Past Participles in Mòcheno: allomorphy, alignment and the distribution of obstruents[1]
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Abstract

Mòcheno, a German variety spoken in Trentino (Italy), displays an interesting case of phonologically conditioned suppletive allomorphy in past participle formation. Past participle formation involves a variety of strategies, from absence of a prefix, to affrication, to prefixing a CV-prefix *ga-*. I propose that two allomorphs are involved in the process, a subsegment [-cont, -voice] and a prefix *ga-* and that the distribution of the two allomorphs is regulated by a hierarchy of wellformedness constraints. This hierarchy in turn consists of two independent partial hierarchies, which are active in the grammar of the language in general, where they are responsible for morphoprosodic alignment at left stem edges and for the distribution of obstruents, respectively. This means that Mòcheno past participles give us evidence in favor of the hypothesis that allomorph selection can, and sometimes must, be interpreted in terms of optimization. By adopting an alternative analysis in terms of subcategorization of the allomorphs for a certain phonological context, the relationship between the distribution of past participle allomorphs and other pieces of the Mòcheno grammar would remain completely opaque.

1. Preliminaries

Mòcheno (or, in German, *Fersentalerisch*) is a Southern Bavarian variety spoken in the speech island Bersntol (Italian: *val dei Mòcheni*, German: *Fersental*) in Trentino, Italy. The speech island is the result of the colonization of the val dei Mòcheni by Tyrolean and Bavarian farmers during the 13th century. It is unclear how many speakers the language currently has.[2]

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[2] The linguistic census carried out by the Autonomous Province of Trento in 2001 reports that 2.278 people declared their affiliation to the Mòcheno minority (Annuario Statistico 2006). It is highly unlikely that this number

Mòcheno, its history, sociolinguistic situation and its structure, has been described in much detail in numerous publications by Anthony Rowley (cf. especially Rowley 1982, 1986, 2003).

In this paper I will describe and analyze the formation of past participles in Mòcheno. I will assume that past participles are formed by prefixing one of two allomorphs to the verbal stem. Specifically, I propose that an allomorph [-cont, -voice] is prefixed to verbal stems beginning with a voiceless stop or a labial or coronal fricative while an allomorph *ga-* is prefixed in all other contexts:

(1) a. Allomorph [-cont, -voice]:
    viern →pfiert   'to conduct, conducted'

    b. Allomorph [ga]:
    rɛarn → garɛart   'to cry, cried'

The principles of allomorph selection have been the topic of much debate in the recent phonological literature (cf., among others, Lapointe 2001, Bye 2007, Paster 2006, Mascaró 2007, Wolf 2008 for discussion, Nevins, to appear, for a comprehensive overview). Specifically, it has been discussed to what degree phonologically conditioned allomorphs are selected by phonological markedness constraints. Analyses have been proposed which assume explicitly or implicitly that phonologically conditioned allomorphy is to a large extent regulated by phonological markedness constraints favoring the optimization of structures (for this position see among others McCarthy and Prince 1993b, Mester 1994, Drachman, Kager and Malikouti-

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reflects the number of speakers of Mòcheno, since Mòcheno is spoken - except for single individuals - only in the three municipalities of Palai/Palù del Fersina, Vlarotz/Fierozzo and Garait/Frassilongo (which includes also Oachlait/Roveda). The number of people who declared their affiliation to the Mòcheno comunity in these municipalities amounts to 947 and represents 95,4% of the population. However, even this number cannot correspond to the actual number of speakers, since for the villages of Garait/Frassilongo and Vlarotz/Fierozzo Rowley (1986) describes a language situation where few families (Garait) or at most half of the families (Vlarotz) still speak Mòcheno. The high percentages resulting in the census could reflect at most the number of speakers in the villages of Palai/Palù del Fersina and Oachlait/Roveda, in which, according to Rowley (1986), most families still speak Mòcheno. If we assume a percentage of 50% speakers in Garait-Oachlait (who figure as a single municipality in the statistics) and Vlarotz and 95,4% speakers for Palai, we arrive at the hypothetical number of 583 Mòcheno speakers (s. also the discussion in the local journal *Lem,* 27. Nov. 2002, 29. Sept. 2003, 30. Dec. 2003).

Drachman 1996, Kager 1996, Mascaró 1996, Tranel 1996, Plag 1999, Rubach and Booij 2001, Wolf 2008). Under this assumption, the best of two or more allomorphs will be selected, where phonological markedness conditions determine what is 'best' in a certain context and language. Other investigators have followed a more cautious approach, proposing that while optimization may play a prominent role in allomorph selection, at least in some cases of phonologically conditioned allomorphy the distribution of the allomorphs is due to subcategorization of the allomorphs for a specific phonological context (Lapointe 2001, Mascaró 2007, Bonet, Lloret and Mascaró 2007). More radically, Paster 2006 and Bye 2007 propose that all phonologically conditioned allomorphy should be described through subcategorization of the allomorph for a phonological context.

For the phenomenon under scrutiny in this paper, under the optimization approach we expect the distribution of [-cont, -voice] and *ga-* in Mòcheno past participles to create structures which are phonologically unmarked, in some sense. Under the subcategorization approach, on the other hand, we will have to mark each allomorph as being selected for a specific phonological context.

The contribution of the present paper to the debate about what determines allomorph selection is to show that (i) it is possible to analyze the process of past participle formation in Mòcheno as a process through which unmarked structures arise (ii) it is desirable to analyze the process as a process of optimization since the constraint hierarchy responsible for allomorph selection subsumes two partial constraint hierarchies which are active in the language as a whole. I will therefore conclude that although there might be cases of phonologically conditioned allomorphy which (still) resist an interpretation in terms of optimization there are other cases where optimization is the most plausible analysis.

In this paper, past participle formation in Mòcheno will be analyzed as driven by markedness, since the choice between the two allomorphs [-cont, -voice] and *ga-* is shown to be triggered to a large extent by the markedness constraint *[+VOICE], favoring the voiceless allomorph [-cont, -voice], and by an alignment constraint, ALIGN (STEM, L, SYLL, L), favoring the morpho-prosodic alignment of left stem edges with syllable boundaries.

In addition to these two constraints, the partial hierarchy dermining the distribution of voiced and voiceless fricatives in Mòcheno conditions the choice of the allmorph in the remaining contexts.

The paper is structured as follows. In section 2 an overview of the pattern of past participle formation in Mòcheno is given. In section 3 I argue for the existence of two past participle allomorphs and identify them as a floating subsegment [-cont, -voice] and a prefix *ga-*. In section 4 I discuss alignment between left stem boundaries and syllable boundaries in Standard German and in Mòcheno, and its significance for past participle formation. In section 5 the distribution of obstruents in Mòcheno is analyzed and a ranking deriving it is established. In section 6, which contains the analysis

proper, I analyze the single contexts of past participle formation and determine the constraint rankings that are relevant for the choice of the allomorphs in each context.

2. Past participle formation in Mòcheno

The regularities of past participle formation in Mòcheno are exhaustively described in Rowley 1986, 2003. Andreolli 2004-05 has elicited an additional number of past participles with respect to those mentioned by Rowley, arriving at the same set of regularities. I have double checked Rowley's and Andreolli's results by eliciting 68 past participle forms from two speakers, one from Palai (Palù del Fersina) and one from Vlarotz (Fierozzo). The regularities which emerge from these sources are consistent among each other and can be summarized as follows.[3]

The past participle in Mòcheno is formed by adding to the verbal root the suffixes *-(ə)t*[4] (for so called 'weak', regular verbs, cf. a. and c. below) or *-(ə)n* (for so called 'strong', irregular verbs, cf. b. below). In strong verbs, the quality of the root vowel may change, in accordance to historical *Ablaut* (b. below). In addition to the suffix and Ablaut, in certain phonologically conditioned contexts a prefix is added, which can be either realized as *ga-* (a. and b.) or take the form of an affricate by forming a complex segment with a root-initial fricative (c.):

(2) infinitive   past participle
     a. bis-n   ga-bis-t   'to know'
     b. nɛm-ən   ga-nom-ən   'to take'
     c. vier-n   p-fier-t   'to conduct

This paper focuses on the context in which past participle prefixes are realized as well as on the form they assume. The distribution of the past participle suffixes *-(ə)t* and *-(ə)n* is unpredictable and will be ignored from now on.

