Theory is stated over “dependents” structure, the representation encompassing both a head’s argument structure and other phrases dependent on it in various ways. If the possessor of a picture NP (PNP) is not part of the head’s argument structure, it follows that reflexives in PNPs with possessors will be “exempt” from Binding Theory, which paves the way to an analysis of the reflexive data.

Furthermore, we also show that if BT is regarded as defined over dependents structure, it follows that a pronoun in a picture NP with a possessor must be disjoint from that possessor phrase.

2 Possessed Picture NPs

Most approaches to Binding Theory predict that a reflexive in a PNP with a possessor phrase is bound by that possessor (see (1)), and that a pronoun in a PNP is disjoint from the possessor (see (2)).

(1) Ebenezer_i saw Jacob_j’s picture of himself_{j/*i}.

(2) Ebenezer_i saw Jacob_j’s picture of him_{i/k/*j}.

These predictions are made by the classic Principles & Parameters Binding Theory of Chomsky (1981, 1986), the “reflexivity” approach of Reinhart & Reuland (1993), as well as most versions of the HPSG Binding Theory, beginning with Pollard & Sag (1992, 1994), and more recently in Manning & Sag (1999). The predictions follow from two claims: (1) that reflexives and pronouns are in complementary distribution, which means that in a given binding domain, the sets of referents available to a reflexive and a pronoun are not overlapping; and (2) that a PNP containing a possessor phrase is a domain for binding. We will illustrate the HPSG analysis of (1) and (2) with the Manning & Sag (1999) version of the Binding Theory (see (3) and (4)).

(3) HPSG Binding Theory (Manning & Sag 1999)

Principle A: A locally a-commanded anaphor must be locally a-bound

Principle B: A personal pronoun must be locally a-free

Principle C: A non-pronoun must be a-free

(4) A-command: If A precedes B on some argument structure (ARG-ST) list, A a-commands B.

A-binding: A a-binds B if A a-commands B and A and B are coindexed.

The data in (1) and (2) follow from the assumption that the head noun ‘picture’ has an ARG-ST containing both ‘Jacob’ and the ‘himself’/‘him’, as in (5) and (6):

(5) ARG-ST: <[_{NP} Jacob]_j, [_{NP} himself]_j>

(6) ARG-ST: <[_{NP} Jacob]_j, [_{NP} him]_{*j}>

For (1), since the anaphor ‘himself’ is a-commanded, it must be a-bound, in this case implying that it must be coindexed with ‘Jacob’. For (2), the pronoun must not be a-bound, which means it can have any index but that of ‘Jacob’. Thus, the complementary distribution of reflexives and pronouns is accounted for on the assumption that the NP is the domain for binding.

However, a number of recent studies (Runner, Sussman & Tanenhaus 2002, 2003, 2005; Keller & Asudeh 2001; Asudeh & Keller 2001; Jaeger 2004) have experimentally investigated these predictions with respect to PNPs containing possessors, and the findings indicate that reflexives and pronouns are not in complementary distribution in PNPs containing possessors. In particular, reflexives are not limited to taking only the possessor as antecedent; the subject of the sentence may also be the antecedent (see (7)). However, a pronoun in the same position is constrained to be disjoint from the possessor phrase (see (8)). Since the pronoun and the reflexive can both take the subject of the sentence as antecedent, this means their referential domains are partially overlapping; in addition, for the reflexive at least, the domain of binding cannot be restricted to the PNP.

(7) Ebenezer_i saw Jacob_j’s picture of himself_{j/i}.

(8) Ebenezer_i saw Jacob_j’s picture of him_{i/k/*j}.

3 The ARG-ST of Possessed PNPs

We begin by illustrating that if one abandons the claim that the possessor and postnominal phrase are co-arguments, an account of the binding in (7) can be developed. Principle A constrains only locally a-commanded anaphors. If an anaphor appears in an ARG-ST, but has no a-commanding co-arguments, Principle A is satisfied vacuously (see (9)):

(9) ARG-ST: <[_{NP} himself]>

Pollard & Sag (1992, 1994) call this type of anaphor “exempt”, and suggest that its distribution is constrained by pragmatic and discourse factors instead of structural Binding Theory. Reflexives in PNPs lacking possessor phrases are one of the ‘classic’ examples of exempt anaphors. It is well known that reflexives in simple PNPs can have antecedents outside the PNP, as in (10). Indeed, these exempt anaphors even occur with clause-

external (or sentence-external) antecedents, as in (11). In addition, as Pollard & Sag argue, something like the discourse notion of “point of view” is relevant to licensing the use of these exempt anaphors, see (12) vs. (13).

(10) John_i saw [a picture of himself_i].

(11) John_i said that there was [a picture of himself_i] in the post office.

