Person and number agreement in Dumi*

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Abstract

Aissen (1999, 2003) argues that prominence hierarchy effects in morphosyntax are governed by fixed rankings of markedness constraints related to the hierarchies themselves by harmonic alignment (Prince and Smolensky 1993). In this article, I analyze the effects of prominence hierarchies on agreement in Dumi, an endangered Kiranti language spoken in Eastern Nepal (van Driem 1993), and argue that the empirical facts can be captured best if hierarchy effects follow from freely rankable binary preference and markedness constraints, not from the fixed ranking of markedness constraints. The analysis further reveals the relevance of number hierarchies for agreement, which are largely neglected in the literature. Thus Dumi resorts to the hierarchy plural > dual > singular that competes with the parallel effects of the more standard person hierarchy (1st > 2nd > 3rd person) on agreement control and also triggers an as yet undocumented number inverse marking, which indicates if one argument of a verb is more prominent for number than the other, but less prominent for person.

1. Introduction

In a number of genetically unrelated languages (e.g., Menominee [Algonquian], Bloomfield 1962; Turkana [Nilotic]), Dimmendaal 1983; Nocte [Tibeto-Burman], Das Gupta 1971), certain types of verbal agreement are not tied to specific grammatical roles such as subject and object. Instead, there is agreement with the argument that ranks higher in a prominence hierarchy. For example, in Dumi, an endangered Kiranti language spoken in Eastern Nepal (van Driem 1993), intransitive verbs consistently show person and number agreement with the subject:[1]

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(1) Dumi intransitive verb forms
  a. phɨkh-ɨ
     get:up-[+1-2+du]
     'we (du.,exc.) got up'
     (van Driem 1993: 97)
  b. a-phɨkh-i
     MS-get:up-[+du]
     'you (du.) got up'
     (van Driem 1993: 97)
  c. phɨkh-a
     get:up-[-du]
     'he got up'
     (van Driem 1993: 97)

However, in transitive predications agreement is with the argument (subject or object) that is higher in the prominence hierarchy 1 > 2 > 3. Thus, if one argument is 1st person, we find the same agreement suffixes as in intransitive 1st person forms (2), and if a 2nd and a 3rd person argument co-occur, 2nd person agreement is found ([3], 1 → 2 denotes 1st person subject and 2nd person object):[2]

(2) Dumi transitive 1 → 2, 2 → 1 forms
  a. luph-ɨ
     catch-[+1-2+du]
     'we (du.,exc.) caught you (du.)'
     (van Driem 1993: 109)
  b. a-luph-ɨ
     MS-catch-[+1-2+du]
     'you (du.) caught us (du.,exc.)'
     (van Driem 1993: 109)
(3) Dumi transitive 1 → 3, 3 → 1 forms
  a. luph-ɨ
     catch-[+1-2+du]
     'we (du.,exc.) caught them (du.)'
     (van Driem 1993: 109)
  b. a-luph-ɨ
     MS-catch-[+1+2+du]
     'they (du.) caught us (du.,exc.)'
     (van Driem 1993: 109)
(4) Dumi transitive 2 → 3, 3 → 2 forms
  a. a-luph-i
     MS-catch-[+du]

'you (du.) caught them (du.)'
(van Driem 1993: 109)

b. a-luph-i
MS-catch-[+du]
'they (du.) caught you (du.)'
(van Driem 1993: 110)

I call this phenomenon "hierarchy-based competition" (HBC)[3] since in these languages there is no general prohibition against agreement with specific types of arguments. Thus, Dumi verbs do agree with 3rd person arguments as long as the other argument is not a better competitor (i.e., 1st or 2nd person) or if there is no other argument, as in intransitive predications. But while each argument competes for agreement, only the one that is highest on the relevant hierarchy "wins", i.e., is actually cross-referenced by agreement affixes.

While other languages with HBC such as Nocte (Das Gupta 1971), can be almost exhaustively described by reference to the standard person hierarchy 1 > 2 > 3, Dumi has actually a much more intricate competition system that includes preference for agreement with arguments that are highest according to the number hierarchy plural > dual > singular (5a). If one argument is higher for number prominence and the other for person (e.g., 3pl and 2du) the two hierarchies make conflicting predictions. I will call this configuration in the following "hierarchy crossing". Interestingly, in some Dumi hierarchy-crossing configurations exceptional two-argument agreement emerges (5b):

(5) Number hierarchy effects on agreement
a. do:khot-t-ini
see-NPast-[-1-du+pl]
'they (pl.) see them (du.)/him'/'they (du.)/he see(s) them (pl.)'
b. do:khot-t-ə-nɨ
see-NPast-[-pl-du-2-3]-[-1-du+pl]
'I see them (pl.)'
(van Driem 1993: 107)

Hierarchy crossing is also indicated by a second morphological reflex. In a subset of the cases where one argument is higher for person and the other for number, the special marker *-si* occurs (6b):[4]

(6) Number inverse marking
a. a-luph-i
MS-catch-[+du]
'you (du.) caught him'
(van Driem 1993: 109)

b. a-lup-si
MS-catch-NI
'you (sg.) caught them (du.)'
(van Driem 1993: 109)

The article is organized as follows. In Section 2, I introduce the optimality-theoretic framework I will assume throughout the article. Section 3 sketches the system of morphosyntactic features I use to represent Dumi affixes, and Section 4 provides an account of affix order in the language that is crucial for the analysis. Section 5 takes a closer look at empirical aspects of hierarchy effects in Dumi, and Section 6 provides an analysis of the data based on constraints directly encoding binary preferences along markedness scales (Trommer 2002a, 2003b, 2003f, 2006). Section 7 extends this approach to number inverse marking. In Section 8, I argue that this analysis allows us to capture the Dumi data much better than directly invoking prominence hierarchies or using an approach to prominence-hierarchy effects based on harmonic alignment (Aissen 1999, 2003; Nagy 1999; Ortmann 2002). Finally, Section 9 provides a short summary of the article.

2. The theoretical framework

The theoretical framework I will assume in the following is distributed optimality (DO) (Trommer 2002a, 2002b, 2003c, 2003d), a constraint-based approach to postsyntactic spellout merging concepts from optimality theory (OT) (Prince and Smolensky 1993; McCarthy and Prince 1993, 1994, 1995) and distributed morphology (DM) (Halle and Marantz 1993). However, most of the arguments should carry over to any OT-based approach to spellout, where morphology has crucial access to syntactic structure (as e.g., in Noyer 1993; Grimshaw 1997, 2001b). DO shares with DM the assumption that morphology is a separate module of the grammar interpreting the outputs of syntax, where the latter operates on abstract feature bundles (= heads = lexical items) without phonological content. Morphology assigns phonological content to syntactic structures by pairing wordlike syntactic units (spellout domains) with strings of vocabulary items (VIs) that combine (underspecified) morphosyntactic features with phonological content. Here is an illustrative example with the Dumi verb form *phɨk-k-a*, 'we (exc. pl.) got up':

(7) Syntax-morphology mapping for phɨk-k-a

Input:	$[+V]_1$	$[+\text{Tense}+\text{past}]_2$	$[+\text{Agr-Erg}+1\text{-}2+\text{pl-du}]_3$	
Output:	phɨk:$[+V]_1$		k:$[+1+\text{pl}]_3$	a:$[\text{-du}]_3$

The input consists of a list of abstract heads, the output of a list of VIs. Both representations are linked by coindexing according to the principles of correspondence theory (McCarthy and Prince 1994, 1995).[5] Note that not all underlying heads and features are expressed in the output (e.g., [+Tense+past] and -2 in [7] are not), and some heads can be expressed by more than one VI (such as [+Agr-Erg+1-2+pl-du] in [7], which corresponds to *k*:[+1+pl] and *a*:[-du]).

Since the output of syntax serves in DO as the input to morphological computation, the grammar generates, as usual in OT, an infinite candidate set of output candidates which contains here all strings which consist exclusively of VIs compatible with input heads.[6] Which heads are actually realized by VIs and the order of VIs in a given language depends on the language-specific ranking of universal constraints on markedness, faithfulness and morpheme order. This is illustrated by the example from (7) and the basic constraint PARSE F in (8):[7]

(8) Input: [+V]$_1$ [+Tense+past]$_2$ [+Agr-Erg+1-2+pl-du]$_3$ (1pe past)

	PARSE F
☞ a. phɨk:[+V]$_1$ k:[+1+pl]$_3$ a:[+1]$_3$	*****
b. phɨk:[+V]$_1$ k:[+1+pl]$_3$	******!
c. phɨk:[+V]$_1$ a:[+1]$_3$	******!
d. phɨk:[+V]$_1$	******!*

PARSE F induces one constraint violation for each input feature that is not realized by a coindexed VI (e.g., +Tense, -past, +Agr, -Erg, -2 for [8a]). Since there are no appropriate VIs in the lexicon of Dumi to express the tense features of a [+past] head or the absolutive (-Erg) feature of 1pl agreement, violations of PARSE F are unavoidable. However, they are minimized to guarantee maximal expression of features by VIs. Blocking of less specific VIs is achieved by independently motivated alignment constraints, such as NUM ⇨ R that aligns all number agreement VIs to the right edge of the spellout domain (roughly the morphological word), and L ⇦ PER that aligns person agreement to the left edge of the spellout domain. Example (9) shows how PARSE F and alignment constraints conspire to suppress the less specific VI -a:[-du] for the form *phɨkhə*, 'I got up' with the more specific VI *ə*: [-pl-du-2-3]:[8]

(9) Input: $[+V]_1$ $[+\text{Tense}+\text{past}]_2$ $[+\text{Agr-Erg}+1\text{-}2\text{-pl-du}]_3$ (1sg past)

	PARSE F	NUM ⇨ R	L ⇦ PER
☞ a. phɨkh:$[+V]_1$ ə:$[\text{-pl-du-2-3}]_3$	*****		*
b. phɨkh:$[+V]_1$ ə:$[\text{-pl-du-2-3}]_3$ a:$[\text{-du}]_3$	*****	*!	*
c. phɨkh:$[+V]_1$ a:$[\text{-du}]_3$ ə:$[\text{-pl-du-2-3}]_3$	*****	*!	**

Crucially, candidates like (9b) and (9c) with an additional affix expressing features already present in a more specific VI are harmonically bounded by candidates that have only the more specific affix (9a) since they do not improve feature realization for PARSE F, but lead inevitably to more violations of the alignment constraints. Hence suppression of the less specific affix is independent of the actual ranking of these constraints. The importance of alignment constraints for the order of agreement affixes in Dumi will be discussed in detail in Section 4.

3. Features and affixes in Dumi verb inflection

Dumi belongs to the Kiranti Rai branch of Tibeto-Burman, spoken in Eastern Nepal. While all languages of this family have an ergative case system and highly complex verbal inflection with phonologically cognate affixes, the morphological systems differ to an astonishing degree. Dumi itself is exclusively documented through fieldwork by George van Driem published in different papers summarized in van Driem (1993). While the book contains only marginal information on the syntax of the language, it gives a detailed description of the segmental phonology and the inflectional morphology. The language was reported to be almost extinct in van Driem's grammar (1993), but it seems that there were still living speakers as late as 2001 (Dörte Borchers p.c.).

3.1. *The feature system*

Case and grammatical functions will be represented by two binary features [+/-Ergative] and [+/-High]:

(10) Feature system for case and grammatical functions

Transitive (ergative) Subject	= [+Ergative+High]
Transitive (absolutive) Object	= [-Ergative+High]
Intransitive (absolutive) Subject	= [-Ergative+High]

[+/-Ergative] corresponds to morphological case, which I take to be derived from syntactic structure, but not isomorphic to syntactic case assignment. [+High] characterizes the argument that occupies the highest A-position at spellout, and [-High] any argument in a lower A-position.

