Evolutionary Process of Zi Rime Change in North Henan Province: Perspectives of Linguistic Geography
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Abstract
This paper makes an attempt to explain the origin and evolutionary process of zi rime change in north Henan Province, mainly from the geographical distribution of zi forms in Hebi area. Based on the investigation into the relationship between the typological distribution and the geographical features, as well as the related historical events of immigrants in Ming Dynasty, the author argues that the degenerated affix of zi rime change in north Henan Province is originated from suffix [ts], and the idea of 'tou' origin is not that convincing. Apart from the establishment of evolutionary chain, this paper also discusses the lenition chain >WVɁ@ >ۍ >ۍ >ۍ >ۍ >ۍ >ۍ DQGPDLQO\ IRFXVHVRQWKHPRWLYDWLRQRIWKHFKDQJHIURP = \ț \? \W?=W? In the author’s point of view, this change is due to the tendency to preserve the semantic function of zi suffix, which forces the segmental affix to be more prominent when it merges into the stem rime in the later stages of the evolution.

Keywords: zi rime change, evolution, linguistic geography, Jin Chinese;

1. Introduction

Zi rime change (zi bian yun) is a process that alters the stem rime to realize zi suffix in various forms which indicate a similar semantic function to the neutral-toned suffix zi ([ts]) in Mandarin (cf. [1][2][3]). Some examples of zi rime change are given in table 1. This special pattern of sound change was first discovered in some dialects of Henan Province in the 1950s [8], and later it was also reported in many other dialects of southeast Shanxi, north Henan and south Hebei Provinces [9][10]. Generally speaking, it is assumed that this phenomenon is the merging of two morphemes (two syllables) in the speech, which results in the phonological alteration of the stem rime, similar to er-suffixation in Mandarin.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Qi County Zi noun</th>
<th>Xin County Zi noun</th>
<th>Zhengzhou Zi noun</th>
<th>Mandarin Zi noun</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ʦi</td>
<td>ʦiou</td>
<td>ʦi:au</td>
<td>ʦiou</td>
<td>ʦi.ʦʔ</td>
<td>'nose'</td>
</tr>
<tr>
<td>b. ʨi</td>
<td>ʨiyou</td>
<td>–</td>
<td>ʨiyou</td>
<td>–</td>
<td>'colt'</td>
</tr>
<tr>
<td>c. ʦʔ</td>
<td>ʦʔou</td>
<td>ʦʔau</td>
<td>ʦʔou</td>
<td>–</td>
<td>'seed'</td>
</tr>
<tr>
<td>d. ʨʰu</td>
<td>–</td>
<td>–</td>
<td>ʨʰu.ʦʔ</td>
<td>'rabbit'</td>
<td></td>
</tr>
<tr>
<td>e. ia</td>
<td>iau</td>
<td>i:au</td>
<td>iau</td>
<td>ia.ʦʔ</td>
<td>'duck'</td>
</tr>
<tr>
<td>f. ʦua</td>
<td>ʦuaau</td>
<td>ʦuaau</td>
<td>ʦuaau</td>
<td>ʦua.ʦʔ</td>
<td>'claw'</td>
</tr>
<tr>
<td>g. ʨʰi:ai</td>
<td>ʨʰi:au</td>
<td>ʨʰi:au</td>
<td>ʨʰi:ai</td>
<td>ʨʰi:ʦʔ</td>
<td>'eggplant'</td>
</tr>
<tr>
<td>h. ʦʰu:ai</td>
<td>ʦʰu:ai</td>
<td>ʦʰu:ai</td>
<td>ʦʰu:ai</td>
<td>ʦʰu:ai:ʦʔ</td>
<td>'table'</td>
</tr>
<tr>
<td>i. ʨʰ:ai</td>
<td>ʨʰ:ai</td>
<td>ʨʰ:ai</td>
<td>ʨʰ:ai</td>
<td>ʨʰ:ai:ʦʔ</td>
<td>'beams'</td>
</tr>
<tr>
<td>j. ʨʰ:ai</td>
<td>ʨʰ:ai</td>
<td>ʨʰ:ai</td>
<td>ʦʰ:ai</td>
<td>ʨʰ:ai:ʦʔ</td>
<td>'chopsticks'</td>
</tr>
<tr>
<td>k. xai</td>
<td>xiau</td>
<td>xɛ:u</td>
<td>xiau</td>
<td>xai.ʦʔ</td>
<td>'child'</td>
</tr>
</tbody>
</table>

1 The examples are based on previous works and my own fieldwork. For the full set of data of Qi County, see Yue [4] and Zhang [5]; For Xin County and Zhengzhou, see Xin [6] and Zhou [7] respectively. The analysis and discussion in this paper will not involve tones, so the tones are not marked in these and following examples.

