

Accounting for parallels between inverse marking and the PCC*

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1. Introduction

Hierarchy effects are attested throughout the grammar and the pervasive and variable ways in which they are manifested can yield valuable insight into the interplay between syntax and morphology. One type of hierarchy effect that has been studied extensively is the Person-Case Constraint (PCC), which restricts person combinations of indirect objects (IOs) and direct objects (DOs) in certain configurations (classically when both are realized as clitics, but this varies). Four main varieties of PCC restrictions have been recognized: strong, weak, strictly descending (ultrastrong), and me-first. These patterns vary in which combinations of IO and DO they rule out, summarized in (1), and much of the literature on the PCC has focused on how to derive the different varieties under similar assumptions (Nevins 2007, Pancheva and Zubizarreta 2018, Coon and Keine 2021, Deal 2021, a.o.).

(1) *Summary of PCC patterns*

IO	DO	Strong	Weak	Strictly descending	Me-first
1	3	✓	✓	✓	✓
1	2	*	✓	✓	✓
2	3	✓	✓	✓	✓
2	1	*	✓	*	*
3	1	*	*	*	*
3	2	*	*	*	✓

I demonstrate that all four types of person restrictions observed in PCC systems can be found in hierarchy effects that hold between subjects and objects in languages with inverse marking. While it has been observed that the types of person hierarchy effects underlying the PCC and inverse systems share many similarities and can possibly be unified (Bianchi

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2006, Stegovec 2017, Zubizarreta and Pancheva 2017, Hammerly 2020, a.o.), some formal accounts have concluded that these two types of hierarchy effects should not receive a unified treatment (Anagnostopoulou 2005, Lochbihler 2007). The fact that the four person restriction patterns seen in the PCC are mirrored in inverse systems lends support to the idea that these two types of hierarchy effects arise due to a similar underlying syntax and should be modeled with the same basic technology. I provide a sketch of a unified account of the two phenomena, taking Deal's (2021) analysis of the PCC as my starting place. I argue that with very minimal modifications this analysis can be leveraged to account for inverse systems. I assume that inverse marking systems differ from PCC systems in the location of the agreement probe implicated in the hierarchy effect and in the nature of the repair used for illicit person combinations, with inverse marking itself analyzed a repair involving an added probe, following Béjar and Rezac (2009). I additionally demonstrate that these two factors, probe location and added probe repair, can be decoupled, predicting a four-way typology of person hierarchy effects that is, in fact, attested.

2. Parallels between inverse marking patterns and PCC patterns

While languages that exhibit a variety of the PCC restrict certain combinations of DOs and IOs, languages with inverse marking can be thought of as restricting certain combinations of subjects and objects. In languages with inverse systems, a morpheme known as an inverse marker appears with certain person combinations of subject and object. Inverse marking has typically been characterized as arising when the object outranks the subject on a person hierarchy, with the details of the hierarchy varying crosslinguistically. The inverse marking literature generally distinguishes four relevant types of person combinations. Inverse contexts involve a 3rd person subject and a Speech Act Participant (SAP) object. In these configurations, inverse marking is typically used. In direct contexts, the subject is a SAP and the object is 3rd person. These contexts typically do not show inverse marking. Local contexts are configurations where both subject and object are SAPs. In these configurations there is more crosslinguistic variation, and this variability is the main point of discussion here. Finally, in non-local contexts, both arguments are 3rd person. There is also crosslinguistic variation in non-local configurations. Some languages display a pattern known as obviation where 3rd persons are internally ranked on the person hierarchy and some combinations of 3rd persons trigger inverse marking. While obviation is found in many languages with inverse marking, it is not found in all of them, suggesting that obviation should be modeled as the result of an additional factor that can also be at play in languages with inverse marking. I set aside non-local configurations in this paper.

In this section, I discuss variation in inverse marking patterns, focusing on four Indigenous languages of North America. I show that the variation observed in the inverse marking patterns closely parallels the four varieties of the PCC mentioned in the introduction.

2.1 A parallel to the strong PCC

The first language with inverse marking that we will examine is Potosino Huastec (Mayan; Mexico). This discussion is based on descriptions offered by Zavala (1994, 2007). Huastec

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shows ergative alignment in its verbal person marking system. Ergative markers are used for transitive subjects; absolutive markers are used for intransitive subjects and primary objects. Transitive verbs are marked with only one person marker which cross-references the argument that is highest on the person hierarchy 1>2>3. In some parts of the paradigm, this person marker is preceded by a prefix /t(V)-/ which Zavala argues is an inverse marker.