In keeping with Harbour (2003) and Trommer (2005), I will assume a rich feature system for phi-features because this allows the most concise characterization of Dumi agreement affixes in a number of cases. For number, I use two binary features [+/-plural] and [+/-dual]:

(11) Feature system for number

Singular	= [-plural-dual]
Dual	= [-plural+dual]
Inclusive plural	= [+plural-dual]
Exclusive plural	= [+plural+dual]

The binary dual feature is motivated by two facts: First, the most basic contrast in suffixal agreement is between singular (12a) and plural (12b) marked by -a ([-dual]), and dual marked by *-i* (12c) ([+dual]):

(12) [-dual] vs. [+dual]

a. phɨkh-a
get:up-[-du]
'he got up'
(van Driem 1993: 97)

b. ham-phɨkh-a
3pl-get:up-[-du]
'they (pl.) got up'
(van Driem 1993: 97)

c. phɨkh-i
get:up-[-du]
'they (du.)/we (du.,exc.) got up'
(van Driem 1993: 97)

Second, the [+/-dual] contrast is extended to 1st person plural forms as in (13):

(13) [-dual] vs. [+dual]

a. phɨkh-kɨ-t-a
get:up-1pl-NPast-[-du]
'we (pl. excl.) get up'
(van Driem 1993: 97)

b. phɨkh-ki-t-i
get:up-1pl-NPast-[+du]
'we (pl. incl.) get up'
(van Driem 1993: 97)

Assuming that [+dual] is polysemous in Dumi denoting a group of cardinality 2 or 2 groups of speech-act participants, inclusive 1pl can be characterized as [+dual+plural] motivating the use of the dual affix in this context.

For the representation of person, I use three binary features [+/-1], [+/-2] and [+/-3]. Assuming that [+3] is incompatible with [+1] and [+2], and [-3] with [-1-2],[9] this gives us exactly the four person categories found in Dumi:

(14) Dumi person categories

1st exclusive	1st inclusive	2nd	3rd
[+1-2-3]	[+1+2-3]	[-1+2-3]	[-1-2+3]

These features allow a straightforward account of the so-called marked-scenario affix *a*-, which according to van Driem (1993: 123), expresses "all scenarios involving a first or second person actant except those with a first person agent or subject." Example (15) shows the contexts where it appears ("marked") and where it does not ("unmarked"):

(15)

Marked	Unmarked
$2 \rightarrow 1$	$1 \rightarrow 2$
$3 \rightarrow 1$	$1 \rightarrow 3$
$3 \rightarrow 2$	$3 \rightarrow 3$
$2 \rightarrow 3$	1
2	3

Without minus-values for [1] and [3] there is no straightforward account for this pattern. However, assuming binary features *a*- can be simply characterized as [+Hi-1][-3], implying that the affix occurs exactly then if (a) the highest argument is [-1] (i.e., 2nd or 3rd person) and (b) there is a non-3rd person argument. Second person subjects fulfill both conditions at the same time (i.e., correspond to both feature structures). In combinations of 3rd person subjects with 1st/2nd person objects, the subject corresponds to the first structure, and the object to the second one:

(16)

Marked	Unmarked
$2_s \rightarrow 1_o$ $[+\text{Hi-1}]_s[-3]_{s,o}$	$1_s \rightarrow 2_o$ $*[+\text{Hi-1}]\ [-3]_{s,o}$
$3_s \rightarrow 1_o$ $[+\text{Hi-1}]_s[-3]_o$	$1_s \rightarrow 3_o$ $*[+\text{Hi-1}]\ [-3]_s$
$3_s \rightarrow 2_o$ $[+\text{Hi-1}]_s[-3]_o$	$3_s \rightarrow 3_o$ $[+\text{Hi-1}]_s*[-3]$
$2_s \rightarrow 3_o$ $[+\text{Hi-1}]_s[-3]_s$	1_s $*[+\text{Hi-1}]\ [-3]_s$
2_s $[+\text{Hi-1}]_s[-3]_s$	3_s $[+\text{Hi-1}]_s*[-3]$

3.2. *Intransitive forms*

The preceding examples have already shown a number of representative intransitive Dumi verb forms. The table in (17) summarizes schematically all intransitive forms:

(17) All intransitive forms

Person	Number		Past	Nonpast
1	Sg		V-ŋ-ə	V-ŋ-t-ə
	Du	incl	V–i	V-t-i
		excl	V-ɨ	V-t-ɨ
	Pl	incl	V-k-i	V-ki-t-i
		exl	V-k-a	V-kɨ-t-a
2	Sg		a-V-a	a-V-t-a
	Du		a-V-i	a-V-t-i
	Pl		a-V-ini	a-V-t-ini
3	Sg		V-a	V-t-a
	Du		V-i	V-t-i
	Pl		ham-V-a	ham-V-t-a

Example (18) shows the feature representations I assume for the affixes in (16). Recall from Section 2 that by the interaction of PARSE F and Alignment constraints any VI is blocked in a form with another VI that specifies a superset of its morphosyntactic features. For example, -*ə*:[-pl-du-2-3] blocks -*a*:[-du] since [-du] is already specified in -*ə*, and -*a* does not specify any other features:

(18) Feature content of inflectional affixes

a-	[-1+Hi][-3]
ham-	[-1-2+3+Hi-Erg+pl]
-ŋ	[+1-pl]

-ə	[-pl-du-2-3]	blocks -a:[-du]
-ɨ	[+1-2+du]	blocks -i:[+du]
-i	[+du]	
-a	[-du]	
-k(ɨ)	[+1+pl]	
-ini	[-1-du+pl]	blocks -a:[-du]
-t [-past]		

3.3. *Transitive forms*

Example (19) shows the full range of transitive verb forms, where the first line of each cell contains the nonpast, and the second line the past form. The tableau corresponds to the one in van Driem (1993: 100) with the exception of the affix -*ŋ* included here, which van Driem (1993: 133–134) discusses in detail, but omits in the tableau for reasons that are unclear to me. *N* stands for a nasal unspecified for place features, which assimilates for place to preceding stops and is otherwise realized as *n*.

(19) Transitive verb forms

<table>
<tr><th></th><th>1sg</th><th>1di</th><th>1de</th><th>1pi</th><th>1pe</th><th>2sg</th><th>2du</th><th>2pl</th><th>3sg</th><th>3du</th><th>3pl</th></tr>
<tr><th>1sg</th><td></td><td></td><td></td><td></td><td></td><td>V-Nta
V-Nna</td><td>V-Nsisti
V-Nsisi</td><td>V-Ntini
V-Nnini</td><td>V-ŋtə
V-ŋu</td><td>V-ŋtəsɨ
V-ŋisɨ</td><td>V-ŋtənɨ
V-ŋinɨ</td></tr>
<tr><th>1di</th><td></td><td></td><td></td><td></td><td></td><td colspan="3"></td><td colspan="3">V-ti
V-i</td></tr>
<tr><th>1de</th><td></td><td></td><td></td><td></td><td></td><td colspan="6">V-tɨ
V-tɨ</td></tr>
<tr><th>1pi</th><td></td><td></td><td></td><td></td><td></td><td colspan="3"></td><td colspan="3">V-kiti
V-ki</td></tr>
<tr><th>1pe</th><td></td><td></td><td></td><td></td><td></td><td colspan="6">V-kɨta
V-ka</td></tr>
<tr><th>2sg</th><td>a-V-tə
a-V-ŋə</td><td rowspan="3"></td><td rowspan="6">a-V-ɨ
a-V-ɨ</td><td rowspan="3"></td><td rowspan="6">a-V-kɨta
a-V-ka</td><td colspan="3" rowspan="3"></td><td>a-V-ta
a-V-ɨ</td><td>a-V-sti
a-V-si</td><td>a-V-tini
a-V-ini</td></tr>
<tr><th>2du</th><td>a-V-təsɨ
a-V-ŋəsɨ</td><td colspan="3">a-V-ti
a-V-i</td></tr>
<tr><th>2pl</th><td>a-V-tənɨ
a-V-ŋənɨ</td><td colspan="3">a-V-tini
a-V-ini</td></tr>
<tr><th>3sg</th><td>a-V-tə
a-V-ŋə</td><td rowspan="3">V-ti
V-i</td><td rowspan="3">V-ki-ti
V-ki</td><td rowspan="3">a-V-ta
a-V-a</td><td rowspan="3">a-V-ti
a-V-i</td><td rowspan="3">a-V-tini
a-V-ini</td><td>V-ta
V-ɨ</td><td rowspan="2">V-sti
V-si</td><td rowspan="3">V-tini
V-ini</td></tr>
<tr><th>3du</th><td>a-V-təsɨ
a-V-ŋəsɨ</td><td></td></tr>
<tr><th>3pl</th><td>a-V-tənɨ
a-V-ŋənɨ</td><td colspan="2"></td></tr>
</table>

In the following, I will abstract away from morphophonological processes and represent the transitive forms as in (20):

(20) Transitive verb forms

<table>
<tr><th></th><th>1sg</th><th>1di</th><th>1de</th><th>1pi</th><th>1pe</th><th>2sg</th><th>2du</th><th>2pl</th><th>3sg</th><th>3du</th><th>3pl</th></tr>
<tr><th>1sg</th><td rowspan="5">Object</td><td colspan="4" rowspan="5">Subject</td><td>V-N-t-R-a
V-N- -R-a</td><td>V-N-t-R-si
V-N- -R-si</td><td>V-N-t-R-ini
V-N- -R-ini</td><td>V-ŋ-t-ə
V-ŋ- -u</td><td>V-ŋ-t-ə-si
V-ŋ- -ə-si</td><td>V-ŋ-t-ə-ini
V-ŋ- -ə-ini</td></tr>
<tr><th>1di</th><td colspan="3"></td><td colspan="3">V-t-i
V-i</td></tr>
<tr><th>1de</th><td colspan="6">V-t-ɨ
V-t-ɨ</td></tr>
<tr><th>1pi</th><td colspan="3"></td><td colspan="3">V-k-t-i
V-k- -i</td></tr>
<tr><th>1pe</th><td colspan="6">V-k-t-a
V-k- -a</td></tr>
<tr><th>2sg</th><td>a-V- -t-ə
a-V-ŋ- -ə</td><td rowspan="3"></td><td rowspan="6">a-V- -ɨ
a-V- -ɨ</td><td rowspan="3"></td><td rowspan="6">a-V-k-t-a
a-V-k- -a</td><td colspan="3" rowspan="3"></td><td>a-V-t-a
a-V- -ɨ</td><td>a-V-t-si
a-V-si</td><td>a-V-t-ini
a-V- -ini</td></tr>
<tr><th>2du</th><td>a-V- -t-ə-si
a-V-ŋ- -ə-si</td><td colspan="3">a-V-t-i
a-V- -i</td></tr>
<tr><th>2pl</th><td>a-V- -t-ə-ini
a-V-ŋ- -ə-ini</td><td colspan="3">a-V-t-ini
a-V- -ini</td></tr>
<tr><th>3sg</th><td>a-V- -t-ə
a-V-ŋ- -ə</td><td rowspan="3">V-t-i
V- -i</td><td rowspan="3">V-k-t-i
V-k- -i</td><td rowspan="3">a-V-t-a
a-V- -a</td><td rowspan="3">a-V-t-i
a-V- -i</td><td rowspan="3">a-V-t-ini
a-V- -ini</td><td>V-t-a
V- -ɨ</td><td></td><td></td></tr>
<tr><th>3du</th><td>a-V- -t-ə-si
a-V-ŋ- -əsi</td><td colspan="2">V-t-si
V- -si</td><td></td></tr>
<tr><th>3pl</th><td>a-V- -t-ə-ini
a-V-ŋ- -ə-ini</td><td colspan="3">V-t-ini
V- -ini</td></tr>
</table>

The most intricate nonconcatenative pattern is found in 1 → 2 forms where complex reduplication of affixal material happens. I assume that all of these are realizations of a reduplicant affix, which will be symbolized as "-R". String-adjacent sequences of *t* and *si* are transformed into *sti*. Thus we get V-*təsɨ* from V-*t-ə-si* (1sg → 3du), but *a*-V-*sti* from *a*-V-*t-si* (2sg → 3du).[10] 1sg -*ə* and *i* are fused to *ɨ* in V-*ŋ-ə-ini* (1sg → 3pl) which gets V-*ŋɨnɨ*. This form also shows the centralization of *i* (here the final *i*) in the context of another centralized vowel. The same happens to the *i* in *a*-V-*t-ə-si* (2du → 1sg) after *ə* resulting in the phonological form *a-V-t-ə-sɨ*.

