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PARADIGMATIC RESTRUCTURING AND THE DIACHRONY OF STEM ALTERNATIONS IN CHICHIMEC

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Stem alternations contribute a unique type of morphological complexity to inflectional systems (Baerman et al. 2015), but despite the fact that they can show remarkable stability over time (Maiden 2018), the manner in which they are maintained and the types of changes they undergo are still poorly understood, in particular when it comes to understudied languages for which diachronic data are usually nonexistent. The verbal inflection of Chichimec (Oto-Pamean, Mexico) is characterized by intricate distributions of stem alternations, and it affords us a unique opportunity to study them from a diachronic perspective, because, unlike most other minority languages, we have a precise and detailed description of its verbal inflection system from almost a century ago (de Angulo 1933) from which we are able to reconstruct the paradigms of 170 verbs. In this article, we compare the verbal system as it was registered by de Angulo in 1930 to our own primary data recorded during two recent field trips. We show evidence that certain elements of the intricate patterns of stem alternations have been reanalyzed and redistributed by the speakers. We argue that the changes make sense only from a morphological perspective in which stem alternations are seen as involving fixed configurations of cells, or 'morphomes' (Aronoff 1994). We also show that speakers have not manipulated these configurations in isolation but in clusters, resulting in a substantial restructuring of verbal inflection at the paradigmatic level. We conclude that the changes have not resulted in a simpler system, but rather one that, while almost the same in terms of morphological complexity, has become more consistent.*

Keywords: stem alternations, stem allomorphy, morphomes, paradigms, inflection, diachrony, Chichimec

1. Introduction. Verbal inflection in Chichimec, an Oto-Pamean language of Mexico, is characterized by intriguing patterns of stem alternations, which have no apparent morphosyntactic function.[1] This is illustrated by the partial paradigm of the verb *epín* 'narrate' in Table 1,[2] which shows just one of several different patterns of stem alternations we observe. The verb forms presented here are fully inflected forms, composed of an inflectional prefix (a cumulative exponent of TAM, polarity, and person and number of the subject) followed by a stem. The verb *epín* 'narrate' has no fewer than five distinct stems, distributed across the paradigm in different ways: the stem *-pʔín* is required in all 3pl forms, and the stem *-mbín* appears only in a single cell of the paradigm

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[1] Stem allomorphy is by no means unique to Chichimec in the Oto-Pamean family, as it is also found in other subgroups like the Otomi languages (Hernández-Green 2019). It is also pervasive across the diverse branches of Oto-Manguean (the stock to which the Oto-Pamean languages belong), including Amuzgan (Kim 2019, Palancar & Feist 2015), Chinantecan (Baerman 2014, Merrifield & Anderson 2007), Popolocan (Jamieson 1982), and Zapotecan (Beam de Azcona 2019, López Nicolás 2019). For a general overview of inflectional complexity in the Oto-Manguean languages, see Baerman et al. 2019.

[2] For the citation form of a verb in Chichimec, we use the 3sg.prs form. Other than when we refer exclusively to a verb's forms from 1930, the citation form we give is the 2019 form.

(1SG.REC), while the remaining three stems (*-pín*, *-ngwín*, and *-βín*) are associated with disjunct groupings of cells.[3]

	1SG	2SG	3SG	3PL
PRS	e-pín	ki-pín	e-pín	e-pʔín
SEQ	ra-pín	i-ngwín	ra-βín	ra-pʔín
FUT	a-pín	ki-ngwín	a-βín	a-pʔín
ANT	tu-pín	ki-ngwín	u-βín	u-pʔín
REC	ku-mbín	ki-ngwín	ku-βín	ku-pʔín
IMM	u-ngwín	i-ngwín	su-ngwín	su-pʔín
POT	nu-ngwín	mi-ngwín	mu-ngwín	mi-pʔín
NEG	su-ngwín	si-ngwín	su-ngwín	su-pʔín

TABLE 1. Partial paradigm of *epín* 'narrate' (in 2019).

It is worth noting here that, given the high degree of syncretism observed in the inflectional prefixes (in Table 1, *su-* is used in five cells; *ki-* in four cells; *ku-*, *ra-*, *u-*, *e-*, and *a-* in three cells each; and *mi-* and *i-* in two cells each), stem alternations may sometimes serve to differentiate between forms (e.g. in the SEQ, FUT, and REC, the prefixes *ra-*, *a-*, and *ku-*, respectively, occur in three persons but each with a distinct stem), but this is often not the case, and the degree to which this happens varies considerably from one verb to the next. When stems do help to differentiate between forms, we consider it a convenient byproduct of the stem alternations.

The phenomenon we are facing here, therefore, neither serves a morphosyntactic function nor follows from phonological rules (since different stems can occur with the same prefix). Instead, the stem alternations appear to operate at a morphological level only, since they concern only the form and not the function of a verb. As such, they contribute a layer of inflectional complexity that speakers must deal with when learning the language and that is uniquely morphological (Baerman et al. 2015).

In inflectional systems like the one we observe in Chichimec, one might wonder whether the different stems of a verb, and their distributions across the cells of a verb's paradigm, are mere residues of historical phonological changes. If we were to take this perspective, verbal inflection in Chichimec would be described as consisting of aleatory combinations of cells, verb after verb. Under this perspective, subsequent diachronic changes would cause the picture to become even more blurred, as myriad idiosyncratic rules would need to be posited for the variety of changes undergone by each verb.

By adopting a morphological perspective, however, we can conceive of the distributions of stem alternants as morphological patterns in their own right, representing splits in the paradigm (Corbett 2015). For the inflectional system of Chichimec, and others like it, we claim that this is the only way to make sense of these data. We take the cells occupied by distinct stems as forming fixed configurations, which speakers can manipulate. Our approach is consistent with existing literature on the concept of the 'morphome', in the sense of Aronoff 1994 and Maiden 2005 (also referred to as 'metamorphomes' by Round 2015 and Esher 2016), where systematic patterns of stem alternations in inflectional paradigms—which we can conceptualize as 'stem zones' (i.e. abstract subsets of cells) of a paradigm occupied by nondefault stems[4]—cannot be explained by appealing

[3] Abbreviations: ANT: anterior past, DU: dual, EXCL: exclusive, FUT: future, IMM: immediate past, INCL: inclusive, NEG: negative, PL: plural, POT: potential, PRS: present, REC: recent past, SEQ: sequential, SG: singular, 1: first person, 2: second person, 3: third person.

[4] Our term 'stem zones' corresponds to Bonami and Boyé's (2002) notion of 'stem slots'.

to any other level of grammar, such as syntax, semantics, or phonology, but instead have to be accepted as purely morphological in nature.

Literature on the morphome has, for the most part, focused on the Romance languages, where such patterns have been well documented (e.g. see Maiden 1992 and an updated overview of the phenomena studied so far in Maiden 2018). Although there is plenty of evidence pointing to the existence of morphomes in other language families too, the evidence is skewed toward Romance because of the availability of diachronic data. Diachronic data are important because they can reveal the 'psychological reality' of such configurations in their role in morphological change, as Maiden (2018:1) explains: 'if diachronic morphological innovations replicated those patterns, then we had clear evidence that they were being detected by speakers rather than constituting a mere historical residue, which perhaps went unnoticed by them'.

There are very few studies on similar morphological structures in language families outside of Romance. Notable exceptions in this regard are the works by Kaye (2013) on Northern Talyshi, Round (2015) on Kayardild, and Herce (2020) on Kiranti, but unsurprisingly none of these investigate how morphomes, once present in a language, may change or be sustained over time. In the case of Chichimec, however, we are in a unique position of being able to investigate the diachrony of morphomes in a non-Romance language, since we have a description of the inflectional system as it existed almost a century ago, in de Angulo 1933. De Angulo's description of the language is so detailed and precise that one is able to confidently reconstruct paradigms of all the verbs he presents in his article. To allow us to conduct a diachronic study, we recorded comparative data during two separate field trips to the Chichimec community, in 2018 and 2019. Such rich data, from two points in time separated by ninety years, present us with an unprecedented opportunity to explore the development of inflectional patterns in a morphologically complex system, by comparing the contemporary form of the language to the form recorded by de Angulo.

In our diachronic study, we find that the inflectional system of Chichimec in 1930 was even more intricate than that which we encounter today. We show that the system has undergone a number of changes, and we have evidence of speakers having manipulated stem-alternation patterns as though they were fixed morphological structures. The result of these changes is a system that has become more consistent, while at the same time retaining much of its original intricacy. An example of this is where certain patterns, through analogical extension, have been favored to the detriment of others; the system as a whole gains in consistency, as speakers have fewer alternative patterns to grapple with, yet at the level of the individual verb things have only been shifted around and are no less intricate.

Our findings for Chichimec have important repercussions for the field of morphology as a whole. This article not only adds to a growing body of research on the morphome by contributing evidence from a language family that has hitherto been absent from the morphome literature, but more importantly it sheds new light on the diachrony of such morphological structures, which until now has necessarily been viewed through the lens of Romance languages.

We further show that, just as a morphome comprises a fixed group of cells, paradigms in Chichimec comprise fixed groups of morphomes; in other words, the morphomes we identify cannot occur in all of their possible combinations but are instead restricted to a small number of 'morphome clusters', which we call PATTERNS. The diachronic facts support this notion: for example, some verbs appear to have acquired three morphomes simultaneously by analogy with other verbs with these morphomes, but we

find no examples of similar verbs acquiring just two of the morphomes, which would have resulted in a new pattern. If stem alternations were simply epiphenomena that pertain between a lexeme's forms, in the absence of any paradigmatic relation between them, we argue that speakers would not have acquired groups of morphomes in this manner. The evidence points to speakers having manipulated the stem-alternation patterns in fixed paradigmatic clusters, strongly suggesting that speakers' knowledge of verbal inflection has paradigmatic structure. This is an important finding in support of the tenets of word-and-paradigm approaches to morphology, which revolve around the notion of the paradigm as fundamental for understanding inflection (see Blevins 2016, Stump 2016, among many others).

The article is structured as follows. We begin with a very brief summary of previous work on Chichimec and outline our methodology (§2). Then we give an overview of Chichimec verbal inflection (§3) and a detailed description of the different stems of Chichimec verbs (§4). Next, we present three examples of changes we observe in stem-alternation patterns between 1930 and 2019 to set the scene for the following sections and to give the reader a sense of what to expect (§5). In presenting the changes that the system has undergone, we start by introducing all of the stem-alternation patterns we find in the Chichimec of 1930 (§6), before going through all of the different types of changes we encounter one by one (§7). We discuss these changes with a view to understanding the mechanisms that have given rise to them (§8), and look at the extent and the nature of the changes (§9), before considering what they can reveal to us about morphological structure (§10).

2. Studies on chichimec verbs. In this section we give a brief overview of previous work on Chichimec (§2.1) and a description of the present study (§2.2).

2.1. Previous studies. In 1933, the *International Journal of American Linguistics* published a general description of Chichimec grammar by Jaime de Angulo. De Angulo's article is based on data he collected during fieldwork in the summer of 1930, working with one speaker, Jorge Mata, whom he characterizes as 'one of the best informants [he] ever had'.[5] The highly detailed and systematic nature of de Angulo's description means it is a seminal work for the study of Chichimec verbal inflection.[6]

De Angulo's description was revisited in Palancar & Avelino 2019, where the verbs are organized into different prefix classes and stem classes. We follow Palancar and Avelino's approach here, although our analysis of the morphological patterns deviates somewhat from their proposal, as we have to accommodate the patterns we find in the present-day stage of the language.

In addition to these two studies, there are a number of other publications that touch on different aspects of Chichimec verbal inflection. Lastra de Suárez 1984 focuses on the allomorphy of the sets of inflectional prefixes and shows that, compared to de Angulo's data, very few changes have taken place in this domain. Having observed the same degree of conservatism in the inflectional prefixes in our fieldwork data, we share this view. More recent work on the distribution of the prefix classes, focusing on the transitivity value of the verbs in question, is studied in López Reynoso et al. 2018, which also makes a superficial excursion into stem alternations.

[5] As a renowned linguist of his time, who had carried out a substantial amount of linguistic fieldwork on other Native American languages prior to working on Chichimec, it is telling that he describes Jorge Mata in this way, and it engenders confidence in his data.

[6] Reconstructed paradigms of all the verbs found in de Angulo 1933 are accessible online in Feist & Palancar 2015.

The only study that deals with stem alternants in Chichimec verbal inflection is Lizárraga Navarro 2018, which studies the treatment of categories such as person and number. As stem alternants have a ubiquitous presence in verbal paradigms, Lizárraga Navarro obviously deals with them, but her approach to the phenomenon differs from ours and thus leads to an altogether different analysis of the data. She focuses on the phonological properties of stem alternants, categorizing them into different classes according to a number of morphophonological mutation rules (see §4.1). This approach results in a classification of verbs based on the possible morphophonological permutations of their stems and overlooks the actual paradigmatic distribution of the stem alternants across different paradigms. We consider that, although the form of a stem is inevitably linked to a given stem-alternation pattern, it represents the realizational layer of the stem zone of a morphome. In focusing on the morphophonology of the alternations and not on the distributional properties they have in common, the analysis proposed by Lizárraga Navarro for the synchronic system therefore lacks the comprehensive morphological angle that would be necessary for it to be used as the basis for a diachronic analysis.

Overall, while previous studies have tried to make sense of de Angulo's description, no study thus far has taken it as a point of departure for a diachronic study. In this sense, our study of Chichimec also offers an original contribution to our understanding of Chichimec verbal inflection.

2.2. THIS STUDY. For the present study, we compared the data from de Angulo's article with comparative data that we recorded over the course of two two-week field trips to Misión de Chichimecas (Guanajuato State, Mexico) in 2018 and 2019, where we worked with six native speakers. We were able to record 160 of the 170 verbs found in de Angulo 1933 (it proved impossible to elicit the remaining ones), and for each verb we recorded the forty forms necessary to reconstruct their paradigms (see §3.1 and n. 8). We recorded all 160 verbs with our two main language consultants, and fewer verbs with the rest. Table 2 provides information about the speakers and gives the number of verbs that were recorded with each.

SPEAKER	GENDER	AGE (2019)	VERBS	INFLECTED FORMS
Taurina Ramírez	F	58	160	6,400
Antonio López	M	38	160	6,400
Trinidad Mata	M	77	71	2,840
Lucía López	F	26	22	880
Regino Mata	M	~53	11	440
Delfina López	F	~57	4	160
TOTAL			*428*	*17,120*

TABLE 2. Chichimec language consultants and number of verbs recorded.

Due to the morphological nature of this study, we used traditional elicitation techniques and recorded all sessions, asking the speakers to produce the different forms of each verb in an appropriate carrier sentence in Chichimec. We also used grammaticality judgments on several occasions where we encountered some variation in the forms given (see §8.1).

In terms of how we represent both sets of data, a few points of clarification are in order. For the data from 1930, we have made the following changes to de Angulo's spelling of forms for the sake of clarity: (i) we do not represent low tone with a grave accent, instead preferring to represent only high tone (with an acute accent) while leaving low-tone syllables unmarked; (ii) de Angulo refers to 'whispered vowels', which he

writes in superscript—these are breathy vowels, which we represent in accordance with the IPA (i.e. with a dieresis below the vowel); (iii) we write nasalized vowels, transcribed by de Angulo with an ogonek, with a tilde above the vowel (following the IPA convention); (iv) de Angulo uses <c> to represent /ʃ/, which we likewise convert to IPA; (v) for the bilabial fricatives /ɸ/ and /β/ de Angulo uses <f> and <v>, respectively, but we represent these in IPA notation; (vi) we represent glottalization (including for ejectives) with the character <ʔ>, where de Angulo uses a half ring <ʾ>; (vii) we use the character <y> for the front high rounded vowel (which has almost disappeared from the language), which de Angulo writes as <ü>.

When transcribing our own primary data, we adopted orthographic conventions broadly in line with those employed by de Angulo, subject to these same alterations. In keeping with his orthography, we use <n> to represent [ŋ], since this is an allophone of /n/ when it appears before /k/ or /g/. Also, phonetically, /g/ is [ɣ] and /r/ is [ɾ] (see Herrera Zendejas 2009), but we follow de Angulo in using <g> and <r>.

As well as changes in the distribution of stems, a number of verbs have undergone minor sound changes. An example of this comes from the verb *etí* 'finish' (Table 23), which has a stem /tý/ in 1930, but which in 2019 is /tí/, due to the high front rounded vowel /y/ having been almost entirely replaced by /i/ (only Trinidad Mata, our eldest consultant, has this phoneme). Since this article is concerned only with the distribution of stem alternants, we do not highlight minor changes such as these, but the reader should nonetheless be aware that they exist.

