

VOICE ASYMMETRY IN EWE NOUNS

Long Peng
National University of Singapore

I argue in this paper that the consonantal influence on tone is highly limited, restricting itself to the tone of the vowel immediately following the onset. This point is demonstrated via Ewe High Tone Insertion, which is blocked by a voiced obstruent if the insertion targets the initial vowel following the onset, but not if the insertion targets the second vowel of a bimoraic syllable. This result confirms a number of earlier studies which show that the phonetic impact of onsets on F_0 is limited to the first 100ms of the following vowel.

0. Introduction*

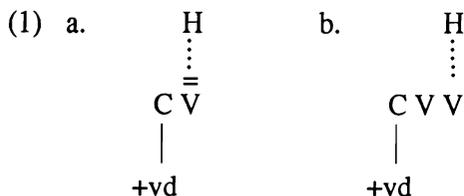
Previous investigations of consonantal interference with tone focus on the effects of the voicing of obstruents on left-to-right tonal spreading [Hyman and Schuh 1974]. These studies reveal that voiceless obstruents in syllable onset typically block low tone spread while voiced obstruents block high tone spread.

Though these studies are right to attribute tonal blocking to the voicing of consonants, they are not precise in identifying the duration of the voice impact on tonal operations. I demonstrate in this study that voice affects tone in a highly restricted manner, limiting itself to a tone on an immediately following vowel.

This point is illustrated through leftwards tonal insertion in Ewe.¹ I show that a voiced onset blocks High Tone Insertion if H is associated with an immediately following vowel (1a). But it does not block insertion when H is mapped onto the second vowel following the onset (1b).

* I wish to thank Jean Ann, Diana Archangeli, and Mike Hammond for discussing the contents of this paper. All errors that remain are mine.

¹ Ewe is a language of the Kwa group of the Niger-Congo family spoken by 1,700,000 people.



This asymmetric behavior of voice has not received any attention in phonological studies of tone-voice interactions.

In section 1, I illustrate voice asymmetry with data from Ewe nouns. I argue in section 2 that this asymmetry can receive a principled account through invoking conditions on tonal operations. In section 3, I consider the problem that the voice asymmetry presents for a purported “general” account of tone-voice proposed by Lieber [1987].

1. Voice asymmetry

Ewe syllables are typically CV or CVV. In both the monomoraic CV or bimoraic CVV syllables, the onset consonant may be either an obstruent or a sonorant: *dà* ‘snake’, *te* ‘yam’, *tú* ‘gun’, *ñi* ‘cow’ and *ló* ‘crocodile’. The bimoraic CVV syllable may have identical vowels or different vowels with the latter being the marked case: *toó* ‘mortar’ and *gàé* ‘money’. In addition, a small number of Ewe syllables may consist of an additional liquid consonant in the onset, giving rise to CLV, CLVV, CrV, and CrVV syllables in Ewe: *glà* ‘jaw’, *kpɔɔ́n* (*kp* being a single velar-labial consonant) ‘table’, *tré* ‘calabash’, and *dréⁿ* ‘dream’ (the superscripted ⁿ indicates that the vowel(s) preceding it is nasalised)

Most Ewe nouns are monosyllabic. Larger nouns are compounds. Tonal patterns of noun compounds are derived from the tones of compound members [Stahlke 1971]. Thus, analyzing tones of monosyllabic nouns is crucial to an understanding of tonal patterns of noun compounds.

Ewe has three surface tones: H, M, L. Combining three tones with voiced, voiceless, and sonorant onsets predicts nine patterns of monomoraic nouns. Five are attested in (2). Significantly, voiceless and sonorant onsets do not cooccur with a following low tone, while voiced obstruents do not appear with either a high or mid tone.

(2)		L		H		M
[+vd] onset	<i>vù</i>	‘fight’	—	—	—	—
[-vd] onset	—		<i>fú</i>	‘bone’	<i>fu</i>	‘sea’
[+sn] onset	—		<i>mó</i>	‘road’	<i>mo</i>	‘face’

Syllables of the CxV type also conform to the above patterns. If the first consonant is a voiced obstruent, only the low tone can occur: *glà* ‘jaw’. If it is voiceless, a high or mid tone may occur: *tré* ‘calabash’ and *gli* ‘wall’.