(12) John_i was going to get even with Mary. That picture of himself_i in the paper would really annoy her, as would the other stunts he had planned.

(13) Mary was quite taken aback by the publicity John_i was receiving. *That picture of himself_i in the paper would really annoy her, as would the other stunts he had planned.

Let us now return to PNPs with possessors. In these constructions, if we assume that the possessor is not represented as part of the ARG-ST of the noun ‘picture’, the reflexive is alone on the ARG-ST, as in (9)—which makes it an exempt anaphor, according to Pollard and Sag’s approach. Under the view that this reflexive is an exempt anaphor, its choice of antecedent is not determined by Binding Theory, but rather by pragmatic and discourse-level factors. In an experimental investigation, Runner et al. (2003) found a preference for the possessor over the subject: participants chose the subject as antecedent on about 25-30% of trials, and the possessor on 70-75% of trials. Thus, in order to succeed, the non-co-argument account needs to explain how pragmatic and discourse factors are responsible for this pattern. The possessor preference may be related to locality conditions on anaphoric reference, and we emphasize the importance of these issues as topics of future work.

It is worth noting that although the assumption that the possessor is not in the ARG-ST of the noun ‘picture’ seems to offer a way of capturing the reflexive data, it results in the loss of the explanation for the fact that a pronoun in the same position must be disjoint from the possessor (8). This disjointness only follows from Binding Theory if the possessor is on the ARG-ST of the head noun.

Thus, the question of whether the possessor phrase is a co-argument of the postnominal phrase is crucial to the analysis of (7) and (8). In the next section, we provide evidence that it is not. Our argument has two parts. First, we present several

independent reasons for not treating the possessor and the postnominal phrase as co-arguments. Then, we discuss findings showing that reflexives in PNPs are sensitive to discourse/semantic factors—which is expected if they are exempt anaphors due to not being co-arguments with the postnominal phrase. In the last part of the paper, we return to the disjoint pattern for pronouns.

4 The PNP Possessor

The first argument against treating the possessor as part of the ARG-ST of the picture noun comes from the interpretation of reflexives in PNPs under ellipsis. Kiparsky (2002), building on Hestvik (1990), argues that a bound variable reading is obligatory when an anaphor is bound by a co-argument, but not when it is bound by a non-co-argument. He provides (14) and (15) as evidence.

(14) John hates himself, and so does Fred.

(15) John considers himself competent, and so does Fred.

Ellipsis is a useful tool since it can be used to reveal meaning differences between bound variable and coreferential construals. The elided VP in (14) can be interpreted only as ‘Fred hates himself’, not as ‘Fred hates John’; thus the elided reflexive behaves as a bound variable only. In contrast, the elided VP in (15) can be interpreted as either ‘Fred considers himself competent’ (bound variable) or ‘Fred considers John competent’ (coreferential). Possessorless PNPs pattern like (15) in also allowing both interpretations (Kiparsky 2002, Grodzinsky & Reinhart 1993):

(16) John has a picture of himself, and so does Fred.

The availability of both readings is expected under the Pollard & Sag approach to PNP reflexives, which treats them as exempt anaphors: the reflexive in (16) is not bound by a co-argument, and thus allows a coreferential interpretation.

We use the correlation between non-co-argumenthood and coreferential readings to probe the status of the possessor in possessed PNPs. If the possessor in a PNP is a co-argument of the postnominal phrase, then only a bound variable interpretation should be available to an elided reflexive in the post-nominal position. Runner, Sussman & Tanenhaus (2002) provide the example

in (17), and suggest that, in the appropriate contexts, both the coreferential and bound variable interpretations are available.

(17) Jimmy bought JFK’s picture of himself for \$500 not realizing he could’ve bought the museum’s for just \$100 in its going out of business sale.

Furthermore, Runner (2003) discusses the results of an experimental investigation of this question and reports that in sequences of instructions (see (18)) given to participants seated in front of a set of dolls and a display containing pictures of these dolls, the reflexive is interpreted coreferentially—as referring to Harry’s picture of Ken—more frequently when elided than when not. The material in angled brackets was present on half of the trials (see also Runner et al. 2005 for details):

(18) Pick up Joe. Have Joe touch Ken’s picture of himself. Now, have Joe touch Harry’s <picture of himself>.

The availability of a coreferential interpretation under ellipsis in examples like (18) and (17) argues against treating the possessor as part of the ARG-ST of the picture noun.

The second argument against treating the possessor of the PNP as part of the ARG-ST of the picture noun also comes from Kiparsky’s (2002) discussion. Following Reinhart & Reuland (1993), he notes that co-arguments and non-co-arguments pattern differently with respect to collective vs. distributive readings. Examples such as (19), with co-argument binding, are acceptable but only on a collective interpretation; a distributed interpretation seems to be blocked. However, in the case of the binding of non-co-arguments as in (20), the distributed interpretation is also available.

