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*Non-optimal onsets in Chamicuro: an inventory maximised in coda position**

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The widely attested onset/coda asymmetry involves a situation in which the inventory of phonemes in syllable-final position in a particular language is a subset of those which contrast in onsets. The inverse of this pattern has been claimed to never occur (Goldsmith 1990, Beckman 1998). However, this prediction is falsified by Chamicuro, a Peruvian language in which /h/ and /ʔ/ are systematically restricted to coda position. Since no permutation of all known constraints can account for this unusual distribution, a new constraint is necessary. I propose that we invoke HAVEPLACE and subcategorise it for onsets. This positional markedness filter permits placeless (laryngeal) consonants to surface in codas, but blocks them in onsets. A beneficial side-effect of this analysis is that it preserves the onset/coda asymmetry while allowing /ʔ/ and /h/ to be the only principled exceptions to it.

1 Introduction

It is a well-known fact that certain phonological domains naturally encourage contrastive featural distinctions to surface, whereas other positions often prohibit the full underlying language-specific inventory of phonemic segments from occurring there. Within Optimality Theory (Prince & Smolensky 1993), these asymmetries have recently been codified in a unified approach known as positional faithfulness (Steriade 1994, Beckman 1997, 1998, Lombardi 1995b, c, McCarthy & Prince 1995, Padgett 1995a, b, Casali 1997, Alderete 1999). For example, Beckman (1998: 5) asserts: 'in circumstances of positional neutralization, it is always the perceptually non-prominent position which undergoes re-

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duction, while the prominent positions preserve a full range of contrasts'. One such prosodic asymmetry is the distinction between syllable onsets and codas. Specifically, it has been claimed that in every human language the set of permissible coda segments is a (potentially improper) subset of possible onset segments, never *vice versa* (Hooper 1976, Goldsmith 1990, Blevins 1995, Beckman 1998). This type of neutralisation is especially common with segments bearing contrastive laryngeal specifications; these features tend to be maintained in onsets yet lost in codas (Lombardi 1995a, 1999).

Nevertheless, this generalisation is falsified by Chamicuro, a possibly extinct language of Peru. In Chamicuro, syllable codas can contain nearly every segment that onsets can, but in addition to this codas *also* allow the phonemic glottal consonants /h/ and /ʔ/ to appear in surface forms, whereas the latter two segments are systematically prohibited in onset position (Parker 1994). Furthermore, at least three other languages have also been reported to exhibit a phonemic glottal consonant which is invariably restricted to syllable-final position: Tiriyó (Jones 1972, Meira 1998, 1999), Carib (Hoff 1968, Peasgood 1972) and Macushi (Hawkins 1950, Abbott 1991, Rose 1996).[1] In contrast to this situation, there are no languages which allow nasal consonants, for example, in codas but not in onsets; the same holds true for glides, fricatives and stops, as far as I am aware. Consequently, the onset/coda asymmetry is clearly not completely false; rather, it represents a very strong and robust universal tendency. The fact that /h/ and /ʔ/ appear in codas in Chamicuro but not in onsets is therefore quite anomalous and demands an explanation.

The goal of this paper is to present a solution to the Chamicuro problem which simultaneously fulfils two theoretical desiderata: (i) preservation of the onset/coda asymmetry as a nearly unviolated universal tendency, while (ii) also allowing /h/ and /ʔ/ to be a principled exception to this generalisation. In order to account for the facts of Chamicuro within OT, I will propose a revision to the constraint HavePlace (Itô & Mester 1993, Lombardi 1995b, Padgett 1995b) so that it specifically requires *onset* consonants to possess a (Supralaryngeal) Place node. This positional filter is necessary in order to constrain the factorial typology in such a way that it generates all and only those languages which are actually attested (including Chamicuro). My findings thus coincide with claims previously made by Zoll (1998), Kager (1999), de Lacy (2001) and Smith (forthcoming), who likewise argue that OT must allow for positional markedness constraints as part of the universal constraint component con. I will conclude, then, that both types of positional constraints are required – faithfulness and markedness – with the proviso that these may refer specifically to onsets, but not directly to codas.

The remainder of this paper is organised as follows. In §2 I introduce the relevant facts of Chamicuro and show that they present a dilemma for

[1] Since these three languages are also spoken in South America, this type of distribution could also be considered an areal phenomenon.

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phonological theory. In §3 I note that the unusual restriction of /h/ and /ʔ/ to codas in Chamicuro cannot be satisfactorily accounted for with any known constraint system. Consequently, I argue that we need to subcategorise the constraint HAVEPLACE so that it can be sensitive to onset position. In §4 I consider and reject three alternative analyses. Finally, in §5 I briefly discuss the broader implications of the revised constraint HAVEPLACE(onset).

2 On the distribution of glottal consonants in Chamicuro

In this section I present data illustrating the contrastive nature of the phonemes /h/ and /ʔ/ in coda position in Chamicuro. I then show that an alternative interpretation which places these segments in the syllable nucleus must be rejected for distributional reasons.

Chamicuro is a virtually extinct Maipuran Arawakan language formerly spoken in Peru.[2] Its underlying segmental inventory consists of /p t k ts ʧ tʂ s ʃ ʂ m n ɲ l ʎ (ɾ) w j ʔ h i e a o u/. The voiceless sibilants /tʂ/ and /ʂ/ are retroflexed alveopalatals, /ʎ/ is a palatal lateral and the flap /ɾ/ occurs only in loanwords.[3] All five vowels can be contrastively lengthened. Primary stress is regularly penultimate. The maximal syllable template in Chamicuro is [CCVC]. Long vowels occur only in open syllables; they cannot be closed by a tautosyllabic coda consonant. Up to two consonants are permitted in onsets, but only one in coda position. In fact, all syllables which are not word-initial are required to have an onset of some type (i.e. at least one consonant). Only word-initial syllables may begin with a vowel, although they are not required to (Parker 1989, 1994, 1995).

Beckman (1998: 19) notes that the most frequently studied cases of positional neutralisation involve the onset/coda asymmetry. In Goldsmith's (1990: 125) discussion of this issue, he asserts that a situation in which a feature appears distinctively only in codas 'never occurs'. His main thrust is to view the onset node as a 'strong licensor' in the sense that only it can grant permission for contrastive consonantal features to exist (whereas the coda cannot). Nevertheless, a strong counterexample to this universal pattern comes from Chamicuro, which exhibits a constraint whereby the contrastive phonemes /h/ and /ʔ/ are systematically restricted to syllable-final position (Parker 1994). The following representative data consist of several minimal pairs demonstrating that /ʔ/ and /h/ contrast with their absence in syllable codas:

[2] My last contact with the final two native speakers of Chamicuro was in November 1993. As of 1999 it appeared that at most one of them was still alive (Associated Press 1999). Most of the data for this study are drawn from Parker (1987, 1994).

