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Author

Operstein, Natalie

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Phonological Adaptation of Spanish Loanwords in Zaniza Zapotec

Natalie Operstein[1]

In his work on the acculturation of the Nahuas to Spanish presence, Lockhart identified three clearly defined chronological stages, hypothesizing that these stages may "represent a universal aspect of the contact of cultures, at least on the indigenous side of large-scale conquests or intrusions" (1997: 35). Lockhart's research provides a useful framework for conceptualizing indigenous-Spanish language contact in Mesoamerica, and the purpose of this paper is to look for evidence for Lockhart's three stages of linguistic acculturation in Zaniza Zapotec, a largely undocumented and endangered Mesoamerican language. Unlike Nahuatl, which has a rich history of colonial-era writing, Zaniza Zapotec is an unwritten language, and the evidence for the periodization of Spanish influence will be obtained from oral data, with the focus on the evolving patterns of phonological adaptation of Spanish loanwords in four areas: Spanish stress, voicing contrast, stressed /o/, and pretonic vowels.

[Keywords: Mesoamerican languages, loanword phonology, loanword prosody, fortis, lenis, stress, tone]

1. Introduction

In his well-cited work on the adaptation of the Nahua language and culture to Spanish presence (Lockhart 1991 et seq.), James Lockhart identified three chronological periods clearly visible in all aspects of the Nahua culture. Stage 1, encompassing the period from the start of the conquest in 1519 until about 1540-1550, was characterized by relatively little change to the indigenous language and culture. Stage 2, stretching from about 1540-1550 to about 1640-1650, was characterized by the Hispanic elements being incorporated into the indigenous cultural and linguistic frameworks "as discrete items" (Lockhart 1997: 34), without causing structural change. Stage 3, which began around 1650 and is still ongoing, involves a more intimate, structure-altering cultural and linguistic contact.

In his later work, Lockhart hypothesized that the three stages of acculturation may "represent a universal aspect of the contact of cultures, at least on the indigenous side of large-scale conquests or intrusions" (1997: 35). Regardless of whether these stages prove to be universal, Lockhart's study provides a useful conceptual framework for the study of indigenous-Spanish contact in Mesoamerica. The aim of the present paper is to look for evidence for Lockhart's three stages of linguistic acculturation in Zaniza Zapotec (ISO code: zpw), a largely undocumented and endangered Mesoamerican language.

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The linguistic correlates of the three stages of acculturation, as identified by Lockhart on the basis of Nahuatl data, are summarized in Table 1.

TABLE 1
NAHUATL LINGUISTIC ADAPTATION TO SPANISH

Stage	Dates	Types of Contact Phenomena
1	1519-1550	• Semantic extensions of native words, for example: 'deer' for 'horse', 'stone spindle' for 'wheel' • Native neologisms, for example: 'fire trumpet' for 'firearm', 'beeswax torch' for 'candle' • Neologisms with the borrowed word 'Castile', for example: 'Castile turkey hen' for 'chicken', 'Castile camote' for 'carrot' • Borrowed Spanish forenames, for example: 'Juan', 'Pedro', 'Antonio', 'Ana', 'María', 'Magdalena'
2	1550-1650	• Massive borrowing of nouns • The nouns are assimilated to the native phonology and grammar • The few verbs that are borrowed are treated like nouns • Semantic extension of native words continues
3	1650-	• Borrowing of Spanish verbs, conjunctions and prepositions • Borrowing of idioms and of nouns previously avoided • Borrowing of Spanish sounds (voiced stops, /f/, /r/)

Stage 1 linguistic phenomena involved very little borrowing; instead, Nahua speakers used the resources of their own language to name the unfamiliar objects, species and practices. The linguistic acculturation was achieved mainly via semantic shifts and descriptive neologisms; the only items borrowed at this time were the word *Castilla* 'Castile' and Spanish forenames, conferred on the Nahuas as part of the practice of baptism.

Stage 2 is characterized by massive borrowing of Spanish nouns in various areas of culture-related vocabulary, including measurements, materials, objects, tools, plant and animal species together with their products, religious and legal terms, and designations for functionaries and other individuals. The words borrowed at this stage were assimilated to the native phonology and morphology. Based on its linguistic effects, Lockhart's Stage 2 may be identified with Haugen's (1950) prebilingual period, "in which the loans are made by a relatively small group of bilinguals and spread widely among the monolingual majority" (216).

Stage 3 is characterized by growing levels of bilingualism on the part of the Nahuas and involves a range of structure-changing contact phenomena; at one point in his exposition, Lockhart compares the pouring in of Spanish elements into Nahuatl at this stage with the breaking of a metaphorical dam (1992: 304). Among the structure-altering

borrowings are Spanish verbs, conjunctions, prepositions, sounds and idioms. This stage is also characterized by the borrowing of noun types that were previously avoided, such as abstract nouns, terms for blood relatives and cardinal directions; and words that had preexisting native equivalents.

As in the case of Nahuatl, Zapotec-Spanish contact began shortly after the conquest, with the first Zapotec dictionary, Córdova (1578*b*), already containing 183 Spanish borrowings (Smith Stark 2007: 10). Unlike Nahuatl, for which a large number of colonial-era documents are available, the specific variety of Zapotec to be examined in this paper has no history of writing. Consequently, the methodology used in the paper is different from Lockhart's in that all the evidence for the historical stratification of Spanish influence will be obtained from oral linguistic data. The specific focus of the paper is on the evolving patterns of phonological adaptation of Spanish loanwords, and the tools to be employed are phonological developments in post-conquest Spanish and post-conquest Zaniza Zapotec.

The paper is organized as follows. Section 2 provides the necessary background information about the phonologies in contact, those of Zaniza Zapotec (henceforth ZZ) and Spanish, focusing on the relevant differences between the two and the facts of Spanish historical phonology that will assist in interpreting the data. Section 3 details why Lockhart's Stage 1 cannot be identified on the basis of phonological data and briefly looks at other types of linguistic evidence supporting the existence of this stage. Section 4 constitutes the bulk of the paper by providing phonological evidence for Lockhart's Stages 2 and 3. Subsection 4.1 looks at two distinct patterns in the adaptation of the voicing contrast, 4.2 examines two distinct patterns in the adaptation of Spanish stressed /o/, 4.3 looks at the treatment of Spanish pretonic vowels, and 4.4 examines two distinct patterns of mapping Spanish stress to ZZ tone. Section 5 summarizes the results of the study.

2. Phonologies in contact

The Ethnologue (Lewis et al. 2014) recognizes more than fifty language varieties in the Zapotec family. These are commonly grouped into five branches; the family tree in Figure 1 is based on the work of Smith Stark (2007*a*), Kaufman (1989, 1994-2007) and Operstein (2012).