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[3] See Cognola, in press, for a discussion of the semantics of *ga-* prefixed verbs and deverbal nouns in Mòcheno. While the realization of the prefix is governed by phonological constraints in past participle formation, its realization in deverbal nouns seems to be sensitive to the semantics of the base nouns, as argued by Cognola.

[4] The suffix can take the form of *-ɐt* or *-ɐn* in the variety of Palai. The *-(ə)n* suffix of strong verbs is not realized when the verbs end in a nasal (cf. *ʃloːŋ* → *tʃloːŋ* 'beat' and *ʃtɛrm* → *(t)ʃtourm* 'die' in (4)).

The presence of a prefix depends, among other things, on the location of stress in the verbal root. As in Standard German, the prefix must be attached to a stressed syllable. It is never realized in verbal roots that do not bear initial stress, as in the following examples (cf. Rowley 1986: 239):

(3) infinitive   past participle
   a. kontá:rn   kontá:rt   'to tell'
   b. vargésn   vargésn   'to forget'

Besides stress, the quality of the initial segment of the verbal root conditions the absence or presence of a prefix as well as its realization as *ga-* or as an affricate.

As illustrated in the table below, the prefix *ga-* is never realized when the root begins with a voiceless stop. When the first segment of the root is a labial [v], alveolar [z] or palatoalveolar [ʃ] fricative, the past participle is formed by changing the initial segment into the corresponding voiceless affricates [pf], [ts] and [tʃ].[5] When roots begin with a sibilant-stop cluster, the sibilant is always realized as [ś] (described by Rowley 1986 as a postalveolar fricative)[6] before voiceless stops (e.g. *śpi:ln,* 'to play'), and as [ʃ] before sonorants (e.g. *ʃnain, tʃni:tn*, 'to cut, cut past part.', Rowley 1982). Verbs with root-initial sibilant-stop clusters form their past participles either by creating an initial affricate (similarly to roots where the first segment is a simple labial or a coronal fricative) or without a prefix. There is variation among speakers regarding these two strategies and even the same speaker might apply one strategy to one verb and the other strategy to another or might accept both possibilities for the same verb. In the analysis below I will treat sibilant-stop verbs in the same way as roots with a single initial fricative (hence forming the past participle through affrication) and will abstract away from the possibility of not realizing the prefix at all, a possibility I will attribute to cluster simplification.

The prefix *ga-* is always realized when the root begins with a voiced stop, the voiceless glottal fricative [h] or a sonorant.

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[5] Syllable-initial labial and alveolar fricatives are always realized as voiced [v] and [z] and the palatoalveolar fricative [ʃ] is voiceless in this context, in the native Mòcheno lexicon (cf. Rowley 1986 and discussion in section 4 of this paper).

[6] Rowley distinguishes between postalveolar [ś] and palatoalveolar [ʃ]. Postalveolar [ś] can be considered an allophone of [ʃ] in the variety of Palai, but syllable finally still participates in phonemic contrast in the variety of Vlarotz (cf. Rowley 1986 for details).

The following table summarizes the regularities of past participles and gives examples for each phonological context. The examples are transcriptions of verbs I elicited from one speaker of the variety of Vlarotz, but except minor details, are identical to those elicited for the variety of Palai.[7] They confirm the regularities already described in Rowley 1986, 2003 and Andreolli 2004-2005.

(4)   Mòcheno past participle formation

past participle formation	first segment of verbal root	infinitive	past participle	gloss
∅	voiceless stop	paizn tondərn krɒtsn	pisn tondərt krɒtst	'to bite' 'to thunder' 'to scratch'
voiceless affricate	labial and coronal fricatives	viern zuaxən ʃlo:ŋ	pfiert tsuaxt tʃlo:ŋ	'to conduct' 'to look for' 'to beat'
affricate or ∅	sibilant-stop cluster	spi:ln stɛrm	(t)spi:lt (t)stourm	'to play' 'to die'
ga	voiced stop	bisn drukʰən griezən	gabist gadrukʰt gagriest	'to know' 'to press' 'to greet'
	h	hupfən	gahupft	'to jump'
	sonorant	o:tnən ju:tsn rɛarn lɒxən nutsn mɒxən	gao:tnt gaju:tst garɛart galɒxt ganutst gamɒxt	'to breathe' 'to cheer' 'to cry' 'to laugh' 'to be of use' 'to make'

The regularities exhibited by the verbs above don't seem to be relics of a historical process, but rather, are productive or, at least, have been productive at some point in time, since they are also active in a subpart of the loanword lexicon.

Mòcheno has integrated a certain number of verbs from the Italian dialect of Trentino (or, more recently, from Standard Italian) in its lexicon. The most common way of integration is to replace the inflectional ending of

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[7] There is some variation e.g. in the realization of diphtongs (*viern* in Vlarotz, *viarn* in Palai) and in the length of the root vowel of one past participle (e.g. *tʃlo:ŋ* in Vlarotz, *tʃloŋ* in Palai). The rules that govern the patterns are the same.

the Romance verbal root with the suffixes *-a:rn, -e:rn, -i:rn* (Rowley 2003: 247):

(5)   'contar' (Trentino)   →   kontá:rn   'to tell'
        'rispondere' (Standard Italian) →   reśpúndərn   'to answer'

None of the loan verbs that have been integrated through this type of suffixation bears initial stress, since stress is preserved on the same syllable as in the Romance base verb - usually the penultimate, or, in some cases, antepenultimate syllable of the verb. For this reason this class of loans will not tell us anything about the alternation of the *ga-* prefix with other strategies of past participle formation, since *ga-* is absent whenever stress is not root initial. However, there is a small number of loan verbs which have not followed the usual path of integration and hence may bear initial stress. They are few in number and there are not examples for every single phonological context, but yet it is clear that the regularities of past participle formation hold for them as well. Below, I give a list of the ones I found, and the past participles produced by my informant in Vlarotz (to a large extent confirmed by the informant from Palai):[8]

(6)   Initially stressed loan verbs in Mòcheno: past participle formation

first segment of verbal root	infinitive	past part.	gloss	Trentino base[9]	gloss
voiceless stop	pintsn tʃu:dln	pintst tʃu:dəlt	'to dent' 'to work badly'	spintsár tʃondolár	'to dent, ruin' 'to work badly'
fricative	vri:gln	pfri:glt	'to grind'	sfregolár	'to grate, rub'
sibilant-stop	śkitsn śkaltsn	śkitst śkaltst	'to crush' 'to kick'	skitʃár skaltsár	'to crush' 'to kick'
voiced stop	beʃln dratʃn	gabeʃlt gadratʃt	'to stutter' 'to rain heavily'	ɛmbeʃolárse dratʃ[10]	'to stutter' 'sieve' (noun)
sonorant	meivərn ritʃln	gameivərt garitʃlt	'to move' 'to make curls'	móver ɛnriðolár	'to move' 'to make curls'

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[8] My informant in Palai did not know all the examples presented here.
[9] Thanks to Lorenza Groff for providing the Trentino verbs from her native Trentino variety of Pinè.
[10] See also the verb *drazar* 'separate' in Ricci (1904).

Loans form their past participles in the same way as verbs from the native lexicon: no prefix is inserted before voiceless stops, affricates are formed if the root begins with the voiced fricative [v] and the prefix *ga-* is present before voiced stops and sonorants. As for sibilant-stop clusters, in this case the speaker chose the strategy of not inserting any prefix in the verbs *śkitsn* and *śkaltsn.*

Anthony Rowley has argued in two lectures (Trento, 1-3 April 2009, Verona, 17 December 2009) that the regularities of past participle formation in Mòcheno cannot have arisen through historical change since they are unattested in this form among the German dialects. Historically, it would seem that syncope (i.e. deletion of the prefix vowel or of the entire prefix) of the prefix targets first fricative-initial roots, then sonorant-initial roots, and evenutally stop-initial roots. Mòcheno, however, would combine the first and the last stage of the development while leaving out the second. Rowley proposes that the pattern in Mòcheno has developed through 'Dialektausgleich', which is assumed to have taken place early in the colonization, between 1220 and 1300 (Kranzmayer 1956). At least some of the mentioned Trentino loans can be assumed to have entered the language after that stage.