2 It is similar, but not totally equivalent to the function of suffix [ʦʔ] in Mandarin. Actually, numbers of stems which have zi-changed forms in the dialects have no correspondent forms in Mandarin. For example, the rime-changed form of [ʦʔ] ('seed') is [ʦʔou] in Qixian, but *ʦʔʦʔ does not exist in Mandarin.
Unlike the studies of er-suffixation, however, researches on zi rime change are still not adequate and very few works on this topic are observed, particularly by synchronic analysis (e.g., [4][6][7][11][12][13]). There are also different understandings of how this phenomenon evolves. The only agreement reached is that the degenerated affix\(^3\) \([u]\) of rime-changed forms are originated from \([ts]\) along with the influence of Shanxi immigrants since the 14\(^{th}\) century, but no enough evidences could prove the hypothetical evolutionary process, i.e., an independent syllabic affix \([ts]\) evolves into a segmental affix \([u]\) (cf. [8][11][13][14]).

The examples in (1) indicate that zi rime change is to some extent systemic and regular, and according to the data of cross-dialectal studies, almost all the zi-changed forms end with segments [-\(ə\)], [-ou] or [-u], i.e. segments with features [+back] and [+round] [14], but the actual phonetic forms of zi-changed words cannot be easily linked to the phonetic form of ‘zi’ (\([ts]\)). H. Wang [14] hypothesizes a lenition chain from \([ts]\) to \([ə]\), i.e. \([ts]\) → \([tsɔʔ]\) → \([təʔ]\) → \([tə]\) → \([ə]\), but she still holds doubt whether this chain can be linked to [-u] of zi rime change. Although some recent works still follow the analysis of H. Wang [14], the origin of zi rime change is still doubtful. In spite of the fact that the semantic function of zi-changed forms is similar to [ts]-suffixed word in Mandarin, it is still inconclusive whether this kind of change is really related to ‘zi’ (\([ts]\)). Therefore, some scholars criticize the long-standing view and propose that the actual morpheme which is merged into the stem and produced the so-called zi-changed form is ‘tou’ [3] or ‘er’ [15].

It generally believed that Zi-form refers to the affixed form which has similar semantic function to the neutral-toned suffix zi (\([ts]\)) in Mandarin, and it can be realized through three ways: zi rime change, zi-suffixation and zero derivation. Zi rime change is the alternation of the stem rime as is mentioned. Zi-suffixation is a process of affixing an independent syllabic suffix to the stems, and this suffix has many variants in Shanxi and Henan Province, as is given in table 2. H. Wang [14] believes that these variants derive from \([ts]\), while L. Wang [3] holds that not all these suffixes come from \([ts]\) and gives different categories, as presented below:

<table>
<thead>
<tr>
<th>Suffix form</th>
<th>Representative places</th>
<th>Suffix form</th>
<th>Representative places</th>
</tr>
</thead>
<tbody>
<tr>
<td>[tsɔʔ]</td>
<td>Qinyuan (SX)</td>
<td>[tə]</td>
<td>Neihuang (HN), Weihui (HN)</td>
</tr>
<tr>
<td>[tsɔ]</td>
<td>Gaoping (SX)</td>
<td>[tei]/[nei]</td>
<td>Hejin (SX)</td>
</tr>
<tr>
<td>[təʔ]</td>
<td>Anyang (HN), Changzhi (SX)</td>
<td>[ya]</td>
<td>Jiang County (SX)</td>
</tr>
<tr>
<td>[laʔ]</td>
<td>Pingshun (SX), Linzhou (HN)</td>
<td>[te]</td>
<td>Linzhang (HB)</td>
</tr>
</tbody>
</table>

Based on the brief review above, there are two controversial issues to be discussed in the diachronic study of zi rime change. The first one is whether nowadays’ rime-changed form (such as cases in (1)) are originated from \([ts]\) or other possible suffixes. The second one is how the syllabic suffix evolved into a degenerated suffix and produced rime-changed forms. This paper presents some new data from the fieldwork of 27 sites conducted by the author on the border region of Shanxi Plateau and North China Plain (also the border area of Jin Chinese and Zhongyuan Mandarin), demonstrating the typological distribution of variants of zi suffix and zi rime change, and intends to interpret this special distribution mainly from the perspective of linguistic geography. Different from similar previous works, my fieldwork is microscopic and the density of the sites under investigation is relatively higher, which could show a finer scenario.