It is obvious from (20) that transitive forms use mainly the affixes from intransitive agreement for subject and object agreement. A small deviation from this pattern are some allomorphs of the affixes expressing 1sg. Thus -*ŋ* is replaced by -*N* in forms with a 1sg subject and a 2nd person object. -*ə* is replaced by -*u* in past-tense forms with 1sg subjects and 3sg objects and by -*R* in forms with 2nd person objects. I will assume that these affixes have the same representation as the corresponding simple affixes plus specific contextual restrictions:

(21) Allomorphs of 1sg suffixes

-N	[+1-pl]	/ [+2+1-Erg]
-ŋ	[+1-pl]	
-u	[-pl-du-2-3]	/ [+3-pl-du-Erg] [+past]
-R	[-pl-du-2-3]	/ [+2-1-Erg]
-ə	[-pl-du-2-3]	

The special portmanteau marker -*ɨ* is used in 2sg → 3sg and 3sg → 3sg past forms and will be represented as in (22):

(22) ɨ [-du-pl-1+Erg] [-du-pl+3-Erg] [+past]

The only affix without an explicit feature specification up to this point is the number inverse suffix -*si* which I will discuss in Section 7. For the time being I will simply assume that it is a variant of [+dual] -*i*.

4. Affix order

In this section, I show that the position of Dumi agreement markers follows from a straightforward extension of the alignment-based approach to affix order proposed in Trommer (2001b, 2003c, 2003d). The same constraints will be shown to have crucial effects on the co-occurrence possibilities of agreement affixes in Section 6.

Descriptively, Dumi agreement affixes occur in four different positions: I) as prefixes, II) immediately before the tense marker -t, III) immediately after the tense marker, and IV) after another agreement affix which already follows -t. Example (23) shows three representative examples and (24) summarizes the position of all agreement affixes:

(23) Positions of agreement affixes

	I	verb stem	II	nonpast -t	III	IV
1pe		V	-k	-t		-a
1sg → 3pl		V		-t	-ə	-ini
3pl	ham-	V		-t		-a

(24) Positions of all agreement affixes

I	II	III	IV
a:[-1+Hi][-3] ham:[-1-2+3+ Hi-Erg+pl]			
	N/ŋ:[+1-pl] k:[+1+pl]		
		u/R/ə:[-pl-du-2-3] ɨ:[+1-2+du] ɨ(portmanteau)	
			si/i:[+du] a:[-du] ini:[-1-du+pl]

My analysis will be based on the optimality-theoretic approach to the order of agreement affixes developed in Trommer (2003d), which uses four types of constraints:

(25) Constraints on affix order

a.	L ⇦ [PER]	Align person features to the left edge of the morphological word
b.	[NUM] ⇨ R	Align number features to the right edge of the morphological word
c.	REFLECT(AGR)	Agreement Affixes should reflect the syntactic position of their host
d.	COHERENCE (D)	Minimize index changes among VIs in domain D

Note that these are constraint types, not single constraints. Thus, there are different alignment constraints for specific number features (e.g., [+plural] and [-dual]) and different COHERENCE constraints for specific affix types. Nonetheless this approach makes strong empirical predictions: number agreement should tend to be at the right edge of words, person agreement at the left edge. REFLECT(AGR) ties the position of agreement affixes to other affix types (usually to tense as the standard host of agreement), and COHERENCE has the effect that agreement affixes corresponding to the same agreement head should typically occur close to each other. See Trommer (2003a, 2003d) for ample crosslinguistic evidence for these constraint types.

Person and number alignment in Dumi seems to be crucially linked to the features [dual] and [1]. Thus, all affixes appearing in the two leftwards positions (I and II) specify [1], and all affixes in III and IV specify dual. These observations follow straightforwardly from the constraints [du] ⇨ R and L ⇦ [1], which align these features to the edges predicted by (25a) and (25b). The tableau in (26) shows how these constraints account for the affix order for an intransitive 2du form:[11]

(26) Input: $[+V]_1$ $[+Hi+2-1-pl+du]_2$ (2du)

	[du] ⇨ R	L ⇦ [1]
☞ a. a:$[-1+Hi]_2[-3]_2$ V_1 i:$[+du]_2$		
b. a:$[-1+Hi]_2[-3]_2$ i:$[+du]_2$ V_1	*!	
c. V_1 a:$[-1+Hi]_2[-3]_2$ i:$[+du]_2$		*!
d. i:$[+du]_2$ V1 a:$[-1+Hi]_2[-3]_2$	*!*	**

The difference between position-III and position-IV affixes is less straightforward. Affixes in both positions specify [dual] and [1]. I assume that the decisive factor is that number is dominant in position-IV affixes in the sense that these either contain only number features (*i*:[+du], *a*:[-du]) or primary (plus-valued) number features, but only secondary (minus-valued) person features. To implement this intuition, I will define primary number affixes as in (27):

(27) An agreement VI is a primary number affix if and only if:
a. it contains positive-valued number features but no positive-valued person features or
b. it contains a negative-valued number feature but no person features

The position of the affixes in slot IV now follows from the number alignment constraint $[\text{NUM}]_{\text{PRIM}} \Rightarrow \text{R}$ again aligning number features to the right, but only targeting primary number affixes. Example (28) shows how high-ranked $[\text{NUM}]_{\text{PRIM}} \Rightarrow \text{R}$ derives the correct relative order of *ə*:[-pl-du-2-3] and -*ini*:[-1-du+pl] in a 2pl → 1sg form:

(28) Input: $[+V]_1$ $[+Hi+2-1-3+pl-du]_2$ $[+Hi-2+1-3-pl-du]_3$ (2pl → 1sg)

	$[\text{NUM}]_{\text{PRIM}} \Rightarrow \text{R}$	$[\text{du}] \Rightarrow \text{R}$	$\text{L} \Leftarrow [1]$
☞ a. a:$[-1+Hi]_2[-3]_2$ V_1 N:$[+1-pl]_3$ ə:$[-pl-du-2-3]_3$ ini:$[-1-du+pl]_2$		*	***
b. a:$[-1+Hi]_2[-3]_2$ V_1 N:$[+1-pl]_3$ ini:$[-1-du+pl]_2$ ə:$[-pl-du-2-3]_3$	*!	*	**
c. a:$[-1+Hi]_2[-3]_2$ V_1 ini:$[-1-du+pl]_2$ ə:$[-pl-du-2-3]_3$ N:$[+1-pl]_3$	*!*	**	***

The last detail to account for is the fact that position-II affixes occur after, not before the stem, as predicted by the constraints introduced so far. (29) shows this for an intransitive 1pe form:

(29) Input: $[+V]_1$ $[+Hi\text{-}2+1\text{-}3+pl\text{-}du]_2$ (1pe)

	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[du] ⇨ R	L ⇦ [1]
☛ a. V_1 k:$[+1+pl]_2$ a:$[-du]_2$			*!
☞ b. k:$[+1+pl]_2$ V_1 a:$[-du]_2$			

We could assume a constraint [pl] ⇨ R which outranks L ⇦ [1] (30), but this would incorrectly predict that ham:[-1-2+3+Hi-Erg+pl] in 3pl forms also appears as a suffix (31):

(30) Input: $[+V]_1$ $[+Hi\text{-}2+1\text{-}3+pl\text{-}du]_2$ (1pe)

	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[du] ⇨ R	[pl] ⇨ R	L ⇦ [1]
☞ a. V_1 k:$[+1+pl]_2$ a:$[-du]_2$			*	*
b. k:$[+1+pl]_2$ V_1 a:$[-du]_2$			**!	
c. V_1 a:$[-du]_2$ k:$[+1+pl]_2$		*!		*

(31) Input: $[+V]_1$ $[+Hi\text{-}Erg\text{-}1\text{-}2+3+pl\text{-}du]_2$ (3pl)

	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[du] ⇨ R	[pl] ⇨ R	L ⇦ [1]
☞ a. V_1 ham:$[-1\text{-}2+3+Hi\text{-}Erg+pl]_2$ a:$[-du]_2$			*	*
☛ b. ham:$[-1\text{-}2+3+Hi\text{-}Erg+pl]_2$ V_1 a:$[-du]_2$			**!	
c. V1 a:$[-du]_2$ ham:$[-1\text{-}2+3+Hi\text{-}Erg+pl]_2$	*!	*		**

The crucial observation seems to be that position-I affixes specify case features while position II affixes do not. Since all position-II affixes (as the position-I affixes) co-occur with other affixes indexing the same agreement head, we can make the following generalization:

(32) Caseless agreement affixes occur at the same side of the verbal stem

I have argued in Trommer (2003a) that such effects and the tendency of agreement affixes to occur close to each other more generally follow from the general constraint schema COHERENCE defined in (33) and shown more schematically in (33):

(33) COHERENCE (*D*): Count a constraint violation for each VI V containing index i that is preceded in domain D by another VI V' containing index j such that $i \neq j$

(34) $*[\ ]_i\ [\ ]_j$ where $i \neq j$

The instantiation of COHERENCE, which is crucial for Dumi, is $\text{COH}_{[\text{-CASE}]}$, i.e., COHERENCE restricted to the domain of VIs that are not case related, where "case related" is defined as in (35):

(35) A VI is case related if and only if
  a. its feature structure specifies at least one case feature (+/-Hi or +/-Erg) or
  b. it corresponds to a case-assigning head (Tense or little v)

According to this definition, -*k*:[+1+pl] and -*a*:[-du] are not case related because they do not specify case features (35a), and agreement heads generally do not assign case (35b). Similarly, VIs realizing verbal roots are never case related since verbal roots neither assign nor are assigned case. Hence in a verb form containing -*k*:[+1+pl] and -*a*:[-du], these VIs and also the VI corresponding to the verb will all be part of the domain of $\text{COH}_{[\text{-CASE}]}$ and lead to at least one violation of this constraint because verb and agreement VIs correspond to different syntactic heads and bear different adjacent indices, which is exactly the configuration penalized by the constraint. However, a form with agreement on both sides of the verb (k:$[+1+\text{pl}]_2$-V_1-a:$[\text{-du}]_2$) will incur one more violation of $\text{COH}_{[\text{-CASE}]}$ than one where both are suffixes (V_1-k:$[+1+\text{pl}]_2$-a:$[\text{-du}]_2$), since it contains two instances of adjacent nonidentical indices (k:$[+1+\text{pl}]_2$-V_1 and V_1-a:$[\text{-du}]_2$) while the latter order only contains one instance of this configuration (V_1-k:$[+1+\text{pl}]_2$). Assuming that $\text{COH}_{[\text{-CASE}]}$ is crucially undominated by other constraints on affix order, this results in the correct order for -*k*:[+1+pl] and -*a*:[-du], as shown in (36). Note that $[\text{NUM}]_{\text{PRIM}} \Rightarrow \text{R}$ blocks the possibility that both affixes are prefixal:

(36) Input: $[+V]_1$ $[+Hi-2+1-3+pl-du]_2$ (1pe)

	COH$_{[\text{-CASE}]}$	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[du] ⇨ R	L ⇦ [1]
☞ a. V_1 k:$[+1+pl]_2$ a:$[-du]_2$	*			*
b. k:$[+1+pl]_2$ a:$[-du]_2$ V_1	*	*!	*	
c. k:$[+1+pl]_2$ V_1 a:$[-du]_2$	**!			

Crucially, COH$_{[\text{-CASE}]}$ does not affect the cases where agreement affixes specifying case features appear in prefixal position since they are not in the domain of the constraint. Hence in all candidates in (37) COH$_{[\text{-CASE}]}$ is only violated by the index change between V_1 and -*a*:$[-du]_2$. ham:$[-1-2+3+Hi-Erg+pl]_2$ is case related and hence "invisible" for the constraint:

(37) Input: $[+V]_1$ $[+Hi-1-2+3+pl-du]_2$ (3pl)

	COH$_{[\text{-CASE}]}$ ⇨ R	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[du] ⇨ R	L ⇦ [1]
a. V_1 ham:$[-1-2+3+Hi-Erg+pl]_2$ a:$[-du]_2$	*			*!
☞ b. ham:$[-1-2+3+Hi-Erg+pl]_2$ V_1 a:$[-du]_2$	*			
c. V_1 a:$[-du]_2$ ham:$[-1-2+3+Hi-Erg+pl]_2$	*	*!	*	**

Similarly, in nonpast forms the VI corresponding to the tense marker -*t* will be irrelevant for COH$_{[\text{-CASE}]}$ since it expresses Tense, a case-assigning head, and is hence not case related.