In direct contexts where the subject is a SAP and the object is 3rd person, the subject is indexed with a person marker drawn from the ergative paradigm (*a* 2SG.ERG and *u* 1SG.ERG in (2a)). The object is not indexed on the verb, and the inverse marker does not appear. In inverse contexts where the subject is 3rd person and the object is a SAP, the object is indexed with a person marker from the absolutive paradigm (*in* 1SG.ABS in (2b)) and the subject is not indexed on the verb. In addition to the absolutive person marker, the inverse marker *ti-* also appears. Direct and inverse configurations are illustrated in (2).¹

(2) *Huastec direct and inverse configurations (Zavala 1994:59, 71)*

- a. \emptyset -**a** pijch-iy an burro \emptyset -**u** pijch-iy
3.ABS-2SG.ERG feed-TT DEF donkey 3.ABS-1SG.ERG feed-TT
'Did you feed the donkey? I fed him.'
- b. ani yab \emptyset che'-nek u aamu **ti-k-in** pijch-iy
and NEG 3.ABS come-PRF 1SG.ERG boss INV-DEP-1SG.ABS feed-TT
'My boss has not come to feed me.'

In local contexts where both arguments are SAPs, the 1st person argument is indexed on the verb. In 1→2 contexts, the 1st person marker is an ergative form (*u* in (3a)).² In 2→1 contexts, the 1st person marker is an absolutive form (*in* in (3b)). In both local configurations the inverse marker appears before the 1st person marker, as seen in (3).

(3) *Huastec local configurations (Zavala 2007:277)*

- a. ne'etz beel **t-u** tolm-iy
FUT anyway INV-1SG.ERG help-TT
'I am going to help you.'
- b. xoo' **t-in** bal-iy al an kw'atzib
now INV-1SG.ABS take.in-TT LOC DEF nixcón
'Now you put me inside the nixcón (cooked corn).'

Considering Huastec person marking patterns, we see a parallel to the strong PCC. In strong PCC languages, the DO must be 3rd person. In Huastec monotransitives, the object must be 3rd person; otherwise, inverse marking must be used. To further draw out this parallel, we can abstract away from which two arguments are involved in the restrictions – IO and DO in the PCC and subject and object in inverse marking – and instead focus on restrictions

¹In the Huastec examples given here, I use glossing conventions adapted from Zavala 2007.

²I use the convention # → # to indicate the person of the subject and (primary) object, with the first number indicating the person of the subject and the second number indicating the person of the object.

between higher arguments (IO/subject) and lower arguments (DO/object). In both Huastec and strong PCC languages like Greek, configurations where the lower argument is 3rd person are allowed with no further complications. However, when the lower argument is a SAP, an issue arises. In Greek a tonic pronoun must be used instead of a structure with two clitics, and in Huastec inverse marking must be used.

2.2 A parallel to the weak PCC

The second inverse marking language we will consider is Picurís (Tanoan; USA). The discussion is based on Klaiman 1993 and the overview offered in Zavala 2007. Transitive verbs in Picurís appear with one person marker. There are three sets of person prefixes relevant for the current discussion. Set I is used for intransitive subjects or objects and Set IIA is used for transitive subjects when both arguments are animate. Finally, there is a set of portmanteau prefixes used only in local configurations. In some parts of the paradigm, verbs can also be marked with the suffix *-mia*, which Klaiman argues is an inverse marker.

In direct configurations in Picurís, the SAP subject is indexed with a Set IIA prefix on the verb (*ti-* 1SG in (4a)). The 3rd person object is not indexed on the verb and no inverse marking appears. In inverse contexts, the SAP object is indexed on the verb with a Set I prefix (*ta-* 1SG in (4b)) and the inverse suffix *-mia* appears. Additionally, the 3rd person subject is marked with an oblique marker.³ These two configurations are illustrated in (4).

(4) *Picurís direct and inverse configurations (Klaiman 1993:357)*

- | | |
|---|--|
| <p>a. Səneŋe ti-mɔŋ-’ən
 man 1SG.IIA-see-PST
 ‘I saw the man.’</p> | <p>b. Ta-mɔŋ-mia-’ən sənene-pa
 1SG.I-see-INV-PST man-OBL
 ‘The man saw me.’</p> |
|---|--|

In local contexts, a special set of portmanteau person markers that indicate the person of both subject and object is used and the inverse marker does not appear, as seen in (5).