This paper presents the details of the fieldwork and the results in the form of dialect atlases, discusses the origin of zi rime change based on the new data from the fieldwork and from a synchronic perspective, and makes an attempt to establish the evolutionary chain of zi rime change.

2. Fieldwork and Results

2.1. Fieldwork

The fieldwork was conducted within Hebi, a city in north Henan Province. Located in the transitional region between Taihang Mountains and North China Plain, this city is divided into two

\(^3\) A degenerated affix is in the form of less than a full segment. It may consist of only one or a few features, a prosodic weight unit such as mora, or the combination of these two [2].

\(^4\) ‘tou’ and ‘er’ are written as ‘ᒦ’ and ‘ᒦ’.
dialectal areas, i.e. Jin Chinese and Zhongyuan Mandarin [16], as given in figure 1. It is generally believed that the linguistic features in the border region of two different dialects are always of great value. Little attention has ever been paid to the dialect in this area. Xin [6] and Yue [4] investigate the zi rime change in Qi County and Xun County (two affiliated administrative divisions of Hebi City), which only focuses on the dialects in the towns, leaving the remote villages untouched. For the places in the Taihang Mountains, there are no published data by now due to the relatively harder accessibility. Although the study of L. Wang [3] involves Hebi area, there are only four sites chosen in this region, all of which are city centre or town centres.

It is noteworthy that there is a major geographical division in this area, i.e. Taihang Mountains. The fieldwork intends to show the typological distribution of zi-form in Hebi Area, and investigate the relationship between this distribution and the geographical features, hoping to shed light upon the evolutionary process of zi rime change.

The selection of survey sites is generally based on the administrative division, and there are 27 villages or towns under investigation. In terms of geographical features, 9 sites are located in the mountainous area, where the altitude is approximately 200-600 meters; and 18 sites selected are in the plain area.

2.2. Results

According to the fieldwork, in the northwest part of Hebi City, zi-form is realized by suffixation, i.e. an independent syllabic suffix. However, there are two variants of this suffix, [tɕʰ] and [tsʰ]. As for the south and southeast part of this city, zi-form is mainly zi rime change instead. The places and their correspondent zi-forms are illustrated in figure 2.

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*This transcription is different from L. Wang [3], and he believes that there is only one suffix form in Hebi area, i.e. [tʂ]. As is mentioned before, the sites selected by previous works are usually macroscopic, and Wang’s work only involves two sites in Hebi, paying less attention on the sites in the mountainous area. My transcription is not influenced by his study since his paper was not published at that time when I conducted my fieldwork. Therefore, I still preserve my opinion and transcribe these suffixes as [tʂʰ] and [tsʰ].*
3. The Origin of Zi Rime Change in North Henan

Recall the two unsolved problems mentioned in the previous section, this part mainly deals with the first one. Since the 1950s when zi rime change aroused the interests of the researchers, whether it is suffix [tsʰ] that gradually merged into the stem and produced today’s zi rime change is still inconclusive. Although the latest work on this topic almost overturns the traditional view and proposes the origin is ‘tou’ ([tʰou]) [3], I argue that it is the morpheme [tsʰ] that plays a role in the evolution of zi rime change from the perspectives of linguistic geography and synchronic cross-dialectal analyses.