3. Overview of chichimec verbal inflection. Chichimec (also known as Chichimeca, Chichimeco, Chichimeca-Jonaz, or Chichimeco-Jonaz, and as 'Uza by its speakers; ISO 639-3: pei; Glottolog: chic1272) is an Oto-Pamean language of Mexico, spoken by around 1,000 people in Misión de Chichimecas, a neighborhood of the town of San Luis de la Paz, in the state of Guanajuato. The received view is that Oto-Pamean is the northernmost branch of the Oto-Manguean stock. Within Oto-Pamean, the closest relative to Chichimec is the Pame family, with which it forms the Pamean subgroup. More distant relatives are the Otomian languages, comprising Matlatzinca, Tlahuica, Mazahua, and the Otomi family.

3.1. Marking of person, number, TAM, and polarity. Verbs in Chichimec inflect for eight tense, aspect, mood, and polarity (TAMP) distinctions. Verbs also inflect for person (1, 2, 3) and number (sg, du, pl) of the subject, with a clusivity distinction in the first-person dual and plural. Multiplying the eleven person-number values by eight TAMP values results in an eighty-eight-cell paradigm. This is illustrated by the full paradigm of the verb *úkhar* 'possess' in Table 3. (Recall here that for the citation form of a verb in Chichimec we use the 3sg.prs form.)

Verbal inflection in Chichimec often involves stem alternations and, to a lesser extent, tone alternations, but it always involves inflectional prefixes, which serve as cumulative exponents of TAM, polarity, and person and number of the subject. There are several different sets of inflectional prefixes, and this is the reason why some of the inflectional prefixes of *epín* 'narrate' (Table 1) differ from those of *úkhar* 'possess' (Table 3). Since the remainder of this article is concerned only with stem alternations, which are orthogonal to the inflectional prefixes,[7] a discussion of the different prefix classes

[7] Palancar and Avelino (2019) propose seven prefix classes in the Chichimec of 1930, claiming that one of them serves as an inflectional default, because it is found in half of the verbs in de Angulo's sample. The authors look at the relationship between prefix classes and stem alternations in order to explore the possibility of meaningful correlations, and they show that the default prefix class comprises verbs of all stem-alternation patterns. This is a strong indication that the two systems are orthogonal. From our 2019 data, similar conclusions can be drawn for present-day Chichimec.

	PRS	SEQ	FUT	ANT	REC	IMM	POT	NEG
1SG	túkhar	rúkhar	úkhar	túkhar	kúkhar	úkhar	núkhar	súkhar
2SG	súkhar	íkhar	kíkhar	súkhar	kíkhar	íkhar	míkhar	síkhar
3SG	úkhar	rákhar	ákhar	úkhar	kúkhar	súkhar	múkhar	súkhar
1DU.EXCL	túkharmu	rúkharmu	úkharmu	túkharmu	kúkharmu	úkharmu	núkharmu	súkharmu
1DU.INCL	túkhares	rúkhares	úkhares	túkhares	kúkhares	úkhares	núkhares	súkhares
2DU	súkhares	íkhares	kíkhares	súkhares	kíkhares	íkhares	míkhares	síkhares
3DU	úkhares	rákhares	ákhares	úkhares	kúkhares	súkhares	múkhares	súkhares
1PL.EXCL	túkharhũ	rúkharhũ	úkharhũ	túkharhũ	kúkharhũ	úkharhũ	núkharhũ	súkharhũ
1PL.INCL	túkharin	rúkharin	úkharin	túkharin	kúkharin	úkharin	núkharin	súkharin
2PL	súkharin	íkharin	kíkharin	súkharin	kíkharin	íkharin	míkharin	síkharin
3PL	ékhar	rákhar	ákhar	ékhar	ékhar	súkhar	míkhar	súkhar

TABLE 3. Full paradigm of *úkhar* 'possess'.

falls outside of the scope of this article (but the interested reader is referred to Lizárraga Navarro 2018 and López Reynoso et al. 2018).

Unlike *epín* 'narrate' (Table 1), the verb *úkhar* 'possess' does not display any stem alternations, so all eighty-eight forms have the stem *-khar*. In all forms, the stem is preceded by an inflectional prefix. Most of the time, prefixes vary according to person, but not number, with the exception of 3PL. This can be more clearly illustrated by representing the forms of just one TAMP value in a separate table and viewing person as orthogonal to number (Table 4).

	SG	DU	PL	
1ST	tú-khar	tú-khar-mu	tú-khar-hũ	EXCL
		tú-khar-es	tú-khar-in	INCL
2ND	sú-khar	sú-khar-es	sú-khar-in	
3RD	ú-khar	ú-khar-es	é-khar	

TABLE 4. Anterior past paradigm of *úkhar* 'possess'.

In the verb *úkhar* 'possess', all first-person ANT forms share the prefix *tú-*, while all second-person forms share the prefix *sú-*. In the third person, however, 3SG and 3DU share the prefix *ú-*, while the 3PL takes *é-*, although it is not always the case that 3PL has a distinct prefix (e.g. see SEQ, FUT, IMM, NEG). The DU and PL forms also have a suffix that encodes number, with special suffixes for the exclusive forms: *-mu* DU.EXCL, *-es* all other DU forms, *-hũ* PL.EXCL, *-in* all other PL forms except 3PL. Note again the special status of the 3PL, which is the only plural form that does not take a number suffix.

The dual and plural forms (except for 3PL) are formed in this way for all Chichimec verbs (i.e. by the addition of a suffix marking number/clusivity), even when the verb displays stem alternations (or tone alternations). This is illustrated with the anterior past subparadigm of *epín* 'narrate' (Table 5), which has stem alternations, as we saw in Table 1. As a result of this, we need only four forms for each of the eight TAMP values of a verb to reconstruct the whole paradigm: 1SG, 2SG, 3SG, and 3PL, hence the thirty-two-cell paradigm presented in Table 1.[8]

3.2. TONAL MELODIES. Chichimec is a tonal language. The tone-bearing unit is the syllable, which may bear low tone (L) or high tone (H). Orthographically, high tone is marked on the syllable nucleus with an acute accent, while low-tone syllables are left

[8] Some verbs display a set of 1PL prefixes that differ from their 1SG counterparts, so to accurately reconstruct a paradigm, one of the 1PL forms is also required for each TAMP value. This is why we recorded forty forms of each verb with our language consultants. However, since this has no bearing on stem alternations, it is not relevant for the purposes of this article, hence why we present only thirty-two forms for each verb.

	SG	DU	PL	
1ST	tu-pín	tu-pín-mu	tu-pín-hũ	EXCL
		tu-pín-es	tu-pín-in	INCL
2ND	ki-ngwín	ki-ngwín-es	ki-ngwín-in	
3RD	u-βín	u-βín-es	u-pʔín	

TABLE 5. Anterior past paradigm of *epín* 'narrate'.

unmarked. All of the verb stems that form part of this study are monosyllabic. Inflected verb forms (i.e. a stem together with its inflectional prefix) are therefore disyllabic (if we disregard the number suffix in dual and plural), and they may bear one of three tonal melodies: LH (low-high), HL (high-low), or HH (high-high). We regard the stem as the determiner of the melody, with the inflectional prefixes bearing whatever tone is necessary to accommodate it.[9]

For the majority of verbs, the tonal melody does not vary across the paradigm (see *epín* 'narrate' in Table 1), but for around thirty percent of the verbs in our sample, tonal alternations occur in conjunction with stem alternations. Such tonal changes contribute yet another layer of complexity to the paradigm. However, verbs with identical stem-alternation patterns may have distinct tone alternations (or no tone alternations at all), indicating that the system of tone alternations is orthogonal to the system of stem alternations. Because of this orthogonal character, we leave tone alternations out of this study, but see Appendix A for some illustrations.

4. THE DIFFERENT STEMS OF CHICHIMEC VERBS. So far, we have seen that the verb *úkhar* 'possess' has just one stem (Table 3), while the verb *epín* 'narrate' has five distinct stems (Table 1). The maximum number of distinct stems we see in Chichimec verbs is five, but there are also verbs with two, three, or four stems, and these stems are distributed across the paradigm in different ways. Before getting into their distributions, however, let us consider how the stems of a verb might differ from each other in form. For most verbs that display stem alternations, we can identify clear correspondences between stems, and so we refer to these as derived stems (§4.1). For these verbs, knowing just one stem is usually enough to predict the shape of all the other stems. For a handful of verbs, however, there are no apparent correspondences, and instead we are faced with suppletive stems (§4.2).

4.1. DERIVED STEMS. Verbs in Chichimec can have up to five distinct stems that we refer to as stems A, B, C, D, and E.[10] We treat stem A as the 'default stem' of the verb, both at the phonological level and with regard to its distribution in the paradigm. The remaining stems (B, C, D, and E) differ from stem A in terms of their onset. These different onsets can be seen as the outcome of a set of morphophonological mutation rules, and this is the reason we characterize stems B–E as 'derived stems'. In this section, we introduce the mutations that give rise to the derived stems. We do this in a straightforward, nontechnical way (for a technical characterization in phonological terms of most of the processes at hand, see Herrera Zendejas 2009).

[9] We consider the stem to be the only element that bears phonological tone. In the case of the LH and HL melodies, the prefix is simply assigned by rule the opposite tonal value to that of the stem. We analyze HH in the inflected forms of verbs as the outcome of a high-tone stem with a preceding floating high tone (^{H}H), which is then docked on the prefix.

[10] De Angulo also uses letters (A–D) as a notational convention when referring to the different stems. It should not be assumed, however, that stems which we refer to with a given letter will map directly onto the same letter in de Angulo, although there will inevitably be a certain amount of overlap.

The onset of stem B is the aspirated, glottalized, or rhotic reflex of the onset of stem A. This is illustrated by a number of example verbs in Table 6. Note that the aspirated correlate of /t/ is not /th/ but a rhotic reflex /rh/. Similarly, if a verb's stem A has a glottal fricative onset /h/, its stem B onset is /rh/. As a consequence of this, it is possible for verbs with stem A onsets in /t/ or /h/ to end up with stem Bs that are homophonous; *étá* 'buy' and *éhá* 'drink', for example, have a homophonous stem B, *-rhá*.

ONSETS	STEM A	STEM B	
p ~ pʔ	pín	pʔín	'narrate'
p ~ ph	pá	phá	'see, find'
t ~ rʔ	tu̱[a]	rʔu̱	'cultivate'
t ~ rh	tá	rhá	'buy'
k ~ kʔ	ki̱n	kʔi̱n	'peer'
k ~ kh	ku̱n	khu̱n	'accompany'
ts ~ tsʔ	tsá	tsʔá	'try'
ʔ ~ rʔ	ʔa	rʔá	'bury'
h ~ rh	há	rhá	'drink'
m ~ mh	mą́	mhą́	'think'
n ~ nh	nú	nhú	'see'
ɓ̃ ~ mʔ	ɓ̃ę	mʔę	'place upright'
ɓ̃ ~ mh	ɓ̃ér	mhér	'roll'
s ~ tsʔ	sa̱	tsʔa̱	'read'
s ~ tsh	se	tshé	'say'

TABLE 6. Stem B mutations.

[a] A creaky vowel in the nucleus surfaces as breathy after a glottal.

The onset of stem C is often a lenis (sometimes also nasalized) reflex of the onset of stem A. This is illustrated by the examples in Table 7. Verbs with a stem A onset in /ʔ/ have a stem C onset in /nd/.[11] In verbs whose stem A vowel is /e/, this is raised to /i/ in stem C (e.g. stem A *-ʔets* vs. stem C *-ndits* 'push').

ONSETS	STEM A	STEM C	
p ~ β	pín	βín	'narrate'
t ~ r	tá	rá	'buy'
k ~ g	ku̱n	gu̱n	'accompany'
ts ~ z	tsá	zá	'try'
kh ~ gh	khę	ghę	'take out'
ʔ ~ nd	ʔa	ndá	'bury'
h ~ nh	há	nhá	'drink'
m ~ β̃	mą́	β̃ą́	'think'
n ~ r̃	nú	r̃ú	'see'
ɓ̃ ~ m	ɓ̃ę	mę	'place upright'
g ~ ng	gáʔ	ngáʔ	'greet'
r ~ nd	rẽ	ndẽ	'breed'

TABLE 7. Stem C mutations.

Stem D is found only with verbs whose stem A has either /p/ or /ʔ/ as the onset. As illustrated in Table 8, verbs with a stem A onset in /p/ have a stem D onset in /ngw/.

ONSETS	STEM A	STEM D	
p ~ ngw	pín	ngwín	'narrate'
ʔ ~ tʔ	ʔa	tʔá	'bury'

TABLE 8. Stem D mutations.

[11] Following Herrera Zendejas 2009, we suggest that this emerged from a historical *nʔV that developed an alveolar excrescence in the onset and then lost the glottal: *ntʔV > *ndʔV > *ndV.

Finally, the fifth distinct stem, stem E, is found only with verbs whose stem A has a plosive onset, /p/, /t/, or /k/, or the affricate onset /ts/. For such verbs, stem E is the prenasalized voiced correlate of the stem A onset, as illustrated in Table 9.

ONSETS	STEM A	STEM E	
p ~ mb	pín	mbín	‘narrate’
t ~ nd	tá	ndá	‘buy’
k ~ ng	kụn	ngụn	‘accompany’
ts ~ ndz	tsá	ndzá	‘try’
kh ~ ngh	khẹ	nghẹ	‘take out’

TABLE 9. Stem E mutations.

Table 10 provides a summary of the correspondences between stem onset mutations in the present-day form of the language.[12]

A	B	C	D	E
p	pʔ, ph	β	ngw	mb
t	rʔ, rh	r	—	nd
k	kʔ, kh	g	—	ng
ts	tsʔ	z	—	ndz
kh	{stem C}	gh	—	ngh
ʔ	rʔ	nd	tʔ	—
h	rh	nh	{stem C}	—
m	mh	β̃	{stem C}	—
n	nh	r̃	{stem C}	—
β̃	mʔ, mh	m	—	—
g	{stem C}	ng	—	—
r	{stem C}	nd	—	—
s	ts(ʔ), tsh	—	—	—

TABLE 10. Correspondences between stem onset mutations (2019).

There are three important things to note about Table 10. First, while this table presents the possible correspondences between stem onsets, it is not the case that all verbs will display the full range of possible stem onsets. For example, there are verbs with a stem A onset in /p/ that display all five of the possible stem alternants, but others that exhibit fewer than this in their paradigms; for example, compare the behavior of *epín* ‘narrate’ with the three other verbs in Table 11.

VERB		A	B	C	D	E
epín	‘narrate’	pín	pʔín	βín	ngwín	mbín
épĩ́	‘steal’	pĩ́	phĩ́	βĩ́	—	mbĩ́
ipa̋r	‘be rich’	pa̋r	pha̋r	—	—	—
upó	‘dwindle’	pó	—	—	—	—

TABLE 11. Stem alternants of different verbs with a stem A onset in /p/.

The second thing to note in Table 10 is that only verbs with a stem A onset in /p/ can display five stems. Verbs with any other onset are restricted as to the number of stems they are able to exhibit. A number of stem A onsets do not permit stem mutations at all,[13] rendering these verbs invariable, but note that some verbs are still invariable irrespective of the fact that they have an onset which does permit mutations (e.g. *upó* ‘dwindle’ in Table 11).

[12] Table 10 is not intended as an exhaustive list of all possible onsets for verbal stems in Chichimec, but rather a list of onsets that are able to exhibit at least one mutation.

[13] For example, stem A onsets in /tʔ, tsʔ, tsh, nh, nd, ndz, mʔ/ lack stem alternations.

The third point is that there are a number of verbs which we treat as belonging to a stem-alternation pattern whose stem A onset precludes them from deriving all of the required stems for the given pattern. In these cases, the 'missing' stem is replaced by the corresponding stem C. This is represented in Table 10 with '{stem C}'—for example, if a verb with a stem A onset in /h/ has a stem-alternation pattern that requires a stem D, it will necessarily use stem C in the relevant cells. This is exemplified by the verbs *éhá* 'drink' (Table 21) and *éhun* 'throw' (example A19 of Appendix B).

4.2. SUPPLETIVE STEMS. For the most part, the phonological shape a derived stem will have is predictable from the mutation rules we presented in the previous section, but there are a few verbs in our sample that have stems whose shape cannot be predicted by these rules. We treat such cases as suppletive stems.