[3] In many previous works on Chamicuro, the four alveopalatal consonants are transcribed with Americanist symbols. The IPA equivalents used here correspond with them as follows: /ʃ/ = /š/, /ʧ/ = /č/, /ʂ/ = /ṣ/ and /tʂ/ = /č̣/.

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(1)	/toʔsona/	'shinbone'	/tosona/	'pile of dirt'
	/meʔsa/	'sea lion'	/mesa/	'table'
	/meʔna/	'woodpecker'	/menu/	'tongue'
	/uʂaʔki/	'I dance'	/uʃaki/	'my vagina'
	/mahtoli/	'tapir'	/matoli/	'species of worm'
	/ihlapi/	'bank, shore'	/ilapa/	'his/her branch'

The next set of illustrative forms shows that /h/ and /ʔ/ also contrast with vowel length, so they cannot be analysed as a devoicing of the second mora of long vowels:

(2)	/meʔsa/	'sea lion'	/me:sa/	'party'
	/itʃehki/	'it burns'	/itʃe:ki/	'it is abundant'

Furthermore, /ʔ/ and /h/ clearly contrast with each other as well, so they cannot be considered variants (co-allophones) of one another:

(3)	/saʔpu/	'lake'	/kahpu/	'bone'
	/aʔtikana/	'we'	/ahtini/	'path, trail'

The data in (4) below further illustrate the occurrence of other (non-laryngeal) coda consonants which contrast with /h/ and /ʔ/, including obstruents, so the laryngeals cannot be analysed as debuccalised allophones of some underlying oral segment (Parker 1994):[4]

(4)	coda /l/	/jelna/	'man, husband'
	coda /j/	/ajno/	'mosquito'
	coda /k/	/sjekputʂle/	'pot-bellied'
		/umakʂoʔtuke/	'my nephew (male speaker)'
		/uaʔʂoʔtale/	'I put it in'
	coda /t/	/netna/	'how much?'
		/umutle/	'my daughter (male speaker)'
		/tuʔlu/	'chest'
	coda /s/	/paspatali/	'raft'
		/lahpaʔatʃi/	'drink (N)'
		/uanasti/	'I watch, look'
		/uatoʂamahti/	'I wash (clothes)'

The next set of forms shows that there are no systematic restrictions on which onset consonants may occur immediately following /ʔ/ and /h/; laryngeal codas can appear equally well preceding stops, fricatives, affricates, nasals, laterals and glides:

[4] Examples illustrating every Chamicuro consonant which can occur in coda position are found in Parker (1987).

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(5)			
__ stop	/nihpa/	'louse (insect)'
	/ajiʔti/	'now, today'
__ fricative	/ahsi/	'tooth'
	/maʔʃeti/	'owl'
__ affricate	/ihʧa/	'his/her string, rope'
	/peʔʧa/	'soft'
__ nasal	/pnahmule/	'swamp, marsh'
	/utsuʔmasi/	'I kiss'
__ lateral	/ihlapi/	'bank, shore'
	/aʔlotsiʔta/	'near, nearby'
__ glide	/mepolahjaka/	'never'
	/naʔjeni/	'where?'

Finally, /h/ and /ʔ/ may both occur in the same word, and each one may also appear multiple times in the same lexical item. The following examples demonstrate these patterns, which show that glottal consonants are not limited to just one occurrence per root:

(6)		
/taʔwohko/	'far, distant'
/lahpaʔsaʧi/	'drink (N)'
/uahtopohkaʃihti/	'I smoke (tobacco)'
/aʔlotsiʔta/	'near, nearby'

In Chamicuro the two laryngeal phonemes predominate to such a degree in coda position that they are in fact overwhelmingly preferred over all other consonantal segments: in one corpus of 700 lexical items, 351 out of 375 codas (93·6%) consist of either /ʔ/ or /h/. Among the two glottal consonants, /ʔ/ is slightly more frequent than /h/. The segments which occur in the 6·4% of non-laryngeal codas include all of the remaining Chamicuro consonants except the two alveopalatal sonorants /ɲ/ and /ʎ/ (Parker 1994).

Before considering the implications of these facts, an alternative interpretation which must be ruled out first is that [h] and [ʔ] are part of the syllable nucleus or simply the phonetic manifestation of a laryngeal feature (perhaps autosegmental in nature) associated with nuclear vowels. There is ample phonotactic evidence to contradict these analyses. In the first place, [h] and [ʔ] cannot occur in the same syllable with either long vowels or any other coda consonant. This is explained most intuitively if the syllable template in Chamicuro is maximally bimoraic and [h] and [ʔ] project their own independent mora. Furthermore, Chamicuro also exhibits a FINALLIGHT constraint by which the final syllable in a prosodic word cannot end with either a long vowel, an oral coda consonant, [h] or [ʔ] (Parker 1995, 1999b).[5] Additionally, when morpheme concatenation

[5] Violations of this FINALLIGHT constraint are normally repaired by epenthesising a following /i/ (Chamicuro's default vowel). This occurs regardless of whether an

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results in a potential complex coda involving /ʔ/ or /h/, the laryngeal consonant must delete. This process is exemplified by the following two paradigmatically related forms. In (7a) /u-/ is the 1st person singular subject agreement marker, /ʂaʔk/ is the verb root for 'dance' and the final /-i/ is the default epenthetic nucleus motivated by the FINALLIGHT constraint (Parker 1995, 1999b). In (7b), /i-/ is the 3rd person subject agreement marker and /-kana/ is the plural suffix. The input form underlying (7b) is thus /i-ʂaʔk-kana/:

(7) a.	[u-ʂaʔk-i]	b. [i-ʂak-kana]
	1SG-dance-EPENTHETIC	3-dance-PL
	'I dance'	'they dance'

In (7b) the potential onset cluster /kk/ is ruled out by a prohibition against tautosyllabic geminates. Consequently, in order not to produce a superheavy rhyme in the second syllable (*[i.ʂaʔk.ka.na]), the /ʔ/ is obligatorily deleted.[6] If [h] and [ʔ] in Chamicuro were nothing more than laryngeal autosegments which dock with vowels, all of these phonotactic restrictions on their distribution would be merely accidental coincidences since glottalic features in and of themselves should not behave as if they were moraic. On the other hand, if [h] and [ʔ] are normal coda consonants, all of these patterns are automatically explained by independently motivated weight restrictions on the rhyme (the syllable is maximally bimoraic). These same arguments also rule out the possibility of analysing [hC] and [ʔC] sequences as preaspirated and preglottalised segments, respectively.[7] Furthermore, in languages where [ʔ] and [h] are reflexes of some type of nuclear laryngeal quality, there is invariably a very perceptible glottalic modification of the vowel – 'creakiness' or 'breathiness' (Goldsmith 1990: 25, Macaulay & Salmons 1995, Golston & Kehrein 1998, Gerfen 1999, Lopes & Parker 1999). In Chamicuro, however, this is never heard. In Yuhup, which does have contrastively glottalised nuclei, such syllables can still end with a canonical (non-laryngeal) coda consonant (Lopes & Parker 1999), but in Chamicuro this is impossible. In addition, as pointed out by an anonymous reviewer, it is probably the case that nuclear 'glottalisation' and 'aspiration' can only be physically manifested on long vowels, for articulatory reasons discussed in Gerfen (1999), but in Chamicuro [ʔ] and [h] occur only with phonemically *short* vowels. Finally, in all other languages where laryngeal consonants are associated in some fashion with the syllable nucleus, they are normally limited to at most one

underlying morpheme-final coda consists of an obstruent or a sonorant, indicating that all consonants are moraic in syllable-final position: /timil/ → [timíli] 'wind (N), air'; /ahkotʃ/ → [ahkótʃi] 'house' (Parker 1995). I have no evidence demonstrating what would happen if a /ʔ/ or /h/ were in danger of surfacing in word-final position since glottal codas are always followed by a tautomorphemic consonant.

