

The First Person Plural Subject Prefix in Babine/Witsuwit'en

Sharon Hargus*
University of Washington

1. Introduction

In Babine/Witsuwit'en (B/W), an Athabaskan language, the first person plural subject prefix exhibits interesting allomorphy.¹ One allomorph of this verbal prefix is used in syllable-initial contexts, and the other allomorph is used syllable-finally. The choice between allomorphs in environments where either could, in principle, be used reveals information about the phonology of B/W.

Optimality Theory (OT) (Prince and Smolensky 1993, McCarthy and Prince 1993) provides a straightforward analysis of the distribution of the allomorphs of this prefix. In addition to the familiar OT constraints like Parse, Fill, NoCoda, and Align-L, the analysis requires *Complex(Except), which disallows complex onsets (except word-initially), and CodaSon, which states a preference for codas which are more sonorous than following onsets. Lowest ranking NoCoda provides the crucial choice between candidates in certain contexts.

Following presentation of data and development of an OT analysis, I outline a derivational generative analysis of the data. Informally, the derivational analysis, with its several "except when..." clauses, seems comparable to the output constraints of the OT analysis. However, a more formal version of the derivational analysis leads to loss of generalization and ad hoc phonological restrictions not required in the OT analysis.

*This is a revised version of a paper presented at the annual meeting of the Linguistic Society of America, Boston, January 9, 1994. Thanks to Emmon Bach, Michael Kenstowicz, Ken Hale, and Andrew Carstairs-McCarthy for helpful comments on my presentation.

I am grateful to the B/W speakers who provided the data which made this presentation possible: William and Hilda George, Josephine West, Alfred Joseph, Margaret and Charles Austin, Lillian Naziel, Mabel Forsythe, and George Holland. All data are from the Witsuwit'en dialect of B/W unless otherwise indicated. Funding for this research has been provided by a grant from the National Science Foundation, OPP-9307704.

¹ I translate this prefix 'we' in this paper, except when it occurs with a stem which requires a dual subject, in which case I translate it as 'we (du.)' or 'we (du. excl.)'. Not all Athabaskanists would analyze the prefix in question as a first person plural subject prefix. In fact, it is generally referred to as the "fourth" person (a special third person) subject prefix, with nonetheless widely attested first person plural interpretation. See Willie and Saxon (1995) for an overview of the functions of this prefix in Athabaskan languages. Following Speas (1991), Rice (1993) analyzes this prefix as a type of direct object marker, and Rice and Saxon (1994) analyze the prefix as having argument, rather than inflectional, status.

2. Allomorphs of the first person plural subject prefix

In the verbal morphology of Athabaskan languages, the verb stem is basically the rightmost element of the verb and is preceded by one or more prefixes which are rigidly ordered with respect to each other and the verb stem. See Hargus (1991) for a summary of verb prefix order constraints in B/W. The rightmost set of prefixes form a phonological domain traditionally called the conjunct prefixes, and the leftmost set of prefixes, the disjunct prefixes, do not form a cohesive phonological domain by themselves but are identifiable by their lack of inclusion within the conjunct domain. See Hargus (1991, 1994) for discussion of verb-internal phonological domains in B/W.

The first person plural subject prefix, a conjunct verbal prefix, has two predictable allomorphs: syllable-initial [ts']- and syllable-final [z]-:

(1.) First person plural subject prefix [ts']~[z]- alternations

[bət.yə.ts'e.ne]	'we cook'
[bət.yez.ta.neʔ]	'we'll cook'
[ts'ə.taʔ.yih]	'we'll save him, her, it'
[wez.taʔ.yih]	'we won't save him, her, it'
[ts'ə.nuʔ.ʔε'n]	'let's look at him, her, it'
[c'əz.nuʔ.ʔε'n]	'let's look at something, window-shop'
[to ts'ə.tat.neʔ]	'we'll drink water'
[taz.tat.neʔ]	'we'll drink water'
[de.ts'əl.kwəyʔ]	'we limped inside'
[dez.nin.ʔaz]	'we (du.) walked inside'
[nin.ts'ə.zut]	'we (dist.) skated to a stop and stayed'
[niz.nin.zut]	'we skated to a stop and stayed'

I consider the [ts']~[z] alternation to be non-phonological allomorphy as there is no independently motivated phonology that could account for the alternation.²

² However, Kari (1990:27) accounts for a similar [ts']~[s] alternation in Ahtna, a related language, by phonological rule:

$$\begin{aligned} ts' &\rightarrow 's & / \text{ ___ CV } & \text{ (Central, Lower, Western dialects)} \\ ts' &\rightarrow s & / \text{ ___ C } & \text{ (Mentasta dialect)} \end{aligned}$$

In favor of a similar, phonological type of analysis of this phenomenon in B/W, Leer (1979) has posited a Proto-Athabaskan rule of Spirantization, whereby affricates become fricatives in syllable-final position. For example, the Proto-Athabaskan root *-/ʔa:ts'/ 'du. go' has a momentaneous imperfective stem *[-ʔa's] alternating with momentaneous perfective *[-ʔa:ts'-ɪ]. However, Spirantization would not otherwise be synchronically motivated for B/W. The B/W momentaneous imperfective and perfective stems of 'du. go' are -[-ʔas] and -[-ʔaz], respectively, with no evidence for a root-internal affricate. Thus, Spirantization, which once accounted for alternations in several morphemes, would be restricted to the first person plural subject prefix.

As a starting point to the analysis, I assume the Lexicality constraint (Noyer 1993) in (2), as well as a general constraint on the shape of the B/W first person plural subject prefix (3):

- (2.) **Lexicality:** A complex sign is well-formed iff it consists only of morphemes.
- (3.) **First person plural subject morpheme:** The first person plural subject prefix is pronounced [ts'] or [z].

As pointed out by Noyer (1993), a constraint on morpheme shape like (3) must be basically inviolate in the grammar in order for phonological sequences to have any morphological value.³

In (4), I summarize the phonological environments in which the allomorphs [ts']- and [z]- are found, to be exemplified in later sections.