For some verbs, it is the stem onsets that deviate from the correspondences outlined in the previous section, as illustrated by the examples in Table 12. For instance, the verbs *engwẹ́n* 'be loaded with' and *éngwin* 'stick' have a stem A onset in /ngw/, which is unusual in our data; the sets of onsets for these verbs (/ngw, pʔ/ and /ngw, mb, β/, respectively) do, however, occur in paradigms of verbs with a stem A onset in /p/, but associated with different stems. The verb *úʔo̱r* 'appear', by contrast, has a stem A onset in /ʔ/, which is not unusual, but its stem B onset in /tʔ/ corresponds to the stem D onset of other verbs with the same stem A onset, so we treat it as suppletive.

We believe that suppletive stems were also present in 1930. De Angulo records the verb *emáɸ* 'show' with a stem B onset in /p/, thus setting it apart from other verbs with a stem A onset in /m/, which had stem B onsets in /mh/ (as they do in 2019). Interestingly, our consultants gave us *-mháɸ* for stem B, a change that means this stem has ceased to be suppletive.

STEM A	STEM B	STEM C	
ngwẹ́n	pʔẹ́n	—	'be loaded with'
ngwin	mbín	βín	'stick'
ʔo̱r	tʔo̱r	—	'appear'
máɸ	páɸ	—	'show' (1930 only)

TABLE 12. Suppletive stems B and C involving the stem onset.

For two verbs in our data, the stem onsets follow the stem-onset mutation rules, but there is a change in vowel quality in the rhyme of stems C and D, as illustrated in Table 13.

STEM A	STEM B	STEM C	STEM D	
ʔo	rʔó	ndí	tʔí	'hear'
hun	rhún	nhín	—	'throw'

TABLE 13. Suppletive stems C and D involving the stem vowel.

5. OVERVIEW OF CHANGES IN STEM-ALTERNATION PATTERNS. We now turn to the different distributions of stems across the paradigms of different verbs. The purpose of this section is to give a brief overview of the types of changes we encounter to lay the foundations for the following sections. Based on our analysis of 170 verbs in de Angulo 1933, we identify six main patterns of stem alternations in the Chichimec of 1930 (see §6). In our own data, we find that the system has undergone a number of changes. We illustrate three of these changes below.

Our first example concerns the verb *étę̣ts* 'bet' (Table 14). De Angulo records this verb as having three different stems, stem A *-tets*, stem B *-rhets*, and stem C *-rets*. These same three stems are present in 2019, but the distribution of stem C has been reduced: it

now appears in only four cells of the 3SG/DU (i.e. SEQ, FUT, ANT, and REC), where previously it occurred in all 3SG/DU cells. In addition, a stem E, *-ndɻ̨ts*, has been acquired in 1.REC. In the case of this verb, a nicely organized paradigm has, on the face of it, become significantly more complex over the course of a few generations.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	tɻ̨ts	A	rhɻ̨ts	B
SEQ	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	rɻ̨ts	C	rhɻ̨ts	B
FUT	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	rɻ̨ts	C	rhɻ̨ts	B
ANT	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	rɻ̨ts	C	rhɻ̨ts	B
REC	tets	A	tets	A	rets	C	rhets	B	ndɻ̨ts	E	tɻ̨ts	A	rɻ̨ts	C	rhɻ̨ts	B
IMM	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	tɻ̨ts	A	rhɻ̨ts	B
POT	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	tɻ̨ts	A	rhɻ̨ts	B
NEG	tets	A	tets	A	rets	C	rhets	B	tɻ̨ts	A	tɻ̨ts	A	tɻ̨ts	A	rhɻ̨ts	B

TABLE 14. Inflectional stems of *étɻ̨ts* 'bet' in 1930 and 2019.

By contrast, the verb *éʔɻ̨* 'put' (Table 15) has undergone barely any changes. The only change is that 2.PRS was formed with a stem D in 1930, but in the present day this form takes stem A.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ʔe	A	te	D	ʔe	A	rɻ̨	B	ʔɻ̨	A	ʔɻ̨	A	ʔɻ̨	A	rʔɻ̨	B
SEQ	ʔe	A	te	D	nde	C	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ndɻ̨	C	rʔɻ̨	B
FUT	ʔe	A	te	D	nde	C	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ndɻ̨	C	rʔɻ̨	B
ANT	ʔe	A	te	D	nde	C	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ndɻ̨	C	rʔɻ̨	B
REC	ʔe	A	te	D	nde	C	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ndɻ̨	C	rʔɻ̨	B
IMM	ʔe	A	te	D	ʔe	A	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ʔɻ̨	A	rʔɻ̨	B
POT	ʔe	A	te	D	ʔe	A	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ʔɻ̨	A	rʔɻ̨	B
NEG	ʔe	A	te	D	ʔe	A	rɻ̨	B	ʔɻ̨	A	tʔɻ̨	D	ʔɻ̨	A	rʔɻ̨	B

TABLE 15. Inflectional stems of *éʔɻ̨* 'put' in 1930 and 2019.

The third example is the verb *epín* 'narrate' (Table 16), previously encountered in Table 1, which represents the most intricate stem-alternation pattern we find in de Angulo 1933. In 2019, however, this verb has a new stem B, *-pʔín*. In one sense, adding a fifth stem might be seen as increasing the intricacy of this verb's inflectional paradigm, but what is interesting about this change is that the newly acquired stem B is present in all 3PL forms, whereas before two 3PL cells were occupied by stem E, so in this sense things have simplified. In addition to this change, the SEQ form of 3SG/DU has changed from stem A to stem C.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pín	A	pín	A	pín	A	pín	A	pín	A	pín	A	pín	A	pʔín	B
SEQ	pín	A	ngwín	D	pín	A	pín	A	pín	A	ngwín	D	βín	C	pʔín	B
FUT	pín	A	ngwín	D	mín	C	mbín	E	pín	A	ngwín	D	βín	C	pʔín	B
ANT	pín	A	ngwín	D	mín	C	mbín	E	pín	A	ngwín	D	βín	C	pʔín	B
REC	mbín	E	ngwín	D	mín	C	pín	A	mbín	E	ngwín	D	βín	C	pʔín	B
IMM	ngwín	D	ngwín	D	ngwín	D	pín	A	ngwín	D	ngwín	D	ngwín	D	pʔín	B
POT	ngwín	D	ngwín	D	ngwín	D	pín	A	ngwín	D	ngwín	D	ngwín	D	pʔín	B
NEG	ngwín	D	ngwín	D	ngwín	D	pín	A	ngwín	D	ngwín	D	ngwín	D	pʔín	B

TABLE 16. Inflectional stems of *epín* 'narrate' in 1930 and 2019.

These three examples demonstrate just a few of the stem-alternation changes that have taken place in Chichimec over the course of ninety years. Some of these changes appear to have done little but shuffle things around or change a single verb form (e.g. *éʔẹ* 'put') for no apparent reason. Other changes may have simplified things to a degree (e.g. *epín* 'narrate'). But other changes seem to have restructured the paradigm in such a way that the end result is more intricate than it was previously (e.g. *étẹts* 'bet'). In order to make sense of these changes (which is the focus of §§7 and 8), it is first of all necessary to have an appreciation of the stem-alternation patterns we find in verbal paradigms in 1930, which is the topic we turn to in §6.

6. STEM-ALTERNATION PATTERNS IN 1930. The paradigms of verbs in the Chichimec of 1930, as described in de Angulo 1933 and characterized in Palancar & Avelino 2019, have different configurations of stem alternations. We have identified ten such configurations (which we assign to six groups), which we call 'stem-alternation patterns'. Pattern 1, which is the simplest pattern we find, has stem B in all 3PL cells (Table 17).

PATTERN 1

	1		2		3SG/DU		3PL	
PRS	máɸ	A	máɸ	A	máɸ	A	páɸ	B
SEQ	máɸ	A	máɸ	A	máɸ	A	páɸ	B
FUT	máɸ	A	máɸ	A	máɸ	A	páɸ	B
ANT	máɸ	A	máɸ	A	máɸ	A	páɸ	B
REC	máɸ	A	máɸ	A	máɸ	A	páɸ	B
IMM	máɸ	A	máɸ	A	máɸ	A	páɸ	B
POT	máɸ	A	máɸ	A	máɸ	A	páɸ	B
NEG	máɸ	A	máɸ	A	máɸ	A	páɸ	B

emáɸ 'show'

TABLE 17. Verb of stem-alternation pattern 1 (1930).

Pattern 2 also has stem B in all 3PL cells, but in addition has stem C in the FUT, ANT, and REC of the 3SG/DU and stem E in the 1.REC (Table 18).

PATTERN 2

	1		2		3SG/DU		3PL	
PRS	tats	A	tats	A	tats	A	rhats	B
SEQ	tats	A	tats	A	tats	A	rhats	B
FUT	tats	A	tats	A	rats	C	rhats	B
ANT	tats	A	tats	A	rats	C	rhats	B
REC	ndats	E	tats	A	rats	C	rhats	B
IMM	tats	A	tats	A	tats	A	rhats	B
POT	tats	A	tats	A	tats	A	rhats	B
NEG	tats	A	tats	A	tats	A	rhats	B

états 'clothe'

TABLE 18. Verb of stem-alternation pattern 2 (1930).

Pattern 3 again shares the stem B distribution that we observe in patterns 1 and 2, but, unlike pattern 2, stem C appears in all forms of the 3SG/DU and there is no stem E in the 1.REC, even though for such verbs in 1930 it would have been possible to derive a stem E on the basis of the verb's stem A onset (e.g. the verb *égã* 'take out', Table 19, could have had a stem E, **-ngã*).

Pattern 4 also has the same distribution of stem B, but there is no stem C, and stem D is present in all forms of the second person (Table 20).[14] As with pattern 3, there is no stem E, even when it would be possible to derive one on the basis of the stem A onset.

[14] The behavior of the verb *utsá* 'make' may appear to be at odds with the information presented in Table 10, since we show there that a stem D cannot be derived from a stem A onset in /ts/. However, it should be

PATTERN 3

	1		2		3SG/DU		3PL	
PRS	kã	A	kã	A	gã	C	khã	B
SEQ	kã	A	kã	A	gã	C	khã	B
FUT	kã	A	kã	A	gã	C	khã	B
ANT	kã	A	kã	A	gã	C	khã	B
REC	kã	A	kã	A	gã	C	khã	B
IMM	kã	A	kã	A	gã	C	khã	B
POT	kã	A	kã	A	gã	C	khã	B
NEG	kã	A	kã	A	gã	C	khã	B

égã ‘take out’

TABLE 19. Verb of stem-alternation pattern 3 (1930).

PATTERN 4

	1		2		3SG/DU		3PL	
PRS	tsá	A	tʃǎ	D	tsá	A	tshá	B
SEQ	tsá	A	tʃǎ	D	tsá	A	tshá	B
FUT	tsá	A	tʃǎ	D	tsá	A	tshá	B
ANT	tsá	A	tʃǎ	D	tsá	A	tshá	B
REC	tsá	A	tʃǎ	D	tsá	A	tshá	B
IMM	tsá	A	tʃǎ	D	tsá	A	tshá	B
POT	tsá	A	tʃǎ	D	tsá	A	tshá	B
NEG	tsá	A	tʃǎ	D	tsá	A	tshá	B

utsá ‘make’

TABLE 20. Verb of stem-alternation pattern 4 (1930).

Table 21 presents four subtypes of pattern 5, all of which display the same stem B distribution seen in patterns 1–4. The four patterns differ from each other with regard to the distribution of stem C and stem D. In patterns 5b and 5d, stem C appears in the same three cells as in pattern 2 (i.e. FUT, ANT, and REC of the 3SG/DU), while in patterns 5a and 5c it is additionally present in the SEQ of the 3SG/DU. In patterns 5a and 5d, stem D is present in all forms of the second person (as in pattern 4), while in patterns 5b and 5c it is lacking in the PRS.

An important point to make about the patterns in Table 21 is that we do not find any examples in de Angulo 1933 of pattern 5c verbs that have a stem A onset from which a stem D can be derived; thus in *éhá* ‘drink’, the verb’s stem C occupies the cells where we would expect stem D (see Table 10). For clarity of exposition, and because the presence of stem C can be accounted for on phonological grounds, we have nevertheless labeled these forms as stem D (using curly brackets to highlight this fact).

In both de Angulo’s data and our own, the only stem A onsets we find in patterns 5a–c are the glottal consonants /ʔ/ and /h/, and, as we have shown in Table 10, neither of these onsets permits a stem E. However, pattern 5d verbs do have a stem E in the 1.REC, just as we saw in pattern 2. In the absence of evidence to the contrary, we take this as an indication that stem E is part of the underlying composition of pattern 5 verbs, even though it rarely surfaces distinctively. Such a treatment provides for a more elegant representation of the stem-alternation patterns by allowing us to treat pattern 5d as a subpattern together with patterns 5a–c rather than positing an entirely separate pattern. The fact that we cannot say for certain that stem E is underlyingly part of patterns 5a–c, however, has no significant bearing on the arguments put forward in this article.

noted that Table 10 reflects only the present-day situation; in 1930 it was possible to derive a stem D from such verbs. We provide an explanation for this change in §8.3.

PATTERN 5a

	1		2		3SG/DU		3PL	
PRS	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B
SEQ	ʔą́n	A	tán	D	ndán	C	rʔą́n	B
FUT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B
ANT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B
REC	ʔą́n	A	tán	D	ndán	C	rʔą́n	B
IMM	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B
POT	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B
NEG	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B

eʔą́n 'ask'

PATTERN 5b

	1		2		3SG/DU		3PL	
PRS	ʔi	A	ʔi	A	ʔi	A	rʔí	B
SEQ	ʔi	A	tí	D	ʔi	A	rʔí	B
FUT	ʔi	A	tí	D	ndí	C	rʔí	B
ANT	ʔi	A	tí	D	ndí	C	rʔí	B
REC	ʔi	A	tí	D	ndí	C	rʔí	B
IMM	ʔi	A	tí	D	ʔi	A	rʔí	B
POT	ʔi	A	tí	D	ʔi	A	rʔí	B
NEG	ʔi	A	tí	D	ʔi	A	rʔí	B

éʔi 'want'

PATTERN 5c

	1		2		3SG/DU		3PL	
PRS	há	A	há	A	há	A	rhá	B
SEQ	há	A	nhá	{D}	nhá	C	rhá	B
FUT	há	A	nhá	{D}	nhá	C	rhá	B
ANT	há	A	nhá	{D}	nhá	C	rhá	B
REC	há	A	nhá	{D}	nhá	C	rhá	B
IMM	há	A	nhá	{D}	há	A	rhá	B
POT	há	A	nhá	{D}	há	A	rhá	B
NEG	há	A	nhá	{D}	há	A	rhá	B

éhá 'drink'

PATTERN 5d

	1		2		3SG/DU		3PL	
PRS	tsá	A	tʃa	D	tsá	A	tshá	B
SEQ	tsá	A	tʃa	D	tsá	A	tshá	B
FUT	tsá	A	tʃa	D	zá	C	tshá	B
ANT	tsá	A	tʃa	D	zá	C	tshá	B
REC	ndzá	E	tʃa	D	zá	C	tshá	B
IMM	tsá	A	tʃa	D	tsá	A	tshá	B
POT	tsá	A	tʃa	D	tsá	A	tshá	B
NEG	tsá	A	tʃa	D	tsá	A	tshá	B

étsá 'try'

TABLE 21. Verbs of stem-alternation patterns 5a, 5b, 5c, and 5d (1930).

The final, and most intricate, patterns we find in de Angulo 1933 are patterns 6a and 6b (Table 22). Unlike all other patterns, neither of these has a stem B. Stem C in both subtypes shares the same distribution as in patterns 2, 5b, and 5d. Stem D occurs in the same cells of the second person as in patterns 5b and 5c, but additionally appears in the first person and 3SG/DU of IMM, POT, and NEG. Finally, stem E is present in 1.REC, as we saw in pattern 2, but also crops up in 3PL: in pattern 6a it is present in FUT and ANT, while in pattern 6b it is additionally present in SEQ.