[6] Due to the fact that syllable codas in Chamicuro strongly prefer to consist of either /ʔ/ or /h/, there are no examples in my data of a non-laryngeal coda consonant deleting in this same environment.

[7] Thanks to an anonymous reviewer for pointing this out.

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occurrence per morpheme or prosodic word, suggesting that they are root-level features of some kind (Macaulay & Salmons 1995, Golston & Kehrein 1998, Gerfen 1999, Lopes & Parker 1999). As we have seen in Chamicuro, however, no such restriction holds of glottal segments; they may occur multiple times in the same root and therefore do not behave like autosegments, which typically dock with only one vowel per morpheme.

The only conceivable motivation for analysing [h] and [ʔ] in Chamicuro as nuclear segments or features is to avoid violating the strongly attested universal tendency for coda inventories to be a subset of onset inventories. Furthermore, if we did opt for this interpretation, we would then have to posit a completely new type of nucleus in Chamicuro – laryngealised – for which there is no independent justification. In summary, there is no positive evidence in Chamicuro for treating [ʔ] and [h] as nuclear segments, nor is there any language-specific negative evidence suggesting that they are not ordinary coda segments just like any other syllable-final consonant. Therefore, in accounting for the facts of Chamicuro, we would derive absolutely no language-specific benefit from assigning [h] and [ʔ] to the syllable nucleus; on the contrary, such a move would actually be detrimental since it would in effect triple the surface inventory of contrastive vowel 'phonemes'. Consequently, insisting that /h/ and /ʔ/ must be reanalysed as nothing but non-segmental nuclear features just because the onset/coda asymmetry has been thought to be universal would be completely circular in this case. I therefore conclude that /ʔ/ and /h/ are fully moraic, canonical coda phonemes on a par with all of the other Chamicuro consonants which occur in syllable-final position, and must not be analysed in any other way.[8]

An anonymous reviewer mentioned a similar but slightly different reanalysis by which the phonetic sequences [Vʔ] and [Vh] in Chamicuro are the surface realisation of bimoraic glottalised and aspirated vowels, respectively, as Gerfen (1999) proposes for Coatzospan Mixtec. In the spirit of the preceding paragraph, this alternative should be rejected for the same reasons: it unnecessarily complicates the analysis of Chamicuro without any compensating advantage, and it lacks language-specific confirmation. Gerfen's (1999) analysis of Coatzospan Mixtec couplet glottalisation is strongly motivated by both phonetic and phonological evidence from that language, most of which is distributional in nature. Specifically, in Coatzospan Mixtec, phonetic [ʔ] occurs only in word-initial syllables, never elsewhere; it is licensed only in stressed syllables,

[8] A final detail of the data is that a vowel immediately preceding a /ʔ/ can be optionally copied after the /ʔ/ in emphatic (fortis) speech: /japleʔti/ → [japléʔti] ~ [japléʔeti] 'lightning'. In Parker (1994) I conclude that this is not a true and productive phonological process, for the following reasons: (i) it is optional; (ii) it is register-dependent; (iii) it happens only with /ʔ/, never with /h/ (suggesting that in Chamicuro /ʔ/ is less marked than /h/); and (iv) it does not perturb the regular assignment of penultimate stress. Consequently, this low-level phenomenon represents one possible phonetic implementation of the release of a tautosyllabic glottal coda, and does not violate the generalisation that /h/ and /ʔ/ never occur in onset position in terms of the phonology.

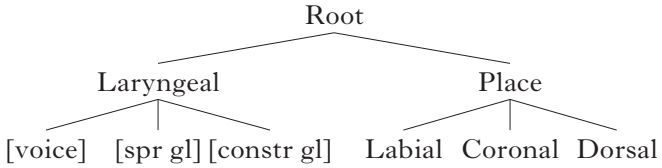
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nowhere else; and it is always intervocalic at the surface level. None of these restrictions holds true of glottal consonants in Chamicuro. Consequently, in the absence of morphophonemic alternations hinting at more abstract underlying representations in Chamicuro, we should conclude that [h] and [ʔ] map unchanged from input to output forms exactly as they appear to be – postvocalic, canonical, coda consonants. This simple and direct analysis follows from the tenet of Occam's Razor, which prohibits us from doing something that is not absolutely necessary. As a final argument against this possible reanalysis of Chamicuro, I would simply point out that it still begs the crucial, ultimate question of how to permit [h] and [ʔ] to appear in coda position while simultaneously blocking them in onsets, given the fact that OT constraints scan *surface* forms.[9]

3 Formal analysis

From a typological perspective the data just presented are significant in that they falsify the universal onset/coda asymmetry. They are also important theoretically since no possible permutation of the most widely used constraints can produce the result that we require for Chamicuro: to systematically restrict /h/ and /ʔ/ to codas while filtering them out from onsets. Therefore, in this section I will posit a revised constraint, HavePlace(onset). Before addressing this proposal directly, however, I first sketch my assumptions regarding issues of feature geometry and underspecification which are relevant for Chamicuro. I assume a rather generic type of hierarchical tree having the following partial structure, drawing from the models of Clements (1985), Sagey (1986), McCarthy (1988, 1994), Kenstowicz (1994) and Halle (1995):

(8)



In (8) the Laryngeal node exhaustively dominates the features [voice], [spread glottis] and [constricted glottis], which are probably privative (Lombardi 1999). Therefore, [voice] is contrastively specified only for voiced obstruents, which Chamicuro lacks. Furthermore, the Laryngeal node itself is also underspecified (absent) in the output for those segments which do not require any laryngeal features to be present. Following Halle & Stevens (1971) and Halle & Clements (1983), I assume that /h/ shares

[9] Ideally, it would have been providential to carry out an instrumental analysis of Chamicuro's glottal segments in order to compare them more fully to those of languages like Coatzospan Mixtec. Unfortunately, however, no tape recordings of Chamicuro speech exist, so it is extremely unlikely that a phonetic study will ever be realised.