5. The interaction of person and number hierarchies in Dumi

In this section, I summarize briefly the data that are relevant for an analysis of HBC in Dumi. While I informally assume here that competition is driven directly by feature hierarchies, it will become clear that this assumption is highly problematic. A more formal, constraint-based analysis of the data avoiding these problems will then be provided in Section 6.

Obviously, the hierarchy $1 > 2 > 3$ cannot determine with which argument a transitive verb will agree in a language with HBC if both arguments have the same person value. Cases where both arguments would be 1st or both 2nd persons are obligatorily expressed in Dumi by intransitive reflexive forms, which are irrelevant for the discussion of HBC. However, for predications where both arguments are 3rd person, there exist in all cases distinct nonreflexive forms. In these forms, Dumi maintains the restriction of agreement to one argument (henceforth: one argument restriction, OAR) by applying a number hierarchy. Agreement is with the plural argument if there is one ([38a], [38b]), otherwise with the dual argument if there is one (38c), and agreement with a singular argument only occurs if there are no dual or plural arguments, i.e., in forms with two singular 3rd person arguments or intransitive forms (38d):[12]

(38) Effects of the number hierarchy in Dumi 3rd person forms

a. luph-ini
catch-[-1-du+pl]
'they (pl.) caught them (du.)'/'they (du.) caught them (pl.)'
(van Driem 1993: 109)

b. luph-ini
catch-[-1-du+pl]
'he caught them (pl.)'/'they (pl.) caught him'
(van Driem 1993: 109)

c. lup-si
catch-NI
'he caught them (du.)'/'they (du.) caught him'
(van Driem 1993: 109)

d. phɨkh-a
get:up-[-du]
'he got up'
(van Driem 1993: 97)

Thus, we can assume that besides the person hierarchy, Dumi agreement also instantiates the number hierarchy pl > du > sg. Presupposing now the two hierarchies for person and number, all the data we have seen so far show minimal contrasts. The forms in (2)–(4) differ only in person, while number is kept constant, and the forms in (38) differ only in number, with the same value for person. The same lack of interaction between the two hierarchies is found in forms where the same argument is higher in both hierarchies, such as forms with a 2nd person plural subject with a 3rd person dual object as in (39a). In these cases, we get exclusive agreement with the hierarchically higher argument, as expected:[13]

(39) Convergence of pl > du and 1 > 2 > 3

a. do:khoʔ-k-t-a
see-[+1+pl]-NPast-[-du]

'we (pl.,exc.) see them/you (du.)'
(van Driem 1993: 107)

b. a-do:khoʔ-k-t-a
MS-see-[+1+pl]-NPast-[-du]
'they/you (du.) see us (pl.,exc.)'
(van Driem 1993: 108)

(40) Convergence of du > sg and 1 > 2 > 3

a. luph-ɨ
catch-[+1-2+du]
'we (du.,exc.) caught him/you (sg.)'
(van Driem 1993: 109)

b. a-luph-ɨ
MS-catch-[+1-2+du]
'he/you (sg.) caught us (du.,exc.)'
(van Driem 1993: 109)

More interesting are cases where one argument outranks the other one on the person hierarchy while the latter is higher on the number hierarchy. I will call this configuration "hierarchy crossing" Intuitively, we would expect that either the number hierarchy outranks the person hierarchy, or vice versa. Interestingly, the distribution of agreement in these cases is quite quirky and the truth lies somewhere in between. If the subject is 2sg, and the object 3rd person dual or plural, agreement is with the non-singular argument, hence in this case the number hierarchy prevails:[14]

(41) pl > sg and du > sg outrank 2 > 3

a. a-luph-ini
MS-catch-[-1-du+pl]
'you (sg.) caught them (pl.)'
(van Driem 1993: 109)

b. a-lup-si
MS-catch-[+du]
'you (sg.) caught them (du.)'
(van Driem 1993: 109)

On the other hand, if one argument is 2du and the other one 3pl, person becomes the decisive hierarchy, and agreement is with the 2du argument:

(42) 2 > 3 outranks pl > du

a. a-luph-i
MS-catch-[+du]
'you (du.) caught them (pl.)'
(van Driem 1993: 109)

b. a-luph-i
MS-catch-[+du]
'they (pl.) caught you (du.)'
(van Driem 1993: 110)

Finally, there is one configuration where the restriction of agreement to one argument is violated, namely in forms with a 1sg and a 3du/2du or 3pl/2pl argument:

(43) Violations of the one-argument restriction
a. lup-t-ə-nɨ
catch-NPast-[-pl-du-2-3]-[-1-du+pl]
'I catch them (pl.)'
(van Driem 1993: 109)
b. a-lup-t-ə-nɨ
MS-catch-NPast-[-pl-du-2-3]-[-1-du+pl]
'they (pl.) catch me'/'you (pl.) catch me'
(van Driem 1993: 109)

Crucially, this violation of the one-argument restriction occurs in a hierarchy-crossing configuration: the 1sg argument is higher on the person hierarchy, while the 2/3pl/du arguments are higher for number. At this point, it should be clear that the assumption of two strictly separate hierarchies for person and number is generally problematic for hierarchy-crossing configurations in Dumi. It leads to a type of ranking paradox for the data in (40) and (41) under the assumption that both hierarchies are strictly ordered with respect to each other. An alternative would be to stipulate a refined hierarchy which "mixes" person and number, as in (44):

(44) $1 > \left\{ \begin{array}{c} 2\text{pl} \\ 2\text{du} \end{array} \right\} > 3\text{pl} > 3\text{du} > 3\text{sg} > 2\text{sg}$

However, the status of this hierarchy in relation to universal markedness hierarchies is dubious at best. Moreover, a hierarchy such as (44) effectively eliminates the phenomenon of hierarchy crossing, which seems to be crucial for an understanding of why Dumi violates the OAR in the forms in (42). No further refinement of the hierarchy would predict this violation. In the next two sections, I will propose an approach to HBC based not on hierarchies themselves, but on binary preference constraints linked to hierarchies by a general constraint schema, an account which derives apparent ranking paradoxes and violations of the OAR as a natural consequence of the constraint system.

6. A constraint-based analysis of HBC in Dumi

In this section I develop a complete, constraint-based analysis of HBC in Dumi. In Section 6.1, I derive the one-argument restriction from constraints already introduced in Section 4. Section 6.2 introduces the general approach to hierarchy effects, and Section 6.3 treats 3du/pl → 2sg forms that pose particular problems for an analysis.

6.1. *Deriving the one-argument restriction*

In this subsection I show that the strong tendency in Dumi to allow in a given verb form only number markers corresponding to a single argument follows from a constraint already independently justified to capture affix ordering facts, namely COHERENCE. Recall that the crucial constraint in Dumi is $\text{COH}_{\text{[-CASE]}}$ and COHERENCE is defined as follows:

(45) COHERENCE (*D*): Count a constraint violation for each VI *V* containing index *i* that is preceded in domain *D* by another VI *V′* containing index *j* such that $i \neq j$.

I will illustrate the affix-suppressing effect of $\text{COH}_{\text{[-CASE]}}$ with the form *luph-i*, 'we (du. incl.) caught him', where both number markers for the subject (-*i*:[+du]) and the object (-*a*:[-du]) would be licensed, but only -*i*:[+du] actually appears. If $\text{COH}_{\text{[-CASE]}}$ is ranked above PARSE F, the preference for forms with one affix (46a, 46b) over the alternative with two affixes follows:

(46) Input: $[+V]_1$ $[+Hi+1+2+du]_2$ $[+Hi+3\text{-}du\text{-}pl]_3$ (1di → 3sg)

	$\text{COH}_{\text{[-CASE]}}$	PARSE F
☞ a. V_1 i:$[+du]_2$	*	
☞ b. V_1 a:$[-du]_3$	*	
c. V_1 i:$[+du]_2$ a:$[-du]_3$	**!	*

This account extends to forms with an additional agreement prefix *a*-, as in *a-luph-i*, 'he caught us (du inc.)'. Since *a*:[-1+Hi][-3] is case related by specifying the case feature [+Hi], it is invisible to $\text{COH}_{\text{[-CASE]}}$, and does not lead to an additional violation for this constraint. Candidates without the prefix (e.g., [47d]) are then ruled out correctly by PARSE F:

(47) Input: $[+V]_1$ $[+Hi+3\text{-}1\text{-}du\text{-}pl]_2$ $[\text{-}Hi+1+2\text{-}3+du]_3$ (3sg → 1di)

	COH[-CASE]	PARSE F
☞ a. a:$[\text{-}1+Hi]_2[\text{-}3]_3$ V_1 i:$[+du]_3$	*	******
☞ b. a:$[\text{-}1+Hi]_2[\text{-}3]_3$ V_1 a:$[\text{-}du]_2$	*	******
c. V_1 i:$[+du]_3$	*	*******!**
d. a:$[\text{-}1+Hi]_2[\text{-}3]_3$ V_1 i:$[+du]_3$ a:$[\text{-}du]_2$	**!	*****

COH[-CASE] also does not block forms with more than one agreement suffix as long as these suffixes cross-reference the same agreement head, such as the forms in (48):

(48) Discontinuous agreement with 1 argument
   a. phɨk-kɨ-t-a
      get:up-[+1+pl]-NPast-[-du]
      'we (pl.,exc.) get up'
      (van Driem 1993: 97)
   b. dza-ŋ-t-ə
      eat-[+1-pl]-NPast-[-pl-du-2-3]
      'I eat it'
      (van Driem 1993: 133)

Since -*k*:$[+1+pl]_1$ and -*a*:$[\text{-}du]_1$ both realize subject agreement and hence bear the same index, forms with both affixes do not incur more COHERENCE violations than forms that have only -*k*:$[+1+pl]_1$ or only -*a*:$[\text{-}du]_1$. Importantly, exactly the same type of agreement affixes (affixes without case specifications) that are bound to occur on the same side of the verb stem can co-occur only under coindexation, and the same type of affixes that can occur in prefixal position (case-marked agreement affixes) can co-occur with other agreement affixes without coindexation restriction. COH[-CASE] captures this close link between ordering and co-occurrence restrictions without any further stipulation.

What is problematic about the ranking discussed so far is the fact that forms without any agreement suffixes fare better than forms with one suffix as shown in (49):

(49) Input: $[+V]_1$ $[+Hi+1+2+du]_2$ $[-Hi+3-du-pl]_3$ (1di → 3sg)

	COH$_{[-CASE]}$	PARSE F
☛ a. V_1 i:$[+du]_2$	*!	*******
☛ b. V_1 a:$[-du]_3$	*!	*******
c. V_1 i:$[+du]_2$ a:$[-du]_3$	*!*	******
☞ d. V_1		**********

That (49d) leads to additional violations of PARSE F is irrelevant since this constraint is ranked lower than COH$_{[-CASE]}$ and must be to achieve any affix-suppressing effect. Example (49d) is, however, in conflict with another constraint crucial for affix order, namely REFLECT,[15] which requires that the position of heads hosting agreement should be reflected by the position of at least one agreement affix under the assumption that all agreement heads are adjoined to Tense:

(50) REFLECT(AGR): The position of the host *H* of an agreement category *A* should be reflected by the position of an agreement affix corresponding to *A* which is
a. right-adjacent to an affix realizing *H*, or
b. occupies the position of *H*, if *H* is not realized in its position

The tableau in (51) shows schematically the effects of REFLECT. The constraint is satisfied in (51a) through (50a) and in (51b) through (50b). Example (51e) violates the constraint because there is no agreement affix which reflects the underlying position of Tense. In (51c) and (51d) there is an agreement affix, but it is not right adjacent to the tense marker:

(51)

	REFLECT
☞ a. V-t-AGR	
☞ b. V-AGR	
c. V-AGR-t	*!
d. AGR-V-t	*!
e. V-t	*!