The behavior of loans together with the fact that the Mòcheno pattern of past participle formation is unattested as the result of diachronic change elsewhere among the German dialects point to the pattern as a productive process at least at some point in time.

3. The allomorphs /ga-/ and [-cont, -voice]

The formation of past participles in Mòcheno is interesting because of the variety of strategies used, which include prefixation, affrication and absence of prefixation.

In this section I will discuss the nature of the prefix and conclude that we are dealing here with a case of phonologically conditioned suppletive allomorphy (Paster 2006, Wolf 2008), i.e. a case of phonologically conditioned allomorphy where the two allomorphs are not linked to the same underlying form. In this sense, phonologically conditioned suppletive allomorphy is distinct from plain allomorphy as e.g. the [-z, -ɪz, -s] allomorphs of English plural markers which can be seen as realizations (through epenthesis and voicing assimilation) of a single underlying morpheme /z/. To make clear the difference between the two types of allomorphy I will compare Mòcheno past participle formation with past participle formation in some Tyrolean dialects of Südtirol-Alto Adige, which, geographically speaking, are the closest Germanic dialect 'neighbors' of the Mòcheno speech island. Only Mòcheno displays phonologically conditioned suppletive allomorphy, while the Tyrolean dialects can, to a

large extent, be analyzed as cases of plain phonologically conditioned allomorphy.

The Tyrolean dialects of Meran, Passeier and Upper Vinschgau display similar strategies as Mòcheno in past participle formation. The patterns are summarized in the table below, following the description in Alber and Lanthaler 2005:

(7) Past participle formation in the Tyrolean dialects of Meran, Upper Vinschgau and Passeier

past participle formation	first segment of verbal root	infinitive	past participle	gloss
Dialect of Meran				
gə	stop	pik^{x}n deŋk^{x}n	gə-pik^{x}t gə-deŋk^{x}t	'to glue' 'to think'
g/k	fricative	fro:gŋ visn	k-frɒk g-vist	'to ask' 'to know'
g	sonorant	ɛsn lɒxn	g-ɛsn g- lɒxt	'to eat' 'to laugh'
Dialect of Upper Vinschgau				
∅	stop	pik^{x}n deŋk^{x}n	pik^{x}t deŋk^{x}t	'to glue' 'to think'
g/k	fricative	fro:gŋ visn	k-frɒk g-vist	'to ask' 'to know'
g	sonorant	ɛsn lɒxn	g-ɛsn g- lɒxt	'to eat' 'to laugh'
Dialect of Passeier				
gɪ	stop	pik^{x}n deŋk^{x}n	gɪ-pik^{x}t gɪ-deŋk^{x}t	'to glue' 'to think'
k	voiceless fricative	fro:gŋ	k-frɒk	'to ask'
gɪ	voiced fricative	visn	gɪ-vist	'to know'
g	vowel	ɛsn	g-ɛsn	'to eat'
gɪ	sonorant	lɒxn	gɪ-lɒxt	'to laugh'

Mòcheno shares with all three varieties the presence of a *gV*- prefix. Similarly to the dialect of Upper Vinschgau it omits the prefix completely before voiceless stops, but differently from the Upper Vinschgau dialect, the

prefix is present before voiced stops. Similarly to the dialect of Passeier, the *gV-* prefix is present also before sonorants. The only strategy exhibited by Mòcheno alone is the expression of the prefix through an affricate in the case of labial and coronal fricatives.

At first glance, the comparison with the dialect of Meran and the dialect of Upper Vinschgau might suggest that we are dealing here with a process guaranteeing syllable wellformedness. For these two dialects it seems plausible to assume an underlying prefix /g-/, which is augmented by a epenthetic vowel (in the dialect of Meran) or dropped altogether (in the Upper Vinschgau variety) whenever illicit clusters would be created.

However, there are several differences with respect to the Tyrolean varieties which suggest that an analysis in these terms is not feasible for Mòcheno. First, in Mòcheno the prefix never appears in the form [g] or [k]. This makes the postulation of an underlying form /g/ for the prefix rather abstract. Furthermore, while the schwa in the *gə-* prefix of the dialect of Meran can be plausibly analyzed as an epenthetic element, the same is not true for the vowel present in the Mòcheno prefix *ga-*. Epenthetic vowels in Mòcheno have a schwa-like quality and are clearly distinct from [a], at least in the variety of Vlarotz.[11] We find it for example in the context of the adjectival inflectional suffix-*s* when it is suffixed to a root ending in a sibilant:

(8) Epenthetic schwas between sibilants: (variety of Vlarotz)

a kʰɒlt-s bɒsər	'some cold (n.sg.nom.) water'
a hoaz-əs bɒsər	'some hot (n.sg. nom.) water'
a vriʃ-əs bɒsər	'some fresh (n.sg. nom.) water'

Since the vowel in the Mòcheno past participle cannot be interpreted as epenthetic, I propose that the underlying form of the prefix is /ga-/.

However, /ga-/ cannot be the only underlying form playing a role in past participle formation in Mòcheno. If this was the case, it would be very difficult to explain why /ga/ does not surface when the root begins with a voiceless stop or a labial or coronal fricative. After all, forms like **ga-pis-n* or **ga-vier-t* would be perfectly well-formed, from the point of view of syllable structure. If we limit our attention to the contexts where the prefix *ga-* does not appear, we see that a second allomorph must be at play here.

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[11] In the variety of Palai, we do find a vowel similar to [ɐ] in contexts where epenthesis can be assumed (cf. Rowley 1986: 82ff. for details of the variation between the local dialects of vowel quality in unstressed syllables.). Epenthetic schwa, as we find it in the variety of Vlarotz, has often a lower, more advanced quality than schwa in Standard German. Rowley (1986) in fact often transcribes it as [ɛ].

Consider again the environment of voiceless stops and labial and coronal fricatives:

(9)   No /ga-/ prefix before voiceless stops and labial/coronal fricatives:

strategy of past participle formation	first segment of verbal root	infinitive	past participle	gloss
∅	voiceless stop	paizn tondərn krɒtsn	pisn tondərt krɒtst	'to bite' 'to thunder' 'to scratch'
voiceless affricate	labial and coronal fricatives	viern zuaxən ʃlo:ŋ	pfiert tsuaxt tʃlo:ŋ	'to conduct' 'to look for' 'to beat'

The past participle of verbs beginning with labial and coronal fricatives is formed by creating initial affricates which differ from root-initial fricatives in voicing. The prefix, in this case, can be assumed to be a subsegment specified for [-cont, -voice]. I will assume that it consists of a root node with the features [-cont] and [-voice], but not specified for place:

(10)   root
             /   \
        [-cont] [-voice]

Adding these features to the initial fricatives, the complex segments [pf], [ts] and [tʃ] are created.[12] Before voiceless stops, on the other hand, we can assume that the allomorph [-cont, -voice] undergoes coalescence with the root-initial stop, thus leading to the realization of a structure without a visible prefix.

Note that it is not possible to reduce the allomorph to one of the two features, either [-cont] or [-voice]. If we assumed that [-cont] was the relevant allomorph, we would expect coalescence to happen also with root-initial voiced stops. If, on the other hand, the allomorph consisted only of a [-voice] feature, we would not expect the participle to be realized by an affricate when roots begin with a voiceless [ʃ].

To summarize, we can hypothesize that in Mòcheno past participle formation two allomorphs are at play, one a more abstract prefix which takes the form of the features [-cont, -voice], the other a regular prefix *ga-*:

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[12] For other analyses involving morphemes expressed as subsegments see Zoll 1996 and Rubach and Booij 2001.