(19) By an overwhelming majority, we preferred me.

(20) I believe us to have been cheated.

Kiparsky argues that the referent of plural expression we in (19) must act as a single collective entity and not as separate individuals. For example, (19) is true in a context where the preference is established by voting, even if there exists a small number of individuals who did not vote for the referent of me. In contrast, the plural expression in (20), us, can be interpreted distributively (e.g. (20)

would be true in a context where each person was cheated on a different occasion). Kiparsky offers a similar example of a PNP lacking a possessor (21), which patterns like a non-co-argument example. This follows from the treatment of such reflexives as exempt anaphors (with no co-arguments).

(21) John and Mary both have a picture of him/her.

Similar examples can be constructed with PNPs containing a possessor. If the possessor is a co-argument, the distributive reading should be excluded. This does not seem to be the case:

(22) John prefers our pictures of me.

(23) I prefer John and Mary's pictures of him.

Here it is possible to interpret the plural possessor as individuals. For example, (23) would be true even in a situation where there are no pictures of John owned by both John and Mary, as long as John and Mary both separately own pictures of John. We follow Kiparsky in interpreting the availability of the distributive reading as an indication that the possessor and the postnominal pronoun are non-co-arguments.

The third argument against treating the possessor as a co-argument of the postnominal phrase comes from the interpretation of 'only' constructions and builds on the claim that reflexives must be interpreted as bound variables if bound by a co-argument. Consider, for example, example (24) from Runner et al. (2002). This sentence can receive a coreferential interpretation in the appropriate context, such as one in which a photography gallery has assembled many photos of Madonna, including one that Madonna shot of herself. The coreferential interpretation is one where Jimmy wants to see that picture of Madonna and not any of the other pictures of Madonna. In contrast, a bound variable reading would be one where Jimmy wants to see a self-portrait of Madonna owned by Madonna and nobody else's self-portrait. The availability of the coreferential interpretation again argues against treating the possessor as part of the ARG-ST of the picture noun.

(24) Jimmy really wanted to see only Madonna's picture of herself.

In sum, these three arguments suggest that the possessor is not on the ARG-ST of the picture noun. If we remove the possessor from the ARG-ST of the

picture noun, we can now begin to analyze examples such as (7), repeated here as (25):

(25) Ebenezer_i saw Jacob_j's picture of himself_{j/i}.

If 'Jacob' is not a co-argument of 'himself', 'himself' is an exempt anaphor and is free to take either 'Jacob' or 'Ebenezer' as antecedent. As mentioned earlier, the choice is presumably modulated by the discourse constraints on exempt anaphors, and is an important question for future work.

5 PNP Reflexives as 'Exempt' Anaphors

Further evidence in favor of treating PNPs as exempt anaphors comes from their sensitivity to non-structural, discourse/semantic factors (see e.g. (12) and (13)). As we pointed out above, no obvious structural explanation will account for the acceptability of (12) and the contrast with (13).

In related work on PNPs without possessors, Kaiser, Runner, Sussman & Tanenhaus (2004, 2005), developing Kuno's (1987) and Sells' (1987) proposals, have experimentally investigated the role of the notion of "source of information" in licensing reflexives in PNPs. In one experiment, participants had to indicate whether a particular sentence matched the scene shown on a computer monitor. Sentences such as (27), with either tell or hear, were used. With tell, the subject of the sentence is the "source of information", but with hear, the object is the source.

(27) Peter {told/heard from} John about the picture of himself on the wall.

The results show that though participants had an overall preference for the subject NP as antecedent of the reflexive, there was still a small effect of verb type. Participants were more likely to accept the object as antecedent of the reflexive if the object was the source of information. In a second experiment using eye-tracking methodology, participants had to click on the appropriate picture mentioned in the sentence. Again, target choices indicate a general subject preference, but there was also a small numerical effect showing that if the object is the source, participants are somewhat more likely to choose it as antecedent than if it is not the source. Furthermore, participants' eye-movements show that they were more likely to consider the possibility of the object as antecedent if it was also the source of information. If sensitiv-

ity to source is characteristic of exempt anaphors, these findings provide evidence in favor of analyzing PNP reflexives as exempt.

Having considered PNPs lacking a possessor phrase, let us now turn to PNPs with possessors. The first argument in favor of treating reflexives in PNPs with possessors as exempt comes from examples (17) and (18). One of the claims of the exempt anaphor analysis is that reflexives in PNPs with possessors resemble pronouns in that they can receive coreferential interpretations, and in particular can receive their interpretation from something in the discourse context. Examples (17) and (18) illustrate this clearly since in both cases the interpretation of the elided reflexive comes from the discourse. Even if the elided NP is literally reconstructed, the reference of the elided reflexive comes from the antecedent NP's possessor.