(5) *Picurís local configurations (Klaiman 1993:358)*

- | | |
|--|--|
| <p>a. (Nə) ’a-mɔŋ-’ən
 (I) 1>2-see-PST
 ‘I saw you.’</p> | <p>b. (’e) may-mɔŋ-’ən
 (you) 2>1-see-PST
 ‘You saw me.’</p> |
|--|--|

In Picurís it is only in combinations of SAP and 3rd person where the SAP is the lower argument that inverse marking appears. This is reminiscent of the weak PCC seen, for example, in Catalan dialects. In weak PCC languages, if there is a 3rd person object, then the DO must be 3rd person. Similarly, we could say for Picurís that if there is a 3rd person argument, then the object must be 3rd person; otherwise, inverse marking must be used.

³Klaiman (1993) argues against previous analyses of this construction as being a passive. Some of her argument is based on morphological parallels between Picurís and other Tanoan languages. However, one important thing to note internal to Picurís is that the type of inverse construction seen in (4b) is only available with 3rd person subjects. SAP subjects are not possible in this construction, which is unexpected on a passive analysis but is predicted under an inverse analysis.

2.3 A parallel to the strictly descending PCC

The next inverse system that we will discuss is that of Ja'a Kumiai (Yuman; Mexico). The discussion here is based on the description of this variety by Caballero and Cheng (2020). The person of the subject and object can be indexed on the verb with a set of prefixes. Typically only one argument is indexed via a verbal prefix with the exception to this being in local contexts: 2→1 configurations allow two person prefixes with one indexing the subject and another the object, and 1→2 configurations use a portmanteau prefix to indicate this specific person combination. In addition to the person prefixes, there is also an inverse marker ?- that surfaces as a prefix between the person prefix(es) and the root.

In direct configurations in Ja'a Kumiai, the SAP subject is indexed on the verb (*m-* 2nd person in (6a)). In inverse configurations, the SAP object is indexed on the verb (again *m-* 2nd person in (6b)). In addition to the prefix indexing the object, the inverse marker ?- is also prefixed on the verb. These patterns are illustrated in (6).⁴

(6) *Ja'a Kumiai direct and inverse configurations (Caballero and Cheng 2020:37)*

- | | |
|---|---|
| a. m-ijɪ
2-give
'You give it to him/her.' | b. m-?-ijɪ
2-INV-give
'S/he gives it to you.' |
|---|---|

In local configurations we observe a split. In 1→2 configurations, the portmanteau prefix *ɲ-*, which indicates this combination of subject and object, is the sole person prefix that appears on the verb, as demonstrated in (7a). No inverse marking appears. In 2→1 configurations, both arguments are indexed with prefixes on the verb and the inverse marker appears as well. This is shown in (7b).

(7) *Ja'a Kumiai local configurations (Caballero and Cheng 2020:37)*

- | | |
|---|--|
| a. ɲ-ijɪ
1>2-give
'I give it to you.' | b. ɲ-m-?-ijɪ
1.OBJ-2-INV-give
'You give it to me.' |
|---|--|

The inverse marking patterns seen in Ja'a Kumiai are parallel to a third PCC pattern: the strictly descending PCC. Recall that the strictly descending PCC rules out combinations of objects where the DO outranks the IO on the person hierarchy 1>2>3. Ja'a Kumiai displays inverse marking in configurations where the object outranks the subject on this same hierarchy. Therefore, once again, if we generalize and think of this in terms of syntactically higher and lower arguments, both PCC languages like Classical Arabic and inverse marking languages like Ja'a Kumiai restrict configurations where the syntactically lower argument outranks the syntactically higher argument on the hierarchy 1>2>3.

⁴Caballero and Cheng (2020) present the Ja'a Kumiai agreement paradigm using the verb 'give' for phonotactic reasons. They vary the subject and IO while using a 3rd person inanimate DO. In this configuration, the prefixes track the subject and IO. The authors note that the monotransitive agreement paradigm is the same, with the prefixes tracking subject and DO.

2.4 A possible parallel to the me-first PCC

The final PCC pattern to be considered is the me-first PCC. While I am unaware of any currently spoken language variety that displays a parallel pattern of inverse marking, this pattern appears to be attested in the earliest documentation of Nez Perce (Sahaptian; USA). The discussion that follows draws on Deal 2014 and Deal 2015c with the relevant data drawn from Hale 1846. The Nez Perce verbal agreement system is complex and both subject and object can be indexed on the verb by a series of prefixes and suffixes. In addition to agreement markers, of interest to us here is a suffix *-m* that has been termed the cislocative (Rude 1985:49) due to its function of indicating location near or movement toward the speaker. Deal argues that this marker has taken on an additional function as part of the verbal agreement system which she notes might be understood as a type of inverse marker (see also Rude 1985:144–146). Across doculects of Nez Perce, there is considerable variation found in the inverse use of the cislocative. Of interest to us in the pattern reported in Hale 1846 where the cislocative appears in all forms with a 1st person object.