Tonal patterns of bimoraic nouns are even more restricted. One restriction of bimoraic nouns is that they all end with a H tone on the second vowel. Tonal variations on the first vowel are limited as well. Pairing LH, HH, MH with three types of onsets predicts nine logical possibilities. Three are attested: voiced onsets appear solely with LH, whereas voiceless and sonorant onsets take only MH.

(3)		LH		HH		MH
	[+vd] onset	<i>víí</i>	‘child’	—		—
	[-vd] onset	—		—	<i>fíí</i>	‘digging stick’
	[+sn] onset	—		—	<i>maá</i>	‘greens’

These data show severe cooccurrence restrictions between the onset and the tone on the immediately following vowel, but not between the onset and the tone on the second vowel. Thus, high tones surface on the second vowel of a bimoraic syllable, whether the onset is voiced or voiceless or sonorant in (3). This is also true of CxVV syllables, as illustrated by *dròéⁿ* ‘dream’ and *kplóóⁿ* ‘table’.

2. Conditions on tonal operations

Tonal distributions of Ewe monosyllabic nouns are completely predictable. I propose that monomoraic and bimoraic nouns are not specified for any tone in underlying representation. High and low tones are derived by phonological rules; mid tones surface as default. Analyzing mid tones as default are consistent with the general observation that mid tones are not active in a three tone system [Pulleyblank 1986].

To account for high tones of monosyllabic nouns, I propose a rule of High Tone Insertion, mapping H onto a mora (μ) on the right edge, as in (4).

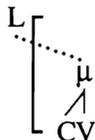
(4) High Tone Insertion²

$$\begin{array}{c} \text{H} \\ \vdots \\ \mu \rightarrow \mu / \text{ _____\#} \end{array}$$

² Following Steriade [1990] and Ishihara [1991], I assume that tone is mapped to moras. As tone is a property of syllable nucleus, this assumption is not unusual. Besides representing weight, moras define syllable nucleus in moraic theory. Mapping tones to moras captures the natural intuition that tone is phonetically realized on syllable nuclear elements (For evidence supporting mapping tones to moras, see Peng [1992]).

To account for low tones, I assume that there is a floating low tone prefixed to monosyllabic nouns, following Ansre [1961] and Stahlke [1971]. This L tone undergoes Low Tone Link, which maps L onto the following mora. In (5), I use the left bracket to mark the prefix boundary.

(5) Low Tone Link³



These rules are too general. To constrain their applications, I propose that High Tone Insertion is governed by [If H, then not +vd], a condition that expresses the known phonetic incompatibility between voicedness and high pitch. Low Tone Link is subject to [If L, then +vd], a condition based on the well-established phonetic correlation between voicedness and low pitch [Lehiste and Peterson 1961, Lea 1973, Hombert 1977, and Hombert, Ohala, and Ewan 1979].

Following Archangeli and Pulleyblank [1994], I call these conditions *path conditions*, so called because *path conditions hold of a representation only if relevant features are on a path*. Path is defined as:

- (6) There is a path between α and β iff
- a. α and β belong to a linked set Σ of nodes /features, and
 - b. in the set Σ , there is no more than one instance of each node/feature.

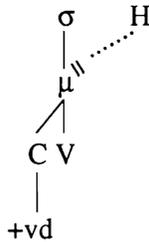
Invoking [If H, then not +vd] on High Tone Insertion explains in a principled manner why a voiced onset blocks a H tone if H links to an immediately following vowel, but not if H links to the second vowel following the onset.

Consider High Tone Insertion for a moment. Inserting H on the mora in (7a) yields a path between H and [+vd]; note that H is linked to [+vd] (6a) and H is linked to [+vd] with no more than one instance of each node/feature (6b). Once [If H, then not +vd] is invoked on High Tone Insertion, H will be blocked from linking in (7a) because H cannot be on a path with [+vd], as required by the path condition.

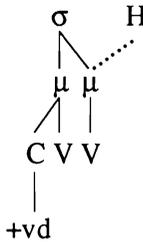
However, H is not blocked by [If H, then not +vd] from linking to the second mora in (7b). Inserting H in (7b) never results in a path between H and [+vd] because they are linked through two instances of mora. Consequently, [If H, then not +vd], even though invoked, does not block High Tone Insertion in (7b).

