Diachrony of Coda /ŋ/ in Suzhou, Wu Chinese: Generational Change and Differing Readings

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This paper looks at descriptive data focusing on the diachrony of coda /ŋ/ in Suzhou, Wu Chinese under the context of three consecutive generations and Differing Literary and Colloquial Readings. The majority of change can be attributed to two phonetics-induced models, *ease of articulation* (Hockett 1958) and *misperception and reconstruction* (Ohala 1981), while the lexically specific pronunciation split between Literary and Colloquial Readings is explainable by standard dialect loanword effects from Mandarin Chinese. Combining language-internal and language-external forces to a fully regular analysis, the paper has proposed an alternative to approach lexically specific patterns of sound change, which would otherwise be considered a case of irregular change.

1. Introduction

This paper aims to tease apart the interaction between ongoing sound change and lexically-determined alternating pronunciations in Suzhou dialect of Chinese ("蘇州話") , a representative member of the Wu Chinese ("吳語") family – I focus on the diachrony of phoneme /ŋ/ in coda position, which has changed in different ways depending on the preceding vowel. Furthermore, there is variation in realizing coda /ŋ/ between two pronunciation registers across three recent generations of speakers – I argue that complex as the data may seem, the diachronic change of coda /ŋ/ in Suzhou is regular in essence, despite accompanied by lexically specific standard dialect influence from Mandarin Chinese. The regularity of change is captured by the fact that all changes are strictly conditioned – coda /ŋ/ fronting happens when the preceding nucleus is non-front [ə] or [ɪ], while coda deletion and subsequent nucleus nasalization (*Vŋ > (Ṽŋ) > Ṽ) takes place when the nucleus is low [a] or [ɒ]. On the other hand, the lexical/register alternation blocks certain processes or regular change due to loanword effects from Mandarin Chinese into Suzhou, a case of standard dialect influence. As I show in the analysis, most patterns of change can be accounted for using various phonetics-induced models of change, and influence from Mandarin pronunciation offers solutions to other changes seemingly irregular at first glance. This paper gives a new perspective into the discussion of regular sound change, as it provides an alternative to lexically specific distributions, which would normally be a case of irregular change.

The paper is structured as follows: Section 2 gives a brief background on both sound change in general and the lexical alternation phenomenon called "Differing Literary and Colloquial Readings" ("文白異讀", henceforth "Differing Readings" or "DRs"). Section 3 presents the data drawn from recent descriptive accounts of Wu Chinese (Qian 1992, Ye 1993). Current literature on models of sound change and the role of phonological contrast in language change is summarized in Section 4. In Section 5 I offer my analyses to the change patterns based on reconstructed underlying representations of different rhymes, followed by a brief summary at the end.

It is essential to note that this account of recent sound change in Suzhou is suggestive and incomplete in nature, in that I only focus on a very limited set of alterations in one dialect among the Wu Chinese family. I believe that the same patterns should occur in dialects bearing a similar status to Suzhou, to which a similar analysis may apply.

2. Background information
2.1. Regularity and irregularity of sound change

There have been numerous attempts to theorize language change since the proclamation of the Neogrammarians (Osthoff & Brugmann 1878) – sound change is regular in the sense that all lexical items sharing the same properties (i.e. identical phonetic environments, see Bermúdez-Otero 2007) would undergo the same changes over time. In opposition to this *Neogrammarian change* is what is known as *classical lexical diffusion* (Wang 1969), where similar phonetic/phonological processes are applied to lexical items on an item-by-item basis. These two prototypical mechanisms of sound change have both been acknowledged and attested in numerous documentations among historical linguists.

The distinction between these two approaches to sound change lies in the concept of *regularity*: if a change is claimed to be Neogrammarian, its outcome must be exceptionless and identical – every A becomes B under condition C. On the other hand, recent accounts of many changes in progress show that a process may not propagate at the same speed with all lexical items that fit a specific conditioning environment[1].

Part of the goal of this paper is to revisit this debate on the regular nature of Neogrammarian change in the context of a recent change of coda /ŋ/ in Suzhou. I would argue that the lexical diffusion model should be considered as an integral part of a regular change, rather than an alternative to it. Instead of deeming an "irregular" change exception to the Neogrammarian tradition, one should consider gaps in sound change informative – they are indicators suggesting where one may look for causes that are not language-internal. In the current case with Suzhou, this irregularity manifests as a result of Differing Readings, a standard dialect loan effect from Mandarin Chinese.

2.2. Differing Readings

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[1] See Bybee 2017 for a recent attempt to "expand the notion of phonetic environment" (Bybee 2017: 273) and utilize grammatical environment and word frequency as causes for a diffused distribution.

Wu Chinese, like many other Chinese languages, has a lexically-determined alternating pronunciation called "Differing Literary and Colloquial Readings". When pronouncing a Chinese character bearing identical meanings in different lexical items, two different phonetic forms will sometimes arise: "Literary Reading" ("文讀", henceforth "LR") and "Colloquial Reading" ("白讀", henceforth "CR"). The decision of which to use seems to be lexically determined, leaving other sociolinguistic factors (e.g. gender, socioeconomic status, level of education) irrelevant in most cases – typically, lexical items requiring LR come from "standard" varieties of Chinese2, and ones with CR are usually older vocabularies in the language which tend to preserve and reflect the sound system of Middle and Old Chinese (Qian 2003: 70, Wang 1981).