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with aspirates the feature [spread glottis], while /ʔ/ and ejectives are all [constricted glottis]. Cross-linguistic evidence supporting these natural classes is abundant. For example, Davis (1999) captures the parallel distribution between /h/ and aspirated stops in English by positing two alignment constraints which require the feature [spread glottis] to coincide with the left edge of stressed syllables and word-initial syllables. And in Cuzco Quechua, [ʔ] and [h] enter into OCP co-occurrence restrictions with ejectives and aspirates, respectively (Parker & Weber 1996, Parker 1997). The constraints *LARYNGEAL and IDENTLARYNGEAL (Lombardi 1995c, 1999) will be used in this paper to prohibit and preserve, respectively, the specification of any of the features dominated by the Laryngeal node:

(9) a. *LARYNGEAL (*LAR)
Laryngeal feature specifications are prohibited in Output forms, where the three privative laryngeal features are [spread glottis], [constricted glottis] and [voice].

b. IDENTLARYNGEAL (IDENTLAR)
Output segments and their Input correspondents must agree in all laryngeal feature specifications, i.e. do not change a segment's laryngeal features.

In the tree in (8) I assume that only supralaryngeal segments possess a structural Place node. This is because of the widely noted fact that glottal consonants often behave phonologically as if they were placeless in terms of vowel copying, debuccalisation, etc. (Steriade 1987a, Yip 1991, Stemberger 1993, Halle 1995, Rose 1996, Ladefoged 1997). At the same time, however, certain languages have been argued to motivate a Pharyngeal Place node for the segments /h/ and /ʔ/ when these pattern with other guttural consonants (Kenstowicz 1994, McCarthy 1994, Lombardi 1995c, Padgett 1995a, Rose 1996). McCarthy (1994) suggests that the presence *vs.* absence of Pharyngeal Place for laryngeal consonants is a universal parameter whose setting is chosen on a language-particular basis. Rose (1996) claims that this determination is in fact predictable: /ʔ/ and /h/ are specified for Pharyngeal Place only when there are other pharyngeal or uvular consonants present in the language-specific inventory; otherwise, glottal consonants have no Place node whatsoever in terms of the feature tree.[10] Given these facts, I conclude that /h/ and /ʔ/ in Chamicuro

[10] In the relatively few languages which do have pharyngeal consonants, the traditional Place node (as in (8)) bifurcates first into Oral and Pharyngeal; the Oral (or Oral Cavity) node then dominates Labial, Coronal and Dorsal, as diagrammed in McCarthy (1994: 223) and Rose (1996: 80). The formal asymmetry between Oral (or Supralaryngeal) Place, which is universally specified, and Pharyngeal Place, which may be absent, is justified by two physiological facts which are probably related: (i) while the tongue and lips are very active and mobile articulators, the pharyngeal wall is relatively passive; and (ii) orosensory nerve endings are much more abundant and proprioceptively acute in the oral cavity than in the pharynx (McCarthy 1994). The phonological mechanism which induces specification of Pharyngeal (when relevant) is the Node Activation Condition of Avery & Rice (1989) and Rose (1996).

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completely lack a Place node insofar as their inherent, internal structure is concerned.

It has also been observed that, among consonants possessing a (Supralaryngeal) Place node, coronals are unmarked with respect to labials and dorsals. This fact has led many researchers to claim that the Coronal node and/or the Place node are left unspecified for coronal consonants during certain stages of the phonological derivation (Paradis & Prunet 1989, 1991). This proposal has not been universally accepted, however. A number of works have pointed out various problems with the coronal underspecification approach (Itô & Mester 1986, Steriade 1987b, Clements 1988, McCarthy & Taub 1992, Steriade 1995). Furthermore, most models of OT are strictly parallel and thus eschew intermediate steps in the derivation. Consequently, since OT constraints govern only surface forms, where most (or all?) features (even redundant ones) must be fully specified (cf. Halle *et al*. 2000), the issue of coronal underspecification at the phonetic level is somewhat moot. With respect to this point I follow Kirchner (1995) and Halle *et al*. (2000) in assuming that all supralaryngeal consonants, including coronals, necessarily possess a structural Place node at the moment at which constraints evaluate output candidates.[11]

I now discuss the constraint which will form the basis of my formal analysis of Chamicuro. Many languages display a pattern whereby in syllable-final position no segment may have an independent Place node, i.e. one that is not shared with the following onset consonant. Prior to the advent of positional faithfulness, this phenomenon was normally captured by the well-known Coda Condition of Itô (1986, 1989), Yip (1991), McCarthy & Prince (1993a, b, 1994, 1995), Lombardi (1995c) and Beckman (1998). In seeking to explain the physical basis of this constraint, several writers have appealed to the notion of segmental release: codas disprefer release into a distinct Place node, whereas onset consonants naturally attract Place specifications concomitantly with their release into the following vowel (Kingston 1990, Steriade 1994, 1995, Padgett 1995b). Several analyses have thus proposed a constraint called HavePlace (Itô & Mester 1993, Lombardi 1995a, Padgett 1995b). The motivation for this is often explained as the need for a contrastive phoneme to be expressed by some articulator, which in turn is licensed by the onset (Goldsmith 1990, Itô & Mester 1993, Padgett 1995b). Consequently, it would be a very natural and principled move to propose that we extend this constraint and

[11] The associate editor and an anonymous reviewer reminded me of the claim that underspecification sometimes persists into the phonetic component (Keating 1988, Pierrehumbert & Beckman 1988, Archangeli & Pulleyblank 1994 and, more recently in OT, Myers 1998). However, much of this work deals with suprasegmental phenomena such as tone and intonation. To my knowledge, no one has demonstrated that the *Coronal* node or feature exhibits behaviour typical of phonetically underspecified structures. For example, there is no evidence that Coronal lacks an articulatory target at the moment of motor implementation, nor that its value is ever filled in solely by interpolation between adjoining vowels. On the contrary, if any class of consonants falls into this category, it would clearly be the laryngeals /h/ and /ʔ/, not coronals. Keating herself (1988) discusses phonetic underspecification of /h/ in English. Thanks to John McCarthy for clarification of these issues.

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posit a related one which governs onset segments only. As a precedent, Beckman (1998) and Smith (forthcoming) show that other prosodically prominent domains also tend to preferentially attract more structure than their weaker counterparts: initial syllables, stressed syllables, etc. Below I formalise this positional markedness filter in an explicit way (cf. Padgett 1995b):[12]

(10) HavePlace(onset)

∀ segment x, where x ∈ Output & x is syllabified in onset position, ∃y such that y ∈ Place & y(x), i.e. x contains y.

'Every onset segment in the Output must have some Place specification.'[13]

According to Zoll (1998), constraints of this type sometimes arise through a local conjunction of two independent, elementary constraints (Hewitt & Crowhurst 1996, Itô & Mester 1996, Alderete 1997, Smolensky 1997, Zoll 1998, Kager 1999). For example, NoLabialCoda results from the combination [*Labial & NoCoda]$_{seg}$. In the present case one might in principle attempt to derive my formulation of (10) from the conjunction [HavePlace & Onset]$_{seg}$. However, this strategy clearly would not work since a hypothetical glottal consonant in syllable-initial position *obeys* Onset while violating only HavePlace. It is here that the analogy with [*Labial & NoCoda] fatally breaks down. Consequently, since an onset /h/ would infelicitously satisfy the whole conjunction [HavePlace & Onset] by virtue of not violating both of its parts, the correct results could not be obtained with a constraint of this type. I therefore conclude that the monolithic filter HavePlace(onset) is required. All of the published analyses utilising positional faithfulness constraints provide us with ample justification for this subcategorisation, so we do not need to try conjoining two more basic constraints anyway.