(4.) [ts'], [z]- contexts, by syllabic shape

	<u> </u> .C.	<u> </u> .C	<u> </u> V
<i>l</i> (C) <u> </u>	ts'	ts'	ts'
V <u> </u>	ts'	ts' / <u> </u> z ts' / <u> </u> [-cons] z / ...	ts'
C <u> </u>	ts'	z / ? <u> </u> ts' / ...	ts'

Inspection of (4) makes it clear that the allomorph [z]- has a limited distribution, occurring in only a subset of possible syllable-final contexts.

The distribution of [ts']- and [z]- is determined entirely by the syllable structure created by other morphemes. Morphological considerations, such as affix order, disjunct/conjunct distinction, are not relevant.⁴ In support of the irrelevance of affix position, consider (5), which contains direct object prefixes [nəxw]- 1/2pO and [həbə]- 3pO from the position immediately preceding the first person plural subject prefix:

(5.) Irrelevance of affix order in accounting for [ts'], [z]-

[nə.nəxw.ts'o.t'ɛ'n]	'we should see you (pl.) again'
[hə.bəz.niz.gwət]	'we poked them in the face'

In (5), the C V environment provided by the first/second person plural object prefix [nəxw]- and the optative prefix [o]- conditions the [ts']- allomorph of the first person

³ Thanks also to Emmon Bach and Michael Kenstowicz for clarification of this point.

⁴ The only phenomenon where this is relevant concerns some restrictions on the allomorph [z]- which occurs in context V .C. Morphosyntactically more distant elements may act like separate words, failing to condition the expected [z]- alternant. See section 2.5.4.

plural subject prefix, whereas the V____C environment provided by the third person plural object [həbə]- and [n]- gender prefixes requires the [z]- allomorph.

In the remainder of this section, I provide data to substantiate (4). In analyzing the data, I draw on the following constraints:

(6.) Constraints required to account for [ts'], [z]- distribution

universal or with parallels in other languages	NoCoda, Fill, *Complex, Align-L, *C _i C _i , *C'C', CodaSon
language-specific	.TS', Z.

2.1 Z.

The constraints in (7) and (8) restrict the first person plural subject prefix allomorphs to certain positions within the syllable.

(7.) **.TS'**: The allomorph [ts']- of the first person plural subject prefix must be syllable-initial.

(8.) **Z.**: The allomorph [z]- of the first person plural subject prefix must be syllable-final.

Constraint .TS' can be considered a special case of a more general phonotactic restriction in B/W, not formulated here, which requires that supralaryngeal glottalized consonants be syllable-initial. .TS' and Z. appear to be undominated in B/W.

2.1.1 *PrWd*[(C)____V

In this context, the first person plural subject prefix is word-initial and precedes a (prefix) vowel. In (9), the prefix vowels are [o]- optative, [ɛ]- progressive, and [en]- perfective.

(9.) [ts']/ *PrWd*[____V

ts' _{1PS} +O _{opt}	[ts' <u>o</u> .deʔ]	'let's sit'
	*[zo.deʔ]	
ts' _{1PS} +ɛ _{prog}	[ts' <u>ɛ</u> ?ɛn]	'we see him, her, it'
ts' _{1PS} +en _{perf}	[ts' <u>en</u> li]	'we are'

In (10), the prefix vowel is the recently proposed /ə/- Mode prefix (Hargus and Tuttle 1995).⁵

⁵ The usual analysis of the [ə] that appears before the final (i.e., stem) syllable in most of the Athabaskan languages is that it is a stem augment: if no syllabic prefix is added by the morphology, the verb stem is augmented with a prefix of the shape [ə] (or cognate). For language-specific descriptions of this phenomenon along these lines, see Rice (1983, 1989) for Slave, Hargus (1988) for Sekani, or McDonough (1990) for Navajo. Hargus and Tuttle (1995) argue that this "augment" is actually a Mode (i.e.,

(10.) [ts']/ *PrWd*[____ə_{Mode}

ts' _{1pS} +ə _{Mode}	[ts'ə.tsəy]	'we cry'
	*[zə.tsəy]	
	[ts'əzəz]	'we sip it'
	[ts'əqəyh]	'we (du.) customarily sit'

In (11), the first person plural subject prefix is followed by the /ə/- Mode prefix plus a consonant sequence:

(11.) [ts']/ *PrWd*[____ə_{Mode} C.

	[ts'ət.ney]	'we drink it'
	[ts'əs.giz]	'we breathed'
	[ts'ət̚.tsəy]	'we made it'

In (12), the first person plural subject prefix is separated from the left edge of the word by an acceptable word-initial onset consonant, /ʔ/- reciprocal:

(12.) [ts']/ *PrWd*[ʔ____V

	[ʔts'o.dəl.ye]	'we know each other'
	*[ʔzo.dəlye]	
	[ʔts'onətqat]	'we slap each other'
	[ʔts'ontaltsəs]	'we'll whip each other'
	[ʔakw'əs ʔts'ət̚yən]	'we almost killed each other'

In (13), the first person plural subject prefix precedes the /ə/- Mode prefix and follows /ʔ/- reciprocal:

(13.) [ts']/ *PrWd*[ʔ____ə_{Mode}

	[ʔts'əl.Gəc]	'we groom each other'
	[ʔakw'əs ʔts'əstc'ey]	'we almost shot each other'
	[q'əqə ʔts'ədət'əy]	'we have each other as friends'
	[ʔts'ətGes]	'we scratch each other'

In all forms, [ts'] is the only acceptable form of the first person plural subject prefix.

tense/aspect/mood) prefix, /ə/-, which serves as a default mode prefix in most of the languages, marking imperfective and certain other forms. The fact that the [ts']- rather than [z]- allomorph of the first person plural subject prefix occurs exclusively in this "pre-stem" environment, patterning with the prevocalic ([ts']-) allomorph found elsewhere in B/W, provides strong support for the mode analysis of pre-stem [ə]. Under the usual phonological account, the first person plural subject prefix should be followed by a consonant here, which would be expected to condition the [z]- allomorph (see section 2.5.1).