³ Following Kubozono [1989] and Katada [1990], I assume that onsets are mapped onto moras.

(7) a. monomoraic pattern

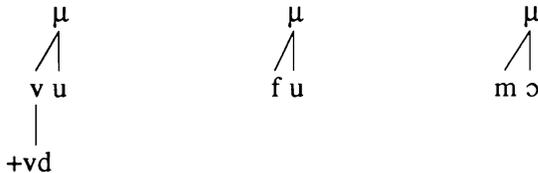


b. bimoraic pattern

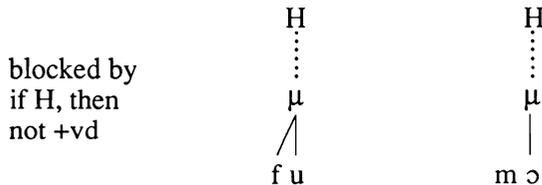


In (8) below, I show the derivations for monomoraic nouns with surface low or high tones: *vù* ‘fight’, *fú* ‘bone’, and *mɔ* ‘road’. In (8a), monomoraic nouns have no underlying tone. [+vd] is specified underlyingly on obstruents, which is consistent with treating [+vd] as the active value. In (8b), High Tone Insertion takes place. This rule is blocked by [If H, then not +vd] from applying to *vu*~ ‘fight’. Prefixing the floating L and Low Tone Link are shown in (8c). Recall that [If L, then +vd] is invoked on Low Tone Link, which requires that L be on a path with [+vd]. This condition prevents Low Tone Link from applying to *fú* ‘bone’ and *mɔ* ‘road’. /f/, being voiceless, and /m/, being redundantly voiced, have no [+vd] specification at the application of Low Tone Link.

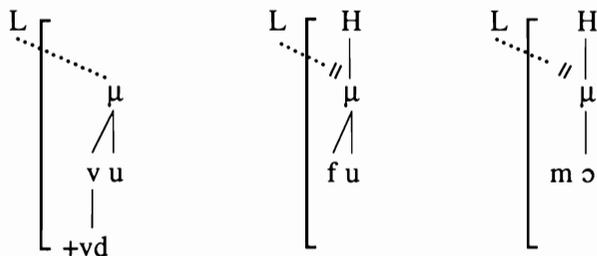
(8) a. underlying representation



b. high tone insertion



c. prefixation and low tone link

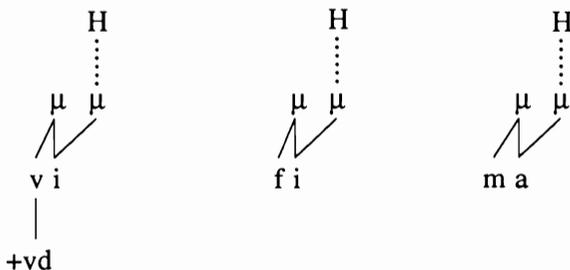


These forms surface as *vù*, *fù*, and *mɔ́*, matching what we observed in (2). Floating L tones that remain in front of a voiceless or sonorant-initial noun undergo stray erasure when they appear in isolation.⁴

To derive monomoraic nouns with mid tones *fù* 'sea' and *mɔ́* 'face', I propose that they are marked extratonal in underlying representation: *f*<*u*> and *m*<*o*>. Extratonicity renders these forms invisible to High Tone Insertion and Low Tone Link. When these forms cease to be on the periphery at the postlexical stratum, extratonicity is erased. They surface as mid tones (See Pulleyblank [1986] for a similar use of extratonicity in Margi).

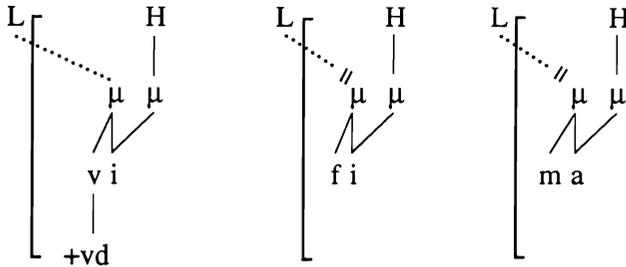
Bimoraic nouns are derived in (9). High Tone Insertion applies in (9a), successfully landing a H tone on the second mora in all three forms.