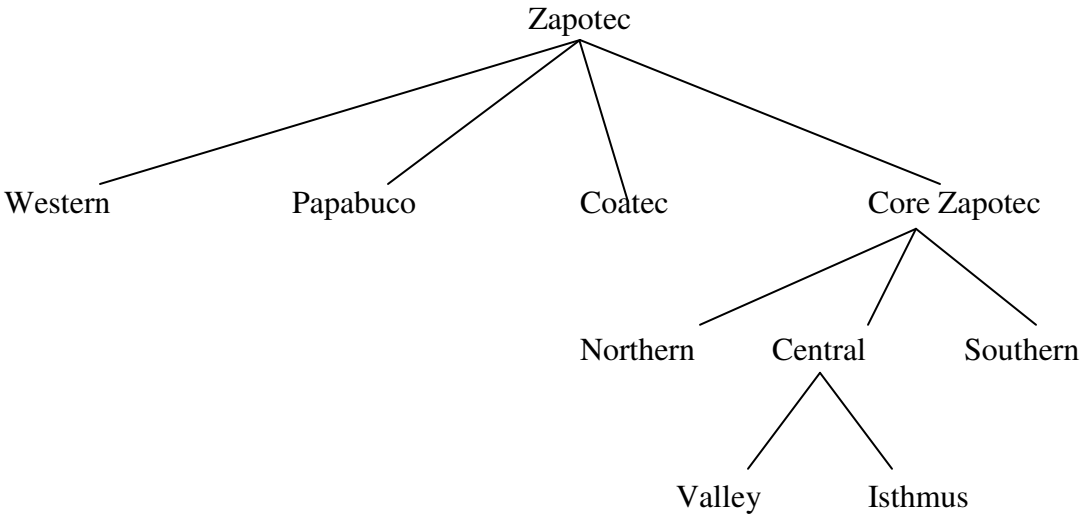

FIG. 1—Zapotec language family

As a group, Zapotec languages are characterized by the fortis/lenis contrast in both obstruents and sonorants. The phonetic features underlying the fortis/lenis contrast are complex and have been the subject of considerable discussion and a growing number of theses and dissertations. The distinction between the two series is context-dependent, and is expressed differently in the obstruents than in the sonorants. Fortis stops and affricates are always described as voiceless; they may be aspirated in some positions and are never lenited. Their lenis counterparts show subphonemic variation in voicing, no aspiration and a tendency towards fricativization. Fortis affricates and fricatives are sometimes described as having greater friction than their lenis counterparts. All fortis obstruents are long after a stressed vowel and are said to be produced with a greater articulatory effort than lenis ones. In some Zapotec varieties, the fortis/lenis contrast in the obstruents may be transformed into that of (almost) pure voicing or that of manner of articulation. In nasals and laterals, the leading feature of the contrast is length. Devoicing (in laterals) and place assimilation or velarization (in nasals) may enhance the contrast in some varieties. In some varieties, the fortis/lenis contrast in sonorants may be transformed into a place of articulation contrast, with the palatal lateral/nasal contrasting with the alveolar lateral/nasal. In some Central Zapotec languages, the fortis counterpart of /l/ is the sequence /ld/ or /nd/ patterning as a single segment (Merrill 2008: 108). When present, the fortis/lenis contrast in the rhotics is realized as trill versus tap. The fortis/lenis contrast is enhanced by the length of the preceding vowel, with vowels generally being longer before the lenis series (Jones and Knudson 1977; Nellis and Hollenbach 1980; Jaeger 1983; Adam 2003; Pickett, Villalobos and Marlett 2009; Teodocio 2009).

The picture that emerges from the above discussion is that the articulatory and acoustic correlates of the fortis/lenis contrast are not uniform across the family, with different Zapotec varieties placing different weight on such cues as consonant and vowel length, voicing, aspiration, degree of occlusion and place of articulation. Historically, the fortis/lenis contrast has been analyzed as a geminate/singleton distinction. In an analysis

initially proposed by Swadesh (1947) and further elaborated by Suárez (1973), Benton (1988) and Kaufman (1983, 1994-2007), lenis consonants are reconstructed at the Proto-Zapotec level as single and their fortis counterparts as geminates or as hetero-morphemic consonant clusters. The presence of the length distinction in at least some contemporary varieties lends support to this analysis. Various kinds of evidence indicate that in the sixteenth century, the phonemic systems of at least some Zapotec varieties may already have operated on the basis of the fortis/lenis rather than geminate/singleton dichotomy. The evidence includes observations of Juan de Córdova, the first missionary grammarian of Zapotec, on the pronunciation of Zapotec consonants and the rendering of Spanish consonants by Zapotec speakers (Córdova 1578*a*, 1578*b*) and the orthography Córdova himself employed in his Zapotec dictionary (Manrique Castañeda 1966-1967; Smith Stark 2003).

2.1 Zaniza Zapotec phonology

ZZ belongs to the Papabuco branch of Zapotec, and the variety described here is spoken in the town of Santa María Zaniza.[2] According to the most recent census (INEGI 2010), the town has 2009 residents; approximately 21% report knowledge of Zapotec. All current ZZ speakers are bilingual in Zapotec and Spanish.

The consonant inventory of ZZ is shown in Table 2. The labiodental fricative /f/ occurs only in Spanish loanwords. Distributional gaps in non-onomatopoeic native vocabulary include the non-occurrence of /p/, /h/ and /h^{w}/ word-initially, and of /k/ and /k^{w}/ word-medially. Most ZZ consonants come in fortis/lenis pairs distinguished mainly by voicing and/or duration. In three of the pairs, the contrast involves place and/or manner of articulation; these are /ɾ/-/tʃ/, /n/-/ɲ/ and /l/-/ʎ/. /tʃ/ (from Proto-Zapotec *tty) serves as the fortis counterpart to both /ɾ/ and /dʒ/ (both from Proto-Zapotec *ty; Operstein 2012).[3] The native /m, w, j, h, h^{w}/ and the borrowed /f/ do not have a fortis/lenis counterpart.

[2] ZZ is an unwritten language, with no prior written documentation and no research publications other than the present author's. The data used in this paper were collected by the author over the period of 1999-2009 within the framework of the Project for the Documentation of the Languages of Mesoamerica (PDLMA). In the framework of this project, I created a lexicographic record of ZZ, as spoken in the town of Santa María Zaniza, by working with bilingual native speakers of the language. The lexical database of ZZ contains over 7,000 entries including personal names, nicknames, toponyms and loanwords.

[3] Here and below, all Proto-Zapotec reconstructions are cited after Kaufman (1994-2007).

TABLE 2
ZANIZA ZAPOTEC CONSONANTS

	Labial	Alveolar	Retroflex	Palatal	Velar	Glottal
Stop	p b	t d			k, k^w g, g^w	
Affricate				tʃ dʒ		
Fricative	(f)	s z	ʂ ʐ	ʃ ʒ		h, h^w
Tap		ɾ				
Nasal	m	n		ɲ		
Liquid		l		ʎ		
Glide	w			j		

ZZ vowel qualities are shown in Table 3. ZZ distinguishes between modal and laryngealized vowels; the latter will be notated with an apostrophe after the vowel. /o/-quality vowels are rare in native morphemes, many of the /o/s deriving from the Proto-Zapotec sequence **awo*, as in **lawo* 'face' > /lo/, **tawo* 'maize spike' > /do/. The inventory also includes nasal vowels; /ã/ and /ĩ/ occur in both native and borrowed words, while the other nasal vowels are confined to onomatopoeic vocabulary and Spanish borrowings.

TABLE 3
ZANIZA ZAPOTEC VOWEL QUALITIES

	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

In Kaufman's (1994-2007) Proto-Zapotec reconstruction, monomorphemic lexical items are predominantly disyllabic, and loanword evidence points to their still having been disyllabic at the time of ZZ's initial contact with Spanish. In present-day ZZ, the situation is more complex in that the final vowels are deleted in connected-speech forms and surface as [a] prepausally and in citation forms. This has resulted in each monomorphemic word having two forms, monosyllabic in connected speech and disyllabic prepausally and in isolation. Although the connected-speech form is historically the more recent of the two, it is taken to be underlyingly basic in the synchronic phonology of the language. This is an instance of what Vennemann (1972) has termed rule inversion, where the earlier rule of final vowel deletion has been replaced with the rule of final [a] epenthesis (a similar analysis is proposed by Martínez-Gil 1997 for Galician).

Table 4 provides examples of native word shapes in ZZ. In monomorphemic words, the only licit consonant clusters are word-initial nasal-stop combinations, as seen in the words for 'egg' and 'navel'. Non-initial consonant clusters do not occur in simple words but may surface across morpheme boundaries in complex words, as seen in 'heart'.

TABLE 4
SAMPLE NATIVE WORD SHAPES IN ZANIZA ZAPOTEC

Underlying shape	Example	Surface shape	Example	Gloss
/V/	/í/	[Va]	[ía]	'here'
/CV/	/ló/	[CVa]	[lóa]	'face'
/CCV/	/ŋgú/	[CVVa]	[ŋgúa]	'egg'
/VC/	/ɲih/	[VCa]	[ɲiha]	'head'
/CVC/	/gɨd/	[CVCa]	[gɨda]	'skin'
/CCVC/	/ŋgídʒ/	[CCVCa]	[ŋgídʒa]	'navel'
/CVC-CV/	/laɾdó'/	[CVC-CVa]	[laɾdó'a]	'heart'

In common with other Zapotec languages, ZZ has both stress and tone; various observers have argued that tone and stress are independent of each other in Zapotec languages (Mock 1988, Sicoli 2007, Chávez Peón 2008). In ZZ, words are stressed on the penultimate syllable of their citation/prepausal form, which is the last syllable of their connected-speech/underlying form. ZZ contrasts three tones on the stressed syllable, high, mid and low; the majority of unstressed syllables are toneless. The low tone has a low type frequency in native morphemes. Clitics do not normally bear a distinctive tone; exceptions to this include the pronominal plural clitic *=bí*, the first person singular pronominal clitic *=â* and the third person singular pronominal clitic *=mà* refering to older females, respected persons of both sexes, animals, deities and heavenly bodies.

2.2 Spanish phonology

For Spanish, the century immediately following the discovery and beginning of colonization of the Americas was a period of intense structural change.[4] Though the vowel system of Spanish has remained stable, its consonant system has evolved considerably over this period. As summarized in Table 5, most of the relevant changes involved mergers.

[4] The phonological changes outlined in this section are discussed in many standard treatments of Spanish historical phonology. The specific sources used for the present summary include Lapesa (1980), Fontanella (1993), Parodi (1995), Obediente (1997) and Penny (2000).