A second argument comes from data presented in Jaeger (2004). Jaeger manipulated the semantic roles of the possessor and the subject such that sometimes the subject was a so-called "salient creator" of the PNP (28), and sometimes the possessor was the salient creator (29):

(28) Manray burned Mary's photo of himself.

(29) Mary burned Manray's photo of herself.

In Jaeger's materials, the reflexive was always bound by the subject. The results of his magnitude estimation experiment show that participants prefer (28) over (29). In other words, given that the reflexive is bound by the subject, participants prefer sentences where the subject is also the salient creator over sentences where the possessor is the salient creator. We take this to suggest that participants would have preferred the salient creator possessor as antecedent in (29), and that the notion of "salient creator" is relevant to the choice of antecedent for these reflexives. This sensitivity to non-structural factors is expected if the reflexive is an exempt anaphor.

6 Implications for Binding Theory

If the possessor is not part of the ARG-ST of the picture noun, how is it associated with the PNP? In addition, how can we account for the disjoint reference between the possessor and a pronoun in the PNP? Here, we outline an analysis of the relationship between the possessor and the head picture

noun, and develop a modified version of Binding Theory which accounts for the disjoint reference.

In recent work on wh-extraction within HPSG, Bouma, Malouf & Sag (2001) argue that, in order for a lexicalist approach to wh-extraction to work, there must exist a level of representation containing the head as well as information about all of its "dependents", including those listed in the ARG-ST as well as those more loosely related to the head, such as adverbials and adjuncts of various sorts. They name this dependents structure (DEPS). The main motivation for this structure comes from extraction involving adjuncts and other phrases that do not appear on a verb's ARG-ST (see Bouma et al. 2001 for details).

The pattern in (26), repeated here as (30), suggests that a disjointness constraint needs to be enforced at some level of representation containing both the pronoun and the possessor of the PNP.

(30) Ebenezer_i saw Jacob_j's picture of him_{i/k/*j}.

We argued above that the possessor is not associated with the head via ARG-ST, and we would like to suggest here that the association takes place on the level of the DEPS structure instead. This would make DEPS a representation that contains both the possessor and the pronoun inside the PNP – in other words, precisely the correct level at which to state the disjointness constraint for pronouns. We suggest that the Binding Theory should apply to DEPS structure rather than on ARG-ST:

(31) Binding Conditions

Principle A. A locally a-commanded reflexive must be locally d-bound.

Principle B. A pronoun must not be locally d-bound.

Principle C. A non-pronoun must not be d-bound.

D-binding is identical to a-binding, with the distinction that it applies on the DEPS list. Importantly, Principle A still refers to a locally a-commanded reflexive in its definition of which reflexives are so constrained. The intuition is that co-argumenthood is what is relevant for defining reflexives as either constrained or exempt from Binding Theory. However, it is "co-dependence" that is relevant to the disjointness requirement for pronouns. In most cases, this version of Binding Theory will overlap with one

based solely on ARG-ST. However, there are some cases where these two approaches differ. For example, for PNPs with possessors, our version of Binding Theory correctly places PNP reflexives outside the control of Binding Theory, and keep PNP pronouns within Binding Theory. Another case where the Binding Theory based on DEPS does not overlap with that based on ARG-ST comes from well-known Principle C violations involving non-pronouns in adjoined phrases.

(32) Mary_i is tired. She_i had to prepare dinner for Betsy when she_i/*Mary_i got home.

The ‘when’ clause is not associated with the ARG-ST of the head verb ‘prepare’ and thus the standard version of ARG-ST-based Binding Theory cannot rule out the use of the non-pronoun here. On the assumption that Principle C is relevant to the binding in examples like (32), the version based on DEPS correctly accounts for it.

7 Conclusion

This paper examines reflexives and pronouns in PNPs. It argues that when present, a possessor is not part of the ARG-ST of the head picture noun, but rather is associated with the head via the DEPS structure. Thus, a reflexive in a PNP containing a possessor will be exempt from Binding Theory, a result we supported with several arguments.

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Verifying Binding Constraints for Anaphor Resolution

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1 Introduction

Syntactic disjoint reference rules are known to be of paramount importance to robust, algorithmic¹ anaphor resolution. Starting with the pioneering paper of Hobbs (1978), a plethora of algorithms has been developed that exploits this source of evidence as a filter for narrowing down sets of antecedent candidates for anaphoric expressions. Among this work are the landmark approach of Lappin and Leass (1994) and its numerous robust, knowledge-poor descendants, e. g. (Kennedy and Boguraev, 1996; Mitkov, 1998; Stuckardt, 2001). These approaches employ syntactic disjoint reference rules that capture referential evidence derived from formal models of grammar such as Government and Binding (GB) Theory (Chomsky, 1981) to the extent that it is deemed relevant to accomplish the task of anaphor resolution.