PATTERN 6a

	1		2		3SG/DU		3PL	
PRS	pín	A	pín	A	pín	A	pín	A
SEQ	pín	A	ngwín	D	pín	A	pín	A
FUT	pín	A	ngwín	D	mín	C	mbín	E
ANT	pín	A	ngwín	D	mín	C	mbín	E
REC	mbín	E	ngwín	D	mín	C	pín	A
IMM	ngwín	D	ngwín	D	ngwín	D	pín	A
POT	ngwín	D	ngwín	D	ngwín	D	pín	A
NEG	ngwín	D	ngwín	D	ngwín	D	pín	A

epín 'narrate'

PATTERN 6b

	1		2		3SG/DU		3PL	
PRS	pę	A	pę	A	pę	A	pę	A
SEQ	pę́	A	ngwę	D	pę́	A	mbę́	E
FUT	pę́	A	ngwę	D	mę́	C	mbę́	E
ANT	pę́	A	ngwę	D	mę́	C	mbę́	E
REC	mbę	E	ngwę	D	mę	C	pę	A
IMM	ngwę́	D	ngwę	D	ngwę́	D	pę́	A
POT	ngwę́	D	ngwę	D	ngwę́	D	pę́	A
NEG	ngwę́	D	ngwę	D	ngwę́	D	pę́	A

épę 'fight'

TABLE 22. Verbs of stem-alternation patterns 6a and 6b (1930).

In this section we have presented the different stem-alternation patterns we find in the paradigms of Chichimec verbs in 1930, and in the previous section (§5) we presented side-by-side the 1930 and 2019 paradigms of three verbs to give a sense of the types of changes the stem-alternation patterns have undergone. We now turn to a detailed discussion of the changes.

7. DIACHRONY OF STEM-ALTERNATION PATTERNS. As we alluded to in the introduction, the best way to understand the changes that have taken place between 1930 and 2019 is to focus on the distribution of the individual stems (stems A–E) across the different patterns, taking each set of cells occupied by a given stem as a morphome. We

group the changes into five types: (i) loss, (ii) acquisition, (iii) acquisition conflicting with another morphome, (iv) co-option of a stem, and (v) contraction/expansion. We discuss each of these in turn.

It is worth noting here that similar diachronic changes at the level of the morphome have been documented in other languages, most notably in Romance (see Esher 2016 and Maiden 2018, among others), so the changes we see in Chichimec are by no means unexpected. Maiden (2018:284) states that 'existing patterns may become subject to systematic disruptions in their distribution that, strikingly, leave them still morphomic, but with a changed paradigmatic domain', and this is precisely what we see happening in Chichimec.

Some of the changes documented in the literature on Romance morphomes are similar in nature, if not direct parallels, to what we find in Chichimec, suggesting that morphomes display similar diachronic pathways crosslinguistically. Smith (2011) and Esher (2016) talk of 'morphome death', which implies that the morphome has been lost from the language. Note that we use the term 'loss' (§7.1) to refer to an individual verb ceasing to exhibit a given morphome, and so these two terms are used to refer to distinct processes. The change we refer to as 'acquisition of a morphome that conflicts with another morphome' (§7.3) shares some similarities with Maiden's (2018:288) notion of a 'clash', since both involve morphomic patterns in which the domain of one pattern intrudes on that of another, but while a clash can give rise to what Smith (2011:319) describes as a hybrid pattern, where elements of both morphomes are retained, such patterns do not occur in Chichimec, and instead we end up with what Smith calls a 'take-over'. We adopt Maiden's (2018:289) notions of 'contraction' and 'expansion' (§7.5) as they neatly describe what we observe in Chichimec, while our concept of 'co-option of a stem' (§7.4) appears to have the same end result as Maiden's notion of 'coalescence'. In recognizing that morphomic changes often result in a morphome changing its shape while retaining its morphomic nature, Esher (2016) employs the catch-all term 'morphome transfiguration'.

7.1. Loss. As already mentioned, the intricate system of stem alternations recorded by de Angulo in 1930 has survived very much intact through to the present day. Notwithstanding this fact, a number of verbs have lost one or more stem alternations. In our sample, some verbs that originally belonged to pattern 1 no longer exhibit stem B in the 3PL forms, rendering them invariable verbs. A clear example of this comes from the verb *etí* 'finish' in Table 23, which has become an invariable verb even though it would be possible for speakers to derive a stem B in the form of *-rhí*.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
SEQ	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
FUT	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
ANT	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
REC	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
IMM	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
POT	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A
NEG	tý	A	tý	A	tý	A	thý	B	tí	A	tí	A	tí	A	tí	A

TABLE 23. Inflectional stems of *etí* 'finish' in 1930 and 2019.[15]

[15] This verb indicates that a verb with a stem A onset in /t/ in 1930 was able to have a stem B onset in /th/, whereas in 2019 such verbs must have a stem B onset in /rh/ (a correspondence that was also present in 1930; see Table 28). This change in permitted stem onset mutations may explain why this verb has lost stem B.

In other cases, however, the loss of stem B can be accounted for as being due to phonological constraints. For example, in 1930, the verb 'make' had a stem A, *-tsá*, and stem B, *-tshá*, but nowadays it has only a stem A, *-tshá*, and, as shown in Table 10, stems B to E cannot be derived from a verb whose stem A onset is /tsh/. In other words, speakers have generalized the old stem B as stem A, and it is not possible to generate another stem B under present-day mutation rules. We consider examples like this to be a loss of the morphological stem-alternation pattern for phonological reasons.[16]

7.2. ACQUISITION. While some verbs have moved from being alternating to invariable, we have also identified verbs that were invariable in 1930 and have since acquired a stem B in all 3PL forms, converting them into pattern 1 verbs, as exemplified by the verb *ipa̍̌r* 'be rich' (Table 24).

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
SEQ	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
FUT	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
ANT	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
REC	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
IMM	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
POT	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B
NEG	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	pa̍̌r	A	phar	B

TABLE 24. Inflectional stems of *ipa̍̌r* 'be rich' in 1930 and 2019.

In 2019, we also find a number of verbs that have acquired more than one stem. The verb *ékɥn* 'accompany' was an invariable verb in 1930, but in 2019 it has four stems (Table 25), while the verb *ekó* 'deny' (Table 26) already had a stem B in 1930, but has acquired a stem C and stem E. In both cases, the changes result in them becoming pattern 2 verbs.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	kɥn	A	khɥn	B
SEQ	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	gɥn	C	khɥn	B
FUT	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	gɥn	C	khɥn	B
ANT	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	gɥn	C	khɥn	B
REC	kun	A	kun	A	kun	A	kun	A	ngɥn	E	kɥn	A	gɥn	C	khɥn	B
IMM	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	kɥn	A	khɥn	B
POT	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	kɥn	A	khɥn	B
NEG	kun	A	kun	A	kun	A	kun	A	kɥn	A	kɥn	A	kɥn	A	khɥn	B

TABLE 25. Inflectional stems of *ékɥn* 'accompany' in 1930 and 2019.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
SEQ	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
FUT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
ANT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
REC	kó	A	kó	A	kó	A	khó	B	ngó	E	kó	A	gó	C	khó	B
IMM	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
POT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
NEG	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B

TABLE 26. Inflectional stems of *ekó* 'deny' in 1930 and 2019.

[16] It could perhaps be argued that, where the loss of stem B can be explained on phonological grounds, a verb is still underlyingly a pattern 1 verb even though no distinctions are present on the surface. However, there are many invariable verbs in Chichimec, so there is little to gain from such a treatment, especially in the case of pattern 1, which is the simplest of all stem-alternation patterns.

In the above three examples, the newly acquired stems replace the original default stem, stem A. However, in the case of patterns 6a and 6b, the acquisition of stem B in 2019 impinges on the presence of a nondefault stem, stem E, in some 3PL cells, so we treat this change separately in the following section.

7.3. ACQUISITION CONFLICTING WITH ANOTHER MORPHOME. In §6, we saw that all stem-alternation patterns in 1930, with the exception of patterns 6a and 6b, had stem B in all 3PL cells. In pattern 6a (Table 22), the FUT and ANT forms of the 3PL (along with 1.REC) previously had stem E, with stem A in the remaining 3PL forms. In 2019, all pattern 6a verbs have acquired stem B in all of their 3PL cells, thereby replacing the original occurrences of stem E in 3PL and rendering the 1.REC the only remnant of the original E morphome. This is exemplified by the verb *épo* 'give' in Table 27.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	po	A	po	A	po	A	po	A	po	A	po	A	po	A	pʔo	B
SEQ	po	A	ngwo	D	po	A	po	A	po	A	ngwo	D	βo	C	pʔo	B
FUT	po	A	ngwo	D	mo	C	mbo	E	po	A	ngwo	D	βo	C	pʔo	B
ANT	po	A	ngwo	D	mo	C	mbo	E	po	A	ngwo	D	βo	C	pʔo	B
REC	mbo	E	ngwo	D	mo	C	po	A	mbo	E	ngwo	D	βo	C	pʔo	B
IMM	ngwo	D	ngwo	D	ngwo	D	po	A	ngwo	D	ngwo	D	ngwo	D	pʔo	B
POT	ngwo	D	ngwo	D	ngwo	D	po	A	ngwo	D	ngwo	D	ngwo	D	pʔo	B
NEG	ngwo	D	ngwo	D	ngwo	D	po	A	ngwo	D	ngwo	D	ngwo	D	pʔo	B

TABLE 27. Inflectional stems of *épo* 'give' in 1930 and 2019.

The acquisition of stem B illustrated in Table 27 is identical to the acquisition of stem B discussed in §7.2, since stem B has been acquired in all cells of the 3PL. The only reason for treating these two changes separately is that the change we observe in this section has a knock-on effect on the distribution of another stem, stem E. Note that, while pattern 6a verbs have acquired stem B in all 3PL cells, in pattern 6b verbs this very same change appears still to be in progress. We return to this issue in §8.1.

7.4. CO-OPTION OF A STEM. We showed in §4.1 that for some onsets a stem B or D cannot be derived for phonological reasons and that, where a verb's stem-alternation pattern requires either stem B or D, it will use stem C instead (see Table 10); this explanation neatly accounts for the stems we find in *éhá* 'drink' (Table 21). In 2019, we still encounter verbs that co-opt stem C for the cells where we would expect stem B or D, but crucially, in the case of stem B, we also find this happening with verbs where that stem is NOT phonologically precluded from occurring. We treat co-option as a distinct type of change as it does not involve the acquisition of a new stem, but rather the repurposing of an existing one.[17]

An example of this is given in Table 28, with the verb *étę* 'wear (clothes)'. In 1930, this verb had a stem B, *-rhẽ*, just as we would expect under the present-day stem onset correspondences (§4.1). There is no obvious reason for this verb to lack a stem B in the present day, and yet in this particular verb, stem C is co-opted to take its place.

As we discuss in §8.2, we see this change as having led to the birth of a new morphome (which we label the 'C2 morphome'). We treat verbs with the C2 morphome as instantiating a new subpattern, pattern 2′. We consider pattern 2 and pattern 2′ to be sub-

[17] In all but one of the verbs in our sample that exhibit this type of co-option, the co-opted stem C fills the stem zone of the B morphome, which was already present in 1930. However, the verb *épę* 'smell' appears to have simultaneously acquired the stem zone of the B morphome and co-opted stem C to populate its cells. This verb is presented in example A22 in Appendix B.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tẽ	A	tẽ	A	tẽ	A	rhẽ	B	tę	A	tę	A	tę	A	rę	C
SEQ	tẽ	A	tẽ	A	tẽ	A	rhẽ	B	tę	A	tę́	A	ré	C	ré	C
FUT	tẽ	A	tẽ	A	rẽ	C	rhẽ	B	tę	A	tę́	A	ré	C	ré	C
ANT	tẽ	A	tẽ	A	rẽ	C	rhẽ	B	tę	A	tę́	A	ré	C	ré	C
REC	ndẽ	E	tẽ	A	rẽ	C	rhẽ	B	ndę	E	tę́	A	rę	C	rę	C
IMM	tẽ	A	tẽ	A	tẽ	A	rhẽ	B	tę	A	tę	A	tę	A	rę	C
POT	tẽ	A	tẽ	A	tẽ	A	rhẽ	B	tę	A	tę́	A	tę	A	rę	C
NEG	tẽ	A	tẽ	A	tẽ	A	rhẽ	B	tę	A	tę́	A	tę	A	rę	C

TABLE 28. Inflectional stems of *étę* 'wear (clothes)' in 1930 and 2019.

types of a single pattern because they share the same overall set of cells occupied by nondefault stems, irrespective of the exact distribution of these stems.

7.5. CONTRACTION AND EXPANSION. A group of changes that have occurred in Chichimec stem alternations since 1930 involves the different distributions of stem C. If we disregard instances of co-option (§7.4), we see that stem C is otherwise restricted to occurring in 3SG/DU. In 1930, there were three C morphomes involving this part of the paradigm, as summarized in Table 29, with distributions extending over three, four, and eight cells, respectively.

MORPHOME	DISTRIBUTION IN 3SG/DU	PATTERNS (1930)
C-i	FUT, ANT, REC	2, 5b, 5d, 6a, 6b
C-ii	SEQ, FUT, ANT, REC	5a, 5c
C-iii	all 3SG/DU cells	3

TABLE 29. Summary of C morphomes in 1930.

In 2019, we find only the C-ii morphome. This means that the C-i morphome has expanded to include the SEQ (Table 30), the C-ii morphome has been maintained unchanged (Table 31), and the C-iii morphome has contracted from its original eight cells of 3SG/DU to just the four cells of the C-ii morphome (Table 32). In other words, the three morphomes involving stem C in 1930 have collapsed into a single morphome. Additionally, as we have already seen in Table 25 and Table 26, all verbs that have acquired a stem C have acquired it in the form of the C-ii morphome.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tu	A	tu	A	tu	A	rhu	B	tũ	A	tũ	A	tũ	A	rʔũ	B
SEQ	tu	A	tu	A	tu	A	rhu	B	tũ	A	tũ	A	rũ	C	rʔũ	B
FUT	tu	A	tu	A	ru	C	rhu	B	tũ	A	tũ	A	rũ	C	rʔũ	B
ANT	tu	A	tu	A	ru	C	rhu	B	tũ	A	tũ	A	rũ	C	rʔũ	B
REC	ndu	E	tu	A	ru	C	rhu	B	ndũ	E	tũ	A	rũ	C	rʔũ	B
IMM	tu	A	tu	A	tu	A	rhu	B	tũ	A	tũ	A	tũ	A	rʔũ	B
POT	tu	A	tu	A	tu	A	rhu	B	tũ	A	tũ	A	tũ	A	rʔũ	B
NEG	tu	A	tu	A	tu	A	rhu	B	tũ	A	tũ	A	tũ	A	rʔũ	B

TABLE 30. Inflectional stems of *étũ* 'cultivate' in 1930 and 2019.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ʔyr	A	tyr	D	ʔyr	A	rʔyr	B	ʔír	A	ʔír	A	ʔír	A	rʔír	B
SEQ	ʔyr	A	tyr	D	ndyr	C	rʔyr	B	ʔír	A	tʔír	D	ndír	C	rʔír	B
FUT	ʔyr	A	tyr	D	ndyr	C	rʔyr	B	ʔír	A	tʔír	D	ndír	C	rʔír	B
ANT	ʔyr	A	tyr	D	ndyr	C	rʔyr	B	ʔír	A	tʔír	D	ndír	C	rʔír	B
REC	ʔyr	A	tyr	D	ndyr	C	rʔyr	B	ʔír	A	tʔír	D	ndír	C	rʔír	B
IMM	ʔyr	A	tyr	D	ʔyr	A	rʔyr	B	ʔír	A	tʔír	D	ʔír	A	rʔír	B
POT	ʔyr	A	tyr	D	ʔyr	A	rʔyr	B	ʔír	A	tʔír	D	ʔír	A	rʔír	B
NEG	ʔyr	A	tyr	D	ʔyr	A	rʔyr	B	ʔír	A	tʔír	D	ʔír	A	rʔír	B

TABLE 31. Inflectional stems of *éʔír* 'sell' in 1930 and 2019.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	kɰ̃	A	kʔɰ̃	B
SEQ	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	gɰ̃	C	kʔɰ̃	B
FUT	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	gɰ̃	C	kʔɰ̃	B
ANT	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	gɰ̃	C	kʔɰ̃	B
REC	kã	A	kã	A	gã	C	khã	B	ngɰ̃	E	kɰ̃	A	gɰ̃	C	kʔɰ̃	B
IMM	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	kɰ̃	A	kʔɰ̃	B
POT	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	kɰ̃	A	kʔɰ̃	B
NEG	kã	A	kã	A	gã	C	khã	B	kɰ̃	A	kɰ̃	A	kɰ̃	A	kʔɰ̃	B

TABLE 32. Inflectional stems of *ékɰ̃* 'take out' in 1930 and 2019.