TABLE 5
CHANGES IN SPANISH CONSONANTS

16th-century Spanish consonants	Products of their merger in modern Mexican Spanish
/s/, /z/, /ʂ/, /ʐ/	/s/
/b/, /β/	/b/
/ʎ/, /j/	/j/
/ʃ/, /ʒ/	/x/ ~ /h/[5]

Previous literature has shown that some of the changes between pre-conquest and present-day Spanish are reflected in the shape of Spanish borrowings in American indigenous languages (Canfield 1934, Campbell 1991, Parodi 1995, 2009). Given the nature of ZZ phonology, such as its fortis/lenis contrast, only some of the changes in Table 5 are informatively reflected in the shape of Spanish borrowings in ZZ, and consequently may be used for establishing the relative chronology of the borrowings. None of the voicing mergers, for example, is reflected in the loanwords. The changes for which the shape of Spanish loanwords in ZZ provides evidence include the following:

(a) Merger of /ʂ/ and /ʐ/ with /s/ and /z/.[6] In the early period, Spanish /ʂ/ and /ʐ/ are distinguished in the loanwords from /s/ and /z/: while the former pair is adapted in ZZ as /ʃ/ or /ʒ/, the latter is adapted as /s/ or /z/. In the more recent period, all four sounds are adapted as /s/. This allows assigning the borrowings in which /ʂ/ and /ʐ/ are reflected as palatal sibilants to the earlier stratum.

(b) Retraction of /ʃ/. While the voicing merger in the palatal fricatives is not attested in the loans, the retraction of its product, /ʃ/, is amply attested. In the early period, this fricative is adapted in ZZ as /ʃ/ or /ʒ/, and in the more recent period, as /k/ or /h/. This allows assigning the borrowings in which /ʃ/ is reflected as a palatal sibilant to the earlier stratum.

(c) Merger of /ʎ/ with /j/. In the early period, /ʎ/ is adapted in ZZ as a lateral and in the more recent period, as a glide. This allows assigning the borrowings in which /ʎ/ is reflected as a lateral to the earlier stratum.

(d) Merger of /β/ with /b/. In the early loans, all Spanish labial obstruents are adapted in ZZ as /b/. The only exception to this pattern is the adaptation of *caballo* 'horse', in which <b> (i.e., /β/) is reflected as labialization on the velar. In combination with other diagnostic features, this allows assigning *caballo* to the early stratum.

3. Linguistic (non-phonological) evidence for Stage 1

As summarized in the introduction, Nahuatl linguistic adaptations during Stage 1 involved semantic shifts, native neologisms, neologisms incorporating the word *Castilla*

[5] This change involved both a voicing merger and a change in the place of articulation.
[6] I am following Parodi (1995) in the phonetic notation of the apico-alveolar fricatives.

'Castile', and borrowed Spanish forenames. In the absence of written documentation, the evidence for Stage 1 in ZZ has to come from a comparison with the types of adaptations that Lockhart has identified for Nahuatl during the comparable period.

Such comparison suggests that coinages with the word "Castile" may derive from this period. Neologisms of this type are reported in different varieties of Zapotec and are present already in Córdova's Zapotec dictionary (Córdova 1578*b*), for example, in the Zapotec equivalents for wheat, bread, rice, apple, apple tree, pomegranate, paper and cloth. Thus, <*Làti castilla*> is glossed by Córdova as "Paño de lino o lana, porque no lo auia aca" [linen or wool cloth, because they did not have it here] (1578*b*: 299). In ZZ, comparable items include /git ʂìʎ/ 'Castilian tortilla' (wheat bread) and /du' ʂìʎ/ 'Castilian fruit' (plantain). Other candidates for Stage 1 phenomena include semantic shifts, such as /gíd/ 'chicken, hen' (/gid dā'w/, literally 'mountain hen', refers to a local wild species); and native coinages, such as /ju' báɲ/ 'stable' (literally 'house for horses').

A comparison with Nahuatl also suggests that some Spanish words, in particular the word *Castilla* 'Castile' and selected forenames, must have been borrowed into ZZ during Stage 1. Nonetheless, the Spanish borrowings that may have entered ZZ during this period are fully adapted to its phonology, which is also the case for Stage 2 loans, as discussed below. For this reason, Stage 1 borrowings cannot be distinguished from Stage 2 borrowings *on phonological grounds*. From the viewpoint of their phonological treatment in ZZ, Spanish loans can only be divided into two layers. For this reason – the impossibility of distinguishing between Stage 1 and Stage 2 loans phonologically – the term "Stage 2", from now on, is to be understood as including both Stage 1 and Stage 2 loans.

4. Phonological evidence for Stages 2 and 3

As already discussed, Zapotec languages distinguish obstruents along the fortis/lenis dimension, reconstructible as a historical geminate/singleton distinction. The adaptation of Spanish obstruents, in which the distinction is based on voicing, to a language in which voicing is at best subphonemic, is a fruitful area for research on the chronological stratification of loanwords since prebilingual- and bilingual-period loans may be predicted to show different adaptation patterns.

4.1 Adaptation of the Spanish voicing contrast

4.1.1 Spanish /t/ and /d/

Adaptation of Spanish /t/ and /d/ shows two clearly distinct patterns in ZZ. During the earlier stage, ZZ adapted both /t/ and /d/ in pre-stress positions as fortis /t/, and in post-stress positions as lenis /d/. The terms "pre-stress" and "post-stress" refer to the location of the consonant relative to the stressed vowel in the Spanish word. At this stage, therefore, the voicing of the Spanish stops is not relevant for their adaptation in ZZ. The early date of introduction of these loans follows from the presence of the diagnostic

sounds in the Spanish words, including /ʂ/, /ʃ/ and /ʎ/, as well as from tone assignment to the stressed Spanish syllable and other language-internal phonological clues (to be discussed below). Examples of Stage 2 treatment of /t/ and /d/ may be seen in (1a) and (1b).[7]

(1a) Spanish /t/ and /d/ in pre-stress position → ZZ /t/ (Stage 2)

taza /ˈtasa/ 'cup'	>	/tàz/
tor /ˈtoɾ/ 'bull'	>	/tòɾ/
trigo /ˈtɾigo/ 'wheat'	>	/tɾìw/
tijera /tiˈʃeɾa/ 'scissors'	>	/tiʃèɾ/
tasajo /taˈʂaʃo/ 'dried beef'	>	/tiʃèʒ/
tomín /toˈmin/ (type of coin)	>	/timìɲ/
botón /boˈton/ 'button'	>	/muntùɲ/
durazno /duˈrasno/ 'peach'	>	/tilàz/
docena /doˈsena/ 'dozen'	>	/tesèn/
domingo /doˈmingo/ 'Sunday'	>	/timĩw/

(1b) Spanish /t/ and /d/ in post-stress position → ZZ /d/ (Stage 2)

morado /moˈɾado/ 'purple'	>	/mɾàd/
Pedro /ˈpedɾo/ (name)	>	/béd/
aceite /aˈsejte/ 'oil'	>	/asèd/
chocolate /tʃokoˈlate/ 'chocolate'	>	/ʂulàd/
barato /baˈɾato/ 'cheap'	>	/bɾàd/ ~ /beɾàd/ ~ /baɾàd/
servilleta /seɾbiˈjeta/ 'napkin'	>	/sibjēd/ ~ /subjēd/ ~ /sibɾjēd/
letra /ˈletɾa/ 'letter'	>	/ʎèdɾ/
granada /gɾaˈnada/ 'pomegranate'	>	/kaɾnàd/

In Stage 3 loans, nativization of Spanish /t/ and /d/ ceases to be determined by their prosodic position and begins to reflect their voicing in the source language. In this stratum, Spanish /t/ is rendered in ZZ with the corresponding fortis stop and Spanish /d/ with the corresponding lenis stop (shown in 2). Assignment of /bestíd/ 'dress' (< *vestido*) to Stage 3 rather than Stage 2 is based on several clues including preservation of the pretonic vowel, treatment of the sequence /st/ and tone assignment (see 4.3 and 4.4).

[7] Contemporary Spanish words in the datasets have been transcribed following conventions similar to those of Schwegler, Kempff and Ameal-Guerra (2010). For Spanish words that precede the historical changes outlined in 2.2, the following conventions are observed: <s> and <ss> are transcribed as /ʂ/; <b> and <v> are transcribed as /b/; <ç>, <z>, and <c> before front vowels are transcribed as /s/; <g> before front vowels and <j> are transcribed as /ʃ/.

(2a) Spanish /t/ → ZZ /t/ (Stage 3)

tuna /ˈtuna/ ‘prickly pear’	>	/tún/
bicicleta /bisiˈkleta/ ‘bicycle’	>	/bisiklét/

(2b) Spanish /d/ → ZZ /d/ (Stage 3)

dulce /ˈdulse/ ‘sweet’	>	/dúls/
vestido /besˈtido/ ‘dress’	>	/bestíd/

To conclude, the adaptation of Spanish /t/ and /d/ in ZZ shows two distinct patterns. In the earlier (Stage 2) period, both stops are adapted as fortis when they occur before the stressed vowel in the Spanish word and as lenis when they occur after the stressed vowel, regardless of their voicing in Spanish. In the later (Stage 3) period, Spanish /t/ is adapted in ZZ as a fortis stop, and Spanish /d/ as a lenis stop. Such adaptation pattern clearly reflects the increased community bilingualism, and perhaps also literacy in Spanish. Additionally, it is indicative of an increased role of voicing in the fortis/lenis contrast, which may be due to the influence of the voicing contrast in Spanish (cf. related discussion in Smith Stark 2003:218).