(11)   Allomorphs in Mòcheno past participle formation

    Allomorph I: [-cont, -voice]
    before voiceless stops and labial and coronal fricatives

    Allomorph II: /ga-/
    before voiced stops, [h] and sonorants

If this approach to the data is correct, we are dealing here with a case of phonologically conditioned suppletive allomorphy, since the distribution of the two allomorphs depends on the quality of the first segment of the verbal root (and on the location of stress in the root, cf. above) but no common underlying form can be established for them.[13]

4. Alignment

It seems puzzling that in Mòcheno past participle formation a CV allomorph should be chosen when roots begin with sonorants while a consonantal prefix is inserted before root-initial (voiceless) stops and fricatives. After all, from the point of view of syllable wellformedness we would rather expect the contrary. Indeed, we see that for example the dialect of Meran has more or less the opposite distribution, placing a *gV-* prefix before stops and a *g-* or *k-* prefix before fricatives and sonorants. At first glance thus it would seem that past participle formation in Mòcheno does not easily yield to an analysis in terms of structure optimization.

        However, the distribution of past participle allomorphs in Mòcheno does consistently respect a principle which is also at play in Standard German and many of its dialects, the principle that a stem should not be resyllabified with a prefix. Thus, in Standard German consonant final prefixes do not readily resyllabify with vowel initial stems, instead a glottal stop is inserted at the stem boundary (s. Giegerich 1989, 1999, McCarthy

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[13] Things are yet more complicated in the dialect of Passeier, in which the [ɪ] of the prefix could be epenthetic since it appears in clear epenthesis contexts such as adjectival inflection. Thus the correspondent form of Mòcheno *hoazəs* in this dialect would be *hoasɪs* (F. Lanthaler, p.c.). Yet, an analysis in terms of syllable wellformedness is not as straightforward as for the dialects of Meran and Upper Vinschgau since the CV prefix appears also before sonorants and voiced fricatives. An analysis following Fleischhacker's (2001, 2005) findings that epenthesis is more readily obtainable before sonorants (and voiced fricatives?) rather than before obstruents might be possible but I have to leave a detailed investigation of this pattern for future research.

and Prince 1993, Alber 2001 for detailed descriptions of the phenomenon and analyses of it):[14]

(12)   Vor.- [ʔ]ort   'suburb'

        ver.- [ʔ]antworten   'to take the responsibility'

        [ʔ]auf.- [ʔ]atmen   'to be relieved'

        [ʔ]Er.- [ʔ]éignis   'event'

I will express this principle with an Alignment constraint (s. McCarthy and Prince 1993 for a similar proposal):

(13)   ALIGN (STEM, L, SYLL, L):
        ∀ stem ∃ syllable such that the left edge of the stem and the left edge of the syllable coincide.
        'align the left edge of a stem with the left edge of a syllable'

If we want to analyze the lack of resyllabification across morpheme boundaries in Standard German in terms of alignment, we have to assume that the insertion of an epenthetic glottal stop violates alignment less than resyllabification of the prefix consonant. We can express this assumption informally by assigning less Alignment violations to misaligned structures containing an epenthetic consonant than to misalignment triggered by a prefix consonant:

Tableau 1: Alignment of left stem edges in Standard German

Vor-ort	ONSET	ALIGN (STEM, L, SYLL, L)	DEP
☞ a. Vor.ʔ-ort		*	*
b. Vor.-ort	*!		
c. Vo.r-ort		**!	

The high-ranked constraint ONSET, requiring consonant initial syllables, is satisfied only by candidates a. and c. Between them, ALIGN chooses candidate a. which displays only an epenthetic consonant between the left morpheme edge and the syllable boundary. Epenthesis takes place at the cost

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[14] The relevant morphological boundary is indicated with a hyphen "-", the relevant syllable boundary with a dot ".". Examples are given in orthographic form.

of the low ranked constraint DEP, disfavoring the insertion of epenthetic elements.

If we now consider the different strategies of past participle formation in Mòcheno, we see that the alignment constraint requiring coincidence of left edge and syllable boundaries is obeyed in all forms and that it determines the choice of the allomorph in some contexts (s. Kager 1996, Drachman, Kager and Malikouti-Drachman 1996, Klein 2003, Bonet, Lloret and Mascaró 2007 for other analyses of allomorphy where alignment of a morphological and a prosodic category plays a role).

Before roots beginning with a sonorant, a vowel, a voiced stop or [h], the presence of the prefix *ga-* allows the left edge of the verbal root to be perfectly aligned with a syllable edge. With sonorant-initial roots, alignment would be violated if the allomorph [-cont, -voice] was realized, e.g. through a voiceless stop with the same place features as the stem-initial sonorant. For instance, the participle for *rɛarn* could then be realized as **t-rɛart*, in violation of the alignment constraint. In these cases, as will be discussed in the analysis below, the choice of the allomorph is conditioned by the alignment constraint.

Roots beginning with a labial or coronal fricative form their past participle by creating an initial affricate. If we assume that these affricates are complex segments, we can conclude that this strategy of past participle formation too leads to a well-aligned structure. The leftmost segment of the root - which is the consonant associated to the affricate - coincides with the left edge of a syllable: [15]

(14) Alignment in verbs with root-initial labial or coronal fricatives:
       viern → pfiert

```
/[-cont, -voice]+    v/
        |            |
        p            f
         \          /
              [。C
```

Finally, if we assume that the past participle of verbs beginning with a voiceless stop are created through coalescence of the allomorph [-cont, -voice] and the first segment of the root, alignment of the root with a syllable edge is obeyed once more, since the initial segment of the root - which

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[15] Note that this conclusion is independent of whether or not we assume that affricates have a two- or a one-root representation (see Clements&Hume 1995 for an overview), as long as we assume that alignment is calculated on the segment to which the single root node or, alternatively, the two root nodes are linked.

corresponds both to the root-initial segment and to the past participle allomorph - coincides with a syllable edge:

(15) Alignment in verbs with root-initial voiceless stops:
  paizn → *pisn*

$$\text{/[-cont, -voice]}_1 \quad + \quad p_2\text{/}$$
$$\diagdown \qquad \diagup$$
$$[_\circ\ p_{1,\,2}$$

Alignment explains why a *gV-* prefix is inserted before sonorants, and we see that this constraint is also obeyed when an affricate is formed before fricatives and when coalescence occurs with voiceless stops. Yet, it does not explain the distribution of the two allomorphs in every one of these context. Why, for example, don't we insert *ga-* before voiceless stops? After all, a form like **ga.pisn* would be syllabically wellformed, respect alignment of the stem with a syllable boundary and furthermore realize the prefix in a more transparent way than through coalescence.

I propose that the answer to this question is that we have to consider [-cont, -voice] to be the default allomorph of past participle formation in Mòcheno. It will be inserted whenever possible. Only when the insertion of [-cont, -voice] leads to the violation of high-ranked constraints in the language such as the constraint requiring a stem to be aligned with a syllable boundary, will the other allomorph, *ga-,* be chosen. The reason why [-cont, -voice] is the default allomorph is that it is less marked than the allomorph *ga-* with respect to voicing, since it bears the (unmarked) feature [-voice] while *ga-* contains a (marked) [+voice] consonant (s. the discussion in section 6).

Although alignment seems to play some role in the formation of past participles in Mòcheno, it is not the case that the constraint ALIGN (STEM, L, SYLL, L) is observed in the same contexts as in Standard German. Thus, differently from Standard German, in Mòcheno no glottal stops are inserted in hiatus contexts at the prefix-stem boundary (examples a. below; cf. also Rowley 1986: 77) and resyllabification takes place between the prefix and the stem (examples b. below):[16]

(16) a. Unresolved hiatus contexts:

  no.-ɒrbatn   'to round off, refine'
  garo.-aus   'straight ahead'

---

[16] Thanks to Leo Toller for helping me find these examples and testing the syllabification for me; transcriptions are given in his native variety of Palai.

b. Resyllabification between prefix and stem:

i.n-ɒtnən	'to breathe in'
au.z-ɒśtn	'to take off branches'
va.r-ɒrbatn	'to process, convert'
untə.r-oum	'upside down'
u.r-ɒltn	'ancestors'

These data point to a language where onsetless syllables are not repaired in hiatus contexts, but misalignment of stems with syllable boundaries is tolerated in order to provide a syllable with an onset. Expressed in a constraint hierarchy, we will have a ranking where the faithfulness constraints MAX and DEP, which, respectively, militate against deletion of input material and insertion of epenthetic elements, will dominate the constraint ONSET, requiring syllables to have onsets. This constraint in turn will dominate ALIGN (STEM, L, SYLL, L).