Assuming that subject and object agreement form in Dumi a syntactic cluster (comparable to clitic clusters) that is adjoined to the Tense head, realizing either subject or object agreement in the appropriate position will satisfy REFLECT. Ranking REFLECT above $\text{COH}_{[\text{-CASE}]}$ will hence correctly block forms without agreement suffixes:

(52) Input: $[+V]_1$ $[+Hi+1+2+du]_2$ $[-Hi+3-du-pl]_3$ (1di → 3sg)

	REFLECT	$\text{COH}_{[\text{-CASE}]}$	PARSE F
☞ a. V_1 i:$[+du]_2$		*	*******
☞ b. V_1 a:$[-du]_3$		*	*******
c. V_1 i:$[+du]_2$ a:$[-du]_3$		**!	******
d. V_1	*!		********

That REFLECT is highly ranked, and indeed, unviolated in Dumi is also evident from the fact that every present-tense verb form in the language has an agreement affix immediately following the Tense marker -*t* (cf. the tables in [17] and [19]).

6.2. *Hierarchies and constraints*

While $\text{COH}_{[\text{-CASE}]}$ correctly derives the one-argument restriction for all relevant forms in Dumi, it does not predict whether the verb will agree with the subject or the object in specific cases. Thus, for a 1di → 3sg form, we get a tie between the candidates in (53a) and (53b):

(53) Input: $[+V]_1$ $[+Erg+1+2+du]_2$ $[-Erg-1-2-du-pl]_3$ (1di → 3sg)

	$\text{COH}_{[\text{-CASE}]}$	PARSE F
☞ a. V_1 i:$[+du]_2$	*	********
☞ b. V_1 a:$[-du]_3$	*	********
c. V_1 i:$[+du]_2$ a:$[-du]_3$	**!	*******

The constraint type I will use to implement the effects of person and number prominence on agreement in Dumi are Relativized PARSE constraints. Relativized PARSE constraints have proven useful in different domains such as direct-inverse marking (Trommer 2003b), number neutralization crosslinguistically (Trommer 2003f), and case conflict in free relative constructions (Trommer 2002b). They have the general format in (54a), where

$F_{1\text{-}3}$ are sets of agreement features. Example (54a) and (54b) are concrete instantiations of this format:

(54) a. PARSE $[F_1]^{[F_2]/[F_3]}$
b. PARSE $[\mathrm{du}]^{[+1]/[+3]}$
c. PARSE $[+\mathrm{Per}]^{[+\mathrm{an}]/[-\mathrm{an}]}$

A constraint of the form (54a) induces a constraint violation for each input head subsumed by $[F_1]$ and $[F_2]$ in the context of an input head subsumed by $[F_3]$ for which $[F_1]$ is not realized by a VI in the output. Thus, given a [+1] and a [+3] head in the input, (54b) requires that the number feature of the [+1] head is expressed by an output VI. (55) shows how this constraint derives the correct agreement with the 1st over the 3rd person argument for the form in (53):

(55) Input: $[+\mathrm{V}]_1$ $[+\mathrm{Erg}+1+2+\mathrm{du}]_2$ $[-\mathrm{Erg}-1-2-\mathrm{du}-\mathrm{pl}]_3$ (1di → 3sg)

	$\mathrm{COH}_{[-\mathrm{CASE}]}$	PARSE $[\mathrm{du}]^{[+1]/[+3]}$	PARSE F
☞ a. V_1 i:$[+\mathrm{du}]_2$	*		********
b. V_1 a:$[-\mathrm{du}]_3$	*	*!	********
c. V_1 i:$[+\mathrm{du}]_2$ a:$[-\mathrm{du}]_3$	**!		*******

Relativized PARSE constraints are linked to universal prominence hierarchies by the schema in (56):

(56) If $[F_2]$ is distinct from $[F_3]$, and $[F_2] \geq [F_3]$ on a prominence scale S then there is a PARSE constraint PARSE $[F_1]^{[F_2]/[F_3]}$

Given the prominence scales in (57), this licenses the PARSE constraints in (58), which will be crucial for the account of HBC in Dumi.[16] [PL] abbreviates in the following [+plural-dual], [DU] [-plural+dual], and [SG] [-plural-dual]. The number hierarchy is hence not strictly speaking a hierarchy of (binary) features, but a hierarchy of feature sets. This assumption is necessary since no specific value of a single feature corresponds in a unique way to singular ([-du] also characterizes plural, [-pl] also characterizes dual).[17]

(57) a. $\left\{\begin{matrix}[+1]\\ [+2]\end{matrix}\right\} > [+3]$
b. [PL] > [DU] > [SG]

(58) a. PARSE $[\mathrm{du}]^{[+1]/[+3]}$
b. PARSE $[\mathrm{du}]^{[+2]/[+3]}$
c. PARSE $[\mathrm{du}]^{[+1]/[+2]}$

d. PARSE $[du]^{[PL]/[SG]}$
e. PARSE $[du]^{[PL]/[DU]}$
f. PARSE $[du]^{[DU]/[SG]}$

Since the effects of the person and the number hierarchy are now effectively "split into pieces", we can model the fact that in some cases number prominence is more important, and in others person prominence. Recall from (13a) that in 2sg → 3du/3pl forms the object instantiating the more prominent number outranks the subject which is higher for person for agreement. This follows if PARSE $[du]^{[PL]/[SG]}$ is ranked above PARSE $[du]^{[+2]/[+3]}$:

(59) Input: $[+V]_1$ $[+Erg+2\text{-}1\ SG]_2[\text{-}Erg+3\ PL]_3$ (2sg → 3pl)

	PARSE $[du]^{[PL]/[SG]}$	$COH_{[-CASE]}$	PARSE $[du]^{[+2]/[+3]}$
☞ a. a V_1 ini:$[\text{-}1\text{-}du+pl]_3$		*	*
b. a V_1 a:$[\text{-}du]_2$	*!	*	
c. a V_1 a:$[\text{-}du]_2$ ini:$[\text{-}1\text{-}du+pl]_3$		**!	

The relative ranking of PARSE $[du]^{[+2]/[+3]}$ and $COH_{[-CASE]}$ is irrelevant for this case, but will become crucial for other forms I will discuss below. In contrast to the 2sg → 3du/3pl forms, person becomes the decisive factor in forms with one 2du and one 3pl argument (cf. [14a]).

This follows straightforwardly if PARSE $[du]^{[PL]/[DU]}$ is ranked below PARSE $[du]^{[+2]/[+3]}$ (60). Relativized PARSE constraints will be abbreviated in the following by the exponents referring to hierarchies. Thus [+2]/[+3] stands for PARSE $[du]^{[+2]/[+3]}$:

(60) Input: $[+V]_1$ $[+Erg+2\ du]_2[\text{-}Erg+3\ PL]_3$ (2du → 3pl)

	[PL]/[SG]	$COH_{[-CASE]}$	[+2]/[+3]	[PL]/[DU]
a. V_1 ini:$[\text{-}1\text{-}du+pl]_3$		*	*!	
☞ b. V_1 i:$[+du]_2$		*		*
c. V_1 i:$[+du]_2$ ini:$[\text{-}1\text{-}du+pl]_3$		**!		

Up to this point, it might seem that the interplay of COHERENCE allows only for a refined statement of hierarchy effects under the OAR, but indeed the violations of the OAR for forms with a 1sg and a 2/3 dual/plural argument illustrated in (43) are a natural consequence of this constraint system. If [+1]/[+3] and [PL]/[SG] are both ranked above $\text{COH}_{[\text{-CASE}]}$, the effect of the latter is suppressed and we get double agreement ([PL]/[DU] is irrelevant here and omitted to enhance readability):

(61) Input: $[+\text{V}]_1$ $[+\text{Erg}+1\text{-}2\ \text{SG}]_2$ $[-\text{Erg}+3\ \text{PL}]_3$ (1sg → 3pl)

	[+1]/[+3]	[PL]/[SG]	$\text{COH}_{[\text{-CASE}]}$	[+2]/[+3]
a. V_1 ini:$[-1\ \text{PL}]_3$	*!		*	
b. V_1 ə:$[-2\text{-}3\ \text{SG}]_2$		*!	*	
☞ c. V_1 ə:$[-2\text{-}3\ \text{SG}]_2$ ini:$[-1\ \text{PL}]_3$			**	

Example (62) shows the complete constraint ranking so far:

(62) $$[+1]/[+3] \gg \left\{\begin{matrix}[\text{PL}]/[\text{SG}]\\ [\text{DU}]/[\text{SG}]\end{matrix}\right\} \gg \text{COH} \gg \left\{\begin{matrix}[+2]/[+3]\\ [+1]/[+2]\end{matrix}\right\} \gg \left\{\begin{matrix}[\text{PL}]/[\text{DU}]\\ [+2]/[+1]\end{matrix}\right\}$$

Generally, exceptional two-argument agreement is limited to the case that agreement for both arguments is favored by different relativized PARSE constraints, which are both ranked higher than $\text{COH}_{[\text{-CASE}]}$. Thus, we still get agreement with a single argument if both PARSE constraints above $\text{COH}_{[\text{-CASE}]}$ favor agreement for the same argument (63), or if one of the relevant PARSE constraints is ranked below it (64):

(63) Input: $[+\text{V}]_1$ $[+\text{Erg}+1+2+\text{pl}+\text{du}]_2[-\text{Erg}+3\ \text{SG}]_3$ (1pi → 3sg)

	[+1]/[+3]	[PL]/[SG]	$\text{COH}_{[\text{-CASE}]}$	[+2]/[+3]
☞ a. V_1 k:$[+1+\text{pl}]_2$ i:$[+\text{du}]_2$			*	
b. V_1 k:$[+1+\text{pl}]_3$ i:$[+\text{du}]_2$ a:$[-\text{du}]_3$			**!	
c. V_1 a:$[-\text{du}]_3$	*!	*	*	

(64) Input: $[+V]_1$ $[+Erg+3\ PL]_2[-Erg+1-2+du]_3$ (3pl → 1de)

	[+1]/ [+3]	COH[-CASE]	[+2]/ [+3]	[PL]/ [DU]
☞ a. a V_1 i:$[+1-2+du]_3$		*		*
b. a V_1 i:$[+1-2+du]_3$ ini:$[-1\ PL]_2$		**!		
c. a V_1 ini:$[-1\ PL]_2$	*!	*		

6.3. *3du/pl → 2sg forms*

The ranking in (62) accounts for all transitive forms in Dumi except for forms with a 2sg object and a 3rd person dual or plural object. Recall that for the converse configuration (2sg → 3du/pl forms), agreement with the higher number agreement prevails (65a). Since none of the constraints in (62) refers to specific grammatical role, we would expect that the same holds for 3du/pl → 2sg forms, but this turns out to be incorrect (65b):[18]

(65) a. a-do:khot-t-ini
MS-see-NPast-[-1 PL]
'you (sg.) see them (pl.)'
(van Driem 1993: 107)
b. a-du:khus-t-a
MS-see-NPast-[-du]
'they (pl.) see you (sg.)'
(van Driem 1993: 108)

Note that this is the only place in the whole transitive paradigm where simple (i.e., non-portmanteau) agreement is sensitive to grammatical role. In all other cases, forms of the type X → Y have the same agreement as Y → X forms. There are two ways to interpret the preference for object agreement here, as a preference for 2nd person over 3rd, or as a preference for agreement with the absolutive argument over the ergative one. Preference for agreement with the absolutive argument is instantiated in a number of languages, e.g., Hindi (cf. Woolford 2000) and especially languages with HBC effects (e.g., Tangut: Kepping 1979; LaPolla 1992; Trommer 2002a; and several Tanoan languages: Noyer 1992; Trommer 2003f).[19] However, the preference for 2nd person over 3rd person agreement has systematical exceptions for cases such as (65a), and no other place in the paradigm shows systematic preference for absolutive agreement. To solve this problem, I propose to conjoin both preferences following the generalized version of the constraint schema in (56) formulated in (66) (Trommer 2003f: 2):

(66) If $F_1 \ldots F_n$ are distinct from $G_1 \ldots G_n$,
and $F_i \geq G_i$, $1 \leq i \leq n$ on prominence scales $S_1 \ldots S_n$
then there is a PARSE constraint PARSE $[F]^{[F_1 \ldots F_n]/[G_1 \ldots G_n]}$

Now, given the scales in (67a) and (67b), this licenses the relativized PARSE constraint in (67c):