Clearly, the only allomorph to choose here is [ts']. [z] in this prevocalic context would violate Z., regardless of whether a consonant precedes:

(14.) /*PrWd*{**ts',z**}+V/

	Candidates	Z.	NoCoda
☞	[ts'ə.tsəɥ]		*
	[zə.tsəɥ]	* !	*
☞	[ʔts'o.dəlye]		*
	[ʔzo.dəlye]	* !	*

2.1.2 V__V

When the first person plural subject prefix is intervocalic, surrounded by prefix vowels, the allomorph [ts']- occurs to the exclusion of [z]-:

(15.) [ts'] / V__V

[ʔə.we.ts'os.t'ɛ'n]	'we shouldn't work'
*[ʔə.we.zos.t'ɛ'n]	
[dewets'eʔəs]	'we (du.) didn't walk inside'
[ʔakw'əs yets'ɛdlyɥ]	'we almost died'
[nets'ɛgeʔ]	'we were healed'

In (16), the first person plural subject precedes the /ə/- Mode prefix:

(16.) [ts'] / V__ə_{Mode}

[ʔə.ts'ə.t'əχ]	'we work'
*[ʔə.zə.t'əχ]	
[c'əts'ət'l'o]	'we knit'
[hots'əts'et]	'we tell a lie'
[hots'əguc]	'we dive forth customarily'

In (17), the /ə/- Mode prefix is followed by a coda consonant:

(17.) [ts'] / V__ə_{Mode}C.

[bə.be.ts'əʔ.ʔəy]	'we wait for him/her'
[hats'əzdil]	'we walked uphill'
[ninets'ənt'az]	'we (du.) stopped walking'
[nəwets'əszut]	'we haven't skated'

In (18), the vowel which precedes the first person plural subject prefix is [ə]:

(18.) [ts'] / ə__V

[nə.ts'o.zut]	'let's skate'
*[nə.zo.zut]	
[ʔəts'ɛt'ɛ'n]	'we worked'
[wec'əts'etsəʔ]	'we didn't chop it'
[həbəts'ontəʔtsəs]	'we will whip them'

Preceding [ə] is singled out for special attention since [ə] (or its cognate) in the verbal prefixes of Athabaskan languages is generally considered non-underlying, following suggestions by Speas (1982). All types of vowels in this context condition the [ts']-allomorph of the first person plural subject prefix.

As with data containing the first person plural subject prefix in word-initial, prevocalic position, intervocalic [z] would fatally violate the B/W constraint Z.:

(19.) /V+{ts',z}+V/

Candidates	Z.	NoCoda
☞ [ʔə.we.ts'os.t'ɛ'n]		*
[ʔə.we.zos.t'ɛ'n]	* !	*

2.1.3 C__V

In this context, forms with [ts']- occur instead of conceivable alternatives with [z]-. In (20), the first person plural subject prefix is followed by a variety of prefix vowels. Note that the final consonant [xw] of the first/second person plural object prefix [nəxw]- is a single consonant, not a consonant cluster.

(20.) [ts'] / C__V

[ne.nəxw.ts'o.t'ɛ'n]	'we should see you (pl.) again'
*[ne.nəxw.zo.t'ɛ'n]	
[nenəxwts'ət'ɛ'n]	'we saw you (pl.) again'
[nəxwts'oziʔts'ay]	'we listen to you (pl.)'
[neʔts'ot'ɛ'n]	'we should see each other again'
[yeʔts'ɛdətal]	'we kicked each other multiple times'
[bənyən q'əwents'et'əs]	'we didn't cut off several heads'

In (21), the following vowel is the /ə/- Mode prefix:

(21.) [ts'] / C__ ə_{Mode}

[yents'ədətsən]	'we're all dirty'
[nəxwts'ət'əy]	'we have you (pl.)'
[nəxwts'əGes]	'we scratch you (pl.)'
[nints'əzut]	'we (dist.) skate to a stop'
[bəyents'əGəz]	'we skin several'
[ʔts'ents'ət'as]	'we split them'

In (22), the /ə/- Mode prefix is followed by a coda consonant:

(22.) [ts'] / C__ ə_{Mode}C.

[yen.ts'əs.də.tən]	'we're all cold'
[yents'əʔq'ət]	'we all swelled up'
[nəxɛʔts'əʔdiʔ]	'we pack it around'
[həbəyənts'əzdil]	'we invited them'
[bəyents'əzGəz]	'we skinned several'

In all preceding forms, [ts'] is the only acceptable allomorph of the first person plural subject prefix.

Under the most reasonable syllabification, forms with [z] would violate Z.:

(23.) /...C+{ts',z}+V/

Candidates	Z.	NoCoda
 [ne.nəxw.ts'o.t'ɛ'n]		**
[ne.nəxw.zo.t'ɛ'n]	* !	**

2.2 *Complex

Certain types of onset and coda clusters occur in B/W, as has been seen above. Additional examples of acceptable word-initial onset clusters are provided in (24):

(24.) Well-formed onset clusters

[sC] onsets:	
[sgiz]	'he, she breathes'
[stan]	'it (sticklike) is'
[sqɛcən]	'my leg'
[sʔay]	'my snowshoe'
[ʔC] onsets:	
[ʔdəw]	'he, she, it cramped'
[ʔGuh]	'he, she, it was trapped'
[ʔqɛcən]	'each other's leg'
[ʔʔay]	'each other's snowshoe'
[nC] onsets:	
[nli]	'he, she, it is'
[ndez]	'he, she, it is heavy'
[nqɛcən]	'your leg'
[nʔay]	'your snowshoe'

Examples of word-internal onset clusters will be seen in subsequent sections.

In B/W, clusters are avoided when a clusterless alternative is available. In (25), the well-formed word-initial onset clusters are syllabified in two different syllables when a vowel precedes.