In the contemporary dialect of Suzhou, lexical items with LR pronunciation mainly consist of foreign loanwords and technical terminology. The majority of the lexicon follows CR, a more conservative phonology dating back to at least Middle Chinese (Wang 1955, Lin 2011). Below in Table 1 are a few examples of Differing Readings in Shanghai dialect, another Wu dialect sharing much resemblance to Suzhou.

Table 1. Differing Literary and Colloquial Readings in Shanghai. Tones are omitted.

Character	Mandarin	Gloss	Literary		Colloquial	
大	[ta:]	big	[ta:]	大學 "university"	[tu:]	大人 "adult"
人	[zən]	person	[zən]	人民 "people"	[nin]	小人 "child"

The two words in the Literary column in Table 1 are both recent3 loans from Japanese, while the ones under Colloquial are native expressions in Chinese. The character "大" in "大學" (lit. "big school", university) has the identical pronunciation as it is in Mandarin ([ta:]), while in "大人" (lit. "big person", adult) it is pronounced [tu:]. The alternating pronunciations of "人" gives a more compelling case: in "人民" (lit. "person citizen", loaned as the legal term "people") the character "人" is [zən] whereas in "小人" (lit. "small person", child) the pronunciation [nin] is directly connected to Middle Chinese *nʲin.

As demonstrated, LR in contemporary Wu Chinese is heavily influenced by the pronunciation of Mandarin, while CR tends to resemble reconstructions of older varieties of Chinese. CR in Wu has a more conservative, native phonology, faithful to historical representations. In contrast, LR is a form of lexically-determined standard dialect influence, which I believe is the cause of irregularities in my current topic, the change in progress of coda /ŋ/ in Suzhou.

3. Recent change of coda /ŋ/: descriptive data
3.1. Preliminaries

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2 Nanjing, Beijing dialects during Ming and Qing dynasties, and Modern Mandarin Chinese. See Lin (2011) for a comprehensive survey on the current status of DRs among Chinese languages.
3 See Shen (2012) for an insightful summary on Japanese nominal loans into Chinese.

In this section, I provide the descriptive data of coda /ŋ/ in Suzhou, synthesizing comprehensive works of Qian (1992) and Chao (1928). Note that both authors chose to account for the recent sound change of Suzhou in the form of an apparent time survey (Bailey et al. 1991), transcribing the speech of three consecutive generational groups – Old, Middle and Young[4]. Crossing three generations with two DRs, there could be maximally six distinctive pronunciations for a single character.

Adding to the complexity of the data are a few separate changes and alterations that I will not cover in great details. I will take each of these into account here and omit them in my summary of the data. Firstly, in younger generations there is a vowel merger combining low back rounded /ɒ/ and low front /a/ into a central variant /ʌ/, indistinctive of vowel place[5]. Even though the front-back contrast plays an essential role at a certain point (see Section 5.2.3), this subsequent merger does not add much to the discussion of coda /ŋ/. I will leave out this merger in my data and analysis.

Secondly, whether prenuclear glides in Chinese languages count as actual phonological segments in a rhyme or secondary articulations attached to the onset has always been a topic of debate. From a purely typological view, Chao (1934) is right in that there is no optimal solution in a phonemic analysis, since there would always be a trade-off between the phonemic inventory and phonological complexity (e.g. phonotactics, syllable structure). I choose to follow Duanmu's (2007) framework to analyze the prenuclear glides as secondary articulations, an integral part of the onset instead of the rhyme, mainly because of the compelling evidence from the phonetics of Mandarin[6]. Moreover, I believe this analysis could be applied to other Chinese languages as well, making prenuclear glides in Suzhou the same structure as they are in Mandarin.

The last piece of the preliminary discussion concerns the focus of this analysis: rhymes. It is a common practice in Chinese phonology to analyze a syllable as consisting of initials ("聲母") and finals ("韻母"), which are roughly the same as onsets and rhymes (Wang 1955). Analysis of historical Chinese phonology, as well as recent literature on dialectology, make extensive reference to *Guangyun* ("廣韻"), a rhyme dictionary compiled in the Song dynasty. The descriptive data of Suzhou I use is also organized according to *Guangyun* rhyme groups, which makes it possible to connect a recent change in progress with historical pronunciation grammars of Middle Chinese or even reconstructions of Old Chinese, revealing the course of sound change in a longer stretch of time. Following the way the data is constructed, I will focus on the change of coda /ŋ/

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[4] Old speakers all aged over seventy at the time of recording; Young informants mainly consisted of high school students in their teens; Middle speakers were mostly in their forties and fifties. Chao's fieldwork was a few decades earlier than Qian's, although they do not seem to disagree on most of the patterns.

[5] This happens to other variants of the two low vowels as well, including glottalized [aʔ], [ɒʔ] and nasalized [ã], [ɒ̃]. See, for example, Yang 2004 for a descriptive account.

[6] See Duanmu (2007: 12-13) for a discussion on the phonetics of Mandarin prenuclear glides and over-analysis of phonemes.

grouped by different rhymes and mention the onset only when it is relevant.

3.2. The Data

Below in Table 2 are all possible /ŋ/-coda rhymes in Standard Mandarin Chinese and their various pronunciations in Suzhou, adapted from Qian (1992) and Chao (1928).

Table 2. /ŋ/-coda rhymes and corresponding pronunciations in Suzhou. Mandarin transcriptions are adapted from Duanmu (2007). Tones and onsets are omitted.