In general, there is a considerable gap between the scope of the formal model and its algorithmic implementation. In dealing with issues well beyond anaphora and in claiming cross-linguistic generality, GB theory refers to complex descriptions of syntactic surface structure that, today as well as in the near future, no robust parser can be expected to construct automatically. Thus, while accounting for many subtleties of language, such formal models at most partially address the *algorithmic* aspects of referential processing that are relevant for practical tasks of referential disambiguation.

¹The adjectives *robust* and *algorithmic* are conceived as synonyms here. Henceforth, they are employed interchangeably for qualifying approaches to anaphor resolution that are fully implemented and work without human intervention. Equally well one might speak of *operational* or *practical* anaphor resolution.

Nevertheless, robust approaches to anaphor resolution require implementations of syntactic disjoint reference that gather as much evidence as possible. This paper investigates the theoretical subtleties to be taken into account as well as the practical requirements to be satisfied. Given the output of a robust state-of-the-art parser, the goal consists in developing an algorithmic account of syntactic disjoint reference that, on one hand, sufficiently captures surface-configurational evidence, and, on the other hand, exhibits computational efficiency and fulfils the robustness requirements.

The paper is organized as follows. Section 2 briefly recapitulates the formal notions of Chomsky's GB theory to the extent relevant to the subsequent discussion. In particular, a number of central issues regarding the GB predictions on coreference are identified that, while being important for accomplishing the task of anaphor resolution, are neglected by many algorithmic accounts of binding. In section 3, starting with an identification of the scope of Chomsky's original algorithm for determining admissible index assignments, different algorithmic approaches to Binding Theory are put under scrutiny. Limitations are identified that render these approaches insufficient for supporting robust anaphor resolution. In section 4, based on this analysis, an algorithmic account of binding is developed that fulfils the theoretical and practical requirements and that can thus be employed as part of a robust rule-based anaphor resolution algorithm. The algorithm is implemented and assessed according to state-of-the-art evaluation methodology; the evaluation gives evidence that, with respect to the task of

anaphor resolution, the implementation of the binding conditions performs nearly optimal.

2 A Formal Model of Syntactic Disjoint Reference

2.1 GB Theory

In the full paper, a brief recapitulation of the central notions of the GB Theory (Binding Principles A, B, C; binding; c-command; coindexation) will be included.²

2.2 GB Predictions for Anaphora Processing: a Closer Look

In order to adequately operationalize the binding conditions for the task of anaphora processing, the implementation has to take into account some subtleties that are not adequately captured by algorithms described in previous work.

2.2.1 Taking into account the binding condition of the antecedent

Considering the issue of binding from the perspective of the algorithmical task of anaphor resolution, which is typically conceived as the problem of determining admissible antecedent candidates for anaphors, one might be tempted to interpret the predictions of Binding Theory *asymmetrically*. Regarding nonreflexive pronouns, for instance, antecedent candidates are sought for that do not locally bind the pronoun, for which BP B applies. However, since coindexing is a symmetrical relation, one has to take into account the BP of the antecedent candidate as well. E. g., in

- (1) * *He_i is shaving the client_i.*

while the binding constraint of *he* is satisfied, coindexing this pronoun with the NP *the client* (which might be conceived as antecedent candidate during anaphor resolution) is nevertheless inadmissible as BP C of the NP would be violated.³

²Various theoretical models that cover disjoint reference phenomena have been stated. Since the disjoint reference conditions are descriptive principles of grammar, the choice of the theoretical model is, in this sense, arbitrary. In the subsequent discussion, the comprehensive and widely known GB theory is referred to.

³This elementary example, which shows an instance of backward anaphora, has been chosen for reason of expository simplicity. There are as well cases of forward anaphora in which this issue is important.

2.2.2 Accounting for decision interdependency

More importantly, however, and nevertheless ignored by many algorithmic approaches to binding, the *transitivity* of the coindexing relation should be taken into account. Here, the misconception consists in identifying the task of determining admissible index assignments with the task of determining sets of (isolated) pairs (α, γ) of anaphors α and antecedents γ to be coindexed. However, as illustrated by the following example, this falls short of avoiding transitive violations of the binding constraints:

- (2) * *The architect_i promises
that he_i is going to support him_i.*

While, *individually*, it is admissible to coindex the type C NP *The architect* with either of the type B pronouns *he* and *him*, taken together, these anaphor resolution decisions violate the binding condition of *him* as it becomes transitively coindexed with the locally c-commanding occurrence *he*.⁴

