

Piro Affricates: Phonological Edge Effects and Phonetic Anti-edge Effects?

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In current theory, affricates are treated either as stops (Steriade 1993, Shaw 1991, Rice 1994, LaCharité 1993, Rubach 1994, Kim 1997, Clements 1999) or as contour/complex segments that contains both [-cont]/[stop] and [+cont] specifications (Sagey 1986, Hualde 1988, Lombardi 1990, 1995, Weijer 1996) undelvingly and in the lexical phonology, and recently, the Stop Hypothesis (SH) seems to be gaining grounds. All proposals have assumed that phonetically an affricate has a fricative release component on the right edge. In this connection, affricates in Piro (Matteson 1965), an Arawakan language of Peru, are of interest in that none of the proposals mentioned above seems to be able to account for their phonological and phonetic behavior: phonologically, the OCP-related cooccurrence restrictions on adjacent obstruent consonants clearly exhibit edge effects but a subclass of affricates and fricatives constitutes systematic exceptions; phonetically, affricates and stops pattern together and show an anti-edge effect with respect to phonetic implementation on their right edge. The cooccurrence distribution of the affricates contradicts the prediction made by the SH that no edge effects are possible at the lexical phonological level; on the other hand, the systematic exceptions to edge effects pose problems for the phonological presence of [+cont]. The phonetic behavior of these affricates also begs for explanations as no anti-edge effects are predicted to exist.

In this paper I argue that the SH is essentially correct by analyzing the behavior of Piro affricates within Optimality Theory (OT). I pursue an analysis in which the affricates are stops in the lexical phonology but become contour segments in the postlexical phonology, and the cooccurrence restrictions are considered output constraints rather than morpheme structure constraints. The phonological edge effects are accounted for by output constraints that are active postlexically, and the systematic exceptions to the edge effects are attributed to the suggestion that affricates pattern with fricatives to the extent that both are stridents (Rubach 1994). The phonetic anti-edge effect is explained by grouping affricates and stops in terms of sonority and by showing that the fricative release is irrelevant to the phonetic implementation process in question. What is crucial theoretically is that derivational OT (Rubach 1997, 2000), in which lexical and postlexical levels may have different constraint rankings, must be adopted.

Piro has the following obstruents: [p t k s ʃ ç ts tʃ tʃ], where [ts, s, tʃ, ʃ] are sibilants and [tʃ, ç] are palatal nonsibilants. The permissible and non-permissible obstruent sequences are:

C1 / C2	p	k	t	ts	tʃ	tʃ	s	ʃ	ç
p		+	+	+	+	+	+	+	+
k	+		+	+	+	+	+	+	+
t	+	+						+	+
ts	+	+	+						
tʃ	+	+	+						+
tʃ	+	+	+				+	+	+
s	+	+	+	+	+	+			
ʃ	+	+	+	+	+	+			
ç	+	+	+			+			

Adopting local self-conjunction in formulating the OCP constraints (Alderete 1997, Itô and Mester (1998) and the general conjunction device (Smolensky 1993, 1995, 1997), I propose four OCP related constraints: Fricative Constraint ($[+cont]^2$), Affricate Constraint ($[-cont, +cont]^2$), Stop Constraint ($[-cont]^2$ & $[Place_i]^2$), and Strident Constraint ($[+cont]^2$ & $[+strid]^2$), and account for the above cooccurrence restriction patterns as follows: (i) At the lexical phonology level, affricates are $[-cont]$ segments. The Fricative Constraint rules out *fricative-fricative sequences and do not affect the affricates. At the postlexical phonology level, affricates are contour segments. The Affricate Constraint rules out the *affricate-affricate sequences and the Stop Constraint removes *pp, *tt, *kk, *t-affricate (cf. affricate-t). In addition, the Strident Constraint eliminates *strident affricate-strident fricative sequences such as *ts/tf-s/f but retains the permissible s/f-ts/tf and tç-fricative sequences. Other minor constraints take care of the ill-formed *tç-s/f and *ts-ç sequences. The two step evaluation process is crucial in accounting for the complex patterns: The Fricative Constraint must be ranked high at the lexical level but ranked lower at the postlexical level, which is in support of the need to divide the OT Eval component into lexical and postlexical strata.

In Piro, phonetically, every consonant not in prevocalic position surfaces either as a syllabic consonant or has to be followed by a very short transitional epenthetic vowel (Matteson and Pike 1958, Matteson 1965): e.g. [k^əsu] '...s house', [ʃk^əota] 'low abdomen'. The generalizations are that (i) a transitional vowel is inserted when there is a transition from a $[-cont]$ consonant to the next consonant (stop-fricative or stop-stop) and (ii) the first consonant in a sequence becomes syllabic when the transition goes from a $[+cont]$ segment to a $[-cont]$ one (fricative-stop). If affricates are represented as $[-cont]-[+cont]$ at the phonetic level, we expect a transitional vowel to be inserted between a stop-affricate sequence and syllabic consonant would be formed in an affricate-stop or fricative-affricate sequence. Piro affricates, however, behave as stops and their fricative releases are rendered invisible in this phonetic process: an affricate-stop cluster is treated as a stop-stop one and an affricate-fricative cluster is treated as a stop-fricative one; e.g. [tʃ^ək^əotu] 'cebus monkey', [petʃits^əxeta]. This then appears to be a case of phonetic anti-edge effects: this phonetic process is sensitive to the right-edge environment of the first consonant in any CC sequence but the affricates and stops pattern together when undergoing this process. I present a sonority-based proposal in which stops and affricates pattern together as the least sonorous consonants and that the phonetic 'syllabicity' process is sensitive to the relative sonority rather than the stricture features of adjacent consonant gestures. An OT analysis is given based on the explanation that the least sonorous consonants, which lack sufficient internal phonetic cues, have stronger release during the consonant transition and create the percept of a transitional vowel whereas more sonorous consonants, which tend to have more internal phonetic cues, maximize the internal perceptual saliency by increasing segmental duration and create the percept of a syllabic consonant. Since the fricative release of the affricate under this analysis is rendered irrelevant, the case for phonetic anti-edge effects seems to have been removed. However, the fact that affricates pattern with stops in a sonority-based process suggests that the $[-cont]$ part of the affricate is the primary stricture feature and the fricative release part is only secondary.

The proposed analysis shows support for treating affricates as stops in the lexical phonology. Even if the fricative release of the affricate must be present lexically in alternative analyses, it is necessary to designate $[-cont]$ as the head stricture in order to account for the Piro data. Piro also provides an interesting case where the close ties between stops and affricates persist onto the phonetic level, which further confirms the fundamental nature of affricates as being stops.