In the data from Hale 1846, direct configurations do not obligatorily appear with the cislocative, with the cislocative seemingly retaining its spatial meaning. In inverse configurations we see a split. With 2nd person objects, the cislocative is also not obligatory. However, in 3→1 configurations, only forms with the cislocative are given, with the cells in the paradigm lacking the cislocative remaining empty. This seemingly obligatory presence of the cislocative is suggestive of a function as part of the verbal person marking system in these cells, where *-m* is as an inverse marker triggered by the presence of a 1st person object. Examples of direct and inverse configurations are given in (8).⁵

(8) *Nez Perce direct and inverse configurations (Hale 1846:558)*

- a. im a {a-k-sa-m / a-ki-sa} ip-na
 2SG 2SG.CL 3.OBJ-see-IPFV-CIS / 3.OBJ-see-IPFV 3SG-ACC
 ‘thou seest him’ (direction towards / direction from)
- b. ip-nim a {ha-k-sa-m / ha-ki-sa} im-ana
 3SG-ERG 2SG.CL 3.SBJ-see-IPFV-CIS / 3.SBJ-see-IPFV 2SG-ACC
 ‘he sees thee’ (direction towards / direction from)
- c. ip-nim ha-k-sa-**m** in-a
 3SG-ERG 3.SBJ-see-IPFV-INV 1SG-ACC
 ‘he sees me’ (labeled direction towards, no direction from form attested)

In local contexts we also observe a split. In 1→2 configurations, the cislocative does not appear, while in 2→1 configurations, forms without the cislocative are unattested, suggesting that it has an inverse marking role in these paradigm cells. This is shown in (9).⁶

⁵Orthographic conventions and translations for the Nez Perce examples are taken from Hale 1846, which provides no morphological segmentation or glossing. Segmentation and glossing are based on comparison with other sources on Nez Perce. I gloss the inverse uses of the cislocative as INV and spatial uses as CIS.

⁶The verbs given in (8b) and (8c) look the same as the forms in (9), but I have glossed them differently. Given the verbal agreement system of Nez Perce, the forms in (8b) and (8c) should bear the 3rd person subject

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(9) *Nez Perce local configurations (Hale 1846:558)*

- a. in a haki-sa im-ana
 1SG 2SG.CL see-IPFV 2SG-ACC
 ‘I see thee’ (labeled direction from, no direction towards form attested)
- b. im a hak-sa-**m** in-a
 2SG 2SG.CL see-IPFV-INV 1SG-ACC
 ‘thou seest me’ (labeled direction towards, no direction from form attested)

To summarize, whenever the object is 1st person, the cislocative, which seems to function as an inverse marker, appears on the verb. This type of pattern parallels the me-first PCC pattern seen in languages like Romanian. In both types of languages, if there is a 1st person, then the syntactically higher argument (either the subject or the IO) must be 1st person.

2.5 Summary of inverse marking parallels to the PCC

We have seen evidence that the same four types of person hierarchy effects attested in PCC languages can also be found in the domain of inverse marking, as summarized in (10).

(10) *Parallels between PCC and inverse marking patterns*

IO/S	DO/O	Strong PCC	Weak PCC	Strictly desc. PCC	Me-first PCC
		Huastec Inv.	Picurís Inv.	Ja’a Kumiai Inv.	Nez Perce Inv.
1	3	✓	✓	✓	✓
1	2	* / INV	✓	✓	✓
2	3	✓	✓	✓	✓
2	1	* / INV	✓	* / INV	* / INV
3	1	* / INV	* / INV	* / INV	* / INV
3	2	* / INV	* / INV	* / INV	✓