(25.) $PrWd[.CCV \sim VC.CV$

[ndi .deʔ]	'he, she was sick'
[we n.di .deh], *[we. ndi .deh]	'he, she isn't sick'
[sdi .niʔ]	'he, she told me'
[wes. di .nil], *[we. sdi .nil]	'he, she didn't tell me'
[ləbət ʔdəʔ]	'the cup shook'
[yəχ ho ʔ.dəʔ] , *[ho. ʔdəʔ]	'the house shook'

The constraint *Complex (Prince and Smolensky 1993:87), which governs both onset and coda clusters, will account for the alternations in (25):

(26.) ***Complex**: No more than one C or V may associate to any syllable position node.

Furthermore, the data in (25) suggest that *Complex is more highly ranked than NoCoda:

(27.) *Complex » NoCoda

Candidates	*Complex	NoCoda
☞ [wen.di.deh]		**
[we.ndi.deh]	* !	*

We will see below that in B/W, a slightly different version of *Complex is required.

2.2.1 $PrWd[(C) \text{ ___ } C]$

In this next set of data, the first person plural subject prefix is word-initial and followed by a consonant sequence comprised of prefixes:

(28.) [ts'] / $PrWd[\text{ ___ } C]$

[ts'ən.di.deʔ]	'we were sick'
*[əz.ndi.deʔ]	
[ts'əntadeyh]	'we'll dance'
[ts'əndənəyət]	'we're grinding it'
[ts'ənteʔəy]	'we're hiding'

In (29), the first person plural subject prefix is separated from the left edge of the word by an acceptable onset consonant, /ʔ/- reciprocal:

(29.) [ts'] / $PrWd[ʔ \text{ ___ } C]$

[ʔts'ən.tal.ʔeʔ]	'we'll look at each other'
*[ʔəz.ntal.ʔeʔ]	
[ʔts'ənteʔəy]	'we hid each other'

In all forms, the [ts']- allomorph of the first person plural subject prefix is preferred.

Assuming that prefixal [ə] (except /ə/- Mode) in (28) is not underlying, all candidates in (30) incur Fill violations:

(30.) / $PrWd[\{ts',z\}+C]$ /

Candidates	*Complex	Fill	NoCoda
☞ [ts'ən.di.deʔ]		*	**
[əz.ndi.deʔ]	* !	*	**

Since the first segment of the consonant sequence forms a coda, selection of the allomorph [ts']- in such forms leads to the simplest syllable structure. Choosing [z]- would have led to an onset cluster, violating *Complex.

The data in (29) indicate that word-initial clusters are preferred over word-internal clusters. I suggest that *Complex in B/W should be formulated as *Complex(Except), the version given in (31):

- (31.) ***Complex(Except)**: No more than one C or V may associate to any syllable position node, except in word-initial position (cf. Onset(Except) (McCarthy and Prince 1993:31))

Thus in (32), only *[təz.ɪntalʔɛtʃ] merits a *Complex violation:

- (32.) /C+{ts',z}+C./

Candidates	*Complex	Fill	NoCoda
☞ [tʃts'ən.tal.ʔɛtʃ]		*	***
[təz.ɪntal.ʔɛtʃ]	* !	*	***

Henceforth, *Complex violations are marked in tableaux only for word-internal clusters.

2.2.2 C__C.

In (33), the first person plural subject prefix follows a consonant and precedes a coda consonant. [ts'] is preferred in this context:

- (33.) [ts'] / C__C.

[wə.ɣən.ts'ən.təs.dil]	'we failed'
*[wə.ɣə.nəz.ɪntəs.dil]	
[weʔts'əntaʔɛtʃ]	'we'll see each other again'
[hanəxwts'əntats'əʔ]	'we'll scratch your (pl.) skin away from face'

In (34), note that the preceding consonant is [ʔ]. As will be seen in a later section, [z] is preferred over [ts'] in other contexts when the preceding consonant is [ʔ], but in (34), [ts']- prevails:

- (34.) [ts'] / ʔ__C.

[bə.qaʔ.ts'ən.ta.ziʔ]	'we'll want it'
*[bə.qa.ʔəz.ɪnta.ziʔ]	
[dəc'aneʔts'əndənɪt'aɣ]	'we fooled ourselves'
[neʔts'əndənəlʔɛn]	'we're looking at ourselves'

In this context, the ill-formed examples violate *Complex.

- (35.) /C+{ts',z}+C./

Candidates	*Complex	Fill	NoCoda
------------	----------	------	--------

☞ [wə.ɣən.ts'ən.təs.dil]		*	***
[wə.ɣə.nəz.ntəs.dil]	* !	*	**

These data also confirm that *Complex is more highly ranked than NoCoda, as the well-formed examples contain a NoCoda violation not found in the forms with [z]-.

2.2.3 V__C.

In (36), the first person plural subject prefix follows a vowel and precedes a coda consonant. Here too the allomorph [ts'] is preferred:

(36.) [ts'] / V__C.

[we.ts'ən.di.del]	'we weren't sick'
*[wez.ndi.del]	
[wets'əntasdec]	'we won't dance'
[nəts'əndənɪdɪl]	'we shook our heads'
[nəts'əndənəʔaʔ]	'we sew designs on it'

As with contexts C__C and *PrWd*[__C, *Complex is responsible for the preference for [ts'] in context V__C:

(37.) /V+{ts',z}+C./; *Complex » Fill

Candidates	*Complex	Fill	NoCoda
☞ [we.ts'ən.di.del]		*	**
[wez.ndi.del]	* !		**

Furthermore, the data show that *Complex is higher ranked than Fill, since the winning candidate contains a Fill violation not found in the loser.

2.3 NoCoda: *PrWd*[(C)__.C

As seen in many examples so far, B/W allows codas. However, we will see that when there is a choice between syllables with and without codas, the codaless syllables are preferred. The OT constraint NoCoda predicts this preference:

(38.) **NoCoda:** (e.g. Prince and Smolensky 1993:34, McCarthy and Prince 1993:10, 119): the preferred syllable is codaless; a syllable with a coda violates NoCoda.