We are now ready to consider a tableau. In the discussion here I will focus only on interactions involving the feature [spread glottis], i.e. /h/ and aspirated stops. The reader can easily envision an analogous treatment for /ʔ/ and ejectives by substituting the feature [constricted glottis] in the appropriate places. Two additional constraints which will now become relevant are defined below:

(11) a. Max(IO)

Every segment in the Input must have a correspondent in the Output, i.e. segmental deletion is prohibited (McCarthy & Prince 1994, 1995, Lombardi 1995c, Beckman 1997, 1998).

[12] In my statement of (10) I refer to the 'onset' without defining this notion explicitly. Since this is not a critical detail in my analysis, I prefer to eschew the theoretical controversy surrounding the correct hierarchical (internal) structure of the syllable, and just use 'onset' in an informal, generic sense.

[13] I intend this constraint to be interpreted as being satisfied in situations when some onset segment shares a Place node with an adjacent, tautosyllabic onset consonant.

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b. IDENT(Place)
Output segments and their Input correspondents must agree in all Place feature specifications, i.e. do not change a segment's place of articulation, where Place = {Labial, Coronal, Dorsal} (Lombardi 1995b, c, Beckman 1998).

In the first tableau I consider the input /nihpa/ from (5):

(12)

/nihpa/	HAVEPL(onset)	MAX	ID(Place)	*LAR	IDLAR
a. ni.pa		*!			
☞ b. nih.pa				*	
c. nis.pa			*!		*
d. nit.pa			*!		*
e. nit^{h}.pa			*!	*	

When an underlying /h/ occurs in coda position, as in (12), top-ranked HAVEPLACE(onset) is irrelevant. Deleting this /h/ outright (candidate (a)) is not the correct result, so MAX must dominate *LAR (the only constraint which (b), the winner, violates). The only other strategy available to avoid violating *LAR involves changing the /h/ to some (supralaryngeal) obstruent (c–e). All of these candidates are also suboptimal, indicating that IDENT(Place) dominates *LAR, too. In candidate (c) [nispa] I assume that voiceless oral fricatives such as /s/ are not specified as [spread glottis] phonologically, even though at a phonetic level they may involve abduction of the vocal folds (Vaux 1998). Consequently, I have assigned it a violation mark for IDENTLAR. Even if this were incorrect, (c) still fatally violates IDENT(Place). Up to this point, then, we have motivated the following crucial rankings:

(13) MAX, IDENT(Place) ⩾ *LAR

Given Richness of the Base (Prince & Smolensky 1993), we must also contend with hypothetical inputs containing infelicitous /h/'s in onset position. Richness of the Base is not just a peculiar way of making life difficult in OT. It is an uncontroversial fact that Chamicuro has no syllable-initial glottal consonants, and *any* analysis must account for this in one way or another. As pointed out by an anonymous reviewer, one way in which we can directly access ROTB is through loanwords (Smolensky *et al.*, forthcoming). Furthermore, a study of loanword repair strategies indicates that, unlike other segments, /h/ and /ʔ/ are often deleted in borrowed words (Paradis & LaCharité 2001). In Chamicuro, however, this is not the case; Spanish words containing a syllable-initial [h] are incorporated into Chamicuro by converting the /h/ into an /ʃ/ (Parker 1987):[14]

[14] In the lowland jungle (interior) region of Peru (where Chamicuro was spoken), virtually everyone pronounces the Spanish *jota* phoneme as a glottal fricative [h] rather than as a velar or uvular fricative, as in other regions of the Spanish-speaking world.

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(14)

Spanish	*Chamicuro*	
naranja	/alanʃa/	'orange'
jabón	/ʃawona/	'soap'
cojo	/koʂo/	'lame, crippled'

In the form /koʂo/ the retroflexed alveopalatal /ʂ/ is chosen since /ʃ/ does not occur before the back (rounded) vowels /o/ and /u/ in Chamicuro (Parker 1990).[15] The following tableau demonstrates that the constraint system posited above correctly handles these cases as well (for the sake of simplicity I will analyse a hypothetical (non-Spanish) form):[16]

(15) *hypothetical*

/nihapa/	HavePl(onset)	Max	Id(Place)	*Lar	IdLar
a. ni.apa		*!			
☞ b. nitapa			*		*
c. nit^{h}apa			*	*!	
☞ d. niʃapa			*		*
e. nihapa	*!			*	

In (15), top-ranked HavePlace(onset) now becomes relevant and eliminates the completely faithful candidate (e). Candidate (a) avoids this violation by deleting the offending /h/, but this breach of Max leads to the impossible Chamicuro word *[ni.apa]. This form would of course violate Onset as well (Itô 1989, McCarthy & Prince 1993a, b, 1994, 1995, Prince & Smolensky 1993, Beckman 1998). Recall from §2 that the requirement for obligatory syllable onsets is relaxed word-initially in Chamicuro, a very common situation universally. Thus, deleting a hypothetical /h/ at the beginning of a word would not produce an incorrect result, but in medial position this type of repair must obviously be blocked. Candidates (b), (c) and (d) convert the underlying /h/ into a supralaryngeal obstruent in order to satisfy HavePlace(onset). In doing so, they all violate Ident(Place), so the decision passes down to lower-ranked *Lar. Candidate (c) retains the feature [spread glottis] by mapping /h/ to an aspirated stop, fatally violating *Lar (Chamicuro has no aspirates).

[15] The preference for /ʃ/ over /s/ as the supralaryngeal repair consonant in Chamicuro is somewhat unexpected, given the universal unmarkedness of alveolars relative to alveopalatals. We might speculate that the Chamicuro speakers were aware of the alternate pronunciation of the Spanish *jota* as /x/ (velar) from other speakers they may have heard, for example, on the radio. In that case the /ʃ/ could be explained by Paradis & LaCharité's (2001) Preservation Principle, according to which the adaptation of loanwords tends to result in segments which are as articulatorily close to the source phoneme as possible. At any rate, this is not a critical detail in my analysis since Chamicuro grammar must still deal with onset /h/'s, regardless of their origin. Consequently, I leave this issue for future research. Thanks to Ellen Kaisse and Carole Paradis for discussion of this point.

[16] In Chamicuro, morpheme concatenation never leads to a situation in which an underlying /h/ or /ʔ/ appears in a position where it would most naturally be syllabified as an onset. Consequently, inputs such as /nihapa/ truly are hypothetical, in every sense of the word.