The parallels between PCC and inverse patterns suggest that the two phenomena may be due to the same type of underlying mechanism, and I argue for a unified account of them. Of course there are obvious differences between the two types of patterns. In the PCC, person restrictions arise between IO and DO. In inverse configurations, person restrictions arise between subject and primary object. Additionally, while it is common to think of PCC violations as involving true restrictions on certain combinations of persons it is perhaps less straightforward to think of inverse marking in these terms. Inverse marking has instead often been framed as providing additional information about the grammatical function of arguments. However, I argue that what is different between PCC languages and inverse

prefix, while the forms in (9) should not bear any prefixes. The orthographic representation of these forms in Hale 1846 is likely misleading since, in this source, vowel length is not indicated. For modern speakers of Nez Perce, when the 3rd person subject prefix *hi-* is added to the root *heki* ‘see’, this results in a long vowel in the first syllable of the word, which is not seen in the unprefix form. This results in the modern forms *he-ekt-ce* ‘3SUBJ-see-IPFV’ and *hekt-ce* ‘see-IPFV’ differing only in vowel length (Amy Rose Deal, p.c.). A reasonable hypothesis is that the forms reported by Hale also differed in vowel length.

marking languages is not the nature of the person restrictions in place but is rather the nature of the repair strategies that are available. I argue that inverse languages restrict subject-object combinations in the same way that PCC languages restrict IO-DO combinations but that inverse marking represents a possible repair to a disallowed person combination. PCC languages often exhibit repair strategies as well, such as expressing the IO in a PP. While the various repairs available in PCC languages are not a focus of this paper, I return to one repair strategy that parallels the repair found in inverse languages in §4.

3. An interaction and satisfaction account of inverse marking

To account for the parallels between the PCC and inverse marking, I adopt Deal's (2021) analysis of the PCC, and I demonstrate that it can be easily extended to account for inverse marking. One difference between the PCC and inverse marking is the arguments that are involved. I argue that this falls out from the location of the relevant agreement probe in the two types of languages. I propose that the second major difference between the PCC and inverse marking lies in the nature of the repair strategy used with person combinations that are ruled out. I argue, following Béjar and Rezac (2009), that inverse marking is a type of repair that involves an added probe that agrees with the subject. By combining an added probe analysis of inverse marking with Deal's (2021) model that can derive all four PCC varieties, the full range of parallel inverse marking patterns can be accounted for.

Deal's analysis of the PCC uses an interaction and satisfaction model of Agree (Deal 2015a). Under this approach, probes are specified with two types of conditions. Interaction conditions specify the set of features that a probe is able to copy. Satisfaction conditions specify which features cause a probe to halt its search. Following Deal (2021), I represent these conditions on a probe as $[INT:\phi, SAT:\phi]$. These two conditions are independent, which allows a probe to interact with a goal with features that meet its interaction conditions even if that goal will not satisfy the probe. An unsatisfied probe can then probe additional goals until it is satisfied or exhausts its search domain.

To account for the PCC, Deal (2021) assumes that a single probe must agree first with the DO and then the IO. One way of achieving this is to assume that the probe is located on v , above both objects, but that the DO consistently moves to a position above the IO.⁷ Thus when the probe on v probes downward into its c-command domain, it first encounters the DO and then later encounters the IO if it remains unsatisfied after interacting with the DO. If the probe is satisfied by the DO it does not agree with the IO, which makes a structure with two object clitics or two object agreement markers impossible.

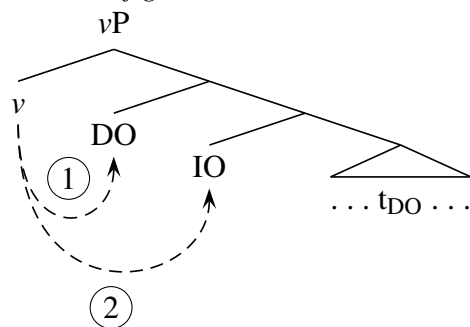
To derive parallel patterns in inverse marking, we need a configuration where the relevant probe first encounters the object and then the subject. I assume a probe on the head that introduces the external argument, which I label Voice. The probe first probes its c-command domain and agrees with the internal argument. If the probe is satisfied by the

⁷Another option is to assume that the probe is located on an Appl head between the base positions of the DO and IO. The probe could then probe down to agree with the DO and later probe the IO in its specifier through cyclic expansion (Béjar and Rezac 2009). As Deal (2021) notes, reverse PCC patterns (Stegovec 2020, Driemel et al. 2020) cannot be accounted for with this structure. I discuss a reverse PCC pattern in §4, so I consider only the structure compatible with reverse PCCs for reasons of space.