4.1.2 Spanish /tʃ/

In the earlier (Stage 2) stratum of borrowings, the affricate /tʃ/ shows the same adaptation pattern as the coronal stops, whereby its reflex in ZZ is dependent on the affricate’s position relative to the stressed vowel in the Spanish word. As shown in (3), /tʃ/ is reflected as fortis before, and as lenis after, lexical stress. The present-day reflexes of Spanish /tʃ/ in ZZ, /ʂ/ and /zʐ/, are the result of fricativization of /tʃ/ and /dʒ/ in ZZ (Operstein 2005).

(3a) Pre-stress Spanish /tʃ/ → */tʃ/ → ZZ /ʂ/ (Stage 2)

chivo /ˈtʃibo/ ‘goat’	>	/ʂíb/
chapulín /tʃapuˈlin/ ‘grasshopper’	>	/ʂuplín/
chilaquiles /tʃilaˈkiles/ (tortilla dish)	>	/ʂukíʎ/
gachupín /gatʃuˈpin/ ‘Spaniard’	>	/kaʂpĩ/

(3b) Post-stress Spanish /tʃ/ → */dʒ/ → ZZ /zʐ/ (Stage 2)

mecha /ˈmetʃa/ ‘wick’	>	/mézʐ/
garrocha /gaˈrotʃa/ ‘goad’	>	/garúzʐ/

canecho /kaˈnetʃo/ ‘cangrejo’[8]	>	/gaɲēz̨/
cahueche /kaˈwetʃe/ ‘bell ringer’[9]	>	/gawēz̨/

The forms in (4) were borrowed during Stage 3, when the adaptation of /tʃ/ began to be guided by its voicing rather than its prosodic position. Two phases may be distinguished here: during the earlier phrase, the fricativization process was still operative in ZZ (shown in 4a), and during the later phrase it ceased to be operative (shown in 4b).

(4a) Spanish /tʃ/ → */tʃ/ → ZZ /s̨/ (Stage 3)

macho /ˈmatʃo/ ‘he-mule’	>	/más̨/
cuache /ˈkwatʃe/ ‘twin’	>	/kʷás̨/
cuche /ˈkutʃe/ ‘pig’	>	/kús̨/

(4b) Spanish /tʃ/ → ZZ /tʃ/ (Stage 3)

chanza /ˈtʃansa/ ‘joke’	>	/tʃáɲs/
ochenta /oˈtʃenta/ ‘eighty’	>	/otʃént/

To summarize, the adaptation of /tʃ/ falls into two chronological strata. In Stage 2 borrowings, it depends on the affricate’s prosodic position and is adapted as fortis before and as lenis after lexical stress. In Stage 3 borrowings, it is adapted in ZZ based on its voicing in Spanish. Because of the deaffrication process in ZZ, it shows up as /s̨/ in Stage 3 loans that were borrowed earlier and as /tʃ/ in those that were borrowed more recently.

4.1.3 Spanish /ʃ/

Sixteenth-century Spanish possessed the palatal fricative /ʃ/, which was later retracted to /x/, /χ/ or /h/ in different varieties of Spanish. The palatal value of the fricative is preserved in the early loans, with the already familiar adaptation pattern whereby the fortis outcome occurs before the stressed vowel (shown in 5a) and the lenis outcome after the stressed vowel (shown in 5b).

(5a) Pre-stress Spanish /ʃ/ → ZZ /ʃ/ (Stage 2)

jícara /ˈʃikaɾa/ ‘gourd bowl’	>	/ʃìg/
gigante /ʃiˈgante/ ‘giant’	>	/ʃigàn/

[8] The Spanish etymon has been tentatively reconstituted here from its ZZ shape. In ZZ, this word refers to a parasite that feeds on bean plants.
[9] This is a suspected Nahuatl loanword. The gloss ‘bell ringer’ approximates the Spanish translation offered by the ZZ speakers, ‘tocador de campana’.

tijera /tiˈʃera/ ‘scissors’	>	/tiʃɛ̀ɾ/
vigilia /biˈʃilja/ ‘vigil’	>	/biʃìʎ/

(5b) Post-stress Spanish /ʃ/ → ZZ /ʒ/ (Stage 2)

ajo /ˈaʃo/ ‘garlic’	>	/àʒ/
tasajo /taˈʂaʃo/ ‘dried beef’	>	/tiʃèʒ/
navaja /naˈbaʃa/ ‘folding knife’	>	/ɲibàʒ/
clavija /klaˈbiʃa/ ‘peg’	>	/kaɾbìʒ/

After its retraction to /x/ or /h/, this fricative appears initially to have been adopted as a fortis velar stop – only one example is attested in the data – and subsequently as a glottal fricative (shown in 6). In either case, its borrowing at this stage is guided by voicing rather than prosodic position. The fricative’s adaptation as a velar stop (in *Ángel*) probably reflects a stage in the history of ZZ when it lacked /h/ and approximated the retracted Spanish fricative with the closest native equivalent.

(6) Spanish /x/ → ZZ /h/ or /k/ (Stage 3)

Ángel /ˈanxel/ (name)	>	/ák/
ángel /ˈanxel/ ‘angel’	>	/ãh/
monja /ˈmonxa/ ‘nun’	>	/mũh/
consejo /konˈsexo/ ‘advice’	>	/konséhʷ/

In conclusion, the adaptation of Spanish /ʃ/ may be divided into two layers. Stage 2 adaptation reflects the fricative’s prosodic position, while Stage 3 adaptation reflects its voicing in Spanish. In addition, Stage 3 loans reflect the fricative’s retraction to /x/ or /h/ in the source language.

4.1.4 Spanish /ʂ/

The sixteenth-century Spanish apico-alveolar /ʂ/, spelled <s> or <ss>, was nativized in ZZ as /ʃ/ before stress (shown in 7a) and as /ʒ/ after stress (show in 7b). This sound’s identification with the native palatal sibilants is explainable by its retroflex articulation and acoustic quality and is common in the American indigenous languages that came into contact with Spanish (Penny 2000: 43; Parodi 2009).

(7a) Pre-stress Spanish /ʂ/ → ZZ /ʃ/ (Stage 2)

silla /ˈʂiʎa/ ‘saddle; chair’	>	/ʃìʎ/
semana /ʂeˈmana/ ‘week’	>	/ʃimàn/

sandía /ʂanˈdia/ ‘watermelon’	>	/ʃindʒì/
escuela /eʂˈkwela/ ‘school’	>	/ʃikʷàl/
tasajo /taˈʂaʃo/ ‘dried beef’	>	/tiʃèʒ/
escaño /eʂˈkaɲo/ ‘bench with a back’	>	/ʃkàj/
fiscal /fiʂˈkal/	>	/biʃkáʌ/

(7b) Post-stress Spanish /ʂ/ → ZZ /ʒ/ (Stage 2)

Tomás /toˈmaʂ/	>	/máʒ/
manso /ˈmanʂo/ ‘tame’	>	/màʒ/
mesa /ˈmeʂa/ ‘table’	>	/mèʒ/
peso /ˈpeʂo/ (type of coin)	>	/bèʒ/
queso /ˈkeʂo/ ‘cheese’	>	/kèʒ/
misa /ˈmiʂa/ ‘mass’	>	/mìʒ/
camisa /caˈmiʂa/ ‘shirt’	>	/mìʒ/
Luis /ˈlwiʂ/	>	/wíʒ/

In later loans, the nativization pattern of this fricative ceases to reflect its prosodic position and begins to reflect its voicing. Prior to its merger with the dental /s/ it is reflected as /ʃ/ (see 8a), and after the merger it is reflected as /s/ (see 8b).

(8a) Spanish /ʂ/ → ZZ /ʃ/ (Stage 3)

lunes /ˈluneʂ/ ‘Monday’	>	/luɲéʃ/
Pascual /paʂˈkwal/ (name)	>	/báʃ/

(8b) Spanish /ʂ/ → ZZ /s/ (Stage 3)

sábana /ˈsabana/ ‘sheet’	>	/sáb/
vaso /ˈbaso/ ‘glass’	>	/bás/

In sum, Spanish loanwords with apico-alveolar /ʂ/ may be divided into two chronological layers. At Stage 2, the adaptation of /ʂ/ is guided by its prosodic position in the source word and is independent of its voicing. At Stage 3, the sibilant is adapted in ZZ based on its voicing in Spanish, first as /ʃ/, and after its merger with the dental sibilant, as /s/.