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Candidates (b) and (d) therefore tie and emerge as the representation of choice since their only other violation mark is for bottom-ranked IDENTLAR (they lose the feature [spread glottis]). We could easily eliminate [nitapa] (b) by invoking an undominated constraint such as IDENT(Cont) to ensure that [niʃapa] (d) wins. Nevertheless, even if we do not, no harm is done since both [nitapa] and [niʃapa] are possible, yet non-occurring surface forms in Chamicuro (as far as I am aware), and this is a hypothetical case. Due to the ranking *LAR ≫ IDENTLAR at the bottom of the hierarchy, no aspirated, glottalised or voiced obstruents in hypothetical inputs will ever be able to surface intact in Chamicuro. The dynamic which permits [h] and [ʔ] to occur in optimal output forms at all is that IDENT(Place) dominates *LAR, so no glottal consonant can be compelled to acquire a Supralaryngeal Place node when it is syllabified in coda position. Tableau (15) therefore demonstrates the need for more crucial rankings:

(16) a. HAVEPLACE(onset), MAX ≫ IDENT(Place)
b. *LAR ≫ IDENTLAR

To summarise this section, I have demonstrated that the constraint HAVEPLACE(onset) produces all the correct results for Chamicuro. Furthermore, as mentioned in §1, at least three other languages also need an analysis along these lines in order to permit glottal consonants to surface only in syllable-final position. Consequently, I conclude that HAVEPLACE (onset) is cross-linguistically required.

4 Alternative analyses considered

In accounting for the facts of Chamicuro, three other alternative analyses might be considered instead of the constraint HAVEPLACE(onset). I will discuss each of these in turn and argue that they are inferior to the approach I have just sketched. First, we might posit a negative positional markedness filter prohibiting laryngeal feature specifications in onset position: *ONSET(Laryngeal). The main problem with this constraint is that its typological predictions are fatal. Given the right circumstances (rankings), *ONSET(Laryngeal) could lead to a pathological language in which aspirates and/or ejectives occur only in coda position but not in onsets. Since no such systems are known to exist, I reject this alternative constraint.[17] An analysis using HAVEPLACE(onset) avoids this problem by

[17] An anonymous reviewer points out that Sierra Popoluca has been described as having aspirated consonants only in codas. However, according to Elson's (1947) report, it is clear that this distribution is only allophonic in nature: /pttʲk/ are aspirated in syllable-final position, but only when they are not followed by a homorganic onset consonant. The latter restriction suggests that this aspiration may simply be the manifestation of an excrescent, 'open transition' phonetic process rather than a postlexical phonological rule. At any rate, the universal generalisation that aspirates/ejectives do not occur *contrastively* only in codas remains exceptionless at the phonemic level. It should be stressed that if we require our theory to encompass every allophonic phenomenon known among all the languages of the world, then the onset/coda asymmetry is obviously overstated. For example, many

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a priori distinguishing between aspirates/ejectives, which have a Place node, and /ʔ/ and /h/, which do not. In Parker (1994) I did make use of an onset filter like *ONSET(Laryngeal), but I was crucially assuming a rule-based framework in which that mechanism was operational only in the language-specific grammar of Chamicuro. Given the cross-linguistic outlook of OT, this is no longer a viable option.

Secondly, in Parker (1989) I suggested that /h/ and /ʔ/ are higher in sonority than all other consonants in Chamicuro. This detail could be used in conjunction with Clements' (1990) Sonority Dispersion Principle to argue that there is a threshold effect on onsets in Chamicuro such that segments of very high sonority are dispreferred in this position and preferred in codas. See Macaulay & Salmons (1995: 41–42) and Bernhardt & Stemberger (1998) for similar proposals. Nevertheless, this type of analysis entails the claim that the voiceless consonants /ʔ/ and /h/ can be higher in relative sonority than the voiced oral glides /w/ and /y/. This is controversial since several works have claimed that sonorants must always be voiced (Ladefoged 1971, Stevens & Keyser 1989, Rose 1996). Furthermore, in my own instrumental work exploring five different physical correlates of sonority (intensity, air flow, intraoral air pressure, constriction duration and F1 frequency), I have found that glottal consonants pattern more often as obstruents than as sonorants (Parker, in preparation). Consequently, I do not pursue this alternative account here.

Finally, Bernhardt & Stemberger (1998; hereafter the 'HPD' model) propose an inventory of universal constraints which are quite different from those which have become standard in the OT literature, at least in name.[18] A beneficial side-effect of the novel HPD system is that it can derive languages like Chamicuro. However, certain aspects of this model are problematic on both theoretical and typological grounds. Before examining its relevant constraints in detail, I first sketch a number of background assumptions in HPD which contrast with those posited in §3 of this paper: (i) Instead of using families of IDENT(Feature) constraints to prohibit sub-segmental changes, HPD employs SURVIVED(Feature) constraints, which are functionally equivalent to those of the MAX(Feature) variety (McCarthy & Prince 1995); (ii) The HPD system crucially divides the feature geometry tree into a primary Consonantal-Place node and a daughter (secondary) Vowel-Place node, *à la* Clements (1991) and

languages exhibit assimilated nasal segments such as [ɲ] and/or [ŋ] only in syllable-final position. In fact, the special occurrence of superficial velar contrasts only in codas is found in enough languages that Trigo (1988) proposes that Dorsal is the unmarked articulator feature there. For this reason it might be beneficial to use HAVEPLACE(onset) in the analysis of [ŋ] in languages such as Yucatec Maya (Orie & Bricker 2000), Iñapari (Parker 1999a) and English. (Davis's 1998 *ONSET/ŋ is ad hoc and brute force.) Nevertheless, it is not clear that CON should necessarily bear the burden of accounting for every one of these phonotactic quirks; many or most of them would better be handled by the grammatical module responsible for effects of phonetic implementation.

[18] I am indebted to an anonymous reviewer for bringing this work to my attention, and for very cogent discussion of the differences between its line of analysis and mine.

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Clements & Hume (1995); (iii) HPD claims that the laryngeal features [voice], [constricted glottis] and [spread glottis] are binary, and that a Laryngeal node is present even when none of its dependents are specified; (iv) The HPD model has no single, general faithfulness constraint against insertion but rather invokes a family of NOT markedness constraints, analogous to *STRUC (Prince & Smolensky 1993).

I now list the four constraints that would be required in the HPD model in order to generate the facts of Chamicuro. Not all of these constraints are specifically mentioned in that volume, but I express each one in a way which is consistent with the schemata they define there. The constraints are listed in order of crucial ranking for Chamicuro, the highest one first, and each one is 'translated' into a corresponding constraint in more familiar terms:

(17) SURVIVED(C-Place)
A Consonantal-Place Node in the underlying representation must be present in the output. (≅ MAX(Place))
⋙
NOTCO-OCCURRING(Rhyme,C-Place)
Rhyme and Consonantal-Place may not co-occur at the same point in time. (≅ *CODA(Place))
⋙
CO-OCCURRING(σ-Margin → C-place)
Syllable margins must co-occur with (must contain) a Consonantal-Place node. (≅ HAVEPLACE(Onset&Coda))
⋙
NOT(C-Place)
A Consonantal-Place node must not appear in the output. (≅ *PLACE)

The following abbreviated tableaux show the evaluation of the same two Chamicuro input forms as before (the second of which is hypothetical), using the HPD system which I have just outlined:

(18) a.