3.1. Perspectives of linguistic geography

This section discusses the possible origin of zi rime change on the basis of the distribution relating to both natural and historical administrative geography. Within Hebi City, there are totally two types of zi-form, i.e. zi suffix and zi rime change, distributing in the northwest part and the southeast part respectively. It is observable that the clear-cut boundary in figure 2 is almost in accordance with the boundary of Shanxi Plateau and North China Plain. To be more specific, zi suffix is always found in the places with geographically higher altitude, while zi rime change is located on the plain, as illustrated in figure 3 and 4. In these two figures, Huangdong, Zhuopo and Tanyu, which are in the mountainous area, have zi suffix [tʰou]. On the plain, Gaocun, Dawa, Qiaomeng and the boundary area (such as Miaokou), zi rime change is popular. It is also noteworthy that these two types (zi suffix and zi rime change) are, at least in Hebi area, in complementary distribution. There are no places using both forms at the same time according to my fieldwork, and the local native speakers of every site are assertive in this point. It is hard to believe that this typological distribution is a coincidence.
Generally speaking, languages or dialects in the isolated area are conservative (cf. Matteo Bartoli, cited in [17]), and Jin Chinese is a good example to illustrate the conservativeness of the language in mountainous and plateau regions [18]. Some other features investigated during this fieldwork could prove the conservativeness of the dialect in northwest Hebi, for example, the preservation of checked tone. Therefore, the linguistic features on each side of this isogloss are quite possibly not at the same evolutionary stages, and the features of the mountainous sites are relatively more conservative and the dialects are older.

The connection between the syllabic suffix on the west side and the rime change on the east side of the isogloss can be established with reference to the history of immigrants and historical administrative divisions, which are also important elements in the study of linguistic geography. The agreement reached by the previous works is that the emergence and evolution of zi rime change in North Henan is related to Shanxi immigrants since the 14th century (early Ming Dynasty) (e.g., [3][5][6][11][13][19], etc.). Guo [11] concludes that both zi suffix and zi rime change were brought to north Henan by Shanxi immigrants. In other words, zi rime change is believed to emerge and evolve in Shanxi Province before the 14th century. However, if we simply regard all these
features were brought by Shanxi immigrants as a whole, it is difficult to interpret this clear-cut boundary in Hebi area.

Dating back to the 1300s, at the beginning of Ming Dynasty (1368-1644 A.D.), A lot of Shanxi immigrants came into north Henan since the population in Central China declined sharply during the war time at the end of Yuan Dynasty (1271-1368 A.D.), and Shanxi immigrants constituted quite a high ratio of the total population in north Henan at that time [5]. As is documented in The Memoir of Chu Yuan-Chang, people from Zezhou, Luzhou of Shanxi Province emigrated to Zhangde, Zhending, Linqing, Guide, Taikang of Henan Province in 1389 A.D. In 1390 A.D., people from Qinzhou of Shanxi Province migrated to Zhangde, Weihui, Huaqing, Guide, Linqing and Dongchang of Henan Province (cited in [5]). Cao [20] also proves that many Shanxi emigrants flooded into north Henan, toward central Henan. In Weihui, the immigrants made up more than 50% of local population around the 15th century [20].

The study of the dialect of north Henan in Ming Dynasty is quite important to my argument. First of all, the detailed information of the administrative division of today’s Hebi area in the 1300s is given in figure 5. The City of Hebi was established in 1950s, and this area used to belong to three different administrative divisions, i.e. Zhangde, Weihui and Daming, the previous two of which were affiliated to Henan Province while the third one was under the administration of Jingshi Province. As for today’s Hebi area, the north part of Hebi was under the government of Zhangde, while Qi County and Xun County were administered by Weihui and Daming respectively. It is also noticeable that the ancient administrative divisions were almost correspondent to the natural geographical features, as well as the linguistic features under investigation. Then, recall the historical events of immigration mentioned before. Zhangde, Weihui and Daming received the immigrants from Shanxi, and Pei [21] believes that the dialect of north Henan in middle and late Ming dynasty was almost the dialects of Shanxi Zezhou and Luzhou after several waves of immigration. Therefore, it could be assumed that the areas on each side of the isogloss in figure 2 were covered by population speaking Shanxi Dialect. In other words, it can be hypothesized that the initial state of this area 600 years ago was dominated by Shanxi Dialect.