(17)   Constraint hierarchy for stem-prefix alignment in Mòcheno:
        MAX, DEP >> ONSET >> ALIGN (STEM, L, SYLL, L)

The following tableau illustrates the constraint interaction:

Tableau 2: Unresolved hiatus and misalignment of stems and syllables

/no-ɒrbat-n/	MAX	DEP	ONSET	ALIGN (STEM, L, SYLL, L)
☞ a. no.ɒrbatn			*	
b. nɒr.batn	*!			
c. no.ʔɒrbatn		*!		*
/ in-ɒtn-n/				
☞ a. i.n-ɒtnən				**
b. in.-ɒtnən			*!	
c. in.-tnən	*!			
d. in.-ʔɒtnən		*!		*

The example *no.ɒrbatn* illustrates that onsetless syllables are tolerated in hiatus contexts. They are neither repaired through deletion (candidate b.) nor

through epenthesis (candidate c.). The evaluation of the example *i.n-ɒtnən* shows us that onsetless syllables are repaired through resyllabification, as in candidate a., thus violating the alignment constraint twice. Not repairing the onsetless syllable, as in candidate b., or repairing it through deletion or epenthesis, as in candidates c. and d., is not an option.

Alignment of a stem with a syllable boundary thus is a subordinate principle in the language as a whole. Yet it does play a certain role in the formation of past participles. The subordinate role of morphoprosodic alignment at the stem boundary is in line with the patterns that we find in Southern German varieties, where glottal stop epenthesis between stems and prefixes seems in general to be more restricted than in Standard German and resyllabification seems more readily available (Alber 2001). I interpret Mòcheno as being most radically 'Southern' in the sense that the effects of morphoprosodic alignment are practically invisible in the language, except for the role that the alignment constraint plays in past participle formation. In the analysis in section 6 I will show how the partial hierarchy established here for stem-prefix alignment in general interacts with other constraints in determining the distribution of allomorphs.

5. Distribution of voiced and voiceless obstruents in Mòcheno

Before turning to the analysis proper, it is necessary to take a closer look at the distribution of obstruents in Mòcheno, since the partial hierarchy regulating it will play a role in allomorph selection in past participle formation.

First of all, I will assume that obstruents in Mòcheno, if at all, contrast for [±voice], since, as other Southern varieties of German, Mòcheno does not exhibit any audible aspiration on stops (except, in some cases, on [k], see footnote 25). In this sense it differs from Standard German, for which it has been proposed that stops contrast for the presence or absence of the feature [spread glottis] (for recent proposals in these terms see Jessen and Ringen 2002).

Second, voiced and voiceless fricatives in Mòcheno differ from voiced and voiceless stops in that they are in complementary distribution. This means that the feature [±voice] is contrastive only in stops, not in fricatives. Thus, in the native lexicon, we find voiced [v, z] word-initially, when preceding a vowel or sonorant (ex. a. below) and word-medially either if they follow a sonorant or if they follow a long vowel (ex. b below). We find voiceless [f, s] word-medially after a short vowel (ambisyllabic context, c.) and word-finally (ex. d.; examples are from Rowley 1982, 1986: 122ff.):

(18) a. voiced [v, z]: word-initially, preceding a vowel or sonorant

zɔk	'to say, 3.P.Sg.'
vrɛsn	'to eat (of animals)'

b. voiced [v, z]: word-medially, following a long vowel or a sonorant

bɛrvɛn	'to throw'
hɛlvɛn	'to help'
ʃlo:vɛn	'to sleep'
ri:vl	'scab'

c. voiceless [f, s]:word-medially, after short vowels

ʃafl	'little tub'
pesər	'better'
basərn	'to water'

d. voiceless [f, s]: word-finally

birf	'to throw, imperative'
i hilf	'to help, 1PSg'
ʃlo:f	'sleep, noun'
tiəf	'deep'

The postalveolar fricatives [ś, ź] contrast with other sibilants only in the varieties of Vlarotz and Oachlait (and there only in few words) and are allophones of [ʃ] before stops in the variety of Palai. In the varieties where they are contrastive, their distribution is similar to that of the fricatives [f/v, s/z] (Rowley 1986: 127). Since they are not contrastive in all varieties, I will ignore them in the following analysis of the distribution of voiced and voiceless obstruents. The palatoalveolar fricative [ʃ] and the glottal fricative [h] are always voiceless.[17] Summarizing, none of the fricatives exhibits a

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[17] Voiced [ʒ] seems to appear sometimes when /ʃ/ undergoes assimilation to an adjacent voiced consonant (e.g. *ʒme:r*, 'grease', *pe:rʒn,* 'Pergine, place name', Rowley 1986: 136), but Rowley does not note an assimilation of this fricative systematically. For example, verbs beginning with a sibilant-sonorant cluster are transribed always with voiceless [ʃ] in Rowley 1982 (e.g. *ʃnain, tʃni:tn,* 'to cut, cut past part.'). Pending clearer data on voicing assimilation of [ʃ] I will ignore voiced realizations of this fricative.

clear voicing contrast, at least when the native lexicon of Mòcheno is considered.

The distribution of voiced and voiceless fricatives in Mòcheno is reminiscent of that described for a variety of West Germanic dialects discussed by van Oostendorp 2003 (see also Bannert 1976 for the same phenomenon in Middle Bavarian). Van Oostendorp analyzes Frisian, Thurgovian German (an Alemannic variety) and Roermond Dutch, which tend to have an complementary distribution of fricatives in word-medial context: voiced fricatives follow short vowels and voiceless fricatives long vowels. Van Oostendorp concludes that fricatives in these varieties do not really differ in voice, but rather in length. Long fricatives appear after short vowels in order to close the preceding syllable, in obeyance of Prokosch's law, which demands stressed syllables to be heavy. This leads to ambisyllabic structures as e.g. Mòcheno *[ʃaʃl]* 'little tub', where the word-medial fricative is voiceless because in closing the preceding syllable containing a short vowel it undergoes final devoicing. On the other hand, syllables containing long vowels or closed by a sonorant are heavy by themselves, hence obey Prokosch's law and therefore do not have to be closed by a following fricative. Thus, the word-medial fricatives in structures such as *[hɛl.vɛn]* 'to help' and *[ʃloː.vɛn]* 'to sleep' are not ambisyllabic and therefore do not undergo final devoicing. On the contrary, since the fricatives appear in a sonorant context, they will be voiced.

Adapting the core of van Oostenorp's analysis, the complementary distribution of fricatives in Mòcheno can be captured by the following constraint hierarchy:

(19) PROKOSCH'S LAW, *GEMVOICE >> VOICE_SON >> *[VOICE] >> IDENT(VOICE)-FRIC

    a. PROKOSCH'S LAW: stressed syllables are heavy
    b. VOICE_SON: an obstruent preceding a sonorant is voiced
    c. *[VOICE]: obstruents are not voiced
    d. IDENT(VOICE)-FRIC: Correspondent fricatives have the same value
    for the feature [±voice]
    e. *GEMVOICE: no voiced geminate consonants

The hierarchy characterizes a language where voicing cannot emerge as contrastive in fricatives since the markedness constraint *[VOICE] dominates the faithfulness constraint IDENT(VOICE)-FRIC, responsible for preserving the input value for [±voice] in fricatives. Word-finally, fricatives will therefore be voiceless (ex. d. above). On the other hand, voicing is mandatory before vowels and sonorants because of the constraint VOICE_SON. Since VOICE_SON dominates *[VOICE], we will have voiced fricatives in word-initial position preceding a vowel or sonorant (ex. a. above) and word-

medially, when the fricative follows a heavy syllable which contains a long vowel or is closed in a consonant (ex. b. above). When the fricative follows a short vowel (ex. c. above), the fricative has to be long in order to close the preceding light syllable, thus satisfying PROKOSCH'S LAW. I will assume with van Oostendorp that the long fricative is attached to two positions (two X-slots or two root nodes), having the structural representation of a geminate. As a geminate, it is targeted by the constraint *GEMVOICE, prohibiting the realization of voiced geminates, which are universally marked. Therefore the long consonants following short vowels emerge as voiceless.[18] The following tableau summarizes the analysis of fricative distribution in Mòcheno:

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[18] I do not follow van Oostendorp in attributing the voiceless realization of long fricatives to a constraint FD (final devoicing). Final devoicing is often analyzed as the result of a partial hierarchy where a positional faithfulness constraint dominates a markedness constraint (i.e. IDENT-VOICE (ONSET) >> *[VOICE] >> IDENT-VOICE; Lombardi 1999). If we combine this partial hierarchy with the ranking VOICE_SON >> *[VOICE], required to explain word-initial voicing, we obtain a hierarchy which, as it is, would predict long fricatives to be realized as voiced, in satisfaction of IDENT-VOICE (ONSET) and VOICE_SON. A constraint like *GEMVOICE is therefore required in any case.