(67) a. [-Erg] > [+Erg]
b. [+2] > [+3]
c. PARSE $[\text{du}]^{[\text{-Erg+2}]/[\text{+Erg+3}]}$

If [-Erg+2]/[+Erg+3] is ranked above the other PARSE constraints, we correctly derive object agreement in 3pl/du → 2sg forms such as (65b):

(68) Input: $[+V]_1$ $[+\text{Erg}+3\text{-}1\ \text{PL}]_2$ $[-\text{Erg}+2\text{-}1\ \text{SG}]_3$ (3pl → 2sg)

	[-Erg+2]/ [+Erg+3]	[PL]/ [SG]	COH$_{[\text{-CASE}]}$	[+2]/ [+3]
☞ a. a V_1 a:$[\text{-du}]_3$		*	*	
b. a V_1 ini:$[\text{-1 PL}]_2$	*!		*	*

A final problem is that the form with two-argument agreement V_1-a:$[\text{-du}]_3$-ini:$[\text{-1 PL}]_2$ seems to outrank the correct candidate (68a) because it neither violates [-Erg+2]/[+Erg+3] nor [PL]/[SG] which are both ranked above COHERENCE:

(69) Input: $[+V]_1$ $[+\text{Erg}+3\text{-}1\ \text{PL}]_2$ $[-\text{Erg}+2\text{-}1\ \text{SG}]_3$ (3pl → 2sg)

	[-Erg+2]/ [+Erg+3]	[PL]/ [SG]	COH$_{[\text{-CASE}]}$	[+2]/ [+3]
☛ a. a V_1 a:$[\text{-du}]_3$		*!	*	
b. a V_1 ini:$[\text{-1 PL}]_2$	*!		*	*
☞ c. a V_1 a:$[\text{-du}]_3$ ini:$[\text{-1 PL}]_2$			**	

Reranking [PL]/[SG] below COHERENCE is not an option since the account of Emergence of Two-Argument Agreement in 1sg → 3pl and 3pl → 1sg forms (cf. Section 6.2) depends crucially on this ranking. Similarly, appearance of 2nd person agreement in 3 → 2 forms is only possible if [-Erg+2]/[+Erg+3] remains ranked above [PL]/[SG]. The solution to this dilemma lies again in a constraint already independently motivated in the realm of affix order. All number affixes relevant for 3 → 2 forms (-*a*, -*i*, and -*ini*) are actually primary number affixes in the sense of the definition in (27), and hence subject to the constraint [NUM] ⇨ R. As argued in Grimshaw (2001b) and Gerlach (1998), high-ranked alignment constraints can have the effect to suppress multiple affixes, if they are ranked above relevant faithfulness constraints: If there are two potential affixes both aligned to a specific edge, only one of them appears because two affixes cannot be adjacent to the same edge at the same time. Thus assuming that $[\text{NUM}]_{\text{PRIM}}$ ⇨ R is ranked above all other constraints relevant for HBC in Dumi, the candidate with two-argument agreement will induce a fatal violation of this constraint, and will be correctly excluded:

(70) Input: $[+V]_1$ $[+\text{Erg}+3\text{-}1\ \text{PL}]_2$ $[-\text{Erg}+2\text{-}1\ \text{SG}]_3$ (3pl → 2sg)

	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[-Erg+2]/ [+Erg+3]	[PL]/ [SG]	$\text{COH}_{[\text{-CASE}]}$	[+2]/ [+3]
☞ a. a V_1 a:$[\text{-du}]_3$			*	*	
b. a V_1 ini:$[\text{-1 PL}]_2$		*!		*	*
c. a V_1 a:$[\text{-du}]_3$ ini:$[\text{-1 PL}]_2$	*!			**	

For 2sg → 3pl/du forms such as (65a) [-Erg+2]/[+Erg+3] is irrelevant and [PL]/[SG] ensures agreement with the 3pl argument:

(71) Input: $[+V]_1$ $[+\text{Erg}+2\text{-}1\ \text{SG}]_2$ $[-\text{Erg}+3\ \text{PL}]_3$ (2sg → 3pl)

	$[\text{NUM}]_{\text{PRIM}}$ ⇨ R	[-Erg+2]/ [+Erg+3]	[PL]/ [SG]	$\text{COH}_{[\text{-CASE}]}$	[+2]/ [+3]
☞ a. a V_1 ini:$[\text{-1 PL}]_3$				*	*
b. a V_1 a:$[\text{-du}]_2$			*!	*	
c. a V_1 a:$[\text{-du}]_2$ ini:$[\text{-1 PL}]_3$	*!			**	

Note that attested forms with two-argument agreement such as *do:khot*: [+V]-*t*-*ə*:$[\text{-2-3 SG}]_1$-*ni*:$[\text{-1 PL}]_2$ do not violate $[\text{NUM}]_{\text{PRIM}}$ ⇨ R since *ə*:[-2-3

SG] is not a primary number suffix. On the other hand, [NUM] ⇨ R does not obviate COHERENCE because there are many forms where agreement with only one argument is in force even if the second argument could be cross-referenced by an affix which is not of the primary number type. Thus in (72a), the primary number affix *i*:[+du] is suppressed in the context of *i*:[+1-2+du] which does not belong to this class. Similarly in (72b), the object is not expressed by the otherwise expected primary number suffix *a*:[-du] although neither *k*:[+1+pl] nor *ə*:[-2-3 SG] are primary number suffixes.

(72) Dumi transitive 1 → 2, 2 → 1 forms
  a. luph-ɨ
    catch-[+1-2+du]
    'we (du.,exc.) catch you (du.)'
    (van Driem 1993: 109)
  b. dza-ŋ-t-ə
    eat-[+1-pl]-NPast-[-2-3 SG]
    'I eat it'
    (van Driem 1993: 133)

7. Number inverse marking

We turn now to the marker -*si* which provides additional evidence for the interaction of person and number hierarchies in Dumi. It is used in transitive verb forms when one argument is 1st person singular and the other one is 2nd or 3rd person dual, or if the subject is 2nd person singular and the object is 3rd person dual. Example (73) shows the occurrence of all *si*-forms in the complete transitive paradigm: Disregarding the 3du → 2sg form (shaded in [73]) which follows the exceptional agreement behavior discussed in Section 6.3, the distribution of -*si* is symmetrical: it occurs in 1sg → 3du, but also 3du → 1sg forms. I will now first show that the distribution of -*si* cannot be captured by a simple characterization through morphosyntactic features and then turn to an alternative analysis in Sections 7.1 and 7.2.

First, -*si* cannot be characterized by a single feature structure. The most plausible candidate for such a structure would be *si*:[-1+du] since the affix only occurs in contexts with at least one dual 2nd or 3rd person argument and never occurs in any form without such an argument. However, this representation incorrectly predicts that -*si* occurs in intransitive forms, as well as in other transitive forms such as 2du → 3sg and in 3sg → 2du forms.

(73) Transitive verb forms

	1sg	1di	1de	1pi	1pe	2sg	2du	2pl	3sg	3du	3pl
1sg			O b j e c t				si			si	
1di											
1de											
1pi	Subject										
1pe											
2sg										si	
2du	si										
2pl											
3sg											
3du	si									si	
3pl											

A promising alternative is to restrict -*si* further by an additional feature structure, say [-pl], which would correctly predict that it only occurs with transitive forms containing a dual argument and another argument which is not plural:

(74) si [-1+du]/[-pl]

However this still does not account for the fact that -*si* appears in 2sg → 3du (75a), but not in 2du → 3sg (75b) forms. In both cases there is a dual argument in the context of a nonplural argument:

(75) Distribution of -si
a. 2sg → 3du → si
b. 2du → 3sg → i
c. 2du → 1sg → si
d. 3du → 3sg → si

On the other hand, any further restriction of (74) to exclude (75b) would predict that -*si* is also absent in other parts of the paradigm. Replacing [-1+du] by [+3+du] would block -*si* in 2du → 1sg forms (75c). Replacing the context restriction [-pl] by [-pl-du] would block it in 3du → 3sg forms (75d). But obviously in both forms -*si* is used. I conclude that the distribution of -*si* cannot be captured by a specific lexical entry alone.

7.1. *-si as number inverse*

Now reconsidering the prominence hierarchies relevant for HBC in Dumi (76), we note that (with the exceptions of the forms where both arguments are 3rd person) all forms with -*si* involve hierarchy crossing, i.e., one argument is higher for person and the other one for number (77):

(76) a. [+1] > [+2] > [+3]
b. [PL] > [DU] > [SG]

(77) Number inverse

1sg - 2du		1sg - 3du		2sg - 3du	
singular	dual	singular	dual	singular	dual
1	2	1	3	2	3

Appearance of a specific marker restricted to hierarchy crossing contexts is a phenomenon familiar from so-called inverse marking (cf. e.g., Comrie 1980b; Klaiman 1992). In inverse marking languages a special marker is used if the object is higher for a prominence hierarchy than the object. Thus in the Tibeto-Burman language Nocte (Das Gupta 1971; DeLancey 1981), the marker -*h* appears in transitive verb forms if the subject is 3rd person and the object is 1st or 2nd person, or if the subject is 2nd person and the object is 1st person. This distribution is illustrated in (78) (Das Gupta 1971: 21):

(78) a. hetho-h-ang
teach-INV-1
'you/he will teach me'
b. hetho-h-o
teach-INV-2
'he will teach you'

If the person values of subject and object are reversed, no -*h* appears:

(79) a. hetho-min
teach-1pl
'I will teach you (pl.)'
b. hetho-ang
teach-1
'I will teach him'
c. hetho-o
teach-2
'you will teach them'

According to the functional literature, inverse markers indicate a case of hierarchy crossing. Arguments of transitive verbs instantiate an argument or case hierarchy as in (80a). Assuming further the person hierarchy in (80b), all forms marked by -*h* in Nocte are hierarchy-crossing configurations as illustrated in (81):

(80) a. Nom > Acc
b. $1 > 2 > 3$

(81) Case inverse

$2 \rightarrow 1$		$3 \rightarrow 1$		$3 \rightarrow 2$	
Nom	Acc	Nom	Acc	Nom	Acc
2	1	3	1	3	2

Just as *-si* is restricted to transitive configurations where there is hierarchy crossing for the person and the number hierarchy, *-h* occurs in transitive configurations where there is hierarchy crossing for the person and the case hierarchy. We can therefore conclude that *-si* belongs to a generalized type of inverse markers which indicate hierarchy crossing by affixal material while "harmony" across hierarchies remains unmarked.

An apparent problem with this view is that *-si* is also used in two contexts where both arguments have obviously equal person prominence: a) if both arguments are 3rd person and dual b) if both arguments are 3rd person, one is singular and the other one is dual. However, inverse marking of transitive forms with equal person prominence is also found in "standard" person/case inverse systems. For example in Turkana (Dimmendaal 1983; Trommer 2003e) inverse marking applies in all contexts where it is found in Nocte, but also if both arguments of a transitive clause are non-3rd person. Hence, $2 \rightarrow 1$ forms, as well as $1 \rightarrow 2$ forms are marked as inverse. Since 1st and 2nd person are not universally ranked with respect to each other, this means that inverse also extends to cases where different arguments have equal prominence status for a given hierarchy.

7.2. *A formal analysis*

In Trommer (2003b) it is argued that person/case inverse markers have the basic feature content [+Nom] [+Acc] (or [+Erg][-Erg]), which accounts for the fact that they occur only in transitive contexts and that they usually co-occur with agreement markers which do not specify case by themselves. The observation that inverse markers tend not to occur in direct (i.e., noninverse) contexts is then captured by IMPOVERISHMENT constraints following the general scheme in (82) that require that they are suppressed for specific combinations of arguments.