4.1.5 Spanish /s/

At Stage 2, Spanish dental /s/, orthographically <c>, <ç> or <z>, was borrowed into ZZ as fortis before stress (see 9a) and as lenis after stress (see 9b). The early date of entry of the forms in (9a) is argued for by the adaptation of /d/ in *docena* and *aceite*, /k/ in *azucar*, stressed /o/ in *oración* (see 4.2) and tone assignment throughout (see section 4.4).

(9a) Spanish pre-stress /s/ → ZZ /s/ (Stage 2)

docena /doˈsena/ ‘dozen’	>	/tesèn/
aceite /aˈsejte/ ‘oil’	>	/asèd/
azucar /aˈsukaɾ/ ‘sugar’	>	/asùg/
oración /oɾaˈsjon/ ‘prayer’	>	/sjùŋ/

(9b) Spanish post-stress /s/ → ZZ /z/ (Stage 2)

taza /ˈtasa/ ‘cup’	>	/tàz/
mazo /ˈmaso/ ‘mallet’	>	/mèz/
mozo /ˈmoso/ ‘servant’	>	/mùz/
Ignacio /igˈnasjo/ (name)	>	/náz/
cruz /ˈkɾus/ ‘cross’	>	/kɾùz/
arroz /aˈros/ ‘rice’	>	/aɾùz/
durazno /duˈrasno/ ‘peach’	>	/tilàz/
garbanzo /gaɾˈbanso/ ‘chickpea’	>	/gaɾbàz/

In later loans, Spanish /s/, which continues earlier /s/ and /s̩/, is uniformly adapted as fortis, which reflects its voicing in Spanish.

(10) Spanish /s/ → ZZ /s/ (Stage 3)

azul /aˈsul/ ‘blue’	>	/asúl/
onza /ˈonsa/ ‘ounce’	>	/óŋs/

In sum, just as in the other coronal obstruents, the nativization pattern of Spanish /s/ reflects its prosodic position in Stage 2 loans and its voicing in Stage 3 loans.

4.1.6 Spanish /p/ and /b/

The adaptation pattern described earlier for /t/ and /d/ also obtains in the labial stops, with a modification. Given that ZZ lacks word-initial /p/s in non-onomatopoeic native words, in the earlier stratum Spanish labial stops are reflected in all positions as /b/ (see 11).

(11) Spanish /p/ and /b/ → ZZ /b/ (Stage 2)

paño /ˈpaɲo/ ‘cloth’	>	/bàj/
peso /ˈpeʂo/ (type of coin)	>	/bèʒ/
pinto /ˈpinto/ ‘motley’	>	/bín/
Pedro /ˈpedɾo/ (name)	>	/béd/
Pascual /paʂˈkwal/ (name)	>	/báʃ/
Felipe /feˈlipe/ (name)	>	/líb/
vaca /ˈbaka/ ‘cow’	>	/bàg/
banco /ˈbanko/ ‘bench’	>	/bãw/
vigilia /biˈʃilja/ ‘vigil’	>	/biʃìʎ/
barzón /barˈson/ (part of plough)	>	/bàz/
arroba /aˈroba/ ‘arroba’	>	/arùb/

In the more recent layer, the adaptation of Spanish /p/ and /b/ is guided by their voicing in Spanish. This adaptation pattern has caused redistribution of /p/ in ZZ, forcing it to appear in word-initial position in non-onomatopoeic words.

(12a) Spanish /p/ → ZZ /p/ (Stage 3)

pavo /ˈpabo/ ‘peacock’	>	/páb/
grupo /ˈgrupo/ ‘group’	>	/gɾúp/

(12b) Spanish /b/ → ZZ /b/ (Stage 3)

banco /ˈbanko/ ‘bank’	>	/bánk/
globo /ˈglobo/ ‘balloon’	>	/glób/

To summarize, in the Stage 2 loanword stratum Spanish /p/ and /b/ are adapted in ZZ as lenis /b/ in all positions. In the Stage 3 stratum, their adaptation in ZZ is determined by their voicing in Spanish. This pattern is different from the one described earlier for /t/ and /d/ because word-initial /p/ is not allowed in native ZZ words; this distributional gap forced the Spanish labial stops to be uniformly adapted as lenis in Stage 2 loans.

4.1.7 Spanish /k/ and /g/

Stage 2 adaptation of Spanish /k/ and /g/ differs from the one described earlier for coronal stops in that it was guided not only by their location relative to the stressed vowel but also by their voicing. (13a) and (13b) show the treatment, respectively, of the voiceless and voiced velar stops before the stressed vowel. With very few exceptions, Spanish pre-

stress /k/ is rendered with fortis /k/ and Spanish pre-stress /g/, with lenis /g/. The early date of introduction of these loans is assured by ZZ reflexes of the diagnostic sounds in the Spanish words, such as /ʂ/ and /ʃ/, by the tone assignment and/or language-internal developments in ZZ (Operstein 2005).

(13a) Spanish pre-stress /k/ → ZZ /k/ (Stage 2)

coco /ˈkoko/ 'coconut palm'	>	/kùg/
queso /ˈkeʂo/ 'cheese'	>	/kèʒ/
cruz /krus/ 'cross'	>	/krùz/
canoa /kaˈnoa/ 'feeding trough'	>	/kanù/
clavija /klaˈbiʃa/ 'peg'	>	/karbìʒ/

(13b) Spanish pre-stress /g/ → ZZ /g/ (Stage 2)

garbanzo /garˈbanso/ 'chickpea'	>	/garbàz/
gigante /ʃiˈgante/ 'giant'	>	/ʃigàn/
garrocha /gaˈrotʃa/ 'goad'	>	/garúzʐ/

In the post-stress position, Spanish /k/ was initially adapted as /g/ (shown in 14a), whereas /g/ was dropped (shown in 14b).

(14a) Spanish post-stress /k/ → ZZ /g/ (Stage 2)

coco /ˈkoko/ 'coconut palm'	>	/kùg/
vaca /ˈbaka/ 'cow'	>	/bàg/
huaco /ˈwako/ (bird species)	>	/k^{w}ég/
azúcar /aˈsukar/ 'sugar'	>	/asùg/

(14b) Spanish post-stress /g/ → ZZ ø (Stage 2)

hanega /aˈnega/ (dry measure)	>	/aɲé/
yegua /jeˈgwa/ 'mare'	>	/jèw/
banco /ˈbanko/ 'bench'	>	/bãw/
amigo /aˈmigo/ 'friend'	>	/mìw/

(14b) shows that medial /k/ was also dropped in the word *banco* 'bench'. This may be due to post-nasal neutralization of contrast between fortis and lenis stops, attested both in older and in more recent loans (see 15).

(15) Post-nasal stop neutralization

ventana /benˈtana/ ‘window’	>	/mendàn/
contra /ˈkontɾa/ ‘against’	>	/kòndɾ/
culantro /kuˈlantɾo/ ‘cilantro’	>	/kuʃàndɾ/
champú /tʃamˈpu/ ‘shampoo’	>	/tʃambú/

At Stage 3, the borrowing of /k/ and /g/ is independent of stress and guided solely by their voicing in Spanish (shown in 16).

(16a) Spanish initial /k/ → ZZ /k/ (Stage 3)

café /kaˈfe/ ‘coffee’	>	/kafé/
camiseta /kamiˈseta/ ‘T-shirt’	>	/kamisēt/

(16) Spanish /g/ → ZZ /g/ (Stage 3)

gaseosa /gaseˈosa/ ‘fizzy drink’	>	/gasjós/
orégano /oˈɾegano/ ‘oregano’	>	/oɾég/

Medial /k/ shows two reflexes in Stage 3 loans: in the earlier loans, it shows up as /h/ (see 17a) and in the later loans, as /k/ (see 17b). The earlier reflex is due to a language-internal sound change in ZZ (Operstein 2005).

(16a) Spanish medial /k/ → */k/ → ZZ /h/ (Stage 3: earlier loans)

Lucas /ˈlukas/ (name)	>	/ʃúh/
loco /ˈloko/ ‘crazy’	>	/lóh/

(17b) Spanish medial /k/ → ZZ /k/ (Stage 3: later loans)

taco /ˈtako/ ‘taco’	>	/ták/
coca /ˈkoka/ ‘coke’	>	/kók/

In summary, the adaptation of Spanish /k/ and /g/ in Stage 2 loans depends both on their voicing and their location relative to word stress in the source word. Their treatment is similar to that of the coronal stops in that each velar stop is rendered with a stronger segment before than after stress. In Stage 3 borrowings, the adaptation of velar stops depends only on their voicing; some of the words with medial /k/ were adopted early enough to participate in the language-internal change of medial /k/ to /h/ in ZZ.