Tableau 3: Distribution of voiced and voiceless fricatives

	PROKOSCH'S LAW	*GEMVOICE	VOICE_SON	*[VOICE]	IDENT(VOICE)-FRIC
/hilv/ or /hilv/					
☞ a. hilf					(*)[19]
b. hilv				*!	(*)
/vrɛsn / or /frɛsn /					
☞ a. vrɛsn				*	(*)
b. frɛsn			*!		(*)
/hɛlvɛn/ or /hɛlfɛn/					
☞ a. hɛl.vɛn				*	(*)
b. hɛl.fɛn			*!		(*)
/ʃafl/ or /ʃavl/					
☞ a. ʃaf.fl			*		(*)
b. ʃa.vl	*!			*	(*)
c. ʃav.vl		*!		**	(*)

Summarizing, fricatives are voiceless by default, given the ranking of the markedness constraint *[VOICE] over the faithfulness constraint

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[19] Since we cannot determine whether the underlying fricative in these examples is voiced or voiceless, we cannot determine whether the constraint IDENT is violated or not. What is crucial is that *if* a fricative was present underlyingly, it could never emerge because of the dominant position of *[VOICE].

IDENT(VOICE)-FRIC. This explains the voicelessness of word-final fricatives as in *hilf*. They are voiced word-initially, as in *vrɛsn*, and word-medially, as in *hɛl.vɛn*, when preceding a sonorant, because VOICE_SON outranks *[VOICE]. However, word-medially after a short vowel, as in *ʃaf.fl*, PROKOSCH'S LAW demands a long consonant. This long consonant can only emerge as voiceless because of *GEMVOICE.

While voiced and voiceless fricatives are in complementary distribution, the situation is different for stops, who contrast in voicing in all contexts (except for /d/, which is not attested word-finally, see Rowley 111ff.).[20] According to Rowley, stops do not even undergo syllable final devoicing (*Auslautverhärtung*) as the majority of German dialects do.

We can describe the different situation of fricatives and stops by assuming that they are targeted by two different faithfulness constraints, one requiring the preservation of the input specification of the feature [±voice] for stops, the other requiring it for fricatives (see Grijzenhout and Krämer 2000 for a similar proposal):

(20)   IDENT(VOICE)-STOP: Correspondent stops have the same value for the feature [±voice]

IDENT(VOICE)-FRIC: Correspondent fricatives have the same value for the feature [±voice]

We can then assume that while IDENT(VOICE)-FRIC, as determined in the analysis above, is ranked below the markedness constraint *[+VOICE], the constraint IDENT(VOICE)-STOP is ranked above it:

(21)   IDENT(VOICE)-STOP >> *[+VOICE] >> IDENT(VOICE)-FRIC

In fact, since stops do not exhibit the same word-medial and word-initial distribution as fricatives, we can assume that IDENT(VOICE)-STOP is ranked also above the other constraints leading to a complementary distribution of fricatives:

(22)   IDENT(VOICE)-STOP >> PROKOSCH'S LAW, *GEMVOICE >>
        VOICE_SON >>*[+VOICE] >> IDENT(VOICE)-FRIC

The top position of IDENT(VOICE)-STOP guarantees that stops are contrastive in all contexts. They do not participate in the length contrasts generated by

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[20] Rowley (1986: 111) mentions assimilation of voicing for stops, but almost all the examples are cases where assimilation of voicing occurs across word boundaries, hence this might be a phenomenon of postlexical phonology.

PROKOSCH'S LAW and they are not voiced before sonorants. Fricatives, on the other hand, cannot faithfully realize their input specification since IDENT(VOICE)-FRIC is dominated by the markedness constraint *[+VOICE], which will favor a voiceless realization of fricatives except in the contexts where the constraint VOICE_SON leads to voicing of fricatives.
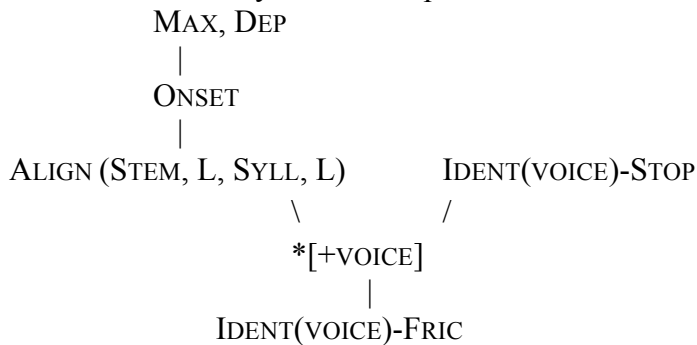
As we will see in the next section, the hierarchy established here for the distribution of voicing will play an important role also in allomorph selection. Specifically, the constraint *[+VOICE] will not only guarantee devoicing of fricatives, but it will also be the constraint that favors the allomorph [-cont, -voice] over the allomorph *ga-*. Furthermore, the ranking of IDENT(VOICE)-STOP over IDENT(VOICE)-FRIC will allow us to explain the different allomorph selection for root-initial voiced and voiceless stops.

6. Analysis

In the analysis of phonologically conditioned suppletive allomorphy in Mòcheno I will follow the majority of the literature on the topic in assuming that suppletive allomorphs are specified in the input and that the constraint hierarchy evaluates the collection of the individual candidate sets of each allomorph.[21]

My proposal for the basic constraint hierarchy responsible for allomorph selection in Mòcheno past participle formation is as follows:

(23)   Constraint hierarchy for allomorph selection:
                MAX, DEP
                   |
                 ONSET
                   |
      ALIGN (STEM, L, SYLL, L)   IDENT(VOICE)-STOP
                        \   /
                      *[+VOICE]
                           |
                   IDENT(VOICE)-FRIC

---

[21] See Mascaró 2007: 718 where this assumption is made explicit. Wolf 2008 proposes a somewhat different approach assuming that morphological feature structures are the only elements present in the input. Allomorphs are then morphs which are associated to identical morphological feature structures. MAX constraints make sure that at least one morphological feature structure is realized while markedness constraints decide which allomorph will be realized.

Before going into the details of the analysis, let us take a step back and look at the geometry of the hierarchy. It is obvious that this hierarchy is the simple result of pasting together the hierarchy proposed for alignment between stems and syllable boundaries and (part of) the hierarchy proposed for the distribution of obstruent voicing. This means that (i) the proposed hierarchy is compatible with pieces of the Mòcheno grammar which have been established independently and, more importantly, (ii) the hierarchy gives us an argument in favor of not interpreting allomorph selection as a simple process of subcategorization. If we were to propose that the two allmorphs of past participle formation are subcategorized for specific phonological contexts, we would discard an explanation that comes for free. In fact, two pieces of the grammar of the language which have been established independently from allomorph selection - when ranked among each other - can explain by themselves the selection of the allomorph, without any additional assumptions.

The core of the hierarchy which is responsible for allomorph selection is the ranking of ALIGN (STEM, L, SYLL, L) and IDENT(VOICE)-STOP over *[+VOICE]. It tells us that, everything else being equal, we will prefer the voiceless allomorph [-cont, -voice] over the voiced allomorph *ga-*. However, if this choice leads to a violation of ALIGN (STEM, L, SYLL, L) or changes the input specification for voicing of a stop, we will select *ga-,* instead. In what follows I will discuss the single contexts of past participle formation beginning with those where [-cont, -voice] is selected.