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**Figure 5. Administrative divisions in Ming Dynasty**

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7. The place names in Chinese: 山西澤州、潞州、河南彰德、真定、臨清、歸德、太康。
8. The place names in Chinese: 山西沁州、河南彰德、衛輝、懷慶、歸德、臨清、東昌。
9. Daming: 大名府。
10. *Jingshí Province (京師)*, a province in Ming Dynasty, governed a similar region to today’s Hebei Province.
11. Later in 1725, Xun County was separated from Daming (Jingshí Province) and merged into Weihui (Henan Province).
Based on the discussion above, the opinion that *zi* rime change firstly emerged in Shanxi and was brought to Henan by the immigrants is not convincing, since there is no *zi* rime change but only *zi* suffix found in north Hebi (previous Zhangde), where it should be dominated by Shanxi Dialect in the past centuries. Therefore, my own opinion is that the emergence and evolution of *zi* rime change started along with the immigration waves since the 14th century, and only *zi* suffix was brought to Henan by the immigrants. This linguistic feature covered most parts of north Henan where there was a large population speaking Shanxi Dialect. In the following centuries, the evolutionary rates of *zi*-suffix in the mountainous area and the plain were different. For the places on North China Plain, the linguistic features evolved faster due to a relative higher degree of language contact, while the evolution is slower and more ancient characteristics were preserved in the mountainous area.

Further, in terms of the typological distribution of *zi* rime change in a broader scope, it can be observed that this phenomenon almost only distributes on the plains and in river valleys, including north and west Henan, southeast Shanxi and south Hebei. In the remote area of Shanxi Plateau, however, this phenomenon is rarely reported. For the places which have *zi* rime change in north Henan, such as Qi County, Xun County, Weihui, Changyuan, Yuanyang, Zhengzhou and Kaifeng, it is believed that this phenomenon in the places near Taihang Mountains (cf. figure 2) is thriving, while it is declining and diminishing in more southern places such as Kaifeng and Zhengzhou, which are the core region of Zhongyuan Mandarin.

Based on the discussion above, the geographical distribution of *zi* suffix and *zi* rime change found in the fieldwork reveals a possible connection between [təʔ], [tə] and *zi* rime change. The possible evolutionary chain is given in (1).

\[ \text{(1)} \]

\[ \text{X} \cdot \cdot \cdot [təʔ] \rightarrow [tə] \cdot \cdot \cdot [-u] \]

\[(\text{zi suffix}) \quad \quad \quad (\text{zi rime change})\]

The dots connecting [tə] and [-u] indicate that there are still some other possible links between these two stages. As is claimed by H. Wang [14], the next step of [tə] in the evolutionary chain would be [ə], which is reasonable, though cannot be confirmed according to my microscopic fieldwork. Anyway, it can be concluded that *zi* rime change is quite likely to be derived from *zi* suffix. The symbol X in (1) is temporarily used to represent the original form of [təʔ], and H. Wang [14] believes that it is [tsɨ]. More evidences from geographical distribution will be presented to discuss whether the original form is [tsɨ] or not.

Recall the lenition chain of [tsɨ] proposed by H. Wang [14], two of the last stages in this chain are [təʔ?] and [tə], which can be found in Hebi area. However, some other possible variants of [tsɨ], such as [tsaʔ], [tsəʔ], [ləʔ], [tei], [nei], [te] etc, are rarely found in north Henan, but mainly appear in Shanxi. Traditionally, all these forms are regarded as the variants of suffix [tsɨ]. In the study of L. Wang [3], however, they are carefully categorized and regarded as the variants of two suffixes, [tsɨ] (‘zi’) and [tʰou] (‘tou’), as given in table 3.

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Variants</th>
</tr>
</thead>
<tbody>
<tr>
<td>[tsɨ]</td>
<td>[tsaʔ], [tsaʔ]</td>
</tr>
<tr>
<td>[tʰou]</td>
<td>[taʔ], [ləʔ], [te], [tə]</td>
</tr>
<tr>
<td></td>
<td>[tei]/[nei]</td>
</tr>
</tbody>
</table>

The reason of this categorization is that the phonetic forms of the variants [taʔ], [ləʔ], [te], [tə] are quite different from [tsɨ], and thus they could not be derived from [tsɨ]. L. Wang [3] claims that the *zi* rime change in north Henan is actually related to [tʰou], since the rime of [tʰou] could be more easily linked to the features [+back, +round] of *zi* rime change. The geographical distribution of all kinds of *zi* suffixes and *zi* rime change in Shanxi and Henan is illustrated in figure 6 (cf. [3]). I modified this atlas according to my fieldwork and sketched two isoglosses.