(9) a. high tone insertion



⁴ When these forms appear in a sentence context, floating as well as linked low tones, as in *vu~*, trigger a postlexical rule of Low Tone Assimilation in Ewe. This is one of the three reasons for treating the L tone as a prefix. In principle, the low tone of *vu~* can be derived by a low tone insertion rule that is governed by [If L, then +vd]. The only difference then is that floating L tones will never be part of the representations for *fù* and *mɔ́* because low tone insertion is simply blocked from applying to these forms. As floating L tones are required for Low Tone Assimilation, treating the L as a prefix is motivated (See Stahlke [1971] and Peng [1992] for additional arguments).

b. prefixation and low tone link



Note that [If H, then not +vd] does not block High Tone Insertion from applying to *vîi* ‘child’, even though the condition is invoked. H never forms a path with [+vd] if it links to the second mora. In (9b), [If L, then +vd] blocks Low Tone Link from targeting *fîi* ‘digging stick’ and *maá* ‘greens’. The derived *vîi*, *fîi*, and *maá* match the observed data noted in (3).

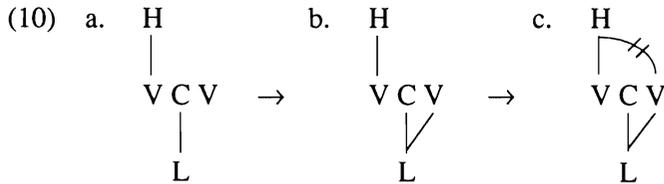
This analysis in terms of path conditions explains the tonal patterns in (2) and (3). Specifically, it explains the asymmetric effect of voice on High Tone Insertion, that is, the restriction between the onset and the tone on the immediately following vowel as opposed to the apparent lack of restriction between the onset and the tone on the second vowel.

This tonal asymmetry is consistent with the phonetic studies on the impact of consonantal voice on fundamental frequency F_0 : acoustic measurement of tone. For instance, Lehiste and Peterson [1961] and Lea [1973] show that $[\pm vd]$ -induced F_0 perturbations are restricted to the first 100 ms of the following vowel in English. Hombert [1977] shows that F_0 changes caused by onset voicing last 60 ms into the following vowel in Yoruba (See Hombert, Ohala and Ewan [1979] for evidence in other languages). As an average vowel lasts anywhere from 180 to 240 ms, these phonetic studies suggest that onset voicing can never affect the tone on the second vowel of a bimoraic syllable. This is entirely consistent with the phonological patterns of tone-voice interactions found in Ewe.

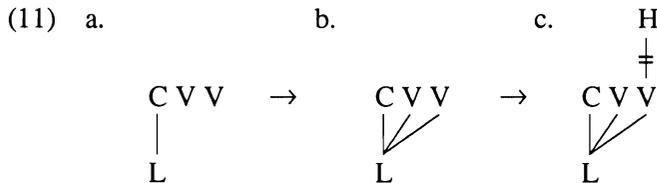
3. Problems with voice asymmetry

Lieber [1987] proposes a purported “general” theory of tone-voice that relies on three mechanisms: i) specifying tones on consonants; ii) spillover; and iii) the Duplicate Feature Filter (DFF). Consider Lieber’s account of the typical blocking of high tone spread by a voiced onset. In (10a) the voiced onset is specified for a low tone. This tone undergoes spillover, which is formally stated as “Prolong tone features of consonantal onset onto following vowels”. High tone spread is blocked by the DFF, which forbids simultaneous specification of two conflicting

values of a single feature, that is, H and L.



Unfortunately, Lieber incorrectly predicts that onset voice can affect tone on the second vowel of a bimoraic syllable. Spillover, as formulated by Lieber, allows consonantal tones to be prolonged to both vowels of a bimoraic syllable, as shown in (11b). High Tone Insertion, as required by Ewe, is predicted to be blocked by the DFF, as in (11c).



Even though Lieber can in principle stipulate that spillover is noniterative, her proposal still leaves open the possibility of an iterative consonantal tone spreading, predicting that onset can affect a tone that is not linked to an immediately following vowel. This possibility is phonologically inconsistent with Ewe and phonetically implausible considering the crosslinguistic fact that onset voice affects F_0 only within the first 100 ms of the following vowel (See Peng [1992] for additional arguments against Lieber's proposal).