(82) If $F_1 \geq F_2$ on a prominence scale S_1 ($F_1 \neq F_2$)
then there is a constraint
IMPOVERISH [+Nom][+Acc]/[+Nom F_1][+Acc F_2]

For example, the constraint in (83) demands that no inverse marking happens in forms with a 1st person subject and a 3rd person object according to the scale [+1] > [+3]:

(83) IMPOVERISH [+Nom][+Acc]/[+Nom+1][+Acc+3]

Consequently, in a $1 \rightarrow 3$ form, the inverse marker is suppressed by the high-ranked IMPOVERISHMENT constraint (84), while PARSE F enforces inverse marking in the $3 \rightarrow 1$ form in (85) where IMPOVERISHMENT is irrelevant:[20]

(84) Input: $[+V]_1$ $[+Nom+1]_2$ $[+Acc+3]_3$ ($1 \rightarrow 3$)

	IMPOVERISH [+Nom][+Acc]/ [+Nom+1][+Acc+3]	PARSE F
a. V_1 h:$[+Nom]_2[+Acc]_3$ ang:$[+1]_2$	*!	*
☞ b. V_1 h:$[+Nom]_2[+Acc]_3$ ang:$[+1]_2$		***

(85) Input: $[+V]_1$ $[+Nom+3]_2$ $[+Acc+1]_3$ ($3 \rightarrow 1$)

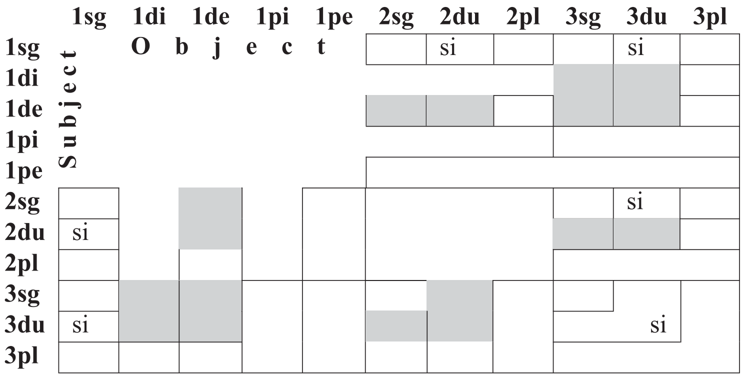
	IMPOVERISH [+Nom][+Acc]/ [+Nom+1][+Acc+3]	PARSE F
☞ a. V_1 h:$[+Nom]_2[+Acc]_3$ ang:$[+1]_3$		*
b. V_1 h:$[+Nom]_2[+Acc]_3$ ang:$[+1]_3$		**!*

I will assume that just as person/case inverse markers are portmanteau affixes specifying case features, person/number inverse markers are portmanteaus specifying number Features. More concretely I represent -*si* as in (86):

(86) si [+du][-pl]

This entry already accounts for the fact that -*si* only occurs in forms with two dual arguments or one dual and one singular argument. (87) shows schematically where it occurs, and where it could occur (marked by shaded cells), given this entry:

(87) Transitive verb forms



Now I generalize the scheme in (82) as in (88):

(88) If $F_1 \geq F_2$ on a prominence scale S_1 ($F_1 \neq F_2$)
and $G_1 \geq G_2$ on a prominence scale S_2 ($G_1 \neq G_2$)
then there is a constraint
IMPOVERISH $[G_1][G_2]/[G_1\ F_1][G_2\ F_2]$

Basically, (88) licenses constraints which suppress inverse marking with respect to a scale S_2 (especially number or case) for all cases which are direct in the sense that S_2 does not lead to hierarchy crossing with scale S_1. The IMPOVERISHMENT constraint in (83) is still subsumed under this scheme with $[+1] > [+3]$ instantiating $F_1 \geq F_2$ and $[+Nom] > [+Acc]$ instantiating $G_1 \geq G_2$, but (88) also licenses constraints as the one in (89), where $F_1 \geq F_2$ is again instantiated by $[+1] > [+3]$ and $G_1 \geq G_2$ by $[+du] \geq [-sg]$. Example (90) shows that this prominence relation indeed holds under the assumed composition of number features:

(89) IMPOVERISH [+du][-sg]/[+du+2][-sg+3]

(90)

a.	plural	>	Dual	>	Singular
b.	[+pl-du]	>	[-pl+du]	>	[-pl-du]
c.			[+du]		
d.			[-pl]		

The tableau in (91) shows how *-si* is enforced by PARSE F in a 2sg → 3du configuration where (90) is irrelevant since it is inverse for person and number. The alternative candidate contains [+du] *-i*, which is minimally distinct from *-si*. In the direct configuration 2du → 3sg in (92), the structural description of (89) is met and the person/number inverse marker is suppressed:

(91) Input: $[+V]_1$ $[+Erg+2-1-du-pl]_2[-Erg+3+du-pl]_3$ (2sg → 3du)

	IMPOVERISH [+du][-sg]/ [+du+2][-sg+3]	PARSE F
☞ a. V_1 si:$[+du]_3[-pl]_2$		*******
b. V_1 i:$[+du]_3$		********!

(92) Input: $[+V]_1$ $[+Erg+2-1+du-pl]_1[-Erg+3-du-pl]_2$ (2du → 3sg)

	IMPOVERISH [+du][-sg]/ [+du+2][-sg+3]	PARSE F
a. V_1 si:$[+du]_2[-pl]_3$	*!	*******
☞ b. V_1 i:$[+du]_2$		********

Note that the scheme in (88) does not license IMPOVERISHMENT constraints for configurations involving two 3rd-person arguments: while 3rd person is more or equally prominent as itself ($[+3] \geq [+3]$), it is not distinct from itself, hence it fails to fulfill the condition that $A \neq B$. As a consequence -*si* should occur in all forms with two 3rd person arguments, where none of the arguments is plural, which is indeed the case.

8. Other approaches to hierarchy-based competition

Hierarchy-based competition has received little attention in the generative literature. Perhaps, the most detailed approach to phenomena of this type in a pre-OT framework is presented in Noyer (1992). Noyer assumes in an elaborate version of distributed morphology that suppression of agreement affixes is triggered by universal filters categorically excluding the co-occurrence of certain feature values. (e.g., *1 + dual). If such a filter is active in a given language, universal feature hierarchies determine which affix is spelled out. For example, the hierarchy 1 > dual ensures that for an input containing the features [1] and [dual] only [1] is realized by an affix.

While this approach has many desirable consequences, it is problematic for the Dumi data discussed here. Assuming that co-occurrence of subject and object agreement is generally suppressed by a surface filter in the language, we would expect that person always outranks number since Noyer assumes that number features are universally lower than person features.

Moreover, his approach cannot explain why the surface filter can be violated in cases of hierarchy crossing, since the role of hierarchies is restricted to determining the way in which the filter is satisfied. In other words, no hierarchy configuration can ever lead to overriding a filter which is otherwise active in a language. Similar problems result with other approaches to hierarchy effects which try to reduce it to specificity effects in a feature-geometric representation of pronominal (agreement) features, as for example Dechaine (1999) and Bejar (2003).

While to my knowledge there exists no other systematic OT-account of HBC, related phenomena play a crucial role in the OT-literature on morphosyntax, following the seminal work on effects of prominence hierarchies in syntax by Aissen (1999, 2003). The standard tool to derive asymmetries in the realization of agreement is basically to assume a fixed ranking of markedness constraints interacting with faithfulness constraints (e.g., Nagy 1999; Ortmann 2002). Schematically, a prominence hierarchy of the form Less Marked > More Marked allows to derive via Harmonic Alignment (Prince and Smolensky 1993) the fixed constraint ranking *More Marked >> *Less Marked. Thus, Ortmann (2002: 161) captures the fact that subject agreement is restricted to animate subjects in certain varieties of Georgian by the markedness constraints *AgrPl/[-an] >> *AgrPl/[+an],[21] and a faithfulness constraint ranked between the two markedness constraints:

(93) Input: $[\text{Agr+Nom+pl+an}]_1$ (1pl animate)

	*AgrPl/[-an]	Faith	*AgrPl/[+an]
a. ∅		*!	
☞ b. $[\text{Agr+pl}]_1$			*

(94) Input: $[\text{Agr+Nom+pl-an}]_1$ (1pl inanimate)

	*AgrPl/[-an]	Faith	*AgrPl/[+an]
☞ a. ∅		*	
b. $[\text{Agr+pl}]_1$	*!		

It should be easy to see how this can be transferred to a system where there is agreement with 1st and 2nd person subjects and objects, but not with 3rd person arguments. If the hierarchy effect is captured by the ranking *Agr/[+3] >> *Agr/[+1], and a corresponding Faithfulness constraint is interspersed, we get subject agreement for 1 → 3 (95), and object agreement for 3 → 1 clauses (96):

(95) Input: $[Agr{+}Nom{+}1]_1$ $[Agr{+}Nom{+}3]_2$ (1 → 3)

	Agr/[+3]	Faith	*Agr/[+1]
a. ∅		**!	
☞ b. $[Agr]_1$		*	*
c. $[Agr]_2$	*!	*	
d. $[Agr]_1$ $[Agr]_2$	*!		*

(96) Input: $[Agr{+}Nom{+}3]_1$ $[Agr{+}Nom{+}1]_2$ (3 → 1)

	*Agr/[+3]	Faith	*Agr/[+1]
a. ∅		**!	
b. $[Agr]_1$	*!	*	
☞ c. $[Agr]_2$		*	*
d. $[Agr]_1$ $[Agr]_2$	*!		*

However, the resulting system does not lead to hierarchy-based competition as in Dumi. For intransitive forms with 3rd person subjects or if both arguments of a transitive form are 3rd person, we get complete suppression of agreement:

(97) Input: $[Agr{+}Hi{+}3]_1$ $[Agr\text{-}Hi{+}3]_2$ (3 → 3)

	*Agr/[+3]	Faith	*Agr/[+1]
☞ a. ∅		**	
b. $[Agr]_1$	*!	*	
c. $[Agr]_2$	*!	*	
d. $[Agr]_1$ $[Agr]_2$	*!*		

No addition of simple markedness constraints will lead to agreement in this case since markedness constraints of this type penalize the presence, not the absence of structure.

Fixed-ranking approaches which use faithfulness instead of markedness constraints are equally problematic for Dumi. Thus we might assume that the person and number hierarchy effects in Dumi are due to the fixed ranking of the constraints in (98), which require realization for single features:

(98) a. PARSE [Agr]$^{[+1]}$ >> PARSE [Agr]$^{[+2]}$ >> PARSE [Agr]$^{[+3]}$
b. PARSE [Agr]$^{[PL]}$ >> PARSE [Agr]$^{[DU]}$ >> PARSE [SG]$^{[+3]}$

These constraints are analogous in effect to constraints requiring realization of case which Aissen (2003) proposes in her account of Differential Object Marking (DOM). Similar constraint formats are used in Wunderlich (2003) and Trommer (2003c). Now, to achieve two-argument agreement in 3pl → 1sg and 1sg → 3pl forms, PARSE [Agr]$^{[+1]}$ and PARSE [Agr]$^{[PL]}$ must be both ranked above the constraint requiring agreement with maximally one argument which I take to be again COH$_{[-CASE]}$:

(99) Input: [Agr+Hi+1 SG]$_1$ [Agr-Hi+3 PL]$_2$ (1sg → 3pl)

	PARSE [Agr]$^{[PL]}$	PARSE [Agr]$^{[+1]}$	COH$_{[-CASE]}$
a. ∅	*!	*	
b. [Agr]$_1$	*!		
c. [Agr]$_2$		*!	
☞ d. [Agr]$_1$ [Agr]$_2$			*

However, this ranking predicts two-argument-agreement in all transitive forms with one 3pl and one 1st person argument, such as in a 1du → 3pl configuration, but in this and other such forms Dumi actually shows single-argument agreement with the 1st-person argument:

(100) Input: [Agr+Hi+1 DU]$_1$ [Agr-Hi+3 PL]$_2$ (1du → 3pl)

	PARSE [Agr]$^{[PL]}$	PARSE [Agr]$^{[+1]}$	COH$_{[-CASE]}$
a. ∅	*!	*	
b. [Agr]$_1$	*!		
c. [Agr]$_2$		*!	
☞ d. [Agr]$_1$ [Agr]$_2$			**

Reranking PARSE [Agr]$^{[PL]}$ below COH$_{[-CASE]}$ would get the right results for 1du → 3pl forms, but would lead to incorrect one-argument agreement for the 1sg → 3pl forms. Thus fixed ranking of PARSE constraints without context restrictions leads to a ranking paradox.[22]

Aissen (1999) develops an alternative technique to refer to conditioning of inflection by pairs of arguments through local conjunction, which she uses to capture direction marking in Nocte. At the heart of her analysis of Nocte is the fixed constraint ranking in (101):