Guangyun	**Example**	**Mandarin**	**Gloss**	**LR Old**	**CR Old**	**LR Mid**	**CR Mid**	**LR Young**	**CR Young**
登 I	恆	[ən]	constant	[ən]	[ən]	[ən]	[ən]	[ən]	[ən]
登 II	朋	[ən]	friend	[ən]	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]
庚 I	爭	[ən]	dispute	[ən]	[ã:]	[ən]	[ã:]	[ən]	[ã:]
庚 II	孟	[ən]	a surname	[ən]	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]
庚 III	橫	[ən]	horizontal	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]
庚 IV	命	[ən]	life	[ɪn]	[ɪn]	[ɪn]	[ɪn]	[ɪn]	[ɪn]
庚 V	兄	[oŋ]	brother	[oŋ]	[oŋ]	[oŋ]	[oŋ]	[oŋ]	[oŋ]
陽 I	嘗	[aŋ]	taste	[ɒ̃ŋ]	[ɒ̃ŋ]	[ɒ̃:]	[ɒ̃:]	[ɒ̃:]	[ɒ̃:]
陽 II	讓	[aŋ]	let	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]	[ã:]
江	江	[aŋ]	river	[ɒ̃ŋ]	[ɒ̃ŋ]	[ɒ̃:]	[ɒ̃:]	[ɒ̃:]	[ɒ̃:]
東	絨	[oŋ]	wool	[oŋ]	[oŋ]	[oŋ]	[oŋ]	[oŋ]	[oŋ]

Each row stands for a distinct chain of sound change under its *Guangyun* rhyme, indicated by the first cell. Markings for subgroups (ones with Roman numerals) do not appear in *Guangyun* and are merely an arbitrary analytical tool, making them easier to refer to – I show in the analysis that different behaviors of subgroups under a single *Guangyun* rhyme exist mainly because of influence from either their onsets or Mandarin influence.

The variation between LR and CR in Suzhou is in essence the opposition between language-external (Mandarin) influence and language-internal phonology. To fully capture the diachrony in this apparent-time dataset, it is also necessary to look at the predecessor variety of modern Wu. Below are phonological data of Middle and Old Chinese from three systems: the Wang system (Wang 1955), the Pulleyblank system (Pulleyblank 1984, 1991) and the Baxter & Sagart system (Baxter 1992, Baxter & Sagart 2014).

Table 3. Proposed reconstructions for the *Guangyun* groups. Prenuclear glides are considered part of the onset and omitted.

Guangyun	Wang	Pulleyblank	Baxter & Sagart
登	*əŋ	*əŋ	*əŋ
庚	*ɐŋ	*aŋ	*aŋ
陽	*ɑŋ	*ɑŋ	*aŋ
江	*oŋ	*ɑŋ	*oŋ
東	*uŋ	*uŋ	*uŋ

Table 3 illustrates the slight but often theoretically important difference on the

representations for each rhyme across reconstruction systems. For instance, Baxter & Sagart has reconstructed 庚 and 陽 rhymes as having the same nucleus (*aŋ), while both Wang and Pulleyblank propose a difference in vowel quality between these two groups (*ɐŋ vs. *ɑŋ or *aŋ vs. *ɑŋ). Difference in vowel quality is sometimes essential to account for the various reflexes in modern varieties of Chinese. For now, I will refrain from following one specific system or determining which reconstruction seems to be more representative according to the data, as both are beyond the scope of this paper. My aim of synthesizing these data is simply to point out the intriguing diversity among reconstructions in historical Chinese phonology, which is open for future research and discussions.

I conclude this section by generalizing the main processes of change in the apparent time survey of Suzhou, integrating various synchronic grammars (three generations, two DRs) with the corresponding historical representations. Note that I will not give justifications of the historical forms for each *Guangyun* rhyme just yet. I will simply lay out the changes below in (1) and leave the detailed discussion to Section 5.

(1)   a. *əŋ > [ən]. Fronting of velar [ŋ]. Found in both subgroups of 登 rhyme to different degrees: across the board in 登I, only on LR Old in 登II.
      b. *əŋ > [ãː]. Abrupt change of both the nucleus and the coda. Found in 登II, on every form other than LR Old.
      c. *aŋ > [ãː]. Coda deletion and nucleus nasalization. Found in 庚I, II and III to different degrees: all CR in 庚I; all CR plus LR Mid and Young in 庚II; across the board in 庚III. Note that 庚II and 登II have the *exact* same surface forms.
      d. *aŋ > [ən]. Abrupt change of both the nucleus and the coda. Found in 庚II on LR Old. It seems like a mirror-image of the change in 登II.
      e. *aŋ > [ɪn]. Fronting/raising of nucleus and subsequent fronting of coda. Found only in 庚IV, applying across the board.
      f. *aŋ > [oŋ]. Change of nucleus. Found only in 庚V, applying across the board.
      g. *ɒŋ > [ɒ̃ŋ] > [ɒ̃ː]. Coda deletion and nucleus nasalization. Found in 陽I and 江. It is the only change with two sequential steps over age in a synchronic account[7] – [ɒ̃ŋ] among Old speakers but [ɒ̃ː] among Mid and Young speakers.
      h. *ɒŋ > [ãː]. Nucleus fronting accompanying coda deletion and vowel nasalization. Found only in 陽II, applying across the board
      i. *uŋ > [oŋ]. Change of nucleus. Found only in 東, applying across the board.

4. Theoretical background

Before continuing to the analysis, it is essential to discuss two technical points on the theory and mechanism of sound change: the various contemporary models, and the role

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[7] Compare this to (1c) and (1h) with only a nasalized monophthong in the synchronic grammar.

of phonological contrasts.