2.2.3 Strong vs. weak application of BP A

While it is important to take into account the binding conditions of anaphor *and* antecedent candidate and to provide a mechanism for avoiding mutually incompatible individual decisions (α, γ) , care should be taken not to over-interpret the requirements for reflexive and reciprocal pronouns, as the applicable BP A merely demands the existence of at least *one* locally c-commanding binder, but doesn't preclude the existence of further coindexed occurrences, as illustrated by the example

- (3) *The barber_i admits
that he_i shaves himself_i.*

This “*weak*” interpretation of BP A should be applied whenever checking for decision interdependency or when considering type A pronouns as antecedent candidates. This will become more clear in section 4.2 where the algorithmic verification of the binding conditions is integrated into a robust anaphor resolution algorithm.

⁴Cases of decision interdependency can even be the consequence of choosing an identical *intersentential* antecedent for pronouns occurring in the same local domain of binding. In this sense, the predictions of BT even have repercussions for instances of intersentential anaphora.

2.3 Further Issues

As has become evident in the above discussion, Binding Theory formally models sets of valid index assignments rather than dealing with individual instances of anaphoric reference. Hence, it covers forward as well as backward anaphora. In order to adequately support anaphor resolution, an algorithmic account of binding should cover both cases of anaphora. More importantly, it should cover expressions of all three binding-theoretic types (A, B, and C), as they are all important as anaphors as well as antecedent candidates, and the implementation of BPs B and C should be complete. As will be seen below, only a fraction of algorithmic approaches to binding fulfils these requirements.

There are two further topics that will be discussed in more detail in the full version of the paper. An adequate implementation of the binding constraints should account for *non-finite local domains of binding*, e.g. NPs with logical subjects such as possessive pronouns. A still more intricate, but technically related issue is the proper treatment of *empty categories*, such as traces (commonly considered occurrences of type B), *pro* elements (type B occurrences, too, but with restricted binding capability), and *PRO* elements (either of type A or (in case of arbitrary control) B). In being a priori coindexed with other non-empty categories, these elements are important as they transitively co-determine the antecedent options of anaphoric occurrences of all three binding-theoretic types. In order to adequately capture the binding conditions contributed by empty categories, dealing with decision interdependency (as defined in section 2.2.2) plays an important role, since the a priori coindexation of these elements can be technically conceived as already performed (and potentially interdependent) decisions.⁵ While a proper algorithmic account of binding should be able to accommodate the processing of empty categories, it is evident that, in the context of robust anaphor resolution, much depends upon the descriptive richness of the employed parser's output.

⁵A detailed account of this issue is given in (Stuckardt, 2000), p182 ff.

3 Algorithmic Approaches to Binding Condition Verification

In general, algorithmic approaches to binding only partially account for the above issues.

3.1 Chomsky's Original Algorithm: the Free Indexing Rule

As part of his original exposition of BT, Chomsky (1981) describes a basic generate-and-test approach for identifying the subset of index assignments that comply with the binding constraints. As it enumerates *all* possible index assignments and tests them for compliance with BT, this algorithm has a runtime complexity exponential in the number of NP and empty category occurrences in the surface structure tree. Since it accounts for the requirements identified in section 2.2, this algorithm can be considered a valid implementation of binding. However, as it does not give a detailed account of how to efficiently check for the validity of particular index assignments, it does not directly contribute to solving the problem of BT verification for robust anaphor resolution. Most importantly, however, it does not contribute to referential *disambiguation* as addressed by anaphor resolution in the sense that, in perfect accordance with its proposed scope, it considers index assignments valid in which anaphoric entities remain unresolved, as in

- (4) *The barber_i admits
that he_j shaves himself_j.*

as BT merely enforces the selection of coindexed local governors for type A pronouns, but doesn't enforce coindexing of type B or C occurrences.

Put in a different way, in enumerating all admissible indexations, free indexing does more than required for anaphor resolution, thus being computationally expensive, while, at the same time, it does less than required as it does not address the issue of identifying index assignments in which anaphoric entities are properly disambiguated.

3.2 The Scope of Other Approaches

Various approaches have been suggested that address the limited scope of the free indexing rule algorithmization of binding. Commonly, these approaches circumvent the exponential time complexity of free indexing by restricting themselves to

determine packed representations of the individual coindexing options for the occurrence-introducing nodes of surface structure trees; full lists of admissible index assignments are not generated. This comes at the expense of reduced coverage of the above requirements. In order to identify the most common limitations, three approaches that have received considerable attention in the literature on BT and anaphor resolution will be analyzed in more detail.⁶

Correa (1988) employs a single traversal of the parsing tree and combines the assignment of individual sets of admissible antecedent candidates with a simple recency-based antecedent selection rule. In doing so, the conceptual distinction between the computation of admissible index assignments (as addressed by the free indexing rule) and the computation of antecedents (as addressed by anaphor resolution), gets blurred. Moreover, the approach does not cover instances of backward anaphora, and it does not deal with cases of decision interdependency, as mutually incompatible antecedent decisions are not recognized. Furthermore, BP C is not accounted for, and the implementation of BP B can be shown to be only partial.