4.1.8 Discussion

The patterns of obstruent adaptation presented in 4.1 through 4.7 clearly show that the loanwords are divided into two layers, which, following Lockhart (1992), are labeled here Stage 2 and Stage 3. In the earlier layer, Spanish voicing is ignored and the obstruents are adapted as fortis before the stressed vowel and as lenis after the stressed vowel. In the later pattern, the borrowing is guided by the voicing of the obstruents in Spanish. The Stage 3 pattern apparently reflects greater familiarity of ZZ speakers with Spanish phonology as well as an increased role of voicing in the fortis/lenis contrast. The Stage 2 pattern, on the other hand, requires a brief discussion in order to understand why the voicing feature was ignored and why the obstruent adaptation was guided by these consonants' location relative to the stressed vowel.

The fact that Spanish voicing was ignored in Stage 2 loans may follow from the general principle, summarized by Kang (2011), that in loanword adaptation features that are contrastive in the native phonology tend to be preserved in the loanwords in preference to features that are redundant in the native phonology. It is likely that during the early phase of the contact obstruent voicing was either entirely absent from, or was merely an enhancing feature of, the fortis/lenis contrast in ZZ. This conclusion is independently suggested by the Zapotec orthography employed by Córdova (1578b), who generally uses letters representing voiceless obstruents in Spanish for both the fortis and the lenis obstruents in Zapotec (Smith Stark 2003: 211ff). On the basis of a detailed study of Córdova's orthography, Smith Stark (2003: 218) concludes as follows:

> From Córdova's less-than-systematic representation of the fortis/lenis opposition in the obstruents it may be concluded that voicing was not a very frequent feature of the lenis sounds. It appears to have been more prominent in the case of /z/, less so in the case of /b/, /g/ and /ž/, and absent in the case of /d/ and /ǰ/. Apparently, in the subsequent centuries voicing has become more relevant in many varieties of Zapotec, perhaps through the influence of Spanish. (Translation mine.)

It would seem that the different status of the voicing feature in the donor and recipient languages may have been responsible for the pattern observed in the loans.

The specific issue of why Spanish obstruents were adapted in ZZ as fortis before stress and as lenis after stress may be addressed by returning briefly to the phonetic cues of the fortis/lenis contrast. Apart from subphonemic voicing in the lenis series, other reported features of the fortis/lenis contrast include consonant length (fortis consonants are longer) and degree of closure (fortis consonants do not vary in their closure type whereas lenis consonants do) (Jaeger 1983; Avelino 2001; Leander 2008; Arellanes 2009; Teodocio 2009; Chávez Peón 2010). Both characteristics appear relevant to the adaptation pattern observed in the loans. Some phonetic studies indicate that Zapotec fortis consonants are longer than their lenis counterparts in all positions (Jaeger 1983; Avelino 2001; Leander 2008). Given this finding, and the fact that the fortis/lenis distinction is reconstructible as a geminate/simplex one, it is likely that during Stage 2 the leading feature of the fortis/lenis contrast was duration. On this assumption, it is likely

that in their adaptation of Spanish obstruents ZZ speakers relied on the obstruents' subphonemic durational differences in pre-stress and post-stress positions. Lavoie (2001: 159) reports that consonant duration in Spanish is strongly affected by stress, with pre-stress segments being longer than post-stress ones. This redundant phonetic difference in Spanish would have been perceived as a categorial one in ZZ. A useful parallel that may be cited here is adaptation of English /s/ in Korean, in which the phonetic length of the sibilant in English determines whether it is adapted as fortis or as lenis in Korean. As reported by Kim (1999) and Kim and Curtis (2002), the longer phonetic duration of a single English /s/ (in *solo*, *bus*) causes it to be borrowed in Korean as fortis, whereas the shorter duration of /s/ in consonant clusters (in *smog*, *disk*) causes it to be borrowed as lenis. One of the distinguishing cues of fortis and lenis /s/s in Korean is duration (Kim and Curtis 2002).

A possible contributing factor in the observed borrowing pattern would have been the degree of closure in Spanish voiced stops /b, d, g/. These are realized as stops word-initially after a pause and word-medially after a nasal (in the case of /d/, also after /l/); in all other positions, they are realized as fricatives [β, ð, ɣ] (Quilis 1993: 200). Since fricativization can be an important cue of the lenis series in Zapotec, the fricative realization of non-initial Spanish /b, d, g/ could have increased the likelihood of their being adapted in ZZ as lenis. Spanish voiceless stops /p, t, k/ also can have a range of lenited realizations when in coda, including as voiced stops, fricatives or glides (Quilis 1993: 205f, 218f). This may have contributed to their being perceived as lenis word-medially.[10] Yet another contributing factor could have been the inter-dependence between vowel and consonant duration reported for some varieties of Zapotec, for example, Güilá Zapotec, where vowels are longer before lenis consonants than before fortis ones (Arellanes 2009: 182). It is possible that the increased duration of the stressed vowel in Spanish would have contributed to the post-stress consonant's being perceived as lenis.

Additional supporting evidence may be gleaned from cross-linguistic typological data. Kang (2011) assembles data from several languages in which one and the same phoneme in the source language is adapted differently in different positions in the recipient language. Some of Kang's examples reference position-dependent adaptation patterns of obstruents between languages with different systems of laryngeal contrasts. Ito and Kenstowicz (2009) show that in Yanbian Korean, Mandarin unaspirated voiceless stops and affricates are adapted as fortis (tense) stops and affricates word-initially and as lenis (lax) stops and affricates word-medially. Word-medially, their adaptation is guided by their voicing and closure duration in the source language, while word-initially it is guided by the voice quality of the following vowel. Both studies are relevant here because they show how the phonetic realization of the contrast in the source language can determine its adaptation in the recipient language. As a final example, Kang (2008) shows that in 1930s Korean, English /b, d, g, dʒ/ were adapted as tense word-initially and as lax word-medially, while at present they are usually realized as lax in all positions.

[10] I thank an anonymous IJAL reviewer for drawing my attention to the lenited realization of Spanish voiceless stops.

Kang links this pattern to the low VOT in English voiced stops, which is close to that of tense stops in Korean; word-medially additional phonetic cues, such as segment length, make Korean lax stops a better match. This borrowing pattern, she argues, has changed in the wake of a change to the structure of the laryngeal contrast in Korean over the last few decades, whereby the focus has shifted from VOT, the leading feature of the contrast in the 1930s, to that of the quality and F_0 of the following vowel. An additional reason for the change is normative orthographic conventions, which dictate the avoidance of tense consonant symbols in the transcription of foreign stops.

The studies and evidence surveyed above suggest that the nature of the contrast between the fortis and lenis series is likely to have changed in ZZ since the time of its initial contact with Spanish. In the coronal nasal and lateral this contrast has now dissolved itself into a place of articulation contrast – /n/ versus /ɲ/ and /l/ versus /ʎ/ – while in the obstruents it now significantly incorporates voicing. Córdova's (1578b) orthography and the treatment of Spanish loans in ZZ also suggest that the nature of the fortis/lenis contrast must have been changing at different rates for different consonants. In the passage quoted above, Smith Stark (2003) observes that Córdova differentiated voicing in the pair /z/-/s/ more consistently than in the pairs /b/-/p/, /g/-/k/ or /ʒ/-/ʃ/, and that voicing was not notated at all in the pairs /d/-/t/ and /tʃ/-/dʒ/. Taken at face value, this orthographic practice suggests that the voicing contrast had already begun to enhance the fortis/lenis opposition in /z/-/s/ but had not yet reached the /d/-/t/ and /tʃ/-/dʒ/ pairs. For ZZ, this might help explain why voicing plays no role in the borrowing of Spanish /d/ and /t/ in Stage 2 loans, while it does play a role in the borrowing of /k/ and /g/. It is probable that at the time the borrowing took place, the latter pair had already incorporated voicing as an enhancing feature of the contrast while the former pair still continued to rely on duration, and possibly other cues.

The patterns of obstruent borrowing presenved above clearly show the effects of community bilingualism, and possibly also literacy in Spanish, on the borrowing of foreign language phonology. In contrast to the Stage 2 pattern, the Stage 3 loanword stratum renders Spanish voiced obstruents as lenis and voiceless obstruents as fortis, displaying both greater familiarity with the voicing contrast in Spanish and a greater role of voicing in the fortis/lenis contrast in ZZ, which in itself is likely to be the result of Zapotec-Spanish bilingualism (cf. Smith Stark 2003: 218).[11]

4.2 Adaptation of Spanish stressed /o/

Another area that shows a clear division into two periods is the adaptation of Spanish stressed /o/. As discussed in section 2.2, the /o/ vowel quality is rare in native ZZ words, many of the /o/s deriving from the reconstructed Proto-Zapotec sequence *awo. For this

[11] The obstruent adaptation pattern identified here for ZZ does not necessarily exist in other Zapotec languages. For example, such Isthmus Zapotec loans, cited in Pickett (1992), as /guzina/ for *cocina* 'kitchen', /ʒiga/ for *jícara* 'bowl', /ʒandje/ for *sandía* 'watermelon' and /beʒu/ for *peso* (coin), suggest that Isthmus Zapotec uniformly adapted Spanish obstruents as lenis even in early loans.

reason, Spanish stressed /o/ was initially nativized in ZZ as the more frequently occurring /u/ (see 18).