4.1. Models of sound change

The modern debate on sound change focuses on the opposition of diachronic regularity and synchronic variation. Both sides of the story seem to miss out a piece of the greater picture: for Neogrammarian change, the emphasis on language-internal mechanisms and regularity is criticized by many (e.g. D'Arcy 2015) as it has not only ignored sociolinguistic variation as well as change in progress within a speech community, and also failed to account for possible interactions between speakers' physical production and mental representation – between phonetic and phonological changes[8]; on the other end, deeming a change lexically gradual solves the problem of "residues" along the course of change (Blevins & Garret 1998, Kiparsky 2016), but often appears to be stipulative and might be misleading if the analysis fails to consider other potential causes of change. The data of Suzhou seems lexically gradual at first glance as well, with changes applying to different degrees as in (1a) and (1c). Additionally, processes unexplainable from a pure Neogrammarian perspective such as (1b) and (1d) are only found in very restricted registers and age groups. The fact that "irregularities" in these data are often spotted in the LR domain suggest that DR is indeed an essential piece of puzzle that needs to be accounted for to fully understand the nature of sound change in Suzhou. On the other hand, ignoring the DR phenomenon and collapsing the data across registers altogether would essentially lead to the false conclusion that many changes in Suzhou are lexically specific and irregular.

Other than suggesting formal or phonological change as a possible source of sound change, recent literature on sound change also features a great number of works arguing for lower-level phonetic processes as the cause of variation and change in speech sounds. Hockett (1958) and Lindblom (1990) have appealed to the notion of *ease of articulation* – automation of neuromotor activity by repetition and speech aerodynamics in production – to account for the origin of speaker-induced sound change. On the other hand, Ohala (1981) offers us insight into listeners' role as the active initiator of sound change based on *misperception and reconstruction* of speech signals. These two models are essential tools to look at systematic variations in a synchronic grammar, where certain changes are both phonetically and lexically gradual (Bermúdez-Otero 2007).

Above are some analytical tools and technical perspectives on sound change which I will utilize for my analysis. Although changes in progress may appear low-level and phonetic in nature as the considerable variation resembles that of phonetic implementation, I would argue that phonological contrast still plays an active role in deciding which direction the change would go in the first place. The very core of my analysis lies in a discussion on the active phonological contrast of [back], employed by both vowels and consonants.

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[8] See Bermúdez-Otero 2015 on the interaction of phonetics and phonology in sound change.

4.2. Role of phonological contrast: active [back] feature
　　Below in (2) are all possible surface forms of *Vŋ rhymes:

(2).　　a. [ən] with a mid central vowel and an alveolar nasal coda.
　　　　b. [ã:] with only a nasalized, monophthongal low front vowel.
　　　　c. [ɪn] with a high front vowel and an alveolar nasal coda.
　　　　d. [oŋ] with a mid back vowel and a velar nasal coda.
　　　　e. [ɒ̃ŋ] with a nasalized low back rounded vowel and a velar nasal coda.
　　　　f. [ɒ̃:] with only a nasalized, monophthongal low back fronted vowel.

　　There is a very striking feature of the synchronic grammar of Suzhou: regardless of generations or DR, the velar coda /ŋ/ only surfaces after a back vowel. When the nucleus is a non-back [ə] or [ɪ], a historical *ŋ is forced to be fronted to alveolar [n]. There appears to be an agreement between nuclei and codas in Suzhou, in that the nuclei need to be [back][9] for a historical *ŋ to surface faithfully. Otherwise, the coda is fronted or completely deleted.
　　This points to an essential contrast between low front /a/ and low back rounded /ɒ/ in Suzhou phonology concerning the representation of the backness contrast. Positing opposing features of [front] and [back] seems like an easier way to the problem. However, Suzhou has a third low vowel in its phonemic inventory: /æ/ in an even more fronted position[10]. To capture this three-way contrast among low vowels in such a narrow vowel space, the /a/ vowel in between has to be the one unmarked (represented as Ø) for backness, leaving /æ/ as [front] and /ɒ/ as [back]. The "unmarkedness" of /a/ fits well with the observation about other non-back vowels such as /ə/ or /ɪ/ – a velar /ŋ/ is not allowed to surface if the preceding nucleus is *not* [back], no matter if it is phonologically marked or not. Ways to amend this clash of features are either deletion or fronting of the nasal coda.
　　Same line of thought can be applied to the two nasals, /n/ and /ŋ/. To begin with, the two are truly contrastive phonemes in Suzhou[11], although they can be positional allophones in codas. Again, the two nasals could be marked as [front] and [back] respectively, since they are the traditional "anterior vs. posterior" pair in *SPE*. This, however, seems to be quite redundant[12]: The only phonologically active phoneme here is the velar /ŋ/, triggering either deletion or fronting when the nucleus is not [back]. On the other hand, the alveolar /n/ does not have these restrictions, as both a front [ɪ] ([front]) and a mid [ə] (unmarked) can co-occur with it. Therefore, by marking /ŋ/ as being [back] and /n/ as being unmarked solves the asymmetric nucleus-coda distribution.
　　The essential point here is that the synchronic grammar of Suzhou (regardless of

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[9] Note that by referring to [back], I am conforming to representational theories of privative features (Dresher et al. 1994, Steriade 1987) as opposed to the traditional *SPE* [±feature] framework (Chomsky & Halle 1968).
[10] Qian (1992) has accounted for the contrast between /æ/ and /a/ as "half-open vs. open".
[11] A minimal pair would be [nɛ:] "you" and [ŋɛ:] "dull".
[12] See, for example, a discussion on phonological redundancy in Lahiri & Reetz (2002).

generations and DRs) blocks all realizations where a specified [back] nasal does not have a corresponding nucleus. Meanwhile, the grammar is less strict when the coda is an unmarked [n], as both unmarked and [front] vowels can be possible candidates for the nuclei. Taking the more straightforward route and specifying alveolar [n] as [front], we run into problems explaining why Ø-[back] ([əŋ]) is ungrammatical, but Ø-[front] ([ən]) is not. The above observation can be summarized in one simple markedness constraint, quite in line with the Optimality Theory framework (Prince & Smolensky 1993)[13]:

(3).   AGREE-NUCLEUSCODA: Assign one (critical) violation when the phonological specification of the coda does not agree with that of the nucleus.