As a direct consequence of these changes, patterns 2, 5b, 5d, 6a, and 6b all now exhibit stem C in the SEQ, and it would appear, on the basis of the data we have available, that pattern 3 no longer occurs in present-day Chichimec.[18]

The D morphome in patterns 5a and 5d has also contracted and now excludes the 2.PRS, as illustrated in Table 33, thereby matching the D morphome of patterns 5b and 5c.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	ʔą́n	A	ʔą́n	A	rʔą́n	B
SEQ	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
FUT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
ANT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
REC	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
IMM	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B
POT	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B
NEG	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B

TABLE 33. Inflectional stems of *eʔą́n* 'ask' in 1930 and 2019.[19]

In the case of pattern 5, the net result of the changes involving stem C and stem D is that patterns 5a, 5b, 5c, and 5d have collapsed into a single pattern, pattern 5c.

In §7.3, we discussed the replacement of stem E in the 3PL of pattern 6a verbs as a result of the acquisition of stem B. Although we treat this as a different type of change, since it involves an interaction between two morphomes, it is worth noting that this change leads to a contraction in the E morphome, reducing its distribution to 1.REC.

8. ANALYSIS: MECHANISMS OF CHANGE. The changes in Chichimec verbal inflection over the course of nearly a century may appear to be inconsequential, since they often only involve one or two cells in a verb's paradigm. We argue here that, on the contrary, the changes that have happened, in effect, reflect a broad restructuring of the whole paradigm. Viewing stem alternations as morphological structures in their own right, that is, as morphomes, gives us the perspective needed to see that even the smallest of changes have had a deep impact by making the inflectional system more consistent.

From the different TYPES of change that we saw in §7, we can identify three different MECHANISMS by which the changes likely occurred: (i) the analogical extension of morphomes as wholes, (ii) the emergence of a new morphome due to the reanalysis of a morphophonological rule, and (iii) the reanalysis of an old morphome (in verbs with a

[18] There is, however, a single exception to this claim: the verb *eβá* 'go' still displays a stem C in all cells of 3SG/DU, as it did in 1930. Crosslinguistically, the verb 'go' is often irregular, and we consider this to be the case in present-day Chichimec, too.

[19] One of our main consultants gave us stem C as *-ndán* (i.e. with a modal vowel) like it was in 1930.

stem A onset in /ts/) as an alternation that can now be accounted for by the phonology. We treat each mechanism in turn in the following three sections.

8.1. Analogical extension of morphomes. Looking across the verbal lexicon, rather than focusing on changes that apply at the level of an individual verb, we observe that changes which might otherwise appear random make sense when viewed in a broader context, since they can be understood as involving the analogical extension of morphomic patterns.[20] This, in turn, allows us to appreciate the broader impact that morphomes have had on the system. From the evidence we have from our diachronic study of Chichimec, we conclude that manipulating morphomes has allowed speakers to make the inflectional system of verbs more consistent (i.e. across lexemes), albeit no less intricate at a morphological level (i.e. over the paradigm).

Observing some of the changes in isolation, we may conclude that the system has become more intricate. For example, the contraction of the C morphome in pattern 3 (shrinking from all cells of 3sg/du to just four cells) in verbs like *étẹ́ts* 'bet' (Table 14) appears to be an instance of the system increasing in morphological complexity, because having stem C in four cells that do not constitute a coherent group is intuitively more intricate than simply having stem C in all 3sg/du forms. However, viewing this change in the context of the other changes involving stem C (as presented in §7.5) points to an alternative explanation: by reducing the number of morphomes involving stem C from three to one, the system as a whole has become less complex.[21] The process by which the C-i and C-iii morphomes end up with stem C in the same four cells as the C-ii morphome is one involving the analogical extension of the C-ii morphome (i.e. the cluster of cells), rather than stem C simply being acquired or lost in a given cell.[22]

A similar effect, whereby the analogical extension of a morphome brings consistency to the system as a whole, can be seen in the contraction of the D morphome in patterns 5a and 5d. Not only does this change bring these patterns into line with the D morphome in patterns 5b and 5c, but it also results in them sharing the gap in 2.prs with patterns 6a and 6b. Even though patterns 6a and 6b display a unique D morphome, the change results in an identical distribution of stem D in second-person forms across all patterns. So again, we have a change that, on the face of it, looks like it is adding complexity to the system (i.e. speakers cannot simply use a stem D with all second-person forms, but now need to know to use stem A in prs), but when we observe the change across the lexicon we appreciate that this change actually has the effect of making verbal inflection more consistent.[23]

[20] In talking about the analogical 'extension' of morphomic patterns, we follow a theory of analogy based on implicative morphology (as advanced in Ackerman et al. 2009, Ackerman & Malouf 2013, Bonami & Beniamine 2016, and Finkel & Stump 2009, among many others), where analogical change involves making predictions about one form from another on the basis of implicative relations which exist between the cells that the forms instantiate. We consider this the only reasonable way of modeling most of the changes we describe.

[21] In the case of *étẹ́ts* 'bet', the contraction of the C morphome cooccurs with the acquisition of stem E in 1.rec, rendering this a pattern 2 verb in 2019.

[22] Because our sample of verbs is limited, we are in no position to know whether speakers of Chichimec favored the C-ii morphome over the other ones due to frequency effects. Our limited data suggest that lexical type frequency is unlikely to have been responsible, because the C-i morphome occurs in fifty of the verbs we find in de Angulo 1933, and the C-iii morphome is attested in thirteen verbs, while the surviving morphome C-ii occurs in only ten verbs. Unfortunately, we do not have access to any discourse data that might reveal whether token frequency played a role.

[23] What do we mean by consistency? There is a relatively common belief among linguists that the outcome of analogical extension targeting a morphological alternation will always entail its simplification by

Furthermore, newly acquired stems exclusively occur in a part of the paradigm where they are already present in other verbs. A clear example of this comes from pattern 6a (as discussed in §7.3), which replaced stem A and stem E with stem B in all 3PL forms, thus reflecting the distribution of stem B in patterns 1–5. In the case of pattern 6a, the acquisition of stem B results in a fifth stem being added to a paradigm that previously consisted of four stems and could thus be seen as contributing additional complexity to the system, but when observed across different paradigms it is evidently a simplification.[24]

While stem B has been extended to all 3PL forms in pattern 6a, the situation with pattern 6b verbs is much less clear. All of the speakers we worked with were inconsistent with regard to the 3PL forms for pattern 6b verbs, suggesting that the system is still undergoing a change. It is worth noting here that all pattern 6b verbs exhibit tone alternations, while pattern 6a verbs do not. We hypothesize, therefore, that the tone-alternation system, despite its apparent orthogonality to the system of stem alternations, has hampered the process of analogical extension, resulting in verbs of pattern 6a and 6b undergoing changes at different rates.[25]

The type of inconsistencies we encountered in the 3PL forms of pattern 6b verbs are illustrated in Table 34, where we present the 3PL forms of the verb *épẹn* 'play music' given by one speaker in three separate elicitation sessions: three are actual recordings, while two are grammaticality judgments.

	RECORDING 1		RECORDING 2		RECORDING 3		JUDGMENT 1			JUDGMENT 2	
	3PL		3PL		3PL		3PL			3PL	
PRS	pʔẹn	B	pʔẹn	B	βẹn	C	* pẹn	A	✓	pʔẹn	B
SEQ	mbɛ́n	E	pʔɛ́n	B	pʔɛ́n	B	✓ mbɛ́n	E	✓	pʔɛ́n	B
FUT	mbɛ́n	E	mbɛ́n	E	pʔɛ́n	B	✓ mbɛ́n	E	✓	pʔɛ́n	B
ANT	mbɛ́n	E	pʔɛ́n	B	pʔɛ́n	B	✓ mbɛ́n	E	✓	pʔɛ́n	B
REC	pʔẹn	B	pʔẹn	B	βẹn	C	* pẹn	A	✓	pʔẹn	B
IMM	pʔẹn	B	mbẹn	E	βẹn	C	* pẹn	A	✓	pʔẹn	B
POT	pʔẹn	B	pʔẹn	B	βẹn	C	* pẹn	A	✓	pʔẹn	B
NEG	pʔɛ́n	B	pʔɛ́n	B	βɛ́n	C	* pɛ́n	A	✓	pʔɛ́n	B

TABLE 34. 3PL stems of *épẹn* 'play music', including grammaticality judgments.

way of leveling. While instances of leveling are found in European languages for which we have historical documentation, they are certainly not the only instances of morphological change involving analogy. The fact that linguistic textbooks and some linguists persist in using examples of leveling as (the clearest) examples of analogical change (often the same ones from the same languages) has certainly not helped to dismantle this belief, despite efforts (starting with Maiden 1992) to show that, at least for Romance, the core of analogical change pertaining to verbal morphology has little to do with leveling. A number of current studies in analogical theory (e.g. Albright 2005 and Garrett 2008) defend a view that paradigmatic leveling is the result of a search for paradigm uniformity, which they conceive of as 'the extension of an existing pattern of nonalternation' (Albright 2005:26); they take the nonalternating paradigm as a model for analogical extension on the basis of its being the dominant pattern. Their focus is again on leveling, so they pay little attention to cases where alternating paradigms are the norm. Fertig 2016, however, calls into question the assumptions behind the notion of paradigmatic uniformity, showing that there are no mechanisms of analogical extension that are exclusive to paradigm leveling or that specifically involve reduction or elimination of allomorphy. Fertig argues in favor of the idea, put forward in Wurzel 1989, that the retention and extension of allomorphy can be accounted for as a general search for system congruity (as opposed to paradigm uniformity). The types of diachronic changes that we observe in Chichimec, which we claim have led to a more consistent system, can be explained in the light of Wurzel's notion of system congruity.

[24] We do not use the term 'simplification' here as a synonym of 'leveling'. We use it loosely to characterize a situation where there is a reduction in the number of possible options: in this particular example, the acquisition of stem B brings pattern 6a verbs into line with patterns 1–5, reducing the possible stem distributions for 3PL cells from two to one.

[25] As this article does not cover tone alternations, we necessarily leave the study of this hypothesis for future research.

In the first recording, the speaker gave stem E in the three 3pl cells that had this stem in 1930; in the second recording stem B was given for two of the cells previously occupied by stem E, but with stem E cropping up unexpectedly in the imm. In the third recording, the speaker gives stem B in those cells that had stem E in 1930, and stem C in all other cells. Interestingly, not one of the remaining 3pl cells has the original stem A, which is nowadays considered to be ungrammatical (see judgment 1).

All of the speakers we worked with displayed very similar patterns of variation and the same grammaticality judgments as those presented in Table 34, not just for the verb *épę̣n* 'play music', but for all pattern 6b verbs. Speakers generally showed either a tendency toward full adoption of stem B in all 3pl cells (as with judgment 2), which results in patterns 6a and 6b collapsing into a single pattern, or toward the pattern observed in recording 1, although other variations (not limited to the patterns of recordings 2 and 3) also arose. This suggests that speakers are not entirely sure which stem to use for this part of the paradigm, yet they all shared a strong sense that stem A in any cell of 3pl is ungrammatical. A final observation we can make from this variation is that the stem zone occupied by stem E in 1930 (i.e. seq, fut, and ant) appears to linger on in the minds of speakers, as evidenced by the distribution of stem B in recording 3.

We consider speakers' dispreference for stem A in any of the 3pl cells of pattern 6b to be a strong indication that they intuitively view the 3pl block of cells as having been replaced in its entirety (as we would expect in the acquisition of the B morphome), but when speakers are already faced with the competition between two nondefault stems (stem B and stem E), the additional layer of complexity brought about by tonal alternations (Palancar & Feist 2019) appears to have hindered the development of this change, creating confusion and explaining the intra- and interspeaker variation we encounter, and even the appearance of stem C where we would not expect to find it (i.e. speakers seem prepared to do anything in order to avoid using stem A). The same cannot be said about pattern 6a verbs (which do not exhibit tone alternations), since speakers do not have to contend with the added intricacy of suprasegmental distinctions.

8.2. Reanalysis of a morphophonological rule as a morphome. In §7.4, we discussed a change that we referred to as co-option, whereby stem C is employed in the stem zone of the B morphome. In 1930, we encounter co-option only in verbs that, for phonological reasons, are precluded from having either a stem B or D (see Table 10), and so we treat these as still having the B or D morphome underlyingly. In 2019, we find that the co-option of stem C to populate the cells of the B morphome has been extended to a small number of verbs for no apparent reason, since their stem A onsets are fully compatible with deriving a stem B.[26]

We hypothesize that the following has taken place. In 1930, co-option of stem C took place only for phonological reasons. Verbs that did not possess a stem B would co-opt stem C for the relevant cells, but those cells were perceived as a stem zone for the B mor-

[26] While we cannot entirely exclude the possibility that there may, ultimately, be a motivating factor (phonological or otherwise) that explains why some verbs co-opt stem C, we were unable to identify any such factor in our data. As well as considering the stem onset, we looked at the voice quality of the stem vowel, since stem Bs often entail aspiration or glottalization (see §4.1), and so their occurrence alongside a laryngeal vowel (i.e. a breathy or creaky vowel) would place two glottal features alongside each other in a single syllable. Kelterer (2017) explains that there are constraints on which laryngeal features can cooccur in a syllable, so we investigated whether this fact might be playing a role in co-option. We found that, while co-option occurs only when the nucleus is a nonmodal vowel, a nonmodal vowel could not be used as a reliable predictor of co-option. In the absence of any other explanation, we conclude that this is a type of morphologically driven co-option, which has arisen by analogy with verbs that exhibit phonologically motivated co-option.

phome. Over time, however, speakers reanalyzed such verbs as genuinely having a stem C in all of the 3PL forms, which, when combined with the stem C cells in 3SG/DU, resulted in a differently shaped morphome involving stem C. This therefore left open the possibility for verbs not precluded from having a stem B to develop in two different ways: (i) with stem B in 3PL, or (ii) with stem C in all forms of 3PL and in four cells of 3SG/DU.

This can be illustrated by the verbs *ékụn* 'herd' (Table 35) and *ékẹ̣ts* 'pick up' (Table 36). Both verbs have a stem A onset in /k/ from which a stem B can be derived, and both verbs belonged to pattern 3 in 1930, yet in 2019 they behave differently with regard to the stem of 3PL forms, with *ékẹ̣ts* 'pick up' co-opting stem C to fill the stem zone of the B morphome. As mentioned in §7.4, we treat these two verbs as subtypes (pattern 2 and pattern 2′) of a single pattern, since they both involve the very same set of cells filled by nondefault stems.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
SEQ	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
FUT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
ANT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
REC	kun	A	kun	A	gun	C	khun	B	ngụn	E	kụn	A	gụn	C	kʔụn	B
IMM	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
POT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
NEG	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B

TABLE 35. Inflectional stems of *ékụn* 'herd' in 1930 and 2019.

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C
SEQ	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	gẹ̣ts	C
FUT	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	gẹ̣ts	C
ANT	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	gẹ̣ts	C
REC	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	ngẹ̣ts	E	kẹ̣ts	A	gẹ̣ts	C	gẹ̣ts	C
IMM	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C
POT	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C
NEG	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C	khẹ̣ts	B	kẹ̣ts	A	kẹ̣ts	A	kẹ̣ts	A	gẹ̣ts	C

TABLE 36. Inflectional stems of *ékẹ̣ts* 'pick up' in 1930 and 2019.

8.3. REANALYSIS OF A MORPHOME DUE TO A PHONOLOGICAL RULE. As well as a morphophonological process giving rise to a new morphome, we also observe this process in reverse, whereby a morphome has been reanalyzed as responding to a phonological rule. In this case, the morphome itself is still present in the language, but it no longer forms part of the inflection of verbs whose stem A onset begins with an affricate (e.g. onsets in /ts/ or /tsh/). We still observe what looks like the morphome in (most of) the cells it previously occupied, but crucially we can no longer treat it as part of the system of stem alternations, since it is nowadays the product of a regular phonological rule.

Consider the verb *utsá* 'make' in 1930 (Table 37). Here we include the inflectional prefixes because they are relevant to this part of the discussion. In 1930, a stem D could be derived from a stem A with an onset in /p/, /ʔ/, or /ts/. In verbs with a stem A onset in /ts/, the stem D counterpart had a palatalized onset in /tʃ/.