(18) Spanish stressed /o/ → ZZ /u/ (Stage 2)

mozo /ˈmoso/ ‘servant’	>	/mùz/
coco /ˈkoko/ ‘coconut palm’	>	/kùg/
dios /ˈdjoʂ/ ‘God’	>	/dʒúʒ/
lomo /ˈlomo/ ‘back of animal’	>	/ʌ̄ūm/
oración /oɾaˈsjon/ ‘prayer’	>	/sjùɲ/
arroba /aˈroba/ ‘11.5 kg’	>	/aɾùb/
arroz /aˈros/ ‘rice’	>	/aɾùz/
Simón /siˈmon/ (name)	>	/mũ̄/
Salomón /saloˈmon/ (name)	>	/mũ̄/
Ambrosio /amˈbrosjo/ (name)	>	/bɾúz/
monja /ˈmonxa/ ‘nun’	>	/mũ̄h/
trompo/ˈtɾompo/ ‘top (toy)’	>	/tɾùm/
plomo /ˈplomo/ ‘lead’	>	/pʌ̄ùm/
corona /koˈɾona/ ‘wreath’	>	/kɾùn/
garrocha /gaˈrotʃa/ ‘goad’	>	/gaɾūz̨/
botón /boˈton/ ‘button’	>	/muntùɲ/
canoa /kaˈnoa/ ‘feeding trough’	>	/kanù/

In words that were borrowed more recently, the stressed /o/ is preserved (see 19). The adaptation of Spanish stressed /o/ as /o/ in Stage 3 loans is indicative of a greater degree of familiarity with the Spanish phonology and is perhaps also influenced by literacy in Spanish.

(19) Spanish stressed /o/ → ZZ /o/ (Stage 3)

loco /ˈloko/ ‘crazy’	>	/lój/
oro /ˈoɾo/ ‘gold’	>	/òr/
palom /paˈlom/ ‘dove’	>	/palóm/
color /koˈloɾ/ ‘color’	>	/kolór/
onza /ˈonsa/ ‘ounce’	>	/óɲs/

4.3 Adaptation of Spanish pretonic vowels

In present-day ZZ, stress uniformly falls on the penultimate syllable of the citation form. This stress assignment pattern continues the one reconstructed by Kaufman (1994-2007)

for Proto-Zapotec, and it has had consequences for the treatment of pretonic material in Spanish loanwords. ZZ shows a consistent preference for eliminating such material, and the degree of its erosion may serve as an indicator of the word's relative chronology of entry into ZZ. This section will focus on the evolving pattern of treatment of pretonic vowels.

In Stage 2 loans, pretonic vowels are lost. The consonants of the pretonic syllables may be lost as well, as in (20a), or they may be partially or completely preserved, as in (20b).

(20a) Loss of consonants in pretonic syllables (Stage 2)

camisa /kaˈmiʂa/ 'shirt'	>	/mìʒ/
comadre /koˈmadɾe/ 'godmother'	>	/màʎ/
oración /oɾaˈsjon/ 'prayer'	>	/sjùŋ/
Ignacio /igˈnasjo/ (name)	>	/náz/
Francisca /fɾanˈsiska/ (name)	>	/síh/
Francisco /fɾanˈsisko/ (name)	>	/síhʷ/

(20b) Preservation of consonants in pretonic syllables (Stage 2)

barato /baˈɾato/ 'cheap'	>	/bɾàd/
corona /koˈrona/ 'wreath'	>	/kɾùn/
escaño /esˈkaŋo/ 'bench with a back'	>	/ʃkàj/
morado /moˈɾado/ 'purple'	>	/mɾàd/
morillo /moˈɾiʎo/ 'beam'	>	/mɾìʎ/
machete /maˈtʃete/ 'machete'	>	/mɾítʃ/
compadre /komˈpadɾe/ 'godfather'	>	/mbáʎ/

In some cases, loss of pretonic vowels has left behind consonant clusters. As seen from the examples in (20b), word-initial syllable onsets tolerated by ZZ are the following: bɾ-, bj-, kɾ-, sj-, ʃk-, mɾ-, mb-. Of these, only nasal-obstruent clusters are also allowed in native words. In three known cases, loss of the pretonic vowel would have left behind an illicit onset; as shown in (21), these structures were repaired through vowel prothesis, which brought these forms into conformity with other borrowings, such as /aɾkàʎ/ (< *alcalde*), /aɾbaŋìʎ/ (< *albañil*) and /almàd/ (< *almohada*), that begin with similar sequences.

(21) Prothetic /a/

remedio /reˈmedjo/ 'cure'	>	/aɾmèɾ/

rosario /roˈsaɾjo/ ‘rosary’	>	/aɾsàɾ/
limeta /liˈmeta/ ‘bottle’	>	/almét/

In Stage 3 loans, pretonic vowels and syllables are preserved (shown in 22).

(22) Preservation of pretonic vowels (Stage 3)

ganancia /gaˈnansja/ ‘gain’	>	/ganáɲs/
centavo /senˈtabo/ ‘cent’	>	/sentáb/
sobrino /soˈbɾin/ ‘nephew’	>	/sobɾín/
pulmón /pulˈmon/ ‘lung’	>	/pulmṍ/

Between these two extremes – complete loss of pretonic vowels at Stage 2 and their complete preservation at Stage 3 – we find a number of cases when the pretonic vowel is preserved but weakened, most commonly to /i/ (shown in 23a). Less commonly, the outcome of vowel weakening is a /u/; this outcome is found next to a labial consonant or /ʂ/ (shown in 23b).

(23a) Weakening of pretonic vowels to /i/

navaja /naˈbaʃa/ ‘folding knife’	>	/ɲibàʒ/
tasajo /taˈʂaʃo/ ‘dried beef’	>	/tiʃèʒ/
panela /paˈnela/ ‘brown sugar loaf’	>	/piɲàl/
sandía /ʂanˈdia/ ‘watermelon’	>	/ʃindʒì/
escuela /esˈkwela/ ‘school’	>	/ʃikʷàl/
domingo /doˈmingo/ ‘Sunday’	>	/timĩw/
novillo /noˈbiʎo/ ‘young bull’	>	/ɲibìʎ/
tomín /toˈmin/ (type of coin)	>	/timìɲ/
durazno /duˈɾasno/ ‘peach’	>	/tilàz/

(23b) Weakening of pretonic vowels to /u/

chocolate /tʃokoˈlate/ ‘chocolate’	>	/ʂulàd/
chapulín /tʃapuˈlin/ ‘grasshopper’	>	/ʂuplín/
chilaquiles /tʃilaˈkiles/ (tortilla dish)	>	/ʂukíʎ/
chicharrón /tʃitʃaˈron/ ‘pork rind’	>	/tʃuʂóɲ/
servilleta /serbiˈjeta/ ‘napkin’	>	/subjed/ ~ /sibjed/

Pretonic vowel weakening is a recurrent tendency in ZZ, responsible for the continuum of variation between the complete loss of pretonic vowels in Stage 2 loans and their complete preservation in Stage 3 loans. The nature of the continuum may be further

illustrated by the weakened vowel in *tornillo* 'screw' and *docena* 'dozen' (in 24a), which is a /e/ rather than /i/, and the variant forms of several of the loans in which the original vowel alternates with a weakened one, or there is more than one degree of weakening (in 24b).

(24a) Pretonic vowel weakened to /e/

tornillo /torˈniʎo/ 'screw'	>	/teɾɲìʎ/
docena /doˈsena/ 'dozen'	>	/tesèn/

(24b) Variation in pretonic vowel weakening

machete /maˈtʃete/ 'machete'	>	/maɾítʃ/ ~ /mɾítʃ/
mayor /maˈjoɾ/ 'mayor's assistant'	>	/bijór/ ~ /bjór/
maravedí /maɾabeˈdi/ (type of coin)	>	/maɾí/ ~ /mɾí/
barato /baˈɾato/ 'cheap'	>	/baɾàd/ ~ /beɾàd/ ~ /bɾàd/

The initial sequence /esk-/ provides an additional illustration. While in the earliest loan /ʃkàj/ the pretonic vowel is dropped, in /ʃikʷàl/ it is weakened to /i/, and in /sekìn/, /serbàn/ and /eskofín/ it remains intact (shown in 24).