Stated in (3), a specified [back] coda requires a [back] counterpart in the nucleus, while the unmarked coda will not lead to violations in any case – the coda has no phonological specification anyway. This peculiar constraint on the synchronic grammar of Suzhou generates an interesting restriction when compared to Mandarin: the extremely common /əŋ/ rhyme (*eng* in Pinyin) is disallowed in Suzhou and is realized as [ən] (or even [ɪn]) instead. This restriction on the /əŋ/ rhyme will play an essential role in my analysis.

I have discussed all technical and analytical tools needed for the analysis of the diachrony of coda /ŋ/ in contemporary Suzhou. In the following section, I will account for all observed changes in (1), making assumptions about historical forms for various rhymes and referring to specific onsets when necessary. I will also split the analysis into two parts, analyzing changes that are mostly regular at first and seek help of standard dialect influence when dealing with the remaining "irregularities".

5. Analysis
5.1. Regular changes – across-the-board changes and mergers
        I will begin by accounting for the changes that are already complete: those showing a unified surface realization across the board. The completed changes are certain subgroups of (1a), (1c) and (1e), (1f), (1g), (1i).

5.1.1. [back] agreement in (1a)
        Within the change stated in (1a), 登 I is the subgroup that have across-the-board realization of *əŋ as [ən]. There is very little debate in the literature to represent 登 rhyme as *əŋ historically. The change is reiterated below:

(4).   *əŋ > [ən]. applying across the board in 登 I.

        This change is rather straightforward: velar *ŋ is fronted to alveolar [n]. This

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[13] The exact framework for derivation is not a central concern of this paper – similar results can be achieved by other representational and derivational systems of phonology without much effort.

process is a case of place assimilation: as [n] is the phonologically unmarked nasal, fronting is equivalent to deleting the [back] feature of /ŋ/ to avoid an unwanted configuration: non-back /ə/ preceding back /ŋ/. Consequently, deleting [back] is an attempt to satisfy the [back] agreement constraint stated in (3), as making the whole rhyme unmarked gets rid of any possibility of ungrammatical sequences to begin with.

We may understand this as a result of *ease of articulation*, a tendency to "speak sloppily" during spontaneous speech (Hockett 1958: 456). Bybee (2015) has attributed assimilation and lenition, two common processes of sound change to this *articulatory ease*: [ən] with both segments being non-back is simply an "easier" target to produce in Suzhou, whereas [əŋ] involves active coordination between an unmarked nucleus and a phonologically active [back] coda. In opposition, Mandarin Chinese favors faithful realization over *ease of articulation*, since it pronounces all 登 rhymes as [əŋ].

5.1.2. Onset palatalization and [back] agreement in (1e)

Below is the change in (1e) reiterated. Note that the difference across reconstruction systems (see Table 3) does not play as big a role in this case – /a/ and /ɐ/ both stand for a low vowel that is not phonologically [front] (as /æ/ would be).

(5).   *aŋ > [ɪn]. Found only in 庚 IV, applying across the board.

Both segments in the rhyme are fronted. This is one case where a satisfactory explanation needs a further elaboration on the onset. 庚 IV is traditionally referred to as "庚三等開口" ("庚 Division III Open") in Old Chinese literature, meaning it contains a [j] prenuclear glide, or a palatalization secondary articulation to the onset (Cʲ) under my framework. Therefore, a full historical reconstruction for this subgroup would be *Cʲaŋ.

The change from *a to [ɪ] seems more approachable now: onset palatalization of 庚 IV category fronts and raises the nucleus over time to a high front position. Since the nucleus is not [back] at any stage, coda *ŋ is forced to be fronted, giving [ɪn] in the synchronic grammar. Interestingly, the corresponding realization of this rhyme in contemporary Mandarin Chinese is [Cʲəŋ], with a fronted and raised nucleus, but an unchanged [ŋ] coda – there is still a slight impact of onset palatalization on the historical *Cʲaŋ words in Mandarin (*a > ə), but the coda stays the same since Mandarin does not have such feature-agreement constraint stated in (3)[14].

This chain of fronting can be seen as a sequence of place assimilations as well, supported by many widely-accepted theoretical frameworks in addition to *ease of articulation*. Articulatory Phonology (Browman & Goldstein 1992) attributes this process to the gradual overlapping of articulatory gestures. In this case, production of a palatalized

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[14] Baxter & Sagart (2014) has made a dialectical difference between *Cʲəŋ and *Cʲɪŋ for this very subgroup. This might as well be the difference already established in Middle Chinese between Wu and northern varieties of Chinese, which later becomes the basis of Mandarin Chinese.