As outlined in section 4, I will assume that the past participle of verbal roots beginning with voiceless stops is formed through coalescence of the allomorph [-cont, -voice] with the root initial segment (cf. structure (15) above). A structure of this type violates the anti-coalescence constraint UNIFORMITY, which will be ranked below the constraint *[+VOICE]:

(24)   UNIFORMITY: no output element has multiple correspondents in the input (no coalescence). (McCarthy and Prince 1995)

The following tableau illustrates the evaluation of the coalescence structure with respect to its competing candidates:

Tableau 4: Coalescence before a voiceless consonant: *paizn* → *pisn*

/{[-cont, -voice], ga}- paiz - n/	Max, Dep, Onset	Align (Stem, L, Syll, L)	*[+voice]	Uniformity
☞ a. [-cont, -voice]₁ - p₂ \ / . p₁, ₂				*
b. [-cont, -voice]₁ - p₂ │ │ . p₁ - p₂		*!		
c. ga.-pisn			*!	

Following Mascaró 2007 and Bonet, Lloret and Mascaró 2007, the input of the past participle is represented as consisting of the verbal root, the past participle suffix *-n* and the two past participle prefix allomorphs. The set of candidates evaluated by the hierarchy consists of possible realizations of both allomorphs. None of the three candidates violate the faithfulness constraints MAX and DEP, since all of them realize faithfully either one or the other allomorph without deleting input material or adding material that in the input was not present. With respect to candidate b., I am assuming that it agrees in its place features with the first segment of the root and therefore does not incur a DEP violation either. The first constraint making some decision among the candidates is ALIGN (STEM, L, SYLL, L). This constraint eliminates candidate b. from the list of competitors.[22] Candidate a. and c. would both guarantee alignment of the root edge with a syllable boundary, but a. is chosen over c. since a. obeys *[+VOICE] by realizing the voiceless allomorph [-cont, -voice]. For this reason candidate a. wins although it

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[22] Note that candidate b. could be eliminated also by a number of other constraints militating against initial geminates or stop clusters in onsets. However, ALIGN (STEM, L, SYLL, L), *can* eliminate this candidate and we will see that its position in the hierarchy will be crucial to decide between candidates in other phonological contexts.

violates the low ranked anti-coalescence constraint UNIFORMITY. The constraints IDENT(VOICE)-STOP and IDENT(VOICE)-FRIC have not been integrated into the tableau since they play no role here: none of the candidates exhibits any change of the input specifications of voicing. Note, however, that the ranking IDENT(VOICE)-STOP >> *[+VOICE] can eliminate candidates like *ka-pisn,* where the stop of the prefix *ga-* has been devoiced in order to obey *[+VOICE].

The second context where the allomorph [-cont, -voice] is chosen is when the verbal root begins with a fricative. In this case, the participle is formed by creating an initial complex segment, an affricate. Similarly to the coalescence structure, the affricate allows for alignment of the left root edge with a syllable boundary (cf. the discussion of structure (14)). The affricate structure itself will also violate certain constraints, such as a constraint against complex segments, which I will call *COMPLEXSEG. Furthermore, to realize the allmorph [-cont, -voice] in *viern* → *pfiert*, the first segment of the verbal root has to be devoiced. This means that the faithfulness constraint IDENT(VOICE)-FRIC, which favors the preservation of input voicing specifications of fricatives is violated in these cases. [23]

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[23] In principle, the underlying fricative of a verb like *viern* could be either voiced or voiceless. Assuming that it *can* be voiced underlyingly, we have to account for the fact that also this underlying structure is realized as voiceless in the affricate. We will not discuss the trivial case, where the underlying fricative is voiceless and is realized as such.

Tableau 5: Affricates before root-initial fricatives: *viern* → *pfiert*

/{[-cont, -voice], ga}- vier - t/	MAX, DEP, ONSET	ALIGN (STEM, L, SYLL, L)	*[+VOICE]	*COMPLEXSEG	IDENT (VOICE)-FRIC
☞ a. [-cont, -voice] - v 　　　　|　　　　| 　　　　p　　　f 　　　　　\　／ 　　　　　. C				*	*
b. [-cont, -voice] - v 　　　　|　　　　| 　　　　. p - f		*!			
c. ga.- vier-t			*!		

None of the three candidates incurs violations of the top-ranked constraints MAX, DEP or ONSET. Candidate b., a structure where the allomorph does not form a complex segment with the first segment of the root, is excluded because of its violation of the alignment constraint. Candidate c., which realizes the second allomorph, would be equally well-aligned as candidate a., but loses because it violates *[+VOICE]. Candidate a. wins, even though it collects one violation of *COMPLEXSEG and violates IDENT (VOICE)-FRIC. Note that the ranking that generates devoicing of the root-initial segment is not quite as simple as represented here. First of all, we must exclude the possibility of affricates in which the stop element and the fricative element disagree in voicing, as e.g. in the hypothetical affricate *pv. These are affricates (or, indeed, tautosyllabic obstruent clusters) which seem to be ruled out universally. Second, the ranking has to select a structure where the root-initial segment is devoiced and rule out a competitor where the past participle allomorph is instead voiced. Hypothetical affricates of this type, i.e. *bv-, *dz, *dʒ can be excluded by the fact that voiced affricates are not

licit structures in Mòcheno and hence can be assumed to be ruled out by some high-ranked constraint.[24]

There is one root-initial fricative which is different from the other fricatives in that it is prefixed by the allomorph *ga-* instead of forming an affricate with the allomorph [-cont, -voice]. This is the fricative [h], as in the example *hupfən → gahupft*. I will assume that the creation of an affricate is not an option in this case, since [kh] or [kx] is not a possible affricate in Mòcheno.[25] Hence, the allomorph [-cont, -voice] cannot be selected before a root-initial [h] without creating an alignment violation and the allomorph *ga-* is chosen instead.

Let us now consider the selection of the second allomorph, *ga-*, with root-initial sonorants, vowels and voiced stops. In the case of sonorants, ALIGN (STEM, L, SYLL, L) emerges as the decisive constraint, as illustrated in the following tableau:

Tableau 6: *ga-* before root-initial sonorants: *rɛarn → garɛart*

/{[-cont, -voice], ga}- rɛar-t /	MAX DEP ONSET	ALIGN (STEM, L, SYLL, L)	*[+VOICE]

a. [-cont, -voice] - r
         | |
         t   r
		*!	

☞ b. ga.-rɛart			*!

Candidate a. realizes faithfully the allomorph [-cont, -voice]. We can imagine it to be realized by a consonant which is assimilated in place to the following sonorant (as was the case with root-initial fricatives and voiceless stops), thus not violating any constraint disfavoring insertion of material not present in the input. Since we have assumed the allomorph to contain a root-node, its projection of a C-slot will not violate DEP either. However, since a faithful realization of the [-cont, -voice] features is not possible any more through an affricate or through coalescence and [-cont, -voice] has to be realized as a segment of its own, the structure necessarily incurs a violation of the alignment constraint requiring coincidence of the left edge of the verbal root with a syllable boundary. Since ALIGN (STEM, L, SYLL, L) cannot

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[24] The affricate [dʒ] is attested in Mòcheno, but is limited almost exclusively to loan words from Italian. Rowley (1986:144f., 2003:57) quotes only two native words containing it, *indʒər*, 'our' and *biəldʒər*, 'mole'.

[25] There is a weakly contrastive aspirated velar stop /k^h/ in Mòcheno, which is sometimes pronounced as [k^x] and often varies freely with [k]. Rowley (1986:113f.) interprets it as a simple consonant, not as an affricate.

be fulfilled through faithful realization of [-cont, -voice], the other allomorph, *ga-* will be chosen. The presence of *ga-* will create a well-aligned structure, at the cost of violating the constraint *[+VOICE]. The behavior of sonorant-initial roots thus shows us that alignment of the left stem edge to a syllable boundary does play a role also in Mòcheno: it drives the selection of *ga-* over the default allomorph [-cont, -voice].