To summarize, this study reveals that tone-voice cooccurrence restrictions are highly limited and found only between an onset and a tone on an immediately following vowel. To the best of my knowledge, this limited impact of voice on tone has gone unnoticed in phonological studies of tone-voice interactions. Thus, an important empirical contribution of this study is to bring to light facts such as Ewe so that they can be taken into account in theory construction.

In addition, this study provides support for the path condition approach advocated by Archangeli and Pulleyblank [In press]. By invoking path conditions on tonal operations, this study provides a principled explanation of the asymmetry of voice in Ewe. In contrast with Lieber [1987], this analysis does not have to resort to specifying tones on consonants and consonantal tone spreading, both of which are specifically invoked to explain tone-voice interactions.

Robert Botne. *A Lega and English Dictionary*. East African Languages and Dialects Series, Volume 3. Köln, Germany: Rüdiger Köppe Verlag, 1994. Pp. xviii, 138, 2 maps. \$28.50 [paper].

Lega (or KelEga) is a Bantu language spoken in eastern Zaire (Guthrie's D.25). This dictionary includes approximately 1800 Lega head words and 1400 English headwords. Entries are marked for tone and vowel length, and indicate grammatical information, historical proto-Bantu source, and whether the word has been borrowed. An index to the Proto-Bantu roots constitutes the third part of the dictionary. A guide to the dictionary presents general grammatical information on the language. Five appendices contain information on kinship relations and terminology, pronoun and demonstrative paradigms, numbers, place names, and verbs of perception.

Denis Creissels. *Aperçu sur les structures phonologiques des langues négro-africaines, Deuxième édition*. Grenoble: ELLUG. 1994, Pp. 321. 130 FF.

This is the 2nd edition of a book by the same title (announced in *Studies in African Linguistics* 20/2). [Adapted from the book announcement]: As for the first edition of this work, the objective is to present the most notable features of black African languages in a elementary and general way. ... Compared to the first edition, the range of data is considerably expanded in order to take into account languages (notably Comorian, Tswana, Zarma, the Sara languages) on which the author has had the opportunity to work during recent years and which make a particularly interesting contribution to the discussion of certain problems, notably in the domains of prosody and syllabic structure. In addition, the second edition makes an effort to integrate recent developments in phonological theory whereby association of segmental units and tonal units to "skeletal positions" organized into syllables gives a way to surmount difficulties that a strictly linear phonological representation had to confront.

Dymitr Ibriszimow. *Towards a Common Chadic Lexicon*. Prace Językoznawcze, Zeszyt 102. Kraków: Nakładem Uniwersytetu Jagiellońskiego, 1990. Pp. 122. z1 2400,—.

The purpose of this work is to reconstruct 13 proto-Chadic roots on the basis of sound correspondences worked out through a broader and better distributed range of data than in previous comparative works. Chapter 1 reviews the three main comparative works on lexical reconstruction for Chadic (Newman and Ma [1966], Newman [1977], Jungraithmayr and Shimizu [1981]), pointing out the deficiencies in source data. Chapter 2 summarizes known and accepted sound changes established within Chadic. Chapter 3 outlines the purpose of the present work, and Chapter 4 lists languages consulted. Chapter 5 provides the reconstructions in tabular form for the roots 'head', 'hair', 'body', 'tooth/bone/egg', 'neck', 'limb', 'stomach', 'sun/fire/ashes', 'moon', 'thorn', 'mud', 'scorpion', 'sharp tool'. Chapter 6 summarizes the results, with particular reference to the reconstruction of labials and labialization. Chapter 7 concludes the book with remarks on diversity in Chadic and directions in both phonetic and semantic change.

Stahlke, H. 1971. "Topics in Ewe Phonology." Ph.D. Dissertation, UCLA.

Steriade, D. 1990. "Moras and other slots." In D. Meyer, S. Tomioka, and L. Zidani-Erog \langle lu (eds.), *Proceedings of the First Meeting of the Formal Linguistics Society of Midamerica*, pp. 254-280.

Linguistics Programme
National University of Singapore
10 Kent Ridge Crescent
Singapore 0511

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