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onset [Cʲ] requires an active fronting gesture of tongue blade, thus gradually making the adjacent vowel more fronted and raised. The 庚IV nucleus in Mandarin ends up being [ə], while in Suzhou it is "pulled" even further to [ɪ]. The *ŋ > n change exclusive to Suzhou is no different: along the change of *Cʲaŋ > Cʲə/ɪŋ, there would be a period where a free phonetic variation of coda [n] and [ŋ] was observed, due to overlapping articulatory gestures. Over time the rhyme with an unmarked alveolar [n] wins over the original [ŋ], since [ɪn] with non-conflicting gestures satisfies the [back] agreement constraint in (3). The status of 庚IV group was attested for at least over a century (Ding 2003), indicating that the change is already quite stable at the time of Qian's (1992) fieldwork.

5.1.3. Merger between sub-rhymes, stability of /ŋ/ in (1f) and (1i)

    (1f) and (1i) can be dealt with together as one merger. In opposition to 庚 IV, 庚 V or "庚 Division III Closed" ("庚三等合口") contains a rounded [u] as part of the nucleus, indicated by "closed". Although the category is traditionally represented as *Ciuaŋ, I will conform to my framework and transcribe the reconstruction as *Cʲuaŋ. There is less debate on the historical form of 東 as *uŋ. Below are the changes associated with these two rhymes:

(6).   a. *(u)aŋ > [oŋ]. Found only in 庚V, applying across the board.
        b. *uŋ > [oŋ]. Found only in 東, applying across the board.

    The two separate groups ended up as [oŋ] in all Readings and all generations. Qian (1992) notes that 庚 V rhyme has merged into 通 rhyme, superset of 東, which gives them [oŋ] rhyme in almost all varieties in Modern Wu[15]. The exact process that causes a change from *u to [o] is not a central concern of this paper. What is of most interest is the stability of [ŋ] in the synchronic grammar – since both nucleus and coda are phonologically [back], the historical velar *ŋ is maintained faithfully. This is the only case in contemporary Suzhou that *ŋ surfaces in all six conditions.

    Another problem remains: for 庚 V, the nucleus [a] is not fronted by onset palatalization as in 5.1.2. I believe the preceding [u] has blocked influence of the onset on [a]. Moreover, fronted [ʉ] as a target of assimilation is not phonetically/phonologically stable. As a result, the merged vowel nucleus (be it [u] or [o]) is not fronted in any variety of Wu, and coda [ŋ] remains intact because it agrees with the preceding vowel in [back].

5.1.4. Coda deletion and nucleus nasalization in (1c) and (1h)

    There are two subgroups belonging to this case: 庚 III in (1c) and 陽 II in (1h). 庚 III consists of words with onset /h, ɦ/ or ones without an onset. 陽 II is also known as "陽 Division III Open" ("陽 三 等 開 口"), indicating the onset is accompanied with
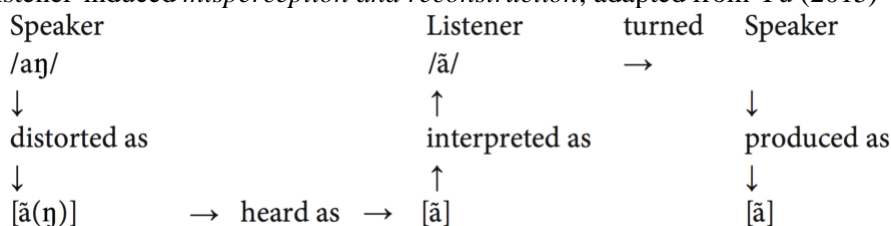
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[15] Interestingly, Changshu dialect still pronounces these rhymes as [uŋ], although a variation between [oŋ] and [uŋ] among the Young generation suggests an ongoing trend of *uŋ > [oŋ].

palatalization. There is little evidence here to determine whether the historical form of 陽 II is *Cʲaŋ or *Cʲɒŋ – the discussion in Section 5.2.3 gives a more compelling case. For the moment I (stipulatively) assume the latter is a more accurate representation. Below is the change reiterated.

(7).   a. *aŋ > [ã:]. Found in 庚III, applying across the board.
          b. *Cʲɒŋ > [Cʲã:]. Found only in 陽II, applying across the board.

Note that (1c) contains two other groups (庚 I, II) showing a change not yet complete – the synchronic forms vary between [ã:] and [ən]. I discuss them in section 5.2.1. For 庚 III, the deletion of coda and subsequent emergence of vowel nasalization in *-aŋ > [ã] can be captured in Ohala's (1981) listener-initiated model of sound change: m*isperception and reconstruction*. I give a demonstration of the mechanism in Figure 2.

Figure 2. listener-induced *misperception and reconstruction*, adapted from Yu (2015)

Speaker			Listener	turned	Speaker
/aŋ/			/ã/	→	
↓			↑		↓
distorted as			interpreted as		produced as
↓			↑		↓
[ã(ŋ)]	→	heard as →	[ã]		[ã]

Shown in Figure 2 is a sequence of change central to Ohala's (1981) framework. Articulatory overlap of the [nasal] gesture (lowered velum) with the vowel offset distorts the rhyme *aŋ as [ã(ŋ)], with very minimal phonetic correlates for the nasal coda. It is *misperceived* by an idealized Listener (often a child in language acquisition) as a nasalized monophthong /ã/, where nasality has completely transferred to the nucleus. When the Listener turned into a Speaker, they will produce a fully nasalized vowel based on the unfaithful *reconstruction* in their phonology. Consequently, a nasalized /ã/ functions as a stable target of the historical *aŋ rhyme and passes on to following generations. One point of this change is worth special notice: coda /ŋ/ is completely deleted, regardless of age and register. Recall that the constraint in (3) prohibits a velar /ŋ/ preceded by any nucleus that is not [back]. Instead of assimilating to the unmarked [n], the coda deletes while its nasality transfers to the nucleus in this case. This observation is still in line with my claim in Section 4.2, in that [aŋ] is never an acceptable rhyme in Suzhou16.
     The condition with change (1h) is similar. Its nucleus was firstly fronted because of onset palatalization (*ɒ > [a]), making it indistinguishable from that of 庚 III. From then

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16 Compare this to (1g), where [ɒ̃ŋ] as a more stable phonetic target surfaces among Old speakers.

on, the course of change illustrated in Figure 2 took place and ultimately changed the rhyme to [ã:]. Consequently, 陽 II words are pronounced as [Cʲã:] in modern Suzhou.