When the first person plural subject prefix is word-initial and precedes an onset consonant, the [ts'] allomorph is preferred:

(39.) [ts'] / *PrWd*[__.C

[ts'ə.dil.kwəs]	'we coughed'
-----------------	--------------

*[əz.dil.kwəs]	
[ts'ənədeyh]	'we dance'
[ʔaʔq'əχ ts'ədiʔts'əy]	'we stay together'

In (40), the first person plural subject prefix is separated from the left edge of the word by /ʔ/- reciprocal:

(40.) [ts'] / *PrWd*[ʔ____.C]

[ʔts'ə.nəl.ʔɛn]	'we look at each other'
*[ʔəz.nəl.ʔɛn]	
[ʔts'ədidiʔts'əy]	'we hear each other'
[ʔts'ətətʃ'eyh]	'we'll shoot each other'

The acceptable as well as unacceptable forms above each contain two Fill violations:

(41.) /*PrWd*[(ʔ){ts',z}+.C/

Candidates	Fill	NoCoda
☞ [ts'ə.dil.kwəs]	**	**
[əz.dil.kwəs]	**	* ! **
☞ [ʔts'ə.nəl.ʔɛn]	*	**
[ʔəz.nəl.ʔɛn]	*	* ! **

However, the losing candidates in (41) contain greater numbers of NoCoda violations, showing that NoCoda is responsible for the choice of [ts']-.

2.4 C____.C

Two different constraints are required to account for the data in this context.

2.4.1 Align-L

When the first person plural subject prefix follows a consonant and precedes an onset consonant, [ts'] is preferred:

(42.) [ts'] / C___.C

[ne.nəxw.ts'ə.ta.t'ɛɸ]	'we'll see you (pl.) again'
*[ne.nə.xwəz.ta.t'ɛɸ]	
[nəxwts'ənizgwət]	'we poked you (pl.) in the face'
[wəbe ts'ezts'ədɪnli]	'we came around the corner'
[weɸts'ədɪsdəts'əq]	'we don't hear each other'
[ʔəɸts'ənilyey]	'we did it to each other accidentally'
[neɸts'ətət'ɛɸ]	'we'll see each other again'
[həbəyənts'ətadɪɸ]	'we'll invite them'
[bəyents'ətəGəz]	'we'll skin several'
[nəcənts'ədəldɪɸ]	'we walk around singing'

Note that there are equal numbers of Fill and NoCoda violations in these forms. The selection of [z]-, syllabified as a coda, would incur a Fill violation, leading to onset syllabification of the consonant before the epenthetic [ə]. In these contexts, the selection of [ts']- rather than [z]- would thus eliminate one set of Fill and NoCoda violations but result in another.

(43.) /C+{ts',z}+.C/: tie on Fill and NoCoda

Candidates	Fill	NoCoda
[ne.nəxw.ts'ə.ta.t'ɛɸ]	*	**
[ne.nə.xwəz.ta.t'ɛɸ]	*	**

I suggest that another constraint, Align-L, is responsible for the preference for [ts'].

(44.) Align-L (morpheme, syllable)

Align-L states a preference for the left edge of a morpheme and syllable to coincide. This bears resemblance to recent proposals by McCarthy and Prince (1994), in which it is suggested that the unmarked affix is canonically a syllable, and a stem, a foot.

(45.) /C+{ts',z}+.C/: Align-L breaks tie

Candidates	Fill	Align-L	NoCoda
☞ [ne.nəxw.ts'ə.ta.t'ɛɸ]	*		**
[ne.nə.xwəz.ta.t'ɛɸ]	*	*!	**

At present, there is no evidence for ranking of Align-L with respect to NoCoda.

2.4.2 *C'C'

A complication arises in this context when the preceding consonant is [ʔ]. In this case, [z]- is the preferred pronunciation of the first person plural subject prefix:

(46.) [ts'] / ʔ ____ .C

[ne.ʔəz.dist.c'ey]	'we shot ourselves'
*[neʔ.ts'ə.dist.c'ey]	
[ʔaʔəzdəgey]	'we finished it'
[ʔaʔəzdətaniʔ]	'we'll finish it'
[ʔəzdətGes]	'we scratch ourselves'
[weʔəzdistgwət]	'we haven't poked ourselves'
[neʔəzdət'əy]	'we have ourselves'

I suggest that adjacent glottalized consonants are avoided:

(47.) *C'C': Avoid contiguous glottalized consonants.

This is obviously some type of anti-geminate consonant constraint, another version of which we will encounter in section 2.5.2.

The data in (46) indicate that *C'C' is ranked higher than Align-L:

(48.) /ʔ+{ts',z}.C/; *C'C' » Align-L

Candidates	*C'C'	Fill	Align-L	NoCoda
 [ne.ʔəz.dist.c'ey]		*	*	***
[neʔ.ts'ə.dist.c'ey]	* !	*		***

The winner violates Align-L but not *C'C', while the loser violates *C'C' but not Align-L.

Returning to the data in (34) involving the first person plural prefix in ʔ ____ C. contexts, those data show that *Complex is ranked higher than *C'C':

(49.) *Complex » C'C'

Candidates	*Complex	*C'C'	Align-L
 [bə.qaʔ.ts'ən.ta.ziʔ]		*	
[bə.qa.ʔəz.nta.ziʔ] ⁶	! *		*

⁶ Regarding the preference for [bəqaʔts'əntaziʔ], one speaker actually produced [bəqaʔəzntaziʔ] first, said it to herself a few times, then said [bəqaʔts'əntaziʔ] and decided 'the last one sounds better'. This episode provided a striking demonstration that less preferred forms may indeed still be possible, as predicted by the OT model.

The loser violates *Complex at the expense of adhering to *C'C'.

2.5 V___.C

The context which conditions the most occurrences of [z] is fairly complex, and its analysis involves several constraints.