(101) $*\varnothing_{D}$ & *Subj/3 & *Obj/1,2 $\gg$ $*\varnothing_{D}$ & *Subj/1,2 & *Obj/3

$*\varnothing_{D}$ marks nonrealization of the direction category, *Subj/3 a 3rd person subject and *Obj/1,2 a 1st or 2nd person object. Thus the first constraint in (101) ($*\varnothing_{D}$ & *Subj/3 & *Obj/1,2), which is formed from these three constraints by local conjunction (indicated by '&') marks the situation, where the subject is 3rd person, the object 1st/2nd and there is no direction marking (101) can hence be paraphrased as in (102):

(102) Mark Direction for 3 $\rightarrow$ 1,2 $\gg$ Mark Direction for 1,2 $\rightarrow$ 3

These two constraints interact with the economy constraint *StructD that marks direction marking in general. The pattern in Nocte results from the following ranking:

(103) 3:1,2 $\gg$ *StructD $\gg$ 1,2:3 $\Rightarrow$ Inverse, but no direct marking

Constraints of this type seem to be denotationally close to Relativized PARSE constraints such as PARSE $[\text{du}]^{[+1]/[+3]}$. However, an analogous constraint such as (104) would not encode the preference to realize the dual of 1st and 2nd in the context of 3rd person. It would just require that any [+/-dual] morpheme appear in an inverse configuration of this type:

(104) $*\varnothing_{\text{dual}}$ & *Subj/3 & *Obj/1,2

Note finally that combining Harmonic Alignment and Local Conjunction is empirically problematic since besides standard hierarchy effects it also predicts unattested and counterintuitive effects of this type as shown in Jäger and Zeevaat (2002), and cannot account for more complex inverse-marking systems as in Algonquian (Trommer 2003b). At the conceptual level, relating prominence hierarchies to single constraints and not to fixed constraint rankings as in Harmonic Alignment is in a line with the general claim in the OT-literature that constraints are universal, but ranking is free (cf. also De Lacy 2002).

9. Summary

In this article, I have shown that Dumi exhibits intricate interactions of person and number hierarchy effects which are problematic for approaches which directly invoke hierarchies themselves or use fixed constraint rankings derived by Harmonic Alignment. I have proposed an analysis based on general constraint schemata linking hierarchies to Relativized PARSE and IMPOVERISHMENT constraints. This approach predicts an interesting variety in small-scale differences of hierarchy effects. Future research must show to which degree this corresponds to the still poorly understood complexities in complex agreement systems of polysynthetic languages.

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Appendix. Complete analysis of Dumi verb inflection

Example (105) shows the complete constraint ranking which derives all transitive and intransitive verb forms in Dumi given the vocabulary items in (18), (21), (22), and (86). All constraints and their ranking have been treated in the preceding sections except the three constraints printed in italics, which I will briefly discuss below.

(105) Complete constraint ranking

$$\left\{\begin{array}{l}\text{IMPOVERISH } [+\text{du}][\text{-pl}]/[+1\text{-}3+\text{du}][+3\text{-}1\text{-pl}] \\ \text{IMPOVERISH } [+\text{du}][\text{-pl}]/[+1\text{-}3+\text{du}][+2\text{-}1\text{-pl}] \\ \text{IMPOVERISH } [+\text{du}][\text{-pl}]/[+3+\text{du}][+2\text{-}1+\text{du}]\end{array}\right\}$$

$$\textit{IMPOVERISH } [\textit{-pl}+1]//[\textit{-past}][+\textit{Hi}+1]$$

$$[\text{NUM}]_{\text{PRIM}} \Rightarrow \text{R}$$

REFLECT

$$\textit{IMPOVERISH } [\textit{pl}]^{[+\textit{du}]}$$

$$\left\{\begin{array}{l}\text{PARSE } [\text{du}]^{[+1]/[+3]} \\ \text{PARSE } [\text{du}]^{[\text{-Erg}+2]/[+\text{Erg}+1\text{-pl-du}]}\end{array}\right\}$$

$$\left\{\begin{array}{l}\text{PARSE } [\text{du}]^{[+\text{pl}]/[\text{-pl-du}]} \\ \text{PARSE } [\text{du}]^{[+\text{du}]/[\text{-pl-du}]}\end{array}\right\}$$

$$\text{COHERENCE}_{[\text{-CASE}]}$$

$$\left\{\begin{array}{l}\text{PARSE } [\text{du}]^{[+1]/[+2\text{-}1]} \\ \text{PARSE } [\text{du}]^{[+2]/[+3]}\end{array}\right\}$$

$$\left\{\begin{array}{l}\text{PARSE } [\text{du}]^{[+\text{pl}]/[+\text{du}]} \\ \text{PARSE } [\text{du}]^{[+2]/[+1]}\end{array}\right\}$$

REQUIRE_CONTEXT

PARSE F

[du] ⇨ R

L ⇨ [1]

REQUIRE_CONTEXT marks forms without vocabulary items with context restriction. In effect this prefers allomorphs which have context restrictions.[23] For example in a 1sg → 3sg form instead of the default 1st person suffix -*ə*, the specific marker -*u* is used which differs from -*ə* only by its context restriction:

(106) a. -ə [-2-3 SG]
b. -u [-2-3 SG]/[+3-pl-du-Erg] [+past]

REQUIRE_CONTEXT now ensures that the allomorph (VI) with the context restriction is chosen:

(107) Input: $[+V]_1$ $[+past]_2$ $[-pl-du-2-3+Erg]_3$ $[+3-pl-du-Erg]_4$ (1sg → 3sg)

	REQUIRE_CONTEXT
a. V1 ə:$[-2-3\ SG]_3$	*!
☞ b. V1 u:$[-2-3\ SG]_3$/[+3-pl-du-Erg] [+past]	

IMPOVERISH [-pl+1]/[-past][+Hi+1] captures a further peculiarity of first person marking *ŋ*:[+1-pl] (or its allomorph -N, cf. [21]) is used for all 1sg arguments, (in)-transitive subjects and objects in both tenses, except for the 1sg object of a non-past transitive form. The constraint directly enforces this gap.

Finally, IMPOVERISH $[pl]^{[+du]}$ captures the generalization that [+/-pl] is never expressed with dual arguments. Thus 1st person singular (108a) and plural forms (108b) both have separate affixes for the features [+/-du] and [+/-pl], but 1st person dual forms only mark [+du] (108c):

(108) Dumi intransitive verb forms
a. dza-ŋ-t-ə
eat-[+1-pl]-NPast-[-2-3 SG]
'I eat (it)'
(van Driem 1993: 133)
b. phɨkh-ki-t-a
get:up-[+1+pl]-NPast-[-du]
'we (pl.,excl.) get up'
(van Driem 1993: 97)
c. phɨkh-t-ɨ
get:up-NPast-[+du]
'we (du., exc.) got up'
(van Driem 1993: 97)

IMPOVERISH [pl]$^{[+du]}$ also blocks *si*:[+du][-pl] from occurring in intransitive dual forms such as (108c), where otherwise both feature structures could express features of the same argument.

Notes

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1. All Dumi data are from van Driem (1993). The "marked scenario affix" *a*-, glossed here as MS, occurs in "all scenarios involving a 1st or 2nd person actant except those with a 1st person agent or subject (van Driem 1993: 123)." See Section 3.1 for discussion. Other abbreviations used in the text and the glosses are: 1(st person), 2(nd person), 3(rd person), agr(eement), acc(usative), asp(ect), cl(itic), de = dual exclusive, di = dual inclusive, du(al), erg(ative), exc(lusive), inc(lusive), pl(ural), pe = plural exclusive, per(son), pi = plural exclusive, nom(inative), num(ber), O = object agreement, NPast = Nonpast, sg = singular, S = subject agreement.
2. Note that the marked scenario affix disambiguates some ([2] and [3]), but not all of these forms (4). Generally, transitive forms in Dumi show a massive amount of syncretism. For reasons of expositional clarity, I will only give readings of specific example forms in the glosses which are relevant for the point under discussion, and note other readings in footnotes. A full overview of transitive forms is given in the table in (19). *luph-i* has also the readings 'we (du.,exc.) caught you (sg./pl.)/him/them' and 'he caught him'. *a-luph-i* has also the readings 'you (sg./pl.)/he/they (pl.) caught us (du.,exc.)' and 'you (sg.) caught him'. Alternative readings for *a-luph-i* are 'you (du.) caught him/them (pl.)' 'he/they (pl.) caught you (du.)' and 'he/they (du./pl.) caught us (du.inc.)'.
3. See Comrie (1980a) and Croft (1990) for discussion of similar phenomena under a functionalist perspective.
4. Cf. (4) and footnote 2 for further readings of *a-luph-i*.
5. Note that not the VIs themselves are coindexed with lexical items, but the feature structures associated with VIs. Thus a portmanteau VI can contain two distinct feature structures with different indices. See Trommer (2003c) for more details. Trommer (2003c: chapter 4.2) discusses the differences in the basic constraint types of standard correspondence theory and DO.
6. See Trommer (2003c) for technical details.
7. With Halle and Marantz (1993), I assume that agreement heads inherit case features from the DPs with which they agree. Since Dumi is an ergative language, these features comprise +/-Erg(ative) for ergative and absolutive case.
8. The idea that alignment constraints can be used to suppress "superfluous" structure was independently developed in Trommer (2001a) and Grimshaw (2001a). See Trommer (2003c) for detailed discussion.
9. In Trommer (2005), it is shown that these restrictions follow straightforwardly from a simple semantics of person features.
10. A rule of this type is explicitly formulated in van Driem (1993: 135). Additional evidence for the (morpho-) phonological character of this process is the fact that it also applies to the reflexive suffix *–nsi*.
11. In the following, I will abbreviate VIs for all verbs as 'V_1' and omit the Tense head and features of the agreement heads wherever they are irrelevant.

12. *luph-ini* also has the reading 'they (pl.) caught them (pl.)'. *lup-si* also has the reading 'they (du.) caught them (du.)'.
13. *do:khoʔ-k-t-a* also has the readings 'we (pl.,exc.) see him/them (pl.)/you (sg./pl.)'. *a-do:khoʔ-k-t-a* also has the readings 'he/they (pl.)/you (sg./pl.) see(s) us (pl.,exc.)'. Cf. (2), (3) and footnote 2 for additional readings of *luph-i* and *a-luph-i*.
14. *a-luph-ini* also has the readings 'you (pl.) caught him/them (du./pl.)' and 'he/they (du./pl.) caught you (pl.)'. Cf. (4) and Note 2 for further readings of *a-luph-i*.
15. See Trommer (2003a, 2003d) for crosslinguistic evidence.
16. A further constraint licensed is PARSE $[\text{du}]^{[+2]/[+1]}$. Similar constraints are crucial for prefixes in Algonquian (Trommer 2002a) and different number preference patterns in Tanoan languages (Trommer 2003f). I assume that this constraint is ranked below PARSE $[\text{du}]^{[+1]/[+2]}$ in Dumi and hence becomes invisible in this language.
17. Note especially that '[du]' here stands for the feature [+/-du(al)] while '[DU]' abbreviates [-plural+dual].
18. *a-du:khus-t-a* also has the readings 'he/they (du.) see(s) you (sg.)'
19. If absolutive is interpreted as nominative, this can be reduced to the preference for agreement with nominative arguments which also holds in nominative-accusative languages (cf. Woolford 2000).
20. As usual in OT, constraints can be reranked, resulting in languages where direction marking extends to direct contexts. This is indeed observed in Algonquian (cf. Trommer 2003b).
21. I have slightly adapted Ortmann's (2002) constraint names and other details to the conventions applied in this article.
22. The situation is not changed if such constraints allow to conjoin different hierarchies as suggested by Aissen for so-called two-dimensional DOM. Thus replacing the PARSE constraints in (99) by PARSE $[\text{Agr}]^{[+3\ \text{PL}]}$ and PARSE $[\text{Agr}]^{[+1\ \text{SG}]}$, again both constraints must be ranked above COH[-CASE] to achieve two-argument agreement which leads in turn to the incorrect prediction that verbs agree with all 3pl arguments.
23. This is formalized as part of the Elsewhere or Subset Principle in other frameworks, cf. for example Halle and Marantz (1993: 123).

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