Ingria and Stallard (1989), too, stay at the intra-grammatical level of computing packed representations of individual admissible index assignments, as they do not address the problem of further referential disambiguation. While this neatly complies with the scope of the free indexing rule, it does not resolve the issue of dealing with decision interdependency. However, this approach adequately covers instances of backward anaphora; moreover, the algorithm is particularly efficient and conceptually compelling.

Giorgi, Pianesi, and Satta (1990) suggest two efficient algorithms for verifying binding conditions. Again, in looking at binding condition verification for type A and type B pronouns from the point of view of individual decisions, their approach exhibits the limitation of not resolving instances of interdependent decisions. While recognizing the impor-

tance of this issue (p. 124): “[...] *it is necessary to put together the constraints that have been separately computed for each item according to Principles A and B (and C);*”, they nevertheless do not propose an algorithmic solution to this (ibid.) “*problem of BT verification, i.e. whether a given index assignment for the NPs of a sentence complies with the restrictions of BT*”.

3.3 Binding Condition Verification for Anaphor Resolution

The above analysis reveals that prominent algorithmic approaches to binding exhibit serious limitations: (a) in general, as the issue of conflicting individual coindexations is not resolved, the implementation is only partial; (b) binding principles B and C are incompletely covered; (c) in addition, the algorithm of Correa (1988) does not deal with backward anaphora.

However, if one takes a closer look at the particular requirements of anaphor resolution, as the set-out goal is the determination of *one particular* index assignment that models a plausible referential interpretation, it turns out that it is not required to emulate the *generate all* part of free indexing. Nor is it necessary to compute individual packed representations of all admissible antecedents as done by the approaches considered in section 3.2. Rather, it is required to compute *one* admissible antecedent for each anaphor, and to employ further means to ensure that the combination of the individual decisions is consistent. Since, however, referential disambiguation generally employs further extragrammatical sources of evidence, this problem should be addressed by properly integrating the binding condition verification algorithm with further anaphor resolution strategies, which are commonly divided into filters and preferences (Carbonell and Brown, 1988).

4 Anaphor Resolution with Robust Syntactic Disjoint Reference

4.1 Dealing With Ambiguous and Partial Parses

Before proceeding with the formal specification of an efficient anaphor resolution algorithm that accomplishes the task of adequately verifying the binding conditions, the issue of robustness deserves

⁶The results of a related investigation that covers further algorithmic accounts of binding are presented by Branco (2002). However, whereas Branco (2002) considers this issue from a mainly theoretical point of view (e.g., assessing the conceptual repercussions of intragrammatical vs. extragrammatical localization of binding processing), the work presented here focusses on the algorithmic aspects of binding condition verification in the context of robust anaphor resolution.

[F1]	✓	$\{ \dots F_i = [\dots bc(\gamma)(\dots \gamma_{type\ B} \dots)] \dots, \dots, F_j = [\dots bc(\alpha)(\dots \alpha_{type\ B} \dots)] \dots \}$
[F2]	*	$\{ \dots F_i = [\dots bn(\gamma)(\dots \gamma_{type\ A/B/C} \dots)] \dots, \dots, F_j = [\dots bc(\alpha)(\dots \alpha_{type\ A} \dots)] \dots \}$
[E1a]	✓	$\{ \dots F_d = [\dots \gamma_{type\ A/B/C} \dots], \dots, F_e = [\dots bc(\alpha)(\dots \alpha_{type\ B} \dots)] \dots \}$
[E1b]	✓	$\{ \dots F_d = [\dots \alpha_{type\ B/C} \dots], \dots, F_e = [\dots bc(\gamma)(\dots \gamma_{type\ B} \dots)] \dots \}$
[E2]	*	$\{ \dots F_d = [\dots \gamma_{type\ A/B/C} \dots], \dots, F_e = [\dots bc(\alpha)(\dots \alpha_{type\ A} \dots)] \dots \}$
[E3a]	*	$\{ \dots F_d = [\dots \gamma_{type\ A/B/C} \dots], \dots, F_e = [\dots \alpha_{type\ C} \dots] \dots \}$, if γ c-commands α regardless of the attachment choice
[E3b]	*	$\{ \dots F_d = [\dots \alpha_{type\ A/B/C} \dots], \dots, F_e = [\dots \gamma_{type\ C} \dots] \dots \}$, if α c-commands γ regardless of the attachment choice
[E4]	*	$\{ \dots F_d = [\dots \alpha_{type\ A} \dots], \dots, F_e = [\dots bn(\gamma)(\dots \gamma_{type\ A/B/C} \dots)] \dots \}$

Figure 1: rule patterns for binding constraint verification on fragmentary syntax

further discussion. The above approaches implicitly assume that there is a sole complete and unambiguous surface-syntactic tree over which the computations of the binding conditions are performed. In general, in the scenario of algorithmic anaphor resolution, this requirement will not be fulfilled, as robust parsers typically yield fragmentary or ambiguous results.