/nihpa/	SURV(CPl)	NOTCO(Rh,CPl)	CO(σ-M→CPl)	NOT(CPl)
☞ i. nihpa			*	**
ii. nit^{h}pa		*!		***
iii. niʃpa		*!		***

b.

hypothetical: /nihapa/				
i. nihapa			*!	**
☞ ii. niʃapa				***

In the tableaux in (18), the top-ranked constraint is analogous to MAX(Place) and is crucial for preserving input consonants with a Supralaryngeal (or Oral) Place node in syllable-final position, such as /netna/ and /paspatali/ from (4) above. The second constraint, NOTCO-OCCURRING (Rhyme, C-Place), has the effect of prohibiting insertion of a Place node

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(/h/ → [ʃ]) in codas, thus eliminating candidates (18a.ii) and (iii). The third constraint, Co-occurring(σ-Margin → C-Place), requires that all onset and coda consonants have a C-Place node. Since this constraint is dominated by NotCo-occurring(Rhyme, C-Place), its effect is to trigger the insertion of a Place node only in onset position (18b.ii). The failure of *[nihapa] to satisfy this constraint is therefore fatal in (18b.i). The bottom-ranked constraint in this hierarchy, Not(C-Place), is analogous to *Place. Since it is crucially dominated by Co-occurring(σ-Margin → C-Place), candidate (18b.ii) correctly wins even though it accrues one more violation of Not(C-Place) than the totally faithful candidate (i) does. Finally, an additional markedness constraint such as NotCo-occurring (C-Place, [+spr gl]) would be required in this system to rule out all aspirated stops in surface forms. We thus see that the HPD approach allows us to derive patterns of distribution like that of Chamicuro in a manner which is functionally identical to §3 but with different constraints. Nevertheless, when we go beyond the facts of Chamicuro alone and consider more far-reaching theoretical implications of the HPD model, certain disadvantages emerge which suggest that a system with HavePlace (onset) is to be preferred in the long run. I now illustrate two of these differences and their significance by means of an explicit comparison of the most relevant points.

One detail of the HPD model which is problematic is its introduction of the rhyme constituent as a primitive argument which can be targeted by constraints. This innovation essentially extends 'positional faithfulness' types of behaviour to coda consonants. However, this system allows con to generate a language in which the entire inventory of coda consonants is limited to voiceless stops and nothing else (Bernhardt & Stemberger 1998: 214ff).[19] While such a pattern may be attested in early stages of child language acquisition, no adult grammars of this type have ever been reported, as far as I am aware. It is extremely doubtful that this type of inventory restriction actually occurs in adult languages, and the fact that the HPD model permits it is an indication of excessive power. The general problem is that, while onsets clearly are psychologically/neurologically prominent (Beckman 1998, Smith, forthcoming), no such prosodic effects (such as augmentation) have been noted for consonants in coda position. Consequently, in the interest of having appropriately grounded constraints, those which give privileged status to syllable-final consonants via reference to the rhyme should be prohibited. The HPD account of Chamicuro does crucially employ one such constraint (NotCo-occurring(Rhyme, C-Place)), which mine avoids, so I conclude that an analysis with HavePlace(onset) is superior in this respect. In other words, allowing the Co-occurring constraint family to take the implicitly complex argument σ-Margin works fine for *onset* consonants (just like HavePlace(onset)), but the extension to codas is problematic. The crux of the difference between our two approaches lies not so much in the exact

[19] Thanks to Joe Stemberger for clarification of this point.

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wording of the constraints themselves, but in the nature of what they ultimately achieve. The HPD approach therefore encounters empirical problems with capturing the basic facts of the universal onset/coda asymmetry, a central topic of this paper.

The second drawback in the HPD theory is that it employs faithfulness constraints of the SURVIVED(Feature) variety (which are analogous to MAX(Feature)) rather than IDENT(Feature). The problem with this is that IDENT(Feature) constraints are much more compact than MAX(Feature)/SURVIVED(Feature). For every MAX(Feature) constraint which is invoked to prohibit deletion of an underlying feature, at least two other constraints are also required: DEP(Feature) to prevent insertion of that feature, and NOFLOP(Feature) to block it from shifting to a different segmental anchor. The three equivalent additional constraints in the HPD model are NOT(Feature), NOT(Link) and SURVIVED(Link). A single IDENT(Feature) constraint achieves this same result (featural stability) and therefore greatly simplifies the inventory of CON. The authors of HPD acknowledge their concern about this proliferation of formal devices (1998: 169) and initially argue that SURVIVED can adequately replace IDENT. However, they later note that some cases of deletion are captured more elegantly by IDENT and hence 'leave it is an open question whether IDENTICAL is [also] needed' (1998: 169). They ultimately suggest that both SURVIVED and IDENT are in fact required in their approach, which for this reason is, in their own words, 'technically inadequate' (1998: 680). I therefore conclude that a theory relying on IDENT(Feature) constraints is more constrained and thus preferable to the less restrictive system which employs SURVIVED(Feature). The HPD analysis of Chamicuro crucially needs the constraint SURVIVED(C-Place) to protect codas such as the /t/ of /netna/. If this were to be replaced by IDENT(Place), we would incorrectly block the mapping from /nihapa/ to [niʃapa] in (18b). Therefore, the debate over IDENT(Feature) *vs.* SURVIVED(Feature)/MAX(Feature) is quite relevant for Chamicuro.[20]

In conclusion, while the HPD theory makes a number of interesting and useful predictions, it is also problematic in certain respects. Specifically, the theoretical underpinnings of the model of CON which I assume in my analysis of Chamicuro glottal consonants, in comparison with those of Bernhardt & Stemberger (1998), are much more restrictive. Consequently, introducing a single (partially) new constraint (HAVEPLACE(onset)) causes less disruption to classical OT in the long run.[21]

[20] A third and final contrast between the HPD model and mine is that HPD assumes the Vowel-Place Theory of Clements (1991) and Clements & Hume (1995), by which consonantal and vocalic place features are segregated onto distinct tiers. Halle *et al.* (2000) forcefully argue that V-Place and C-Place should not be distinguished either structurally or in terms of the features that they dominate. I refer the reader to this latter work and to Zetterstrand (1996, 1998) for an extensive discussion of these issues, and consequently do not pursue them further here.

[21] In Pater's (1999) review of the HPD volume he makes several of these same points as well.