2.5.1 Fill

When the first person plural subject prefix follows a vowel and precedes an onset consonant, the allomorph [z]- is preferred, as illustrated in (1). Selected data are repeated in (50):

(50.) [z] / V___.C

[bət.ɣez.ta.neɫ]	'we'll cook'
[weztaɫyih]	'we won't save him, her, it'
[c'əznuɫʔɛ'n]	'let's look at something, window-shop'
[taztatneɫ]	'we'll drink water'
[dezniŋʔaz]	'we (du.) walked inside'
[nizniŋzut]	'we skated to a stop and stayed'

I suggest that the preference for the [z]- allomorph in this context is due to constraint ranking: Fill is more highly ranked than NoCoda and Align-L:

(51.) Fill » NoCoda, Align-L

	Fill	NoCoda	Align-L
☞ [bət.ɣez.ta.neɫ]		***	*
[bət.ɣe.ts'ə.ta.neɫ]	* !	**	

2.5.2 *C_iC_i and Parse

The data in (50) illustrate that [z] is the allomorph of choice in the basic V___.C context. However, [ts']- must be used instead of [z]- under certain conditions, as will be seen in this section and the next.

If the following consonant is the rare [z]- qualifier prefix, the first person plural subject prefix is [ts']:

(52.) [ts'] / V___ .z

[hə.bə.ts'ə.zuʔ.yitl]	'we should kill them (du.)'
*[hə.bəz.zuʔ.yitl]	
*[hə.bə.zuʔ.yitl]	
[wets'əzuʔyitl]	'we shouldn't kill him/her'
[weebəts'əziʔyil]	'we didn't kill them (du.)'

The explanation for the ill-formed words in (52) is straightforward. There are no geminate consonants in B/W:

(53.) *C_iC_i: Geminate consonants are not allowed.

*[həbəzzuʔyitl] indicates that *C_iC_i must be higher ranked than Fill, which we have seen is higher ranked than NoCoda. *[həbəzuʔyitl] indicates that Parse is higher ranked than Fill. Otherwise, the geminate would be resolved by non-parsing of either the /z/- qualifier prefix or the first person plural morpheme.

(54.) /V+{ts',z}+z/; Parse » Fill, *C_iC_i » Fill

Candidates	Parse	*C _i C _i	Fill	NoCoda
☞ [hə.bə.ts'ə.zuʔ.yitl]			*	**
[hə.bəz.zuʔ.yitl]		*!		***
[hə.bə.zuʔ.yitl]	*!			**

2.5.3 CodaSon

A second special case arises when the following consonant is a glide, [y], [w] or [h]. In this case, forms with [ts']- are obligatory:

(55.) [ts'] / V___ [-cons]

we.ts'ə.yəʔ.ʔəts	'we haven't sneezed'
*wez.yəʔ.ʔəts	
bits'əyintsəl	'we chopped at him/her/it and missed'
bəqats'əyətoʔε'n	'let's look for him/her/it'
həbəq'εts'əwətaʔaʔ	'we'll blame them'
yəχ bəyəts'ooninʔay ⁷	'we gave him/her a house'
*bəyəzhoninʔay	
cats'oostnic	'we're hungry'

⁷ In 'hungry' and 'give house', intervocalic [h] is not parsed, as is typical for B/W. Compare word-initial [h] in [mbi bəyəχ hənqət] 'whose house did he/she buy?'.

To account for these data, I suggest that a syllable-contact special case of the Possible Coda Parameter, which I refer to here as CodaSon, is at work.

(56.) **Coda Sonority (CodaSon):** A coda should be more sonorous than a following onset.

Versions of (56) have been proposed by Hooper (1976), Murray and Venneman (1983), Clements (1988), and Kaye (1990). Also in Ponapean, McCarthy and Prince (1986) note that onset [y] must assimilate to the following vowel if preceded by a less sonorous coda.

Thus with glide-initial prefixes in B/W, selection of the Fill-economical, [z]-allomorph of the first person plural subject prefix would lead to an obstruent coda, more sonorous than the following obstruent:

(57.) /V+{ts',z}+[-cons]/; CodaSon » Fill

Candidates	CodaSon	Fill
we.ts'ə.yəʔ.ʔəts		* * *
wez.yəʔ.ʔəts	* !	* *

These data also indicate that CodaSon must be higher ranked than Fill as the winning candidate contains a Fill violation not found in the loser.

2.5.4 Morphosyntax of preceding elements

Finally, I mention a complication to this context whose analysis lies beyond the scope of this paper. For certain types of preceding vowels, [ts']- is sometimes considered an acceptable variant (Hargus and Denham 1995). When the preceding vowel is a conjunct or disjunct morpheme, [ts'] is judged either outright ungrammatical or possible but less preferred in this context, although there is some speaker variability which complicates the following generalizations.

A preceding vowel-final conjunct prefix basically requires [z]-:

(58.) [z] / V_{conjunct} ____ .C

c'- unspecified object	c'əznuʔʔɛ'n	'let's look at things, window shop'
	*c'əts'ənuʔʔɛ'n	

If a vowel-final disjunct morpheme precedes the first person plural subject prefix, [z]- is preferred but [ts']- is more acceptable here than when a conjunct prefix precedes. Speakers report that forms with [ts']- have a stilted, more formal ring to them (here marked ?).

(59.) [z] » [ts'] / V_{disjunct} ____ .C

disjunct qe 'foot'	[qɛztaʔɛz]	'we'll wear shoes'
	ʔ[qɛts'ətəʔɛz]	

When the preceding vowel belongs to a verb-external word, there are additional complications which have to do with the syntactic role of the word-external element. When the preceding word is an adjective or adverb, forms with [ts']- are generally judged better than those with [z]-. When the preceding word is a direct object, the [z]- alternant is unacceptable:

(60.) [ts'], ʔ*[z] / V]_{PrWd PrWd}[____ .C

uye 'shy'	uye ts'ətaliʔ	'we'll be shy'
	ʔ~*uyeztaliʔ	
nts'ɛ 'where'	nts'ɛ ts'ədiʔtsəy	'where are we staying?'
	ʔ~*nts'ɛzdiʔtsəy	
χada 'moose'	χada ts'əniʔʔɛn	'we're looking at a moose'
	*χadazniʔʔɛn	

(For data concerning postpositions, see Hargus and Denham (1995).)