5.1.5. Interim summary

I have accounted for all completed changes of coda /ŋ/ in modern Suzhou. Although most changes did not involve any generational or lexical difference, the mechanisms demonstrated above would serve as a baseline for more complex discussions below – two main phonetics-induced change models are in play here: *ease of articulation* and *misperception and reconstruction*. The former covers the process of fronting (*ŋ > [n], *Cʲa > [Cʲɪ]), while the latter coda deletion and nucleus nasalization (*Vŋ > [Ṽ:]). A noticeable observation is that both processes work in conspiracy towards a same goal: that only [back] nuclei are allowed to precede /ŋ/ in Suzhou.

In the following subsection I deal with changes that are either ongoing or are lexically graded, therefore cannot be regarded as being fully "regular". In addition to the analytical tools for regular change, I will also argue that a split between LR and CR is directly caused by standard dialect influence from Mandarin Chinese.

5.2. Ongoing and "irregular" changes – age-graded distributions and Mandarin influence

In this part I discuss the "irregular" changes, namely the remaining groups of (1a) and (1c), and (1b), (1d), (1g). Since the problem at hand is the split between Literary and Colloquial in some rhyme subgroups, it is essential to compare different processes of change under similar rhyme groups. This would combine the analysis of 登 II and 庚 II together (both have [ən] in LR Old, but [ã:] in every other condition). Similarly, 庚 I ([ən] in LR, [ã:] in CR) should be dealt with in one setting.

5.2.1. Merger between rhymes, loss of Differing Readings in 登II and 庚II

登 II and 庚 II are two very peculiar groups: they contain 登 and 庚 rhyme syllables with a single labial onset (/b/, /p/, /pʰ/ and /m/ – I will use /B/ below as a cover term for all labial segments). Since the two have different historical rhymes (*əŋ and *aŋ), it might appear counterintuitive at first to group the two subgroups together in a single analysis. Below are the relevant changes reiterated.

(8).   a.*əŋ > [ən]. In 登 II, Literary Old.
        b. *əŋ > [ã:]. In 登 II, every condition other than Literary Old.
        c. *aŋ > [ən]. In 庚 II, Literary Old.
        d. *aŋ > [ã:]. In 庚 II, every condition other than Literary Old.

The outcome of change for these two groups are identical, supposedly because of a merger. This is further confirmed by a few other neighboring dialects of Wu[17]. One characteristic of this change is that a pronunciation of [ən] in LR old is attested, despite of the historical form of 庚 II (*aŋ). The fact that all words of 庚 rhyme are pronounced as [əŋ] in Mandarin (see Table 2) leads to a possible solution to the LR-CR split: Suzhou gets its LR vocabulary as loanwords from Mandarin. As for the Colloquial domain, the change *aŋ > [ã:] as outlined in Figure 2 applies as well to merged 登 II/庚 II.

However, LR [ən] is only maintained in Old pronunciation and is lost in later generations, which poses a problem for a fully regular analysis. My hypothesis is that 登 II/庚 II is a phonologically confined category (*Baŋ after the merger) with simply not many vocabularies eligible for the DR phenomenon[18]. Younger generations start to lose the ability to keep a contrast between LR and CR in this merged rhyme, because they simply cannot tell which should be pronounced as Literary. My proposal for the whole course of change is illustrated as follows:

(9).   a. Merger between *əŋ and *aŋ after a labial onset. *Bəŋ > *Baŋ.
        b. LR emerges as loanwords from Mandarin /əŋ/. /əŋ/ > [ən] in LR Old because of *ease of articulation*; *aŋ > [ã:] in CR due to *misperception and reconstruction*.
        c. [ən] is lost through an insufficient vocabulary to maintain the LR/CR contrast.

The two change models I have mentioned in 5.1 are still in use here: *ease of articulation* has changed all [əŋ] input into [ən], with no exception even if the input comes from Mandarin; in the Colloquial domain the change caused by *misperception and reconstruction* is completely regular, identical to the one analyzed in 5.1.4. This pair of subgroups is probably the most complicated change in the dataset I have provided, considering that multiple forces of change have taken place along the course, making the pattern rather chaotic.

5.2.2. Clear split of DRs in 庚I
        Now that I have dealt with the more complicated pattern in 5.2.1, the analysis for 庚 I follows almost naturally. Here are the patterns of change:

(10).   a. *aŋ > [ən]. In 庚 I Literary.
         b. *aŋ > [ã:]. In 庚 I Colloquial.

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[17] For example, in Kunshan dialect, 登 and 庚 have merged completely, showing only [ən] in Literary and only [ã:] in Colloquial across all generations.
[18] The only pair I can think of that shows a robust contrast is 猛: [mən] ("勇猛", brave) vs. [mã:] ("猛門", rude). Even so, [mən] is extremely rare because the vocabularies associated with it are only used in literary works and are almost never pronounced.