(25) Treatment of the sequence /esk-/

escaño /esˈkaɲo/ 'bench with a back'	>	/ʃkàj/
escuela /esˈkwela/ 'school'	>	/ʃikʷàl/
esquina /esˈkina/ 'corner'	>	/sekìn/
escribano /eskɾiˈbano/ 'clerk'	>	/serbàn/
escofina /eskoˈfina/ 'rasp'	>	/eskofín/

To summarize, the treatment of pretonic vowels shows a different pattern in Stage 2 loans (complete loss) than in Stage 3 loans (complete preservation). Between these two extremes there are a number of loans in which the pretonic vowel, though preserved, is weakened and/or varies between a full and a weakened vowel. Stage 3 loans show a greater overall tolerance toward non-native phonological structures, in this case, acceptance of longer words and pretonic vowels and syllables.

4.4 Adaptation of Spanish stress

ZZ has three phonemic tones, high, mid and low. In Stage 2 loans, outside of forenames, the stressed syllable of the Spanish word was most often assigned the low tone (illustrated in 26).

(26) Low tone assignment (Stage 2)

Castilla /kaʂˈtiʎa/ ‘Spain’	>	/ʂìʎ/
silla /ˈʃiʎa/ ‘chair; saddle’	>	/ʃìʎ/
paño /ˈpaɲo/ ‘cloth’	>	/bàj/
taza /ˈtasa/ ‘cup’	>	/tàz/
mula /ˈmula/ ‘she-mule’	>	/mùʎ/
ánima /ˈanima/ ‘spirit’	>	/àɲm/
oración /oɾaˈsjon/ ‘prayer’	>	/sjùɲ/
escaño /esˈkaɲo/ ‘bench with a back’	>	/ʃkàj/
trigo /ˈtɾigo/ ‘wheat’	>	/tɾìw/
barato /baˈɾato/ ‘cheap’	>	/bɾàd/
morado /moˈɾado/ ‘purple’	>	/mɾàd/
morillo /moˈɾiʎo/ ‘wooden beam’	>	/mrìʎ/
tijera /tiˈʃeɾa/ ‘scissors’	>	/tiʃèɾ/
tasajo /taˈʂaʃo/ ‘dried beef’	>	/tiʃèʒ/
tomín /toˈmin/ (type of coin)	>	/timìɲ/
testigo /tesˈtigo/ ‘witness’	>	/teʂtìw/
durazno /duˈɾasno/ ‘peach’	>	/tilàz/
docena /doˈsena/ ‘dozen’	>	/tesèn/
chocolate /tʃokoˈlate/ ‘chocolate’	>	/ʂulàd/
aceite /aˈsejte/ ‘oil’	>	/asèd/
canoa /kaˈnoa/ ‘feeding trough’	>	/kanù/
botón /boˈton/ ‘button’	>	/muntùɲ/
clavija /klaˈbiʃa/ ‘peg’	>	/kaɾbìʒ/
alcalde /alˈkalde/ ‘mayor’	>	/aɾkàʎ/
albañil /albaˈnil/ ‘mason’	>	/aɾbaɲìʎ/

In Stage 3 loans, the stressed syllable is most often assigned the high tone, although mid tone assignment is also found (shown in 27).

(27) High and mid tone assignment (Stage 3)

azul /aˈsul/ ‘blue’	>	/asúl/
banco /ˈbanko/ ‘bank’	>	/bánk/
brújula /ˈbɾuxula/ ‘compass’	>	/bɾúh/
cubeta /kuˈbeta/ ‘bucket’	>	/kubét/
enero /eˈneɾo/ ‘January’	>	/enéɾ/

foco /ˈfoko/ ‘light bulb’	>	/hók/
gasolina /gasoˈlina/ ‘gas’	>	/gasolín/
ganancia /gaˈnansja/ ‘gain’	>	/ganáɲs/
grapa /ˈgɾapa/ ‘staple’	>	/gɾ̄ap/
gris /ˈgɾis/ ‘gray’	>	/gɾ̄is/
hule /ˈule/ ‘rubber’	>	/úl/
libro /ˈlibɾo/ ‘book’	>	/líbɾ/
lima /ˈlima/ ‘file’	>	/lím/
tele /ˈtele/ ‘TV’	>	/tél/

The literature on borrowing from stress to tone languages suggests that the Stage 3 adaptation pattern has a perceptual basis. This inference is based on the fact that both stress and high tone use higher F_0 as an important cue, and that in similar contact situations elsewhere the higher pitch associated with stress in non-tonal donor languages has been held responsible for its adaptation as high tone in tonal recipient languages. For example, higher F_0 has been described as an important correlate of stress in English (Hyman 1977; Beckman 1986; Zhang et al. 2008; Gordon 2011), and the adaptation of English stresses as high tones in such languages as Yoruba, Shona, Hausa, Twi and Cantonese has been explained by reference to this characteristic of the English stress (Kenstowicz 2006; Hao 2009; Kang 2010; Davis, Tsujimura and Tu 2012). Studies on the phonetics of tone in Zapotec and of stress in Spanish both suggest that a similar donor/recipient language pairing obtains here as well. On the one hand, phonetic research reveals that Spanish stress is signaled via fundamental frequency, intensity and duration (D’Introno, del Teso and Weston 1995: 126ff; Hualde 2012: 164f), and on the other, Spanish stress is reported to be adapted in different Zapotec languages by means of a variant of high tone (Teodocio 2009; Arellanes et al. 2013). In light of these parallels, the adaptation pattern in (27) is probably based on perception and may reflect greater familiarity with Spanish at the community level. The Stage 2 adaptation pattern is different and does not appear to be based on perception. Given that the low tone has the lowest type frequency in native ZZ morphemes, assigning this marked tone to loanwords appears to have been used in the early period as a strategy for marking the loanwords phonologically as unusual.[12]

To summarize, it seems likely that the Stage 2 pattern of assigning the low tone to Spanish stressed syllables was not based on perception while the Stage 3 pattern of assigning the stressed syllables the high tone appears to be perceptually based. It is likely that the change from a non-perceptual to a perceptual basis of tone assignment is tied to the increased level of the community’s bilingualism and knowledge of Spanish.

[12] See Operstein (2015) for a more detailed discussion of this borrowing strategy.

5. Conclusion

The patterns of loanword adaptation that emerge from sections 4 of this study may be summarized as shown in Table 5.

TABLE 5
ADAPTATION OF SPANISH PHONOLOGICAL STRUCTURES IN ZANIZA ZAPOTEC

Phenomenon	Stage 2 Loans	Stage 3 Loans
Adaptation of Spanish obstruents	Spanish voicing is ignored in the process	Spanish voicing guides the process
Adaptation of Spanish stressed /o/	Adapted as /u/	Adapted as /o/
Adaptation of Spanish pretonic vowels	Pretonic vowels are lost	Pretonic vowels are kept
Adaptation of Spanish stress	Adapted by means of low tone	Adapted by means of high or mid tone

The differences between the adaptation patterns in columns 2 and 3 provide clear evidence for different loanword adaptation strategies. In Stage 2 loans, Spanish obstruent voicing, which was redundant or non-existent in ZZ, is ignored in the adaptation process; Spanish stressed /o/, which is rare in native words, is adapted by means of the much more frequent /u/; Spanish pretonic vowels are lost; and Spanish stress is mapped to a marked tone. By contrast, in Stage 3 loans the Spanish phonological structures are faithfully reproduced in the receiving language. The differences between the Stage 2 and Stage 3 patterns show the influence of the Zapotec-speaking community's bilingualism on loanword adaptation and provide empirical support from a genetically unrelated language for the basic correctness of Lockhart's division of the contact process between Mesoamerican indigenous languages and Spanish into clearly defined stages.

Given the total bilingualism of the present-day ZZ-speaking community, and the high prestige of Spanish, many of the older borrowings are now being re-borrowed into ZZ, or at least partially remodelled to become closer to their Spanish originals.[13] As a result, some loanwords may have more than one realization, ranging on a continuum from more Zapotec-like to more Spanish-like. Such "remodelling" may involve sound addition or substitution, and perhaps also tonal changes. For example, /mansàn/ is closer to Spanish *manzana* 'apple' than /maɲsàn/ because the former realization does not reflect pre-/s/ palatalization of /n/. The personal names Flojencio/Flojencia have at least three variants, /hẽs/, /heɲs/ and /hens/. Restoration of the pretonic vowel is evident in /amìw/, a "refurbished" variant of /mìw/ (< *amigo* 'friend'); and in /nabàʒ/, a more Spanish-like variant of *navaja* 'folding knife' than /ɲibàʒ/. Although such refurbishing of loanwords

[13] Smith Stark (2007: 20) makes a similar observation.

may make their historical analysis more difficult, it does not obscure the overall picture of loanword stratification that emerges from the discussion in this paper.

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