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13 Though the degenerated affix may also be [-ou], [-u] is temporarily used here. The detailed discussion on this point will be given in section 3.2.
14 The original form of [tei]/[nei] is not mentioned by L. Wang [3].
It is observable that the boundary between rime change and *zi* suffix is quite clear, i.e. isogloss A in figure 6. Another isogloss is identified based on the onset consonants of the suffixes. The variants on the left side of isogloss B begin with affricate [ts]-/[tʃs]-, while other variants, [t]- or [l]- ([təʔ], [ləʔ], [te], [tə]) are located on the right side, and they are believed to have no connection with [ts]- suffixes [3]. However, it is generally assumed that the basic principle of geographical distribution is continuity, i.e., the distribution of languages/dialects or linguistic features should be a gradient continuum (cf. [22]). For the distribution of *zi* suffix and *zi* rime change in figure 6, a continuum is clearly demonstrated in the atlas, so it could be hypothesized that all the forms are of the same origin, i.e. [ts], or it is hard to interpret this clear boundary, and hard to explain why the variants in region A are derived from [ts] while those in B are derived from [tʃ]. Therefore, for the regions A, B and C, the change of the onset consonant of the suffixes could be shown as (2). In general, the onset of the origin [ts] is weakening as is illustrated by the geographical distribution, and for the *zi* rime change, it is regarded as the lost of the onset and then the rime part (which also undergoes changes) is merged into the stem, which at the same time causes a series of phonological alternation of the stem.

Moreover, though L. Wang [3] claims that the dialect of Yishi (猗氏) uses [tou] as a noun suffix and it is the rime part of [tou] that merges into the stem to produce rime-change form, there is nevertheless no convincing evidence to show that whether [tou] is not a variant of [ts]. In other words, it is hard to say that whether the phonetic form [tou] is written as ‘_POOL’ or it is a variant of ‘_zi’.

To sum up, this section mainly discusses the origin of *zi* rime change based on the geographical distribution of different forms and variants, as well as the historical events of immigration in Ming Dynasty. *Zi* rime change is related to the independent syllabic suffix, and the original suffix involved in the evolution of *zi* rime change is [ts]. Further, I propose that *zi* rime change actually emerged in

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15 *Zi* form in Jiang County is [ya], whose origin is unclear [3].
Henan Province along with the influence of the immigrants of Shanxi, and what they bought to north Henan in the 14th century was zi suffix, instead of the rime-changed forms. The detailed discussion of the evolutionary process and the motivation will be given in section 4.

3.2. Evidence from synchronic analysis

Many cross-linguistic studies suggest that synchronic analysis can help examine the phonological nature of diachronic rime-changed form and understand its origin and evolution.

Obviously, the rime-changed forms in north Henan are systemic and it is generally assumed that a degenerated affix with features [+back, +round] (usually [u]) is suffixed to the stem rime (cf. [1][2]), such as [piou] (←[pi] ‘nose’), [teyou] (←[tey] ‘colt’), [tšau] (←[tšur] ‘table’), [teʰiau] (←[teʰie] ‘eggplant’) (cf. table 1). However, according to the data, it seems that the actual ‘suffix’ is [-ou], which is considered to be derived from syllabic suffix [tʰou] [3]. This idea is seemingly reasonable, and the examples supporting this point are given in (3). Wang [3] transcribes the rime-changed forms in the following way since he believes that these are the actual phonetic forms used in careful speech. In fast speech, however, these forms could be transcribed as [tʰou] and [sou] according to my fieldwork as well as some other works, such as Yue [4] and Zhang [5]. The transcriptions in (3) could facilitate his analysis which claims that the ‘suffix’ [-ou] is originated from [tou], but when more data are taken into consideration, this conclusion would be more doubtful.

(3)  a. [teci] → [teci.ou] ‘chicken’
    b. [suo] → [suo.ou] ‘lock’
      (Qi County)

Similar to some formal analyses of rime change (cf. [1][2]), I still hold the idea that the degenerated affix of zi rime change in some places of north Henan is [-u], which is the last stage of the evolution as is claimed in (2), and it is not [-ou] that merges into the stem and produces rime-changed forms.