In the full paper, the implications of this issue will be thoroughly analyzed. As a solution, a set of rule patterns for binding constraint verification on fragmentary syntax will be developed (see figure 1).

4.2 Formal Specification of the Anaphor Resolution Algorithm

Finally, the full paper gives the formal specification of an anaphor resolution algorithm that robustly accomplishes the verification of the binding conditions while complying with the requirements identified in section 2.2 (see figure 2). According to the results of an in-depth corpus-based evaluation, with respect to the task of anaphor resolution, the implementation of the binding conditions performs nearly optimal.

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1. *Candidate Filtering*: for each anaphoric NP α , determine the set of admissible antecedents γ :
 - (a) verify morphosyntactic or lexical agreement with γ ;
 - (b) if the antecedent candidate γ is intrasentential:
 - if α and γ belong to the same syntactic fragment, then verify that
 - i. the binding restriction of α is constructively satisfied,
 - ii. the binding restriction of γ is not violated,
 - iii. no i-within-i configuration results;
 - else (α and γ belong to different syntactic fragments) *try the rule patterns*:
 - iv. if one of the patterns [E2], [E3a], [E3b], [E4], or [F2] is matched, then some binding restrictions are violated,
 - v. else if one of the two i-within-i rule patterns applies, then some binding restrictions are violated,
 - vi. else if pattern [E1a], [E1b], or [F1] applies, then the binding restrictions of α and γ are satisfied,
 - vii. else (*no rule pattern applies*) assume heuristically that the binding restrictions of α and γ are satisfied;
 - (c) if α is a type B pronoun, antecedent candidate γ is intrasentential, and, with respect to surface order, γ follows α , verify that γ is *definite*.
2. *Candidate scoring and sorting*:
 - (a) for each remaining anaphor-candidate pair (α_i, γ_j) : based on a set of preference heuristics, determine the numerical plausibility score $v(\alpha_i, \gamma_j)$.
If the binding theoretic admissibility was approved *heuristically* in step 1(b)vii, then reduce the plausibility score $v(\alpha_i, \gamma_j)$ by a constant value;
 - (b) for each anaphor α : sort candidates γ_j according to decreasing plausibility $v(\alpha, \gamma_j)$;
 - (c) Sort the anaphors α according to decreasing plausibility of their respective best antecedent candidates.
3. *Antecedent Selection*: consider anaphors α in the order determined in step 2c. Suggest antecedent candidates $\gamma_j(\alpha)$ in the order determined in step 2b.
Select $\gamma_j(\alpha)$ as candidate if there is no interdependency, i.e. if
 - (a) the morphosyntactic features of α and $\gamma_j(\alpha)$ are still compatible,
 - (b) for all occurrences $\delta_{\gamma_j(\alpha)}$ and δ_α the coindexing of which with $\gamma_j(\alpha)$ and (respectively) α has been determined in the *current* invocation of the algorithm: the coindexing of $\delta_{\gamma_j(\alpha)}$ and δ_α , which results transitively when choosing $\gamma_j(\alpha)$ as antecedent for α , does neither violate the binding principles nor the i-within-i condition, i.e.
 - if $\delta_{\gamma_j(\alpha)}$ and δ_α belong to the same syntactic fragment, then, for both occurrences, verify the respective binding conditions and the i-within-i condition according to steps 1(b)iii and 1(b)iii,
 - else if $\delta_{\gamma_j(\alpha)}$ and δ_α belong to different syntactic fragments, then proceed according to steps 1(b)iv, 1(b)v, 1(b)vi, and 1(b)vii (with the exception of the rule patterns [F2], [E2], and [E4], by means of which binding principle A is *constructively* verified).
 (The case $\delta_{\gamma_j(\alpha)} = \gamma_j(\alpha) \wedge \delta_\alpha = \alpha$ does not need to be reconsidered.)

Figure 2: the ROSANA anaphor resolution algorithm

Untersuchungen zur algorithmischen Textinhaltserschließung am Beispiel der referentiellen Interpretation. TENEA Verlag, Berlin. Ph.D. Thesis, Department of Social Sciences, Johann Wolfgang Goethe University Frankfurt am Main.

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