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5 Extending the analysis

In this section I briefly consider the cross-linguistic ramifications of the constraint HAVEPLACE(onset). It is beyond the scope of this paper to exhaustively account for the complete factorial typology of all languages resulting from different combinations of glottal consonants and laryngeal features. Nevertheless, I can at least sketch how we would generate some of the most common and obvious inventories. In Table I, I consider critical interactions between HAVEPLACE(onset) and certain other constraints with which it may logically come into conflict. This treatment therefore expands the analysis to include the behaviour of /ʔ/ and /h/ in onset position as well. Before presenting the table, however, I first define

Language type (a)	Glottal consonants permitted everywhere, both in onsets and in codas.
Examples	Southern East Cree (Brittain 2000), Yuhup (Lopes & Parker 1999)
Crucial rankings	IDENT(Place) ≫ HAVEPLACE(onset), *LAR
Effects (*ceteris paribus*)	Underlying glottal consonants may not be compelled to acquire a supralaryngeal place specification; in both onsets and codas they must surface completely unchanged.
Language type (b)	Glottal consonants permitted only in onsets; prohibited in codas.
Examples	Spanish (some dialects), Quechua (Parker & Weber 1996), English
Crucial rankings	IDENTONSET(Laryngeal), IDENTONSET(Place) ≫ *LAR, HAVE PLACE(onset) ≫ IDENTLAR, IDENT(Place) (This is the positional faithfulness analysis of Lombardi 1995c, 1999.)
Effects	In onset position, glottal consonants must surface completely unchanged; they cannot be compelled to acquire a Place node there. In coda position glottal consonants must be converted into some supralaryngeal segment; they must acquire a Place node and lose all laryngeal specifications. (Alternatively they may be deleted if MAX is low-ranked.)
Language type (c)	No glottal consonants permitted anywhere, either in onsets or in codas.
Examples	Rotokas (Firchow & Firchow 1969), Wolof (Ka 1994)
Crucial rankings	*LAR ≫ IDENT(Place), (MAX) (In this case the ranking of HAVE PLACE(onset) is irrelevant.)
Effects	Underlying glottal consonants cannot surface unchanged in any position; they are compelled to acquire some (Oral) Place node or delete.

Table I

Critical interactions between HAVEPLACE(onset) and other constraints.

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several constraints which are referred to in this section for the first time. None of these constraints is my own invention; all of them have ample support in previous OT literature, so I assume that no further discussion is necessary:

(19) a. IDENTONSET(Laryngeal)
Output segments in onset position and their Input correspondents must agree in all laryngeal feature specifications, i.e. do not change an onset segment's laryngeal features (Lombardi 1995c, 1999).

b. IDENTONSET(Place)
Output segments in onset position and their Input correspondents must agree in all Place feature specifications, i.e. do not change an onset segment's place of articulation (Lombardi 1995b, c, Beckman 1998).

c. NOCODA
Coda consonants are prohibited in Output forms: *C]$_{\sigma}$ (Prince & Smolensky 1993, McCarthy & Prince 1993a, b, 1994, 1995, Beckman 1998).

d. *PLACE
Place feature specifications are prohibited in Output forms, where Place = {Labial, Coronal, Dorsal} (Lombardi 1995c, Padgett 1995a, Beckman 1998).

An anonymous reviewer notes that there seems to be a continuum of language types in (20a–d) with respect to the inventory of consonants permitted in syllable-final position:

(20) a. No codas at all.
b. Placeless codas only.
c. Coda and onset inventories basically identical.
d. Coda inventory same as onset inventory plus laryngeals.

Type (d) at the extreme end is exemplified by Chamicuro, and can be produced as explained in this paper. The remaining three types of languages can be generated as in Table II.

In conclusion, in this section I have shown that the constraint HAVEPLACE(onset) is cross-linguistically valid since it produces the correct results for languages like Chamicuro without simultaneously creating the danger of illicit permutations that predict unattested languages.[22]

[22] An anonymous reviewer notes that some of these phenomena could also be accounted for with positional markedness constraints that arise via local conjunction. For example, to rule out glottal consonants in codas, one could invoke [NOCODA & *LAR]. However, local conjunction is potentially a very powerful device and thus

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Language type (20a)	No codas whatsoever.
Examples	Maori (Bauer 1993), Rotokas (Firchow & Firchow 1969)
Crucial rankings	NoCoda ≫ Faith
Effects	All underlying coda consonants are forced to delete or are repaired by inserting a vowel.
Language type (20b)	Only placeless codas are allowed.
Examples	Bora (Thiesen & Thiesen 1975)
Crucial rankings	IdentOnset(Place) ≫ *Place ≫ Ident(Place) (This is the positional faithfulness analysis of Lombardi 1995c.)
Effects	All onset consonants must surface unchanged, even if they have a supralaryngeal place specification. Underlying coda consonants must undergo debuccalisation and surface as either [h] or [ʔ].
Language type (20c)	(Virtually) all consonants which occur in onset position may also appear in codas.
Examples	Yokuts (Goldsmith 1990)
Crucial rankings	Faith ≫ NoCoda
Effects	All consonants surface completely unchanged, regardless of their position in the syllable.

Table II
Typology of coda inventories.

6 Conclusion

In this paper I have examined the very striking but firm restriction of glottal consonants to syllable-final position in Chamicuro. These data are important since they counterexemplify a very strong universal asymmetry between onset and coda inventories (Hooper 1976, Goldsmith 1990, Blevins 1995, Beckman 1998). To account for this pattern I have proposed another positional markedness constraint, HavePlace(onset). This innovation constitutes a very logical, benign and restrictive expansion of a previous constraint which is phonetically grounded in the notion of segmental release. Furthermore, this same constraint is also necessary for languages other than Chamicuro.

A significant theoretical repercussion of my account is that it allows us to maintain the positional faithfulness insight that the syllable onset is one of the prominent domains which is 'privileged' *vis-à-vis* the coda.

raises fears about issues such as learnability. See Kager (1999) for a helpful discussion of this problem. I therefore conclude that we should eschew analyses involving local conjunction whenever possible. I prefer to freely employ positional faithfulness and an occasional positional markedness constraint, but reject markedness strategies which focus specifically on syllable-final consonants, except for the generic NoCoda.

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Likewise, Goldsmith's (1990) view of the onset node as a 'strong' licensor is not only retained, but actually reinforced in a certain sense: just as there is a cross-linguistic tendency for placeless segments to prefer codas over onsets, so there is a corresponding pressure for consonants in onset position to optimally exhibit a salient contrast for place of articulation. Smith (forthcoming) proposes that CON should be *a priori* constrained such that the only positional markedness constraints we admit are those which serve to enhance the prominence of universally salient domains, and a contrastive place specification in the syllable onset does exactly that. My proposal is therefore consistent with this notion since it elevates to the status of a formal universal constraint a natural desire of onset segments: not only do they tend to preserve underlying featural specifications, but they can also require certain contrastive structure (a Place node) to exist there. In short, HAVEPLACE(onset) is the logical counterpart of the (No Place) Coda Condition mentioned in §3. This predicts (correctly I think) that only placeless segments like glottal consonants should in principle be able to exhibit the type of exceptional distribution observed in Chamicuro.

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