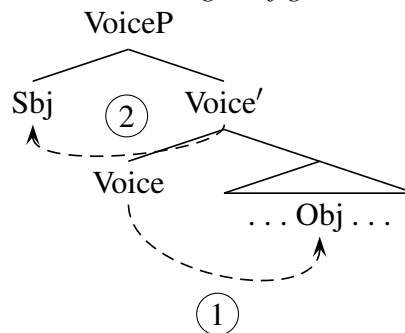
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object, it is unable to subsequently agree with the subject. If the probe remains unsatisfied, it then reprojects to the intermediate projection level, cyclically expanding the search domain of the probe (Rezac 2003, Béjar and Rezac 2009). From this position, the probe c-commands the specifier of VoiceP and is able to probe the external argument. The probing configurations for the PCC and inverse marking are schematized in (11) and (12).

(11) *PCC configuration*



(12) *Inverse marking configuration*



These structures allow us to derive the parallels between the PCC and the person restrictions seen in inverse marking languages. Just as the features of the DO in PCC languages determine whether agreement with the IO is possible, likewise the features of the object in inverse marking languages determine whether agreement with the subject is possible.

I propose that the second major difference between PCC languages and inverse languages is the nature of the repair strategies used with illicit person combinations. In PCC languages, there are a variety of attested repair strategies (Bonet 2008, Rezac 2009, a.o.), such as introducing the IO in a PP rather than using a clitic. I argue that inverse marking is also a type of repair strategy used when the relevant probe cannot agree with both relevant arguments. Specifically, following Béjar and Rezac (2009), I assume that the inverse marker is a morphological indication of the addition of an extra probe. This added probe is located on Voice and must be present to result in subject agreement when the features of the object prevent the regular probe on Voice from agreeing with the subject. For concreteness, I follow Béjar and Rezac (2009) in assuming that this probe is added on the intermediate projection after the original probe agrees on the first cycle of agreement with the internal argument. I also follow them in assuming that the derivation will not converge if this probe is added in configurations where the original probe is still able to enter into an Agree relation with the external argument. With these assumptions in place, we can see how this technology can be leveraged to account for the four parallel PCC and inverse patterns.

First, consider the strong PCC and the parallel Potosino Huastec inverse pattern. In strong PCC languages, the DO must be 3rd person. Deal (2021) assumes that the probe on *v* in these languages has the specifications [INT: ϕ , SAT:PART]. This means that the probe can interact with any goal that has ϕ -features and will halt its search upon copying features from a SAP. If the DO is 3rd person, it does not satisfy the probe and the probe is able to continue searching past the DO to also agree with the IO. If the DO is a SAP, the probe is satisfied and does not continue to search. Because the probe never agrees with the IO, a structure where the IO appears as a clitic or agreement affix is unable to be generated, ruling out those configurations and resulting in the observed strong PCC pattern.

In Huastec, inverse marking is required whenever the object is a SAP. This can be captured using the same [INT: ϕ ,SAT:PART] specifications for a probe on Voice. In direct contexts, the probe agrees with the 3rd person object and then reprojects to agree with the SAP subject. At spell out the agreement marker that corresponds to the argument highest on the hierarchy 1>2>3 is inserted since it matches the greatest number of features on the probe. In inverse and local contexts, the probe on Voice agrees with the SAP object and is satisfied because of its [PART] feature. An extra probe is added when Voice reprojects, and this probe agrees with the subject. When the structure is spelled out, the added probe results in the insertion of the inverse marker in addition to an agreement marker.

Next, consider the weak PCC and the parallel Picurís inverse pattern. For the weak PCC, if there is a 3rd person object, then the DO must be 3rd person. Deal (2021) accounts for this pattern by leveraging two additional notions on top of the general interaction and satisfaction framework. The first is probe insatiability (Deal 2015b, Clem 2021). If a probe has no specified satisfaction conditions ([INT: ϕ ,SAT:-]), it interacts with all possible goals in its c-command domain, only halting its search once it exhausts its search domain. The second piece of necessary technology, introduced by Deal (2021), is dynamic interaction. Dynamic interaction refers to the idea that a probe's interaction conditions need not be fixed for the entirety of the derivation. Instead, when a probe copies back certain features from a goal, it may copy those features into its interaction condition, thus affecting what types of goals it may copy features from on subsequent instances of Agree. Not all features interact dynamically in this way, and which features do is a language-specific matter. Deal (2021) uses the notation \uparrow to indicate features that interact dynamically. For weak PCC languages, Deal assumes an insatiable probe on v with dynamically interacting [PART] \uparrow . If the DO is 3rd person, the specifications of the probe are not altered and it continues to probe the IO. However, if the DO is a SAP, it has the feature [PART] \uparrow and this is copied into the interaction condition of the probe, resulting in the probe specification [INT:PART,SAT:-]. This means that the probe is then only able to agree with the IO if the IO is also a SAP. This causes configurations with two SAP objects to be grammatical, but rules out configurations where the DO is a SAP and the IO is a 3rd person, resulting in the weak PCC pattern.