Now consider the modern reflex of the verb, *utshá* 'make', in Table 38. In 2019, speakers have reanalyzed the old stem B of this verb *-tshá* as stem A. But note that there is a portion of the paradigm where the stem is *-tʃhá* and it looks like a stem D. However,

1930

	1		2		3SG/DU		3PL	
PRS	tu-tsá	A	su-tʃă	D	u-tsá	A	u-tshá	B
SEQ	ra-tsá	A	gi-tʃă	D	ru-tsá	A	ru-tshá	B
FUT	gu-tsá	A	ki-tʃă	D	ga-tsá	A	ga-tshá	B
ANT	tu-tsá	A	ki-tʃă	D	u-tsá	A	u-tshá	B
REC	ku-tsá	A	ki-tʃă	D	ku-tsá	A	ku-tshá	B
IMM	u-tsá	A	i-tʃă	D	zu-tsá	A	zu-tshá	B
POT	nu-tsá	A	mi-tʃă	D	mu-tsá	A	mi-tshá	B
NEG	su-tsá	A	si-tʃă	D	su-tsá	A	su-tshá	B

TABLE 37. Inflectional forms of *utsá* 'make' in 1930.

the mutation of a stem A onset from /tsh/ → [tʃh] occurs whenever the palatal vowel /i/ is present in the prefix, and it must therefore be treated as a phonological rule. This explains two facts: (i) we no longer observe a palatalized onset /tʃh/ in 2.PRS since its prefix is *su-*, and (ii) this onset now appears in 3PL.POT since its prefix is *mi-*. Note that the stem *-tʃhá* did not occur in 3PL.POT in 1930 even though it also had the prefix *mi-*.

2019

	1		2		3SG/DU		3PL	
PRS	tu-tshá	A	su-tshá	A	u-tshá	A	e-tshá	A
SEQ	ru-tshá	A	i-tʃhá	A	ra-tshá	A	ra-tshá	A
FUT	u-tshá	A	ki-tʃhá	A	a-tshá	A	a-tshá	A
ANT	tu-tshá	A	ki-tʃhá	A	u-tshá	A	u-tshá	A
REC	ku-tshá	A	ki-tʃhá	A	ku-tshá	A	ku-tshá	A
IMM	u-tshá	A	i-tʃhá	A	su-tshá	A	su-tshá	A
POT	nu-tshá	A	mi-tʃhá	A	mu-tshá	A	mi-tʃhá	A
NEG	su-tshá	A	si-tʃhá	A	su-tshá	A	su-tshá	A

TABLE 38. Inflectional forms of *utshá* 'make' in 2019.

Further evidence for this change is found in a number of verbs that did not have a stem D in 1930 and yet which have a palatalized affricate onset whenever the stem follows a prefix ending in /i/. An example comes from the verb *isá* 'gamble' (Table 39), which in 1930 was an invariable verb, with a stem A onset in /s/. By 2019, this verb had acquired the B morphome in 3PL, with an onset in /ts/, but the 3PL.PRS prefix *i-* causes the onset to mutate to [tʃ]. This example further shows how, as a phonological rule, it is orthogonal to the system of stem alternations.

2019

	1		2		3SG/DU		3PL	
PRS	ti-sá	A	si-sá	A	i-sá	A	i-tʃhá	B
SEQ	na-sá	A	sa-sá	A	ra-sá	A	ra-tshá	B
FUT	ta-sá	A	ki-sá	A	a-sá	A	ta-tshá	B
ANT	ta-sá	A	sa-sá	A	ta-sá	A	ta-tshá	B
REC	sa-sá	A	sa-sá	A	sa-sá	A	sa-tshá	B
IMM	i-sá	A	i-sá	A	i-sá	A	su-tshá	B
POT	na-sá	A	na-sá	A	na-sá	A	na-tshá	B
NEG	si-sá	A	si-sá	A	si-sá	A	su-tshá	B

TABLE 39. Inflectional forms of *isá* 'gamble' in 2019.

In fact, it is not just onsets beginning with a voiceless affricate that have palatalized allophones; we also encounter the same behavior with the prenasalized voiced affricate /ndz/, which surfaces as a palatalized variant [ndʒ] if the stem follows a prefix ending in /i/. This is exemplified by the verb *éndze* 'arrive' (Table 40), which in 1930 had the stem

-ndze(r)[27] regardless of whether the prefix ended in /i/. In 2019, however, the stem onset is palatalized in precisely those forms where the prefix ends in /i/ (Table 41). This example further corroborates the fact that we are simply observing the surface realizations of a phonological rule. If this were not the case, we would be forced to posit a D morphome for this verb, which would not only have a shape found in no other verb, but would also occur in the absence of any other morphomes, which we also find nowhere else.

1930

	1		2		3SG/DU		3PL	
PRS	é-ndze	A	kí-ndze	A	é-ndze	A	é-ndzer	A
SEQ	ná-ndze	A	mí-ndze	A	rá-ndze	A	rá-ndzer	A
FUT	tá-ndze	A	kí-ndze	A	gá-ndze	A	gá-ndzer	A
ANT	tá-ndze	A	kí-ndze	A	ú-ndze	A	ú-ndzer	A
REC	ká-ndze	A	kí-ndze	A	kú-ndze	A	kú-ndzer	A
IMM	ká-ndze	A	kí-ndze	A	kú-ndze	A	kú-ndzer	A
POT	má-ndze	A	mí-ndze	A	má-ndze	A	mí-ndzer	A
NEG	sá-ndze	A	sí-ndze	A	sí-ndze	A	sí-ndzer	A

TABLE 40. Inflectional forms of *éndze* ‘arrive’ in 1930.

2019

	1		2		3SG/DU		3PL	
PRS	é-ndze	A	kí-ndʒe	A	é-ndze	A	é-ndzer	A
SEQ	ná-ndze	A	í-ndʒe	A	rá-ndze	A	rá-ndzer	A
FUT	tá-ndze	A	kí-ndʒe	A	á-ndze	A	á-ndzer	A
ANT	tá-ndze	A	kí-ndʒe	A	ú-ndze	A	ú-ndzer	A
REC	ká-ndze	A	kí-ndʒe	A	kú-ndze	A	kú-ndzer	A
IMM	ká-ndze	A	kí-ndʒe	A	ú-ndze	A	ú-ndzer	A
POT	má-ndze	A	mí-ndʒe	A	mí-ndʒe	A	mí-ndʒer	A
NEG	sá-ndze	A	sí-ndʒe	A	sí-ndʒe	A	sí-ndʒer	A

TABLE 41. Inflectional forms of *éndze* ‘arrive’ in 2019.

9. DISCUSSION. Now that we are familiar with the types of changes that have taken place in Chichimec verbal inflection and have considered the mechanisms by which these changes are likely to have taken place, we turn our attention to two subsidiary matters, namely, the extent and the nature of the changes we observe.

9.1. EXTENT OF THE CHANGES. In this section we provide some figures to contextualize the changes that have taken place. Before doing so, however, it will be helpful to compare the set of morphomes encountered in 1930 (Table 42) with those we encounter in 2019 (Table 43).

We can see at a glance that there were ten morphomes in 1930. The original ten morphomes correspond to just five morphomes in the present-day language, with a sixth morphome—which we label the ‘C2 morphome’ in Table 43—having been added to the system (see §8.2).[28] The overall reduction from ten morphomes to six clearly illustrates how the system has simplified, while retaining its intricacy; there has been no reduction

[27] Some verbs in Chichimec take a special plural suffix in *-r* (see Lizárraga Navarro 2018 for further details), but this is orthogonal to the stem-alternation patterns, so we do not discuss it in this article.

[28] In n. 18, we mention that the verb *eβá* ‘go’ still displays a stem C in all cells of 3SG/DU (i.e. the C-iii morphome of 1930). While we consider this verb to be irregular nowadays, we also acknowledge that its paradigm might point to the existence of a C-iii morphome in other verbs in the lexicon that we are unaware of.

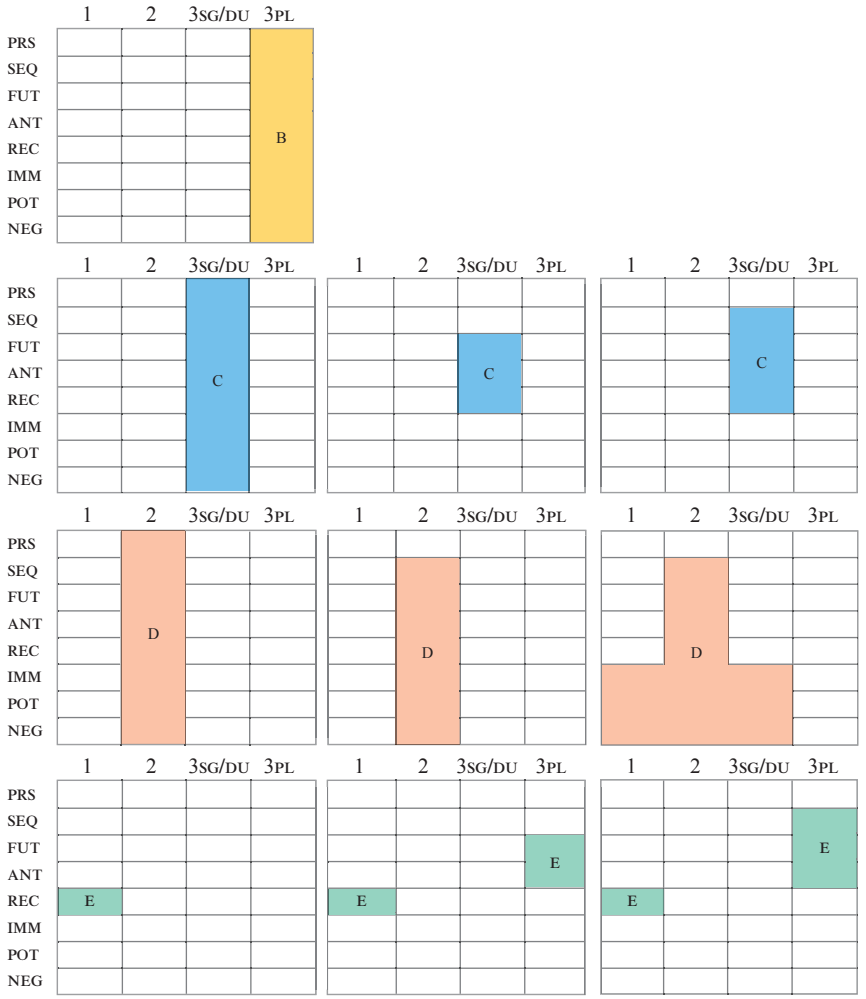

TABLE 42. The morphomes of Chichimec in 1930.

in the number of stem alternants a verb can have, but the way these are distributed over the paradigm has become more consistent across lexemes.[29]

Clearly, in order for the entire inflectional system to have reduced its number of morphomes from ten to just six, a large number of changes must have taken place. Although a quantitative analysis of these changes is outside of the scope of this article, we nevertheless feel it would be informative to present the number of changes the system has undergone at the level of individual morphomes in order to reach its current, more consistent state.

[29] Note that, for simplicity of exposition, we have disregarded the fact that stem E sometimes appears in 3PL forms in pattern 6b verbs, because of the unstable nature of these verbs. Note also that, although some verbs co-opt stem C for the cells of the D morphomes, we do not consider this a possible morphome, since the motivation for this co-option is always phonological. In the case of the C2 morphome, however, co-option that was originally phonological has given rise to a new morphome, so this fact is reflected here (see §8.2).

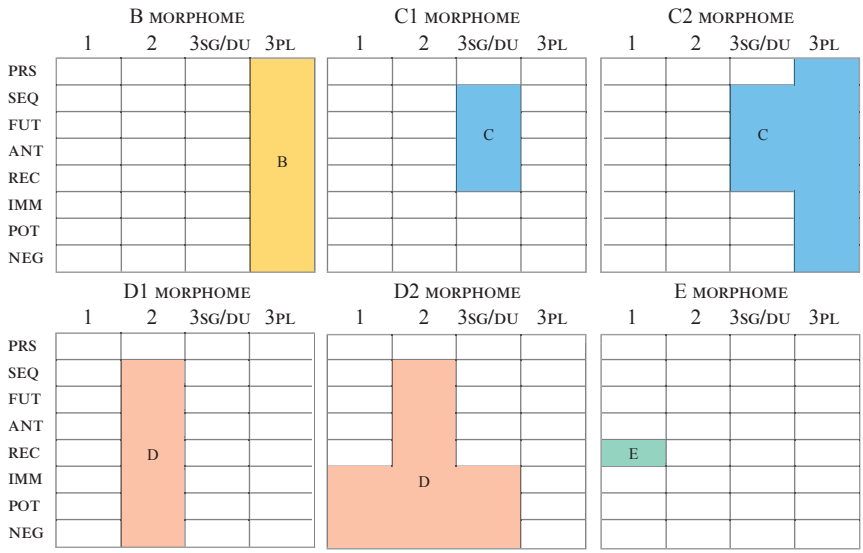

TABLE 43. The morphomes of Chichimec in 2019.[30]

Table 44 details the number of times, in our sample, a given morphome has been maintained, has been acquired, or has undergone expansion or contraction to bring it in line with the six morphomes of the present-day system.

CHANGE	B	C1	D1/D2	E	TOTAL
maintenance	71	9	30	23	*133*
acquisition	32	10	4	18	*64*
expansion	—	50	—	—	*50*
contraction	—	13	5	16	*34*
TOTAL	*103*	*82*	*39*	*57*	*281*

TABLE 44. Extent of morphome maintenance and change.

Table 45 presents the number of times, in our sample, a given morphome has been lost, including those cases where the B morphome has been replaced by the co-option of stem C, giving rise to the C2 morphome. Apart from the B morphome, these figures reveal that loss of a morphome is not at all common. In fact, all five instances of the loss of the D morphome were due to stem D in these verbs being reanalyzed as the result of a phonological rule (see §8.3).

CHANGE	B	C1	D1/D2	E	TOTAL
loss	14	3	5	1	*23*
replacement with co-opted stem	14	—	—	—	*14*
TOTAL	*28*	*3*	*5*	*1*	*37*

TABLE 45. Extent of morphome loss.

[30] Given the nature of Chichimec stem alternations, whereby it is the stem onset that is affected in all cases (except in the case of suppletive stems—see §4.2), morphomes in Chichimec cannot, by definition, overlap, as they have been shown to do in other languages (see Herce 2019). As such, if a verb has the C2 morphome, it cannot have the B morphome (note: we treat verbs that are precluded from having a stem B purely on phonological grounds as still incorporating, underlyingly, the B morphome and C1 morphome). Also, it should be apparent that any given verb can have only one of the D morphomes.

While some verbs have remained virtually unchanged since 1930, for many other verbs the net result of all of these morphome-level changes is an entire restructuring of their paradigms, switching them from one stem-alternation pattern to another. (We touch briefly on the theoretical relevance of this in the conclusion.) In Appendix B, we present a representative example of each diachronic pathway between stem-alternation patterns that we find in our data (illustrating both straightforward cases and verbs involving phonological and morphological co-option). A summary of the changes we find at the level of the paradigm is given in Table 46, with the numbers cross-referencing the examples in Appendix B.

	1930	2019	CHANGE IN STEM-ALTERNATION PATTERN
A1	invariable	invariable	N/A
A2	pattern 1	invariable	loss [B]
A3	pattern 3	invariable	loss [B, C]
A4	pattern 4	invariable	loss [B, D]
A5	pattern 1	pattern 1	N/A
A6	invariable	pattern 1	acquisition [B]
A7	pattern 3	pattern 1	loss [C]
A8	pattern 2	pattern 2	expansion [C]
A9	pattern 2	pattern 2′	expansion [C] + co-option [C→B]
A10	invariable	pattern 2	acquisition [B, C, E]
A11	pattern 1	pattern 2	acquisition [C, E]
A12	pattern 1	pattern 2′	acquisition [C, E] + co-option [C→B]
A13	pattern 3	pattern 2	acquisition [E] + contraction [C]
A14	pattern 3*	pattern 2*	contraction [C]
A15	pattern 3	pattern 2′	acquisition [E] + contraction [C] + co-option [C→B]
A16	pattern 5d	pattern 2	loss [D] + expansion [C]
A17	pattern 5a	pattern 5c	contraction [C]
A18	pattern 5b	pattern 5c	expansion [C]
A19	pattern 5b*	pattern 5c*	expansion [C]
A20	pattern 5c*	pattern 5c*	N/A
A21	pattern 6a	pattern 6	acquisition [B] + contraction [E] + expansion [C]
A22	pattern 6a	pattern 6′	acquisition by co-option [C→B] + contraction [E] + expansion [C]
A23	pattern 6b	pattern 6[a]	acquisition [B] + contraction [E] + expansion [C]

Table 46. Summary of paradigm-level changes [* = exhibits phonological co-option].

[a] For the sake of clarity, we treat pattern 6b verbs as having fully acquired the B morphome, despite the intraspeaker variation still evident in the language. Under this approach, patterns 6a and 6b can be considered to have collapsed into a single pattern 6 in the present-day form of the language.