Recall the data in table 1. It can be noticed that when the nucleus of the stem is a high vowel, i.e. [i], [y] and [u], the affix seems to be [-ou] (example a, b, c, d in table 1). For the stems containing a non-high nucleus, [-u] is more likely to be regarded as the affix, and the features of the stem nucleus itself would undergo certain changes under the influence of this degenerated affix (example e, f, g, h, i in table 1). This point can be clearly illustrated when comparing the rime-changed forms [tey-ou] (stem [tey]) and [teya-u] (stem [teyɑ̃]) in Zhengzhou Chinese.

However, it is believed that rime change is generally a unified process, and the cases above should be explained by the same set of constraints or rules. Therefore, I assume that segment [o] in [-ou] is a synchronic epenthetic segment which facilitates the articulation, instead of a diachronic remnant, and the degenerated affix of zi rime change in some places of North Henan is [-u].

The epenthetic process can be explained by current phonological theories. Notice that [-u] has the features [+high, +back, +round], and the vowels [i], [u] and [y] are specified as [+high]. According to Chung (1995, cited in [23]), in the rhyme domain, two segments which have the same specification for feature [high] cannot be adjacent. This is a version of OCP. In the framework of Optimality Theory [24], two constraints in conflict can be used to interpret this epenthetic process, as given in (4) and (5).

(4) *ahighahigh: Adjacent vocalic segments with the identical feature [high] are prohibited [23].
(5) DEP-IO: Output segment must have input correspondents [25].

Based on the constraint ranking *ahighahigh >> DEP-IO, the tableau is presented in (6), with the example of input /pi/ (‘nose’). Due to the influence of feature [+round] of affix [u], the epenthetic segment is [o] instead of other possible candidates. The optimality-theoretical analysis (constraints and candidates) are abridged since this is not the main issue in this paper.

(6) /pi/ + [u] → [piou] (‘nose’)

<table>
<thead>
<tr>
<th>input: /pi+/[u]</th>
<th>*ahighahigh</th>
<th>DEP-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. piu</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. piou</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
The analysis in (6) intends to illustrate the point that although the form [-ou] does appear in certain cases of zi rime change, it is not necessarily from [tʰou]. If it is [-ou] that merges into the stem and produce rime-changed form, as is claimed by L. Wang [3], the cases with a non-high nuclei as is discussed above will be problematic. Therefore, it is more reasonable to regard the degenerated affix is [-u], while the [o] is epenthetic, which could synchronically treats zi rime change as a unified process.

The typological distribution observed in my own fieldwork, as well as the historical events of immigration, indicates the possible connection between zi suffix and zi rime change. A brief synchronic analysis shows that [-ou] in the certain rime-change forms cannot be simply regarded as part of [tʰou], and the idea that zi rime change is originated from [tʰou] is not that impeccable. I think that it is morpheme [ts] that plays a role in the evolution of zi rime change.

4. Evolutionary Process of zi Rime Change

On the basis of the discussion above, the fact discovered by my fieldwork reveals a possible connection between the syllabic suffix [ts] and degenerated affix [u] (recall (5)). In general, the syllabic suffix is gradually weakening and finally the onset consonant diminishes. The remaining vowel (which has reduced to schwa [ə]) starts to merge into the stem and produce different rime-changed forms. Though seemingly reasonable, this process is always doubted by some researchers since the change from original [ə] to schwa [ə] and then to the degenerated form [-u] is puzzling. In the following section, the evolutionary process is to be discussed.

4.1. The lenition chain

H. Wang [14][26] proposes the lenition chain of suffix [ts] in Shanxi Province, and it is later modified and improved by Guo [11], as given in (7). All these forms have been found in Shanxi Province (cf. [9]). Since this changing process has been argued and proved by previous works, this paper will briefly discuss this issue.

\[(ts) \rightarrow (ts\dot{a}) \rightarrow (t\dot{a}) \rightarrow (ta) \rightarrow (s)\]

Generally speaking, the consonants of these forms are gradually weakening. The onset consonant of the original suffix is affricate [ts-], and then reduces to plosive/lateral, and the final stage is onsetless. Notice the glottal stop in [tsə?] and [tə?], and the emergence of glottal coda in [tsə?] and [tə?] may be regarded as fortition. However, as the only dialect that preserves the glottal coda in North China, Jin Chinese tends to glottalize the weakened syllables as a result of systemization and unification, which is similar to Wu Chinese (cf. [11][27]). In the lenition chain above, the lost of glottal stop in the later stages is still a weakening process. For the nuclear vowel, the reduction is obvious and easy to interpret. Due to the articulatory efficiency, the initially high front vowel reduces to a featurally unmarked schwa [ə], which is the least marked segment in non-head position (as a suffix) [28]. If investigated from the perspective of geographical distribution, these variants are distributed in Shanxi Province almost from the west to the east, and from the plateau to the plain, i.e. region A, B and C in figure 6. Though there is no direct evidence that the form [tsə?] would change into [ə], this is theoretically possible.