In Picurís, the inverse marker is found when the subject is 3rd person and the object is a SAP, which can be modeled with the same assumptions as the weak PCC. In direct contexts, Voice's probe agrees with the object and then with the subject. In local contexts, the probe on Voice agrees with the SAP object, which bears the feature [PART] \uparrow . Because of dynamic interaction of this feature, the interaction condition of the probe is narrowed, allowing the probe to only agree with other SAP arguments on subsequent cycles of Agree. Since the subject is also a SAP it is able to interact with the original probe on Voice. In inverse contexts, the interaction condition of the probe on Voice is once again narrowed after agreement with the object due to the feature [PART] \uparrow . Because the subject in inverse configurations is 3rd person, it is unable to be a goal for Agree for this probe. Instead, a probe is added to Voice to agree with the subject. The presence of the added probe results in the insertion of the inverse marker in addition to an agreement marker.⁸

⁸In Picurís the subject is marked with oblique case in inverse contexts. Because these are the instances where the subject agrees with an added probe on Voice rather than with the original probe on Voice, we could

Parallels between inverse marking and the PCC

We now turn to the strictly descending PCC and the parallel Ja'a Kumiai inverse marking. For strictly descending PCC languages, the IO must outrank the DO on the person hierarchy $1 > 2 > 3$. To account for this, Deal (2021) assumes dynamic interaction of $[\text{PART}]^\uparrow$ and a probe on v that is satisfied by 1st person goals: $[\text{INT}:\phi, \text{SAT}:\text{SPKR}]$. If the probe encounters a 3rd person DO, its interaction conditions are not altered, nor is it satisfied. This allows it to continue to probe the IO. If the probe encounters a 2nd person DO, its interaction conditions are changed, resulting in the specifications $[\text{INT}:\text{PART}, \text{SAT}:\text{SPKR}]$. Thus if the IO is 1st person, the probe is able to agree with it, but if it is 3rd person no agreement is possible. Finally, if the probe encounters a 1st person DO it is satisfied and cannot probe the IO, regardless of its feature specifications. This results in the desired strictly descending pattern where a 3rd person DO allows any person as the IO, a 2nd person DO allows only a 1st person IO, and a 1st person DO is unable to occur with an agreeing IO.

Recall that the inverse marker in Ja'a Kumiai is used whenever the object outranks the subject on the hierarchy $1 > 2 > 3$. This can be captured under the same assumptions as the strictly descending PCC. In direct contexts, the probe on Voice agrees with the 3rd person object and then the SAP subject. In $1 \rightarrow 2$ configurations, the interaction condition of the probe is narrowed due to the feature $[\text{PART}]^\uparrow$ on the object. Agreement with the 1st person subject is still possible. In inverse $3 \rightarrow 2$ contexts $[\text{PART}]^\uparrow$ is again copied into the interaction condition of the probe, and this prevents it from agreeing with the 3rd person subject. In $2 \rightarrow 1$ and $3 \rightarrow 1$ contexts, the probe is satisfied and cannot agree with the subject. In all three of these cases, an added probe is necessary in order for there to be agreement with the subject. At spell out, this added probe results in the insertion of the inverse marker.

The final PCC pattern to consider is the me-first PCC, along with the parallel Nez Perce inverse marking pattern. For me-first PCC languages, if there is a 1st person object, it must be the IO. Deal (2021) accounts for this pattern by assuming a probe on v that is satisfied by 1st person: $[\text{INT}:\phi, \text{SAT}:\text{SPKR}]$. If the probe encounters a 1st person DO, it is satisfied and is unable to probe the IO. However, if the probe encounters any other DO, then it is able to also agree with the IO. This results in the me-first pattern where the only combinations of DO and IO that are ruled out are ones where the DO is 1st person.

The inverse marking use of the Nez Perce cislocative in Hale 1846 parallels the me-first PCC pattern and can be analyzed by assuming a probe that is satisfied by $[\text{SPKR}]$. In direct contexts, the probe on Voice agrees with both arguments. In inverse and local contexts, there is a split. When the object is 2nd person, the probe on Voice agrees with both arguments. However, when the object is 1st person, the probe on Voice is satisfied, ruling out agreement with the subject without an added probe. The addition of this probe results in the insertion of the cislocative, constituting an inverse marking use of the cislocative.