To summarize, the acceptability of [z]- in the V ____ .C context depends on whether the preceding vowel forms part of the same phonological domain as the first person plural subject prefix. Conjunct prefixes are unequivocally part of the same domain; disjunct prefixes slightly less so; and word-external elements sometimes judged as forming part of the same domain as the first person plural subject prefix. In other words, there is optional cliticization of certain word-external elements to the verb.

2.6 Summary

In (61), I summarize the constraint(s) primarily responsible for the allomorph(s) which occurs in each context:

(61.) [ts'], [z]- contexts, by syllabic shape and with responsible constraint

	____ C.	____ .C	____ V
/(C)____	ts' (*Complex)	ts' (NoCoda)	ts' (Z.)
V____	ts' (*Complex)	ts' / ____ z (*C _i C _i , Parse) ts' / ____ [-cons] (CodaSon) z / ... (Fill)	ts' (Z.)
C____	ts' (*Complex)	z / ʔ ____ (*C'C') ts' / ... (Align-L)	ts' (Z.)

CodaSon is a newly proposed constraint, and the B/W version of *Complex is actually *Complex(Except).

(61) reveals the context where there is the most constraint interaction: when there is a following onset. This is the only context where [z]- ever appears as an allomorph of the first person plural prefix. The evidence for constraint ranking that we have seen is summarized in (62):

(62.) Constraint ranking, for pairs of constraints

*Complex » Fill	V__C.	wets'əndidel, *wezndidel
*Complex » NoCoda	C__C.	wəyənts'əntəsdił, *wəyənəzntəsdił
*Complex » *C'C'	?__C.	ne?əzdistc'ey, *ne?ts'ədistsc'ey
*C _i C _i » Fill	V__z	həbəts'əzułyitł, *həbəzzułyitł
Parse » Fill	V__z	həbəts'əzułyitł, *həbəzułyitł
CodaSon » Fill	V__.[-cons]	wets'əyəł?əts, *wezyəł?əts
Fill » NoCoda, Align-L	V__C	bətyəztaneł, *bətyets'ətaneł
*C'C' » Align-L	?__C	bəqa?ts'əntaził, *bəqa?əzntaził

Constraint ranking can also be represented in slightly more streamlined fashion, where → represents the domination function:

(63.) Constraint ranking, summary

Parse, CodaSon, *C _i C _i	→	Fill	→	NoCoda
	↗		↘	
*Complex	→	*C'C'	→	Align-L

If *C_iC_i and *C'C' are considered the same constraint (referred to as *C_iC_i in (64)), then *Complex becomes the highest ranked of the constraints for which there is evidence of ranking:

(64.) Constraint ranking, collapsing *C_iC_i and *C'C'

*Complex	→	*C _i C _i	→	Fill	→	NoCoda
		Parse, CodaSon	↗		↘	Align-L

Z. is undominated, and does not interact with the other constraints documented here.

Finally, the analysis suggests a direction for historical change in the Athabaskan languages. To account for data involving [z]- in post-vocalic, pre-onset contexts, I have suggested that Fill is more highly ranked than NoCoda. In some of the languages, such as Slave and Sekani, the affricate allomorph of the first person plural subject prefix is used in all of the contexts in (61): there is no fricative form of this prefix. While I have not done a systematic study of this property of Athabaskan languages, languages like B/W, Deg Xinag, Ahtna, and Navajo, which have this alternation, do not form a coherent subgrouping within Athabaskan, in contrast to Sekani and Slave which arguably do. This suggests that languages which have this alternation are the more conservative languages,

and that languages like Sekani and Slave have changed so that NoCoda is ranked higher than Fill in those grammars.

3. Conclusion: Comparison with derivational analysis

The OT analysis of the first person plural subject prefix requires several constraints (NoCoda, CodaSon, *Complex(Except), Fill, Align-L, *C'C', *C_iC_i, Z., .TS'), but in fact only two of these (.TS', Z.) are clearly language-specific. That is, apart from .TS', and Z., the other constraints required have parallels in other languages. Thus, the analysis indicates that B/W syllable structure is in line with what is seen in other languages.

A legitimate question to ask at this point is whether or not the OT framework provides a truly superior way to state these generalizations about B/W phonology. I argue in this section that it does.

A conventional analysis of B/W first person plural subject allomorphy would require something like the disjunction of morphological rules in (65), which would insert the allomorphs [z]- and [ts']- in appropriate contexts:⁸

(65.) Morphological rules, derivational analysis (informal)

Insert [z] /	V___.C except when C = [z] or [-cons]
Insert [ts']	elsewhere except when preceded by C = [ʔ] unless followed by CC

The "except when...(unless...)" conditions in (65) are needed to account for the complications seen above concerning preceding and following consonants. When the following consonant is [z] or a glide, the [ts']- alternant is preferred over the [z]- alternant in context V___.C. When the preceding consonant is [ʔ], the [z]- alternant is preferred over [ts'] in ___.C but not ___.C contexts. The analysis in (65) seems relatively simple and the "except when..." statements are reminiscent of the OT constraints reviewed above. The difficulty with (65) is that it is only an informal version of a derivational analysis. The "except when..." statements have no formal status in this model. Therefore, (65) must be more formally stated as in (66):

⁸ Of course, both subrules of (65) would have to be further constrained with morphological features so that the first person plural subject prefix is inserted in the correct order with respect to other affixes (as would the selection of [ts']-, [z]- in the OT analysis).

(66.) Morphological rules, derivational analysis (more formal)

Insert [z] /	V___.C
	?___.C
Insert [ts']	V___.z
	V__[-cons]
	?__CC
...	

The derivation in (67) shows how this analysis would work in a relatively simple case, context V___.C:

(67.) Derivational analysis, /V___.C

	de___.nin?az
Insert z	dez.nin.?az
	[deznin?az]

In more complicated cases, the output of these insertion rules would also undergo a rule of [ə] Epenthesis (not formulated here), as illustrated in (68).