In terms of this fieldwork, only [tsə?], [tə] and zi rime change are found in the area under investigation, and [ə], which is assumed to be the last stage, does not appear in north Henan. According to the published data, [ə] is only recorded in Yuanping of Shanxi Province (山西原平) [9]. Located in Xinzhou Basin, Yuanping is surrounded by mountainous areas where the people use [tsə?], [tə?] and [ta]. Xinzhou Basin is connected to Taiyuan Basin and the valley of the Fen River. If the geographical features of Shanxi Province are taken into consideration, Yanping is actually located in a ‘corridor’ which facilitates the communication and language contact from south Shanxi.

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where Zhongyuan Mandarin is dominant. In such a geographical environment, it is quite possible for Yuanping dialect to evolve [ə] suffix, and the lenition chain in (7) is reasonable.

Beyond that, why there is no [ə] suffix found in the border region between Jin Chinese and Zhongyuan Mandarin in north Henan, where it is supposed to have such a form? Unlike Yuanping, Hebi is located in the border area of vast North China Plain, where the evolutionary rate of linguistic features is assumed to be more rapid. In such a circumstance, a suffix in the form of schwa [ə] is more unstable and harder to preserve, therefore no traces are left in this area, but only zi rime change is demonstrated.

4.2. Emergence of the degenerated affix

According to the discussion in section 3, the evolutionary chain is established in (8). Previous stages are generally reasonable and explainable, but the last stage from schwa [ə] to the degenerated affix [-u] ( [+high, +back, +round]) is relatively puzzling.

(8)
\[
\begin{align*}
\text{[ts]} & \rightarrow \text{[tsəʔ]} \rightarrow \text{[əʔ]} \rightarrow \text{[ə]} \rightarrow \text{[ə]} \cdots \cdots \cdots \rightarrow \text{[ə]} \\
\text{[ə]} & \rightarrow \text{[ə] rime change}
\end{align*}
\]

H. Wang [14][26] claims that there may be some stages between [ə] and [-u] undiscovered. As is discussed in 4.1, the ‘expected’ intermediate links may not be discovered due to the instability and harder preservation of such forms, while zi rime change (the final stage) and the syllabic suffixes [taʔ]/[tə] are relatively more stable, therefore demonstrate in this area. Anyway, the investigation in Hebi area and the typological distribution suggest the connection between [ə]/[tə] and [-u] is reasonable (section 3.1), and this section makes an attempt to interpret this seemingly impossible change.

Functional motivation is one of the triggers in language change. Miller [29] argues that segments with a grammatical function are more resistant to change than identical non-functional ones, at least after a period of variation, and endangered functional elements can be reinforced or undergo renewal. This is not uncommon in world languages, especially for some grammatical markers, such as plural forms, gender and case, in various Indo-European languages [29]. Roberge (1985, cited in [29]) also discusses the strength of the functional segments:

When a phonological innovation threatens oppositions that are of communicative importance, it is possible for the requirement of intelligibility to hinder its spread. Speakers may at first use the new articulation at the expense of a linguistic distinction. If ambiguity results, they will repeat with more precise enunciation (thereby restoring the original pronunciation) or else find paraphrases. …

These discussions are inspiring for the interpretation of zi rime change. H. Wang [14] also mentions that it is the degenerated affix [-u] which has features [+high, +back, +round] that preserves the semantic function of ‘zi’. However, due to the force of articulatory efficiency, the vowel of the original suffix [ts] keeps declining, and the tendency is toward a schwa [ə]. When this schwa starts to merge into the stem and form rime-changed form, its endangered semantic function caused by the less prominence of this affixal segment is necessary to be reinforced.

In terms of feature specification, [ə] is specified with [+back] cross-linguistically. Most dialects in Henan can be analyzed as with an underlying 7-vowel system, as shown in (9) (cf. [30]). The sonority scale of these vowels