We have now seen that the four patterns of inverse marking observed in §2 can be derived by assuming the same probe specifications and dynamically interacting features as Deal (2021) assumes to account for the four parallel PCC patterns. By locating the probe on Voice between the object and subject, we can account for the fact that the person

model this by assuming that the added probe assigns a different case than what is typically assigned by Voice. Béjar and Rezac (2009) note that oblique case assignment can be found in inverse contexts. However, they only consider oblique case on internal arguments. This pattern is different than the one observed in Picurís, but it provides a precedent for the idea that the addition of a probe can disrupt typical case assignment.

restriction in inverse languages holds between these two arguments rather than between two objects in a ditransitive. Further, by assuming, following Béjar and Rezac (2009), that the inverse marker functions as a repair indicating the addition of a probe to agree with the subject, we can account for the distribution of this marker across the four languages. While this account makes use of Béjar and Rezac's added probe approach to inverse marking, the interaction and satisfaction model of Agree adopted here is more empirically adequate than Béjar and Rezac's articulated probing approach, which can only capture strong and strictly descending patterns.

4. Exploring the predicted typology of hierarchy effects

In the analysis of inverse marking patterns we have seen two differences between inverse marking and the PCC. The first is the height of the probe and the second is the availability of a repair strategy involving an added probe. These two differences are logically separable. Therefore, the prediction is that these two factors should be able to come apart, resulting in two additional types of systems that have not yet been discussed here. In the first type of predicted system, there would be a high probe on Voice but without the possibility of an added probe as a repair. This would yield a monotransitive person restriction without inverse marking. In the second type of predicted system, a low probe on v with the possibility of an added probe repair would yield a pattern that looked like inverse marking sensitive to the two objects in a ditransitive. Both of these predictions are borne out.

In Tupinambá (Tupí-Guaraní; Brazil), when the subject outranks the object on the hierarchy $1 > 2 > 3$, both the subject and object are indexed on the verb. However, when the object outranks the subject, only object agreement appears.⁹ This is a strictly descending person restriction. This could be modeled, as suggested by Deal (2021), with a probe that is satisfied by [SPKR] and with dynamic interaction of [PART][↑]. As in inverse marking languages, this probe would be located on Voice. In Tupinambá, when the probe is unable to agree with the subject, the result is simply a lack of subject agreement. No repair strategy is used. Thus it is possible to have a language with a person restriction due to a higher probe on Voice but without the repair strategy of an added probe.

The next case we will consider is essentially the reverse: a lower probe on v , but an added probe repair strategy. Driemel et al. (2020) discuss this type of configuration in Shapsug Adyghe (Northwest Caucasian; Russia and Turkey), where the cislocative has an inverse marking function. Interestingly, the cislocative is not restricted to monotransitives but can also appear in ditransitives when the IO outranks the DO on the hierarchy $1 > 2 > 3$. If the distribution of the cislocative is taken to indicate restricted person combinations, this pattern constitutes a reverse PCC effect (Stegovec 2020), and specifically a reverse strictly descending pattern. In Adyghe, the restricted combination of person markers is allowed to surface so long as the cislocative is also present. Driemel et al. (2020) assume that the cislocative is a repair that appears when the probe on v would otherwise not be able to agree with the DO. This is very similar to the type of assumption I have made for inverse markers here. If there is no shift of the DO above the IO in Adyghe, the probe on v will encounter

⁹Examples illustrating all relevant points can be found in Jensen 1990:121–122.

the IO first, yielding the observed reverse PCC pattern (Deal 2021, Driemel et al. 2020). If the probe is unable to subsequently agree with the DO due to satisfaction or dynamic interaction, a probe is added to v and this added probe agrees with the DO and results in the insertion of the cislocative. Thus, this use of the cislocative receives the same treatment as inverse marking with the only difference being the height of the probe.

This discussion illustrates that all four of the predicted combinations of probe height and added probe repair are attested, lending support to the general insight that these two factors are at play in deriving the distinction between PCC systems and inverse systems. Further, Deal's (2021) model of the PCC can be extended to account for all four of these types of person hierarchy systems as well as all four varieties of the PCC and inverse marking considered here. This strengthens the argument in favor of adopting an interaction and satisfaction model of these person hierarchy effects.

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