The role that alignment plays here in allomorph selection is a typical case of the Emergence of the Unmarked (TETU, McCarthy and Prince 1994) in the context of allomorph selection, a phenomenon observed in many analyses (see, among others, Kager 1996, Mascaró 1996, 2007, Rubach and Booij 2001, Bonet, Lloret and Mascaró 2007). TETU effects have been observed most clearly in reduplication or truncation, where, in the analysis of McCarthy and Prince 1994, 1995, the faithfulness constraint in a F-IO >> M ranking is vacuously satisfied in reduplicants or truncation morphemes targeted by an M >> F-R/TB ranking, since reduplicants or truncation morphemes are not subject to an input-output correspondence relation.[26] The reason unmarked structures can emerge in allomorphy selection under an F >> M ranking is somewhat different: in the case of allomorphy, faithfulness constraints get two (or more) chances to be fulfilled, since they are satisfied by the realization of any of the underlying allomorphs. Since either of the allomorphs satisfies faithfulness, markedness can choose the most unmarked among them.

For Mòcheno this means that although in the overall language the faithfulness constraints MAX and DEP dominate the markedness constraint ALIGN (STEM, L, SYLL, L), which therefore does not seem to have any effect, the constraint emerges in a context where MAX and DEP can be satisfied in more than one way, i.e. through the faithful realization of more than one allomorph. Since MAX and DEP cannot decide between the two allomorphs, the decision can be passed to a lower markedness constraint, in this case ALIGN (STEM, L, SYLL, L). In the context of root-initial voiceless stops and fricatives, the alignment constraint will not make any decision, since both allomorphs would guarantee alignment of the stem to the syllable edge. The choice of the allomorph is decided by *[+VOICE]. In the context of root-initial sonorants, though, only *ga-* fares well in terms of alignment, and hence is preferred over [-cont, -voice], even though it violates *[+VOICE].

Let us now consider the evaluation of the context of root-initial vowels:

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[26] F-IO = some faithfulness constraint relating input to output, F-R/TB = some faithfulness constraint relating a reduplicant or a truncation morpheme to its base, M=some markedness constraint.

Tableau 7: *ga-* before root-initial vowels: *o:tnən → gao:tnt*

/{[-cont, -voice], ga}- o:tn-n /	MAX	DEP	ONSET	ALIGN	*[+VOICE]

a. [-cont, -voice] - o:
      | |
     .t/ʔ   o:
		*!		*	

☞ b. ga.-o:tnt			*		*

Candidate a. represents an attempt to realize the morpheme [-cont, -voice] in the most faithful way, by inserting a voiceless stop bearing an unmarked place feature, i.e. a coronal [t] or a glottal [ʔ].[27] This insertion of a feature not present in the input leads to a violation of the constraint militating against insertion, DEP (or, probably more precisely, DEP-FEATURE, since only a feature is inserted), excluding candidate a. in favor of candidate b. The constraint ALIGN (STEM, L, SYLL, L) is not the constraint choosing between the allomorphs, here, since at the prefix-root boundary, as we know from section 4, misalignment is in principle allowed in order to satisfy ONSET. However, epenthesis is not, and since [-cont, -voice] is a subsegment, which requires the insertion of a place feature to be realized, it is excluded.[28]

Note that if we were to assume that the underlying form of the allomorph was /k-/, we would expect this segment to show up in at least this context.

The last context in which we find the allomorph *ga-* is before voiced stops, as in the example *bisn → gabist.* The challenge here is to explain why coalescence is not a possbility in this context as it is before voiceless stops. Why do we have the pattern *bisn → gabist* but *paizn → pisn*? My proposal is that a hypothetical coalescence candidate, which in the case of root-initial

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[27] I am assuming here with de Lacy (2006) that glottal stops are not placeless.

[28] The fact that DEP and not ALIGN chooses between the allomorphs in this case, points to another possible analysis of Mòcheno past participle formation, which does not make use of alignment. If in fact we were to assume that the default allomorph consisted of two independent floating features, [-cont] and [-voice], not connected by a root node, we could assume that the allomorph *ga-* was chosen in all those cases where realizing [-cont] and [-voice] required the insertion of a root node. Thus the burden of the choice of the allomorph *ga-* would lie entirely on the constraint DEP. I have not followed this line of analysis since I find it difficult to conceive the allomorph [-cont, -voice] as not linked by anything and I do not know of cases where two floating subsegments combine to a single morpheme.

voiced stops would be something like *bisn* → *pist* is ruled out by IDENT(VOICE)-STOP. This constraint, as we know from the analysis of obstruent distribution in section 5, is ranked above *[+VOICE] and hence blocks *[+VOICE] from selecting the allomorph [-cont, -voice]:

Tableau 8: *ga-* before voiced consonants: *bisn* → *gabist*

/{[-cont, -voice], ga}- bis - t/	MAX DEP ONSET	ALIGN	IDENT(VOICE)-STOP	*[+VOICE]
a. [-cont, -voice]$_1$ - p$_2$ \ / . p$_{1,2}$			*!	
b. [-cont, -voice]$_1$ - p$_2$ | | . p$_1$ - b$_2$		*!		
☞ c. ga.-bist				*

For a coalescence structure as in a. to be realized, the voice value of the first segment of the root (or, in another possible coalescence candidate *bisn* → *bist*, the voice value of the default allomorph) has to be changed. This change, however, leads to a violation of the constraint IDENT(VOICE)-STOP, which is fatal, since IDENT(VOICE)-STOP, differently from IDENT(VOICE)-FRIC, is ranked *above* the constraint *[+VOICE]. For this reason, changing the voice value of a stop is not an option, even if this means that *[+VOICE] has to be violated by selecting the allomorph *ga-*. Candidate c., which realizes the 'second-best' allomorph but rates well on alignment and faithfulness, emerges as the winner. The non-coalescing candidate b., as above, is eliminated because of its violation of alignment (and of numerous other syllable-structure constraints).

As in the case of root-initial sonorants, where the insertion of *ga-* is due to ALIGN (STEM, L, SYLL, L), also in this case the choice between the two allomorphs is determined by a partial hierarchy which has been determined independently to hold in the language, i.e. IDENT(VOIC)-STOP >> *[+VOICE].

7. Conclusions

Mòcheno displays a variety of strategies in forming the past participle of verbs, which can be described as prefixing of an allomorph [-cont, -voice] to roots beginning with a voiceless stop (resulting in coalescence) and labial and coronal fricatives (resulting in affrication) and prefixing an allomorph *ga-* elsewhere. The distribution of the two allomorphs would seem puzzling, since the consonantal allomorph [-cont, -voice] is found before obstruents while the CV allomorph *ga-* is found before sonorants. From the point of syllable wellformedness we might expect the contrary. However, it has been shown that an analysis in terms of optimization is possible, since allomorph selection can be interpreted as being driven by a well-defined set of markedness and fathfulness constraints which play a role in other parts of the Mòcheno grammar. Thus, the constraint *[+VOICE] will favor the allomorph [-cont, -voice] over *ga-*, because of its unmarked voicing feature, while ALIGN (STEM, L, SYLL, L) will select *ga-* before sonorants, where the realization of [-cont, -voice] would lead to misalignment between the left edge of the verbal root and the syllable boundary. In addition, the faithfulness constraint DEP favors *ga-* in the context of vowel-initial roots and IDENT(VOICE)-STOP favors it before root-initial voiced stops.

The overall hierarchy determining the distribution of allomorph selection consists of two partial hierarchies which are relevant for pieces of the grammar of the language independent of past participle allomorph selection. They determine on the one hand the phenomenon of (mis)alignment at the left edge of stems and on the other the distribution of voiced and voiceless obstruents. We can therefore claim that an analysis in terms of optimization is not only possible, but also desirable, since (i) it makes use of constraints which are either plausibly universal (*[+VOICE], DEP, IDENT(VOICE)-STOP) or active in other German varieties (ALIGN (STEM, L, SYLL, L); (ii) the grammar determining the distribution of allomorphs in Mòcheno consists of constraint rankings which hold for the language in general.

If on the other hand we were to subcategorize each allomorph for the phonological context it occurs in, the relationship between the distribution of past participle allomorphs and other pieces of the Mòcheno grammar would remain completely opaque.

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