(68.) Derivational analysis, /?___.C and /?__CC, with Epenthesis

	ne?.___.dist.c'ey
Insert z	ne?.z.dist.c'ey
Epenthesis	ne.?əz.dist.c'ey
	[ne?əzdistc'ey]
	bə.qa?.___.nta.ziʔ
Insert ts'	bə.qa?.ts'.nta.ziʔ
Epenthesis	bə.qa?.ts'ə.nta.ziʔ
	[bəqa?ts'əntaziʔ]

In contrast to the generality of the OT analysis, the conventional generative analysis in (66), with its consequent Epenthesis rule, has a number of unattractive features. Basically, the list of contexts required for the correct insertion of [ts'] and [z] in (66) is not explanatory. The contexts cannot be collapsed, and bear no formal relation to phonological statements such as "no geminates" that would need to be stated elsewhere in the grammar (although "no geminates", an output constraint, could not easily be stated formally in a derivational model).

Likewise, it is difficult to relate the contexts in (66) to universal trends in syllable structure. The derivational analysis does not explain the connection between the [z]-allomorph and the context in which it appears; that is, why it does not appear in a larger range of contexts. In the OT analysis, this is explained by constraints on syllable well-formedness such as NoCoda and their ranking with respect to other constraints such as

Fill. Although B/W is a language which allows codas, as well as certain onset and coda clusters, forms containing codas and clusters are not used when an alternant, coda- or clusterless form is available. In the OT analysis, we have seen that lowest ranked NoCoda plays a role in the prosodic morphology of a language that allows codas, in confirmation of general OT principles, while in the conventional derivational analysis, it is difficult to see how NoCoda could be formulated at all in such a language.

Not only does the derivational analysis in (66) duplicate certain aspects of B/W phonology, the accompanying Epenthesis rule leads to similar recapitulation. Epenthesis must be constrained so that only [əz]- (e.g. [neʔəzdistc'ey]) is created, instead of the more normal, onset-containing syllable [zə]- (e.g. *[neʔzədistc'ey]). However the Epenthesis rule is formulated to do this, this is clearly the OT Z. constraint at work. In the OT analysis, Z. is a morphological constraint; in the derivational analysis, a morphological fact must be built into the phonological rule of Epenthesis.

References

- Clements, G.N. (1988) The role of the sonority cycle in core syllabification. *Working Papers of the Cornell Phonetics Laboratory 2*: 1-68.
- Hargus, Sharon (1988) *The Lexical Phonology of Sekani*. New York: Garland.
- Hargus, Sharon (1991) The Disjunct Boundary in Babine-Witsu Wit'en. *International Journal of American Linguistics 57*:487-513.
- Hargus, Sharon (1994) Historical Change in Athabaskan Rule Domains. *Theorie des Lexikons---Arbeiten des Sonderforschungsbereich 282*, ed. by Richard Wiese, 185-204. (Working Papers of the Institut für Sprachwissenschaft, Heinrich-Heine Universität, Düsseldorf, Germany.)
- Hargus, Sharon and Kristin Denham (1995) Clitic vs. affix in the preverbal morphology of Witsuwit'en. Ms., University of Washington.
- Hargus, Sharon and Siri Tuttle (1995) Augmentation as Affixation in Athabaskan Languages. Ms., University of Washington.
- Hooper, J.B. (1976) *An introduction to natural generative phonology*. New York: Academic Press.
- Kari, James (1990) *Ahtna Athabaskan Dictionary*. Fairbanks: ANLC.
- Kaye, Jonathan (1990) 'Coda' Licensing. *Phonology 7*:301-330.
- Leer, Jeff (1979) *Proto-Athabaskan Verb Stem Variation. Part I: Phonology*. Fairbanks: ANLC.
- McCarthy, John and Alan Prince (1986) *Prosodic Morphology*. Univ. MA, Amherst and Brandeis Univ. Ms.
- McCarthy, John and Alan Prince (1993) *Prosodic Morphology: Constraint Interaction and Satisfaction*. Univ. MA Amherst and Rutgers Univ. Ms.
- McCarthy, John and Alan Prince (1994) *The Emergence of the Unmarked*. Univ. MA Amherst and Rutgers Univ. Ms.
- McDonough, Joyce (1990) *Topics in the Phonology and Morphology of Navajo Verbs*. Ph.D. dissertation, University of Massachusetts.

- Murray, R.W. and T. Vennemann (1983) Sound change and syllable structure in Germanic phonology. *Language* 59:514-528.
- Noyer, Rolf (1993) Optimal Words: towards a declarative theory of word-formation. Presented at the Rutgers Optimality Workshop, Oct. 22-24, 1993.
- Prince, Alan and Paul Smolensky (1993) *Optimality Theory: Constraint Interaction in Generative Grammar*. Rutgers Univ. Ms.
- Rice, Keren (1983) Epenthesis in the Athapaskan Languages and the Linking of Levels. Presented at the Canadian Linguistics Association meeting, Vancouver, B.C.
- Rice, Keren (1989) *A Grammar of Slave*. Berlin: Mouton de Gruyter.
- Rice, Keren (1993) The structure of the Slave (northern Athabaskan) verb. In S. Hargus and E.M. Kaisse, eds. *Studies in Lexical Phonology*, 145-171. San Diego: Academic Press.
- Rice, Keren and Leslie Saxon (1994) Two subject positions in Athapaskan languages. Presented at the Morphology-Syntax Connection workshop, Cambridge, MA.
- Speas, Margaret (1982) Navajo Verbal Prefixes in Current Morphological Theory. *Studies on Arabic, Basque, English, Japanese, Navajo and Papago*, ed. by Thomas G. Larson, 115-144. (Coyote Papers: Working Papers in Linguistics from A→Z, 3.) Tucson: Univ. of Arizona.
- Speas, Margaret (1991) Functional heads and the Mirror Principle. *Lingua* 84:181-214.
- Willie, Mary and Leslie Saxon (1995) Third person forms in Athapaskan languages: An examination of the "fourth" person. Presented at the Athapaskan Morphosyntax Workshop, Albuquerque, NM.