9.2. Nature of the changes. In our data from 2018–19, we found no significant interspeaker variation with regard to stem-alternation patterns, despite the fact that we worked with consultants spanning three generations. The eldest of the speakers with whom we worked, Trinidad Mata, was born in 1942, only twelve years after de Angulo's field trip to the community (see §2). Trinidad Mata would therefore have acquired his language a mere twenty or so years after de Angulo's visit, and yet, nearly seventy years later, he shares his stem-alternation patterns with the youngest of our consultants, Lucía López, half a century his junior.

On the face of it, this might give the impression that the changes we have presented in this article took place very rapidly, sometime between de Angulo's visit in 1930 and Trinidad Mata acquiring his mother tongue by the early 1950s, or that we may not be witnessing diachronic change at all, but rather dialectal or idiolectal variation. Since Misión de Chichimecas is a small, close-knit community, we can disregard the possibil-

ity of dialectal variation, but, particularly since de Angulo worked with only a single speaker, we have to entertain the possibility that the stem-alternation patterns we find today were already present in 1930 and that the patterns registered by de Angulo are simply a reflection of idiolectal variation on the part of Jorge Mata (de Angulo's consultant).[31] There are, however, four reasons why we believe the changes we present represent diachronic changes in the language, which we detail below.

First, if the inflectional system of the language was susceptible to significant idiolectal variation in 1930, one must wonder why speakers spanning three generations exhibit a high degree of consistency in terms of stem-alternation patterns in 2019. The data we collected suggest that, while not impossible, idiolectal variation is an improbable explanation for the different patterns we observe between the two reference points.

Second, noting the time interval between de Angulo's field trip and the year of Trinidad Mata's birth misses a key point, namely, the age of de Angulo's consultant. De Angulo (1933) does not disclose Jorge Mata's age, but we can assume that he was some way into his adult life, given that he was married and that he and his wife were able to host de Angulo at their home (i.e. an indication that they no longer lived with their parents, but owned their own house). If we estimate that Jorge Mata would have been around thirty years of age in 1930, twelve years before Trinidad Mata was born, this equates to an age difference between them of forty or so years (around two generations), a timespan not dissimilar to the fifty-odd years that separate Trinidad Mata from our youngest consultant, Lucía López. In diachronic terms, then, this places Trinidad Mata around halfway between Jorge Mata and our youngest speaker, so it is likely that some of the changes were already in progress when Trinidad Mata was acquiring his language. In any case, we do not believe there is a need to speculate that the changes were fully effectuated within two generations of de Angulo's visit, for the reason we outline next.

Third, the idea that synchronic variation between speakers of different generations can be used as a proxy for revealing long-term trends—the notion of apparent time (e.g. Bailey 2002, Bailey et al. 1991, Labov 1966)—is predicated on the belief that speakers' linguistic systems remain fairly stable after they have acquired their language (e.g. Lightfoot 1999, Sobin 1997). But research on language change across the lifespan of an individual (e.g. Sankoff 2013, 2018, Sankoff & Blondeau 2007, Sankoff & Evans Wagner 2006, Schilling-Estes 2005) has shown that the language of adult speakers is susceptible to change over time. Labov (1994:84) describes four patterns of language change in the individual and the community, the fourth of which he terms COMMUNAL CHANGE, where 'all members of the community alter their frequencies together, or acquire new forms simultaneously'. In the absence of any panel studies investigating changes to complex inflectional systems over the lifespan of individual speakers, we are unable to say with any certainty if this is indeed the type of change we see in Chichimec. However, the consistency we find across speakers' stem-alternation patterns in present-day Chichimec points to this being a case of communal change (as opposed to a generational change, which would be observable in apparent time). As such, it is plausible that the inflectional system of Trinidad Mata started off more closely aligned with that of Jorge Mata, but has undergone changes over the course of his life. Further evidence in support of this being a communal change comes from pattern 6b verbs (see §8.1), where all of our consultants, regardless of age, exhibit variation in

[31] We would like to thank the two anonymous referees who highlighted this possible alternative interpretation.

their 3PL forms, suggesting that all members of the speech community are simultaneously restructuring these paradigms.

Our fourth and final point is perhaps the simplest and most convincing reason why we believe we are indeed observing diachronic change. Although the variation between individual morphomes may be relatively minor in nature, the combined effect of lots of small differences is much more significant. The overall divergence between the two systems makes it problematic to conceive of it as mere idiolectal variation. As we have seen throughout this article (and as the additional examples in Appendix B show), some verbs have undergone complete restructuring, resulting in a change in their stem-alternation pattern (i.e. inflectional class). Idiolectal variation in which a proportion of one speaker's verbs belong to completely different inflectional classes from another speaker's verbs would not be conducive to successful communication.

10. Conclusion. We have laid out the diachrony of the stem-alternation patterns in Chichimec, based on a comparison of 160 verbs from 1930 and 2019, and identified three mechanisms that we believe gave rise to the changes observed. Throughout the article, we treated a fixed group of cells (i.e. stem zone) sharing the same nondefault stem as a morphome, and we argued that morphological changes in the verbal inflection of Chichimec make sense only if morphomes are regarded as morphological objects that can be manipulated by speakers.

When changes affecting the distribution of a stem alternant are seen in isolation, they may give the impression that the morphome has simply contracted or expanded, leading to the overall sense that the structure in question is generally quite fluid, but in fact the opposite is true. In all of the diachronic changes we have seen, morphomes behave as indivisible units. For example, when the paradigm of a verb that had the three-cell configuration involving stem C in 3SG/DU nowadays has a four-cell configuration, we propose that from the right morphological perspective the change should not be taken to mean that the verb has acquired a stem C in a fourth cell, but rather that speakers have generalized one morphome (i.e. the old C-ii morphome, now the C1 morphome) in all verbs that had a morphome involving stem C. Furthermore, we do not find cases where a verb acquires a new stem in a distribution not found elsewhere, nor do we find verbs where a morphome loses a stem in a subset of its cells, except where doing so brings it into line with an existing distribution.

We have also shown that, just as morphomes adhere to fixed groupings of cells, paradigms in Chichimec adhere to fixed groupings of morphomes. The implications of this can be clearly seen in the diachrony of stem-alternation patterns. In spite of all the changes that have taken place, with morphomes expanding, contracting, being acquired, or being lost, the structure of the paradigm has been preserved. In other words, the changes that have taken place have not done so haphazardly, but in keeping with a higher-level structure. For instance, the verbs *ékq̃* 'take out' (Table 32) and *ékụn* 'herd' (Table 35) belonged to pattern 3 in 1930. As a result of the diachronic changes that stem C has undergone, the distribution of stem C was reduced in these verbs. The change could have stopped there, but instead both verbs (and others like them) also acquired a stem E, with the effect of rendering them pattern 2 verbs (Table 47).

We saw the same behavior in Table 25, where a previously invariable verb has acquired the B, C1, and E morphomes as though they came as a fixed bundle, and Table 26, where a pattern 1 verb, which already had the B morphome, has acquired the C1 and E morphomes. In contrast, we do not encounter verbs that acquire only the C1 morphome in the absence of the B morphome, or verbs that acquire the E morphome in the absence of both the B and C1 morphomes.

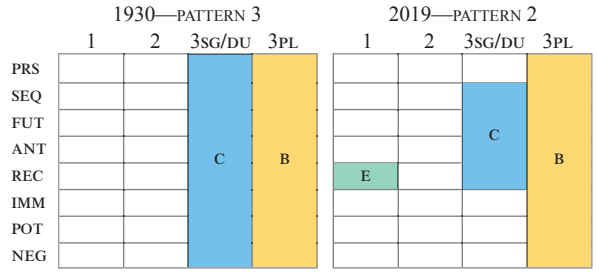

TABLE 47. Change in stem-alternation patterns of verbs like *ékq̃* 'take out' and *ékụn* 'herd'.

In this article, by studying the paradigms of Chichimec verbs over a time period of almost a hundred years, we hope to have shown two important findings that contribute to a better understanding of the inflectional structure of languages with stem-alternation patterns. First, we have shown that clusters of cells behave together as one, reaffirming the notion of the morphome, and second, we have shown that clusters of morphomes behave in unison, underscoring the importance of the concept of the paradigm.

In discussing morphomes, we have shown that stem zones, the stems that can fill them, and the associations between zones and what fills them constitute a morphological ontology that is not only useful, but also fundamental in making sense of morphological changes in inflection. Specifically, treating stem zones independently of the forms that populate their respective cells allows us to explain mismatches between zone and form in an elegant manner, without needing to posit myriad unnecessary morphomes and stem-alternation patterns; this approach allows us to account for co-option of a stem when the required stem is phonologically precluded.

Similarly, just as cells cluster together in morphomes, we have shown that morphomes cluster together in (stem-alternation) patterns. Remarkably, in spite of all the changes that the system has undergone at the level of individual morphomes, the number of ways in which the morphomes are able to fit together in a paradigm has actually reduced. Far from leading to new stem-alternation patterns not seen in 1930, the changes have led to the loss of patterns 3, 4, 5a, 5b, and 5d, with pattern 6b looking likely to follow suit. Overall then, the morphological changes exhibited by Chichimec verbs can be fully appreciated only if one conceives of the restructuring as operating at a paradigmatic level of morphological structure.

The facts from Chichimec that we have introduced and discussed in depth in this article strongly suggest that paradigms cannot be treated as epiphenomena that emerge at the syntax-morphology interface through the association of a lexeme's forms, but that they constitute, instead, essential elements in the morphological domain of inflection. The morphological perspective that we advocate in this article not only helps us to understand the diachrony of Chichimec inflection in a more comprehensive way, but it also shows that, by using the morphomes and clusters of morphomes at their disposal, speakers have converted the verbal inflection of their language into a more consistent system, while keeping much of its original complexity.

APPENDIX A: TONAL CHANGES IN PARADIGMS

For some verbs with stem alternations, there is an argument for treating the tone changes as being linked to the individual stem forms, because the tonal changes align with the stem alternations, as illustrated by the verb *é?a* 'bury' in Table A1, where forms involving stem A bear HL tone, those with stem D have LH tone, and forms with either stem B or stem C have HH tone.

	1			2			3SG/DU			3PL		
PRS	é-ʔa	HL	A	kí-ʔa	HL	A	é-ʔa	HL	A	é-rʔá	HH	B
SEQ	rá-ʔa	HL	A	i-tʔá	LH	D	rá-ndá	HH	C	rá-rʔá	HH	B
FUT	á-ʔa	HL	A	ki-tʔá	LH	D	á-ndá	HH	C	á-rʔá	HH	B
ANT	tú-ʔa	HL	A	ki-tʔá	LH	D	ú-ndá	HH	C	ú-rʔá	HH	B
REC	kú-ʔa	HL	A	ki-tʔá	LH	D	kú-ndá	HH	C	kú-rʔá	HH	B
IMM	ú-ʔa	HL	A	i-tʔá	LH	D	sú-ʔa	HL	A	sú-rʔá	HH	B
POT	nú-ʔa	HL	A	mi-tʔá	LH	D	mú-ʔa	HL	A	mí-rʔá	HH	B
NEG	sú-ʔa	HL	A	si-tʔá	LH	D	sú-ʔa	HL	A	sú-rʔá	HH	B

TABLE A1. Paradigm of *éʔa* 'bury' (2019) showing aligned tone and stem alternations.

But most often tonal changes display distributions that differ from the distribution of the stems, meaning the tonal changes can be thought of as grammatical in nature. However, we can see that tone alternations are orthogonal to stem alternations, since verbs of the same stem-alternation pattern can have different tone alternations (or indeed no tone alternations at all), as illustrated in Table A2 and Table A3, both verbs of stem-alternation pattern 1, yet with distinct tone alternations.

	1			2			3SG/DU			3PL		
PRS	é-sá	HH	A	kí-sá	HH	A	é-sá	HH	A	é-tshá	HH	B
SEQ	ra-sá	LH	A	í-sa	HL	A	ra-sá	LH	A	ra-tshá	LH	B
FUT	a-sá	LH	A	kí-sa	HL	A	a-sá	LH	A	a-tshá	LH	B
ANT	tu-sá	LH	A	kí-sa	HL	A	u-sá	LH	A	u-tshá	LH	B
REC	kú-sá	HH	A	kí-sa	HL	A	kú-sá	HH	A	kú-tshá	HH	B
IMM	u-sá	LH	A	í-sa	HL	A	su-sá	LH	A	su-tshá	LH	B
POT	nú-sá	HH	A	mí-sa	HL	A	mú-sá	HH	A	mi-tʃhá	LH	B
NEG	su-sá	LH	A	sí-sa	HL	A	su-sá	LH	A	su-tshá	LH	B

TABLE A2. Paradigm of *ésá* 'win' (2019) showing cross-cutting tone and stem alternations.

	1			2			3SG/DU			3PL		
PRS	tí-tẹr	HL	A	sí-tẹr	HL	A	í-tẹr	HL	A	í-rhẹr	HL	B
SEQ	ná-tẹr	HL	A	sa-tɛ́r	LH	A	ná-tẹr	HL	A	ná-rhẹr	HL	B
FUT	tá-tẹr	HL	A	sa-tɛ́r	LH	A	tá-tẹr	HL	A	tá-rhẹr	HL	B
ANT	tá-tẹr	HL	A	sa-tɛ́r	LH	A	tá-tẹr	HL	A	tá-rhẹr	HL	B
REC	sá-tẹr	HL	A	sa-tɛ́r	LH	A	sá-tẹr	HL	A	sá-rhẹr	HL	B
IMM	í-tẹr	HL	A	í-tẹr	HL	A	í-tẹr	HL	A	í-rhẹr	HL	B
POT	ná-tẹr	HL	A	sa-tɛ́r	LH	A	ná-tẹr	HL	A	ná-rhẹr	HL	B
NEG	sí-tẹr	HL	A	sí-tẹr	HL	A	sí-tẹr	HL	A	sí-rhẹr	HL	B

TABLE A3. Paradigm of *ítẹr* 'laugh' (2019) showing cross-cutting tone and stem alternations.

APPENDIX B: EXAMPLES OF EVERY PARADIGM-LEVEL CORRESPONDENCE BETWEEN 1930 AND 2020

(A1) [invariable = invariable]: *úkhar* 'possess'

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
SEQ	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
FUT	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
ANT	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
REC	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
IMM	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
POT	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A
NEG	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A	khar	A

(A2) [pattern 1 → invariable]: *éndun* ‘buzz’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
SEQ	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
FUT	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
ANT	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
REC	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
IMM	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
POT	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A
NEG	ndun	A	ndun	A	ndun	A	ndhun	B	ndun	A	ndun	A	ndun	A	ndun	A

(A3) [pattern 3 → invariable]: *úpan* ‘heat’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
SEQ	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
FUT	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
ANT	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
REC	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
IMM	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
POT	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A
NEG	pan	A	pan	A	nban	C	phan	B	pan	A	pan	A	pan	A	pan	A

Note: The verb *úpan* ‘heat’ neatly illustrates the fact that some of the correspondences between stem-onset mutations have changed since 1930, since in present-day Chichimec /nb/ is not a permitted stem C onset for a verb with a stem A onset in /p/. Note that the correspondences presented in Table 10 relate to present-day Chichimec.

(A4) [pattern 4 → invariable]: *útsʔo* ‘spend’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tsʔo	A	tsʔo	A	tsʔo	A
SEQ	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A
FUT	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A
ANT	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A
REC	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A
IMM	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A
POT	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tʃʔo	A
NEG	tsoh	A	tʃoh	D	tsoh	A	tshoh	B	tsʔo	A	tʃʔo	A	tsʔo	A	tsʔo	A

Notes: (i) The postalveolar affricate onset of the original D morphome has been reanalyzed as a result of a phonological rule (see §8.3) whereby the stem onset is [tʃʔ] if it follows an inflectional prefix ending in /i/, as indicated by the cells shaded in gray. (ii) We register a change from /ts/ → /tsʔ/ in the stem A onset of this verb, ruling out a stem B (see Table 10).

(A5) [pattern 1 = pattern 1]: *ésu̱ts* ‘split’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
SEQ	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
FUT	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
ANT	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
REC	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
IMM	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B
POT	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tʃʔu̱ts	B
NEG	sus	A	sus	A	sus	A	tsus	B	su̱ts	A	su̱ts	A	su̱ts	A	tsʔu̱ts	B

Note: The cell shaded in gray indicates that the onset of this stem has changed, /ts/ → [tʃ], in the presence of the prefix *mi-* (now a regular phonological process).