It shows a clean split between Literary and Colloquial in 庚 I: the contrast between the two DRs has been kept all the way to even the Young generation, without any bleeding effect from either side. Since 庚 I stands for *Caŋ with a non-palatalized onset (excluding glottals in 庚 III and labials in 庚 II), there is still a wide variety of vocabularies in this category, especially those used in the Literary domain. Having a decent size of LR vocabularies enables the speaker to maintain the knowledge about this special register caused by Mandarin loanwords. As a result, LR and CR operate as two separate grammars, with the former undergoing *ease of articulation* ([əŋ] > [ən]), whereas the latter undergoes *misperception and reconstruction* (*aŋ > [ã:]).

5.2.3. Age-graded propagation and stability of /ŋ/ in 陽I and 江

Before analyzing the change, I should first decide what historical representations for these two categories should be used. 陽 I is a subgroup containing 陽 rhymes without onset palatalization (which is 陽 II; see 5.1.4). The modern Suzhou realizations of this rhyme typically contain nasalized [ɒ̃], making *ɒŋ a more probable historical reconstruction. The same can be said for 江. Below is the change reiterated:

(11).   *ɒŋ > [ɒ̃ŋ] > [ɒ̃:]. In 陽 I and 江 rhymes. [ɒ̃ŋ] in Old generation, [ɒ̃:] in Middle and Young generations. Differing Readings have no effect on the pronunciation.

This is another case of historical /ŋ/ maintained in the synchronic grammar, *along with* nasalization on the nucleus, which makes it particularly interesting. [ɒ̃ŋ] is essentially the "intermediate" stage of what I have demonstrated in Figure 2: nasality starts to appear on the nucleus, yet coda /ŋ/ still stays. Interestingly, a stage of [ãŋ] (with low unmarked [a]) does not exist anywhere in the synchronic grammar, while [ɒ̃ŋ] seems like a stable target among Old speakers.

I believe the explanation again lies in the feature-agreement constraint of Suzhou: only [back] nuclei are allowed to precede the velar /ŋ/. If Ohala's (1981) model of *misperception and reconstruction* is at work here, [ãŋ] would definitely be present at some point along the change of *aŋ > [ã:]. However, since [ãŋ] violates (3), the form was never a phonologically stable target, and only served as an extremely brief transition during the variation between conservative [aŋ] and innovative [ã:]. This is exactly why there is no [ãŋ] in the synchronic grammar, as the change took a short time to complete and there is already no trace of variation in modern Suzhou. [ɒ̃ŋ] should also be a legitimate target along the change – only this time the form could stay according to grammar, as both the nucleus and the coda are [back] and the rhyme is therefore acceptable in Suzhou. This peculiar "latency" effect among the Old speakers not only provides an extra piece of evidence for the *misperception and reconstruction* model (we can actually see the very first stage of

misperception as a stable phonetic/phonological target), but also further confirms the strict constraint on agreeing [back] features in Suzhou.

5.2.4. Interim summary

  I have analyzed all remaining change patterns in the data, where variation appears either across LR and CR, or across generations. In addition to the applicability of the two change models, *ease of articulation* and *misperception and reconstruction*, I have also argued for Mandarin loanword effect on LR for those changes that does not seem regular at first glance. Lastly, the change of *ɒŋ > [ɒ̃ŋ] > [ɒ̃:] shows a very valuable "latency" effect along the course of regular coda deletion/nucleus nasalization, giving an account of the very first step of change. Below is a summary of main operations of change.

(12). a. *Ease of articulation*. Causing coda /ŋ/ to be fronted when preceded by non-back
    vowels [ə] and [ɪ], and also the onset palatalization effect.
  b. *Misperception and reconstruction*. Causing coda /ŋ/ deletion and vowel
    nasalization (*Vŋ > Ṽŋ > Ṽ) when preceded by [a] or [ɒ].
  c. Mandarin loan influence. Changing LR of some *aŋ rhymes to [ən]. Whether it
    applies or not and how stable the influence would depend on the size of
    vocabulary under a certain conditional environment.

6. Concluding remarks

  This paper analyzes the status of coda /ŋ/ and its change across three consecutive generations and two Differing Reading domains using the synchronic data of Suzhou, Wu Chinese. I have identified three major processes of sound change in play: *ease of articulation*, which causes the fronting of coda /ŋ/ and sometimes the preceding nuclei; *misperception and reconstruction*, which deletes the coda segment and transfers its nasality to the vowel nucleus; lastly, Mandarin loanword effect in LR, which gives an alternative phonological representation to words that have a Literary vocabulary. Many of the patterns of change are not only specific to the regional variety of Suzhou, but can be applied to most dialects of Wu Chinese. By looking at the combination of traditional regular change and "irregular" loanword effect, I have demonstrated that "lexical diffusion" is often not the only solution to a lexically-graded change pattern, and that regularity of change can still be maintained even a great deal of variation exists in the synchronic grammar.

  Future directions for the research might contain a complete examination of all Old/Middle Chinese nasal coda rhymes (including /n/, /m/) and their present status in Suzhou, as well as elicitations of phonetic data of present day Suzhou speakers in either laboratory or natural settings – it has been over two decades since the fieldwork of Qian (1992) and the speech community has moved forward for another generation. It would be intriguing to see whether Suzhou continues to go in this unique path of coda deletion and nucleus nasalization, turning remaining rhymes such as [oŋ] to [õ:] as well, or assimilates more to the language mainstream as more of the dialectical features recede.

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