(A6) [invariable → pattern 1]: *iβ́ír* ‘wish’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
SEQ	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
FUT	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
ANT	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
REC	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
IMM	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
POT	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B
NEG	mír	A	mír	A	mír	A	mír	A	β̃ír	A	β̃ír	A	β̃ír	A	mhír	B

(A7) [pattern 3 → pattern 1]: *ésą* ‘read’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
SEQ	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
FUT	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
ANT	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
REC	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
IMM	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B
POT	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tʃʔą	B
NEG	sa	A	sa	A	dza	C	tsha	B	są	A	są	A	są	A	tsʔą	B

Note: The cell shaded in gray indicates that the onset of this stem has changed, /ts/ → [tʃ], in the presence of the prefix *mi-* (now a regular phonological process).

(A8) [pattern 2 = pattern 2]: *etó* ‘watch’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tó	A	tó	A	tó	A	rhó	B	tó	A	tó	A	tó	A	rhó	B
SEQ	tó	A	tó	A	tó	A	rhó	B	tó	A	tó	A	ró	C	rhó	B
FUT	tó	A	tó	A	ró	C	rhó	B	tó	A	tó	A	ró	C	rhó	B
ANT	tó	A	tó	A	ró	C	rhó	B	tó	A	tó	A	ró	C	rhó	B
REC	ndó	E	tó	A	ró	C	rhó	B	ndó	E	tó	A	ró	C	rhó	B
IMM	tó	A	tó	A	tó	A	rhó	B	tó	A	tó	A	tó	A	rhó	B
POT	tó	A	tó	A	tó	A	rhó	B	tó	A	tó	A	tó	A	rhó	B
NEG	tó	A	tó	A	tó	A	rhó	B	tó	A	tó	A	tó	A	rhó	B

(A9) [pattern 2 → pattern 2′]: *etę́ts* ‘receive’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	téts	A	téts	A	téts	A	rhéts	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
SEQ	téts	A	téts	A	téts	A	rhéts	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
FUT	téts	A	téts	A	réts	C	rhéts	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
ANT	téts	A	téts	A	réts	C	rhéts	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
REC	ndéts	E	téts	A	réts	C	rhéts	B	ndę́ts	E	tę́ts	A	rę́ts	C	rę́ts	C
IMM	téts	A	téts	A	téts	A	rhéts	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
POT	téts	A	téts	A	téts	A	rhéts	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
NEG	téts	A	téts	A	téts	A	rhéts	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C

Note: In *etę́ts* ‘receive’, stem C has been co-opted to fill the stem zone of the B morphome, for no apparent (phonological) reason. We consider the B and C morphomes to have merged and been reanalyzed as a new morphome, and we treat such verbs as a subtype of pattern 2, which we label pattern 2′.

(A10) [invariable → pattern 2]: *ikú* ‘run a race’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	kú	A	khú	B
SEQ	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	gú	C	khú	B
FUT	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	gú	C	khú	B
ANT	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	gú	C	khú	B
REC	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	ngú	E	kú	A	gú	C	khú	B
IMM	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	kú	A	khú	B
POT	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	kú	A	khú	B
NEG	kúʔ	A	kúʔ	A	kúʔ	A	kúʔ	A	kú	A	kú	A	kú	A	khú	B

(A11) [pattern 1 → pattern 2]: *ekó* ‘deny’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
SEQ	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
FUT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
ANT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	gó	C	khó	B
REC	kó	A	kó	A	kó	A	khó	B	ngó	E	kó	A	gó	C	khó	B
IMM	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
POT	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B
NEG	kó	A	kó	A	kó	A	khó	B	kó	A	kó	A	kó	A	khó	B

(A12) [pattern 1 → pattern 2′]: *etę́ts* ‘lift’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
SEQ	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
FUT	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
ANT	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	rę́ts	C	rę́ts	C
REC	téts	A	téts	A	téts	A	thét̄s	B	ndę́ts	E	tę́ts	A	rę́ts	C	rę́ts	C
IMM	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
POT	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C
NEG	téts	A	téts	A	téts	A	thét̄s	B	tę́ts	A	tę́ts	A	tę́ts	A	rę́ts	C

Notes: In *etę́ts* ‘lift’, (i) stem C has been co-opted to fill the stem zone of the B morphome, for no apparent (phonological) reason. We consider the B and C morphomes to have merged and been reanalyzed as a new morphome, and we treat such verbs as a subtype of pattern 2, which we label pattern 2′; (ii) as a result of the changes, the stems of this verb are now homophonous with the stems of *etę́ts* ‘receive’ (see example A9).

(A13) [pattern 3 → pattern 2]: *ékụn* ‘herd’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
SEQ	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
FUT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
ANT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	gụn	C	kʔụn	B
REC	kun	A	kun	A	gun	C	khun	B	ngụn	E	kụn	A	gụn	C	kʔụn	B
IMM	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
POT	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B
NEG	kun	A	kun	A	gun	C	khun	B	kụn	A	kụn	A	kụn	A	kʔụn	B

(A14) [pattern 3 → pattern 2]: *ugáʔ* ‘greet’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	gáʔ	A	ngáʔ	{B}
SEQ	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	ngáʔ	C	ngáʔ	{B}
FUT	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	ngáʔ	C	ngáʔ	{B}
ANT	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	ngáʔ	C	ngáʔ	{B}
REC	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	ngáʔ	C	ngáʔ	{B}
IMM	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	gáʔ	A	ngáʔ	{B}
POT	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	gáʔ	A	ngáʔ	{B}
NEG	gá	A	gá	A	ngá	C	ngá	{B}	gáʔ	A	gáʔ	A	gáʔ	A	ngáʔ	{B}

Note: In *ugáʔ* ‘greet’, stem C is co-opted to fill the stem zone of the B morphome (in both 1930 and 2019), but since stem B is precluded on phonological grounds (see Table 10), we treat the B morphome as being present underlyingly and indicate this with curly brackets.

(A15) [pattern 3 → pattern 2′]: *ékẹts* ‘pick up’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	kẹts	A	gẹts	C
SEQ	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	gẹts	C	gẹts	C
FUT	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	gẹts	C	gẹts	C
ANT	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	gẹts	C	gẹts	C
REC	kẹts	A	kẹts	A	gẹts	C	khẹts	B	ngẹts	E	kẹts	A	gẹts	C	gẹts	C
IMM	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	kẹts	A	gẹts	C
POT	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	kẹts	A	gẹts	C
NEG	kẹts	A	kẹts	A	gẹts	C	khẹts	B	kẹts	A	kẹts	A	kẹts	A	gẹts	C

Note: In *ékẹts* ‘pick up’, stem C has been co-opted to fill the stem zone of the B morphome, for no apparent (phonological) reason. We consider the B and C morphomes to have merged and been reanalyzed as a new morphome, and we treat such verbs as a subtype of pattern 2, which we label pattern 2′.

(A16) [pattern 5d → pattern 2]: *etsá* ‘try’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	tsá	A	tʃa	D	tsá	A	tshá	B	tsá	A	tʃa	A	tsá	A	tsʔá	B
SEQ	tsá	A	tʃa	D	tsá	A	tshá	B	tsá	A	tʃa	A	zá	C	tsʔá	B
FUT	tsá	A	tʃa	D	zá	C	tshá	B	tsá	A	tʃa	A	zá	C	tsʔá	B
ANT	tsá	A	tʃa	D	zá	C	tshá	B	tsá	A	tʃa	A	zá	C	tsʔá	B
REC	ndzá	E	tʃa	D	zá	C	tshá	B	ndzá	E	tʃa	A	zá	C	tsʔá	B
IMM	tsá	A	tʃa	D	tsá	A	tshá	B	tsá	A	tʃa	A	tsá	A	tsʔá	B
POT	tsá	A	tʃa	D	tsá	A	tshá	B	tsá	A	tʃa	A	tsá	A	tʃʔá	B
NEG	tsá	A	tʃa	D	tsá	A	tshá	B	tsá	A	tʃa	A	tsá	A	tsʔá	B

Note: In *etsá* ‘try’, the postalveolar affricate onset of the original D morphome has been reanalyzed as the result of a phonological rule (see §8.3) whereby the stem onset is [tʃ] if it follows an inflectional prefix ending in /i/, as indicated by the cells shaded in gray.

(A17) [pattern 5a → pattern 5c]: *eʔą́n* ‘ask’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	ʔą́n	A	ʔą́n	A	rʔą́n	B
SEQ	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
FUT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
ANT	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
REC	ʔą́n	A	tán	D	ndán	C	rʔą́n	B	ʔą́n	A	tʔą́n	D	ndą́n	C	rʔą́n	B
IMM	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B
POT	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B
NEG	ʔą́n	A	tán	D	ʔą́n	A	rʔą́n	B	ʔą́n	A	tʔą́n	D	ʔą́n	A	rʔą́n	B

Note: For *eʔą́n* ‘ask’, one of our main consultants gave us stem C as *-ndán* (i.e. with a modal vowel), like it was in 1930.

(A18) [pattern 5b → pattern 5c]: *éʔe* ‘give’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	ʔe	A	ʔe	A	ʔe	A	rʔé	B	ʔe	A	ʔe	A	ʔe	A	rʔé	B
SEQ	ʔe	A	té	D	ʔe	A	rʔé	B	ʔe	A	tʔé	D	ndé	C	rʔé	B
FUT	ʔe	A	té	D	ndé	C	rʔé	B	ʔe	A	tʔé	D	ndé	C	rʔé	B
ANT	ʔe	A	té	D	ndé	C	rʔé	B	ʔe	A	tʔé	D	ndé	C	rʔé	B
REC	ʔe	A	té	D	ndé	C	rʔé	B	ʔe	A	tʔé	D	ndé	C	rʔé	B
IMM	ʔe	A	té	D	ʔe	A	rʔé	B	ʔe	A	tʔé	D	ʔe	A	rʔé	B
POT	ʔé	A	té	D	ʔé	A	rʔé	B	ʔe	A	tʔé	D	ʔé	A	rʔé	B
NEG	ʔe	A	té	D	ʔe	A	rʔé	B	ʔe	A	tʔé	D	ʔe	A	rʔé	B

(A19) [pattern 5b → pattern 5c]: *éhun* ‘throw’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	hun	A	hun	A	hun	A	rhun	B	hun	A	hun	A	hun	A	rhún	B
SEQ	hun	A	nhín	{D}	hun	A	rhun	B	hun	A	nhín	{D}	nhín	C	rhún	B
FUT	hun	A	nhín	{D}	nhin	C	rhun	B	hun	A	nhín	{D}	nhín	C	rhún	B
ANT	hun	A	nhín	{D}	nhin	C	rhun	B	hun	A	nhín	{D}	nhín	C	rhún	B
REC	hun	A	nhín	{D}	nhin	C	rhun	B	hun	A	nhín	{D}	nhín	C	rhún	B
IMM	hun	A	nhín	{D}	hun	A	rhun	B	hun	A	nhín	{D}	hun	A	rhún	B
POT	hún	A	nhín	{D}	hún	A	rhun	B	hun	A	nhín	{D}	hun	A	rhún	B
NEG	hun	A	nhín	{D}	hun	A	rhun	B	hun	A	nhín	{D}	hun	A	rhún	B

Note: In *éhun* ‘throw’, stem C is co-opted to fill the stem zone of the D morphome (in both 1930 and 2019), but since stem D is precluded on phonological grounds (see Table 10), we treat the D morphome as being present underlyingly and indicate this with curly brackets.

(A20) [pattern 5c = pattern 5c]: *éhá* ‘drink’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	há	A	há	A	há	A	rhá	B	há	A	há	A	há	A	rhá	B
SEQ	há	A	nhá	{D}	nhá	C	rhá	B	há	A	nhá	{D}	nhá	C	rhá	B
FUT	há	A	nhá	{D}	nhá	C	rhá	B	há	A	nhá	{D}	nhá	C	rhá	B
ANT	há	A	nhá	{D}	nhá	C	rhá	B	há	A	nhá	{D}	nhá	C	rhá	B
REC	há	A	nhá	{D}	nhá	C	rhá	B	há	A	nhá	{D}	nhá	C	rhá	B
IMM	há	A	nhá	{D}	há	A	rhá	B	há	A	nhá	{D}	há	A	rhá	B
POT	há	A	nhá	{D}	há	A	rhá	B	há	A	nhá	{D}	há	A	rhá	B
NEG	há	A	nhá	{D}	há	A	rhá	B	há	A	nhá	{D}	há	A	rhá	B

Note: In *éhá* ‘drink’, stem C is co-opted to fill the stem zone of the D morphome (in both 1930 and 2019), but since stem D is precluded on phonological grounds (see Table 10), we treat the D morphome as being present underlyingly and indicate this with curly brackets.

(A21) [pattern 6a → pattern 6]: *épɛ́* ‘send’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pé	A	pé	A	pé	A	pé	A	pɛ́	A	pɛ́	A	pɛ́	A	pʔɛ́	B
SEQ	pé	A	ngwé	D	pé	A	pé	A	pɛ́	A	ngwɛ́	D	βɛ́	C	pʔɛ́	B
FUT	pé	A	ngwé	D	mé	C	mbé	E	pɛ́	A	ngwɛ́	D	βɛ́	C	pʔɛ́	B
ANT	pé	A	ngwé	D	mé	C	mbé	E	pɛ́	A	ngwɛ́	D	βɛ́	C	pʔɛ́	B
REC	mbé	E	ngwé	D	mé	C	pé	A	mbɛ́	E	ngwɛ́	D	βɛ́	C	pʔɛ́	B
IMM	ngwé	D	ngwé	D	ngwé	D	pé	A	ngwɛ́	D	ngwɛ́	D	ngwɛ́	D	pʔɛ́	B
POT	ngwé	D	ngwé	D	ngwé	D	pé	A	ngwɛ́	D	ngwɛ́	D	ngwɛ́	D	pʔɛ́	B
NEG	ngwé	D	ngwé	D	ngwé	D	pé	A	ngwɛ́	D	ngwɛ́	D	ngwɛ́	D	pʔɛ́	B

(A22) [pattern 6a → pattern 6′]: *épɛ* ‘smell’

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pe	A	pe	A	pe	A	pe	A	pɛ	A	pɛ	A	pɛ	A	βɛ	C
SEQ	pe	A	ngwe	D	pe	A	pe	A	pɛ	A	ngwɛ	D	βɛ	C	βɛ	C
FUT	pe	A	ngwe	D	me	C	mbe	E	pɛ	A	ngwɛ	D	βɛ	C	βɛ	C
ANT	pe	A	ngwe	D	me	C	mbe	E	pɛ	A	ngwɛ	D	βɛ	C	βɛ	C
REC	mbe	E	ngwe	D	me	C	pe	A	mbɛ	E	ngwɛ	D	βɛ	C	βɛ	C
IMM	ngwe	D	ngwe	D	ngwe	D	pe	A	ngwɛ	D	ngwɛ	D	ngwɛ	D	βɛ	C
POT	ngwe	D	ngwe	D	ngwe	D	pe	A	ngwɛ	D	ngwɛ	D	ngwɛ	D	βɛ	C
NEG	ngwe	D	ngwe	D	ngwe	D	pe	A	ngwɛ	D	ngwɛ	D	ngwɛ	D	βɛ	C

Note: In *épɛ* ‘smell’, stem C has been co-opted to fill the stem zone of the (newly acquired) B morphome, for no apparent (phonological) reason. We consider that the (new) B and (preexisting) C morphomes have merged and been reanalyzed as a new morphome, and we treat such verbs as a subtype of pattern 6, which we label pattern 6′.

(A23) [pattern 6b → pattern 6]: *épí* 'wait'

	1930								2019							
	1		2		3SG/DU		3PL		1		2		3SG/DU		3PL	
PRS	pi	A	pi	A	pi	A	pi	A	pí	A	pí	A	pí	A	pʔí	B
SEQ	pí	A	ngwi	D	pí	A	mbí	E	pí	A	ngwi	D	βí	C	pʔí	B
FUT	pí	A	ngwi	D	mí	C	mbí	E	pí	A	ngwi	D	βí	C	pʔí	B
ANT	pí	A	ngwi	D	mí	C	mbí	E	pí	A	ngwi	D	βí	C	pʔí	B
REC	mbi	E	ngwi	D	mi	C	pi	A	mbí	E	ngwi	D	βí	C	pʔí	B
IMM	ngwí	D	ngwi	D	ngwí	D	pí	A	ngwí	D	ngwi	D	ngwí	D	pʔí	B
POT	ngwí	D	ngwi	D	ngwí	D	pí	A	ngwí	D	ngwi	D	ngwí	D	pʔí	B
NEG	ngwí	D	ngwi	D	ngwí	D	pí	A	ngwí	D	ngwi	D	ngwí	D	pʔí	B

Note: For the sake of clarity, we treat this verb as having fully acquired the B morphome, despite the intraspeaker variation still evident in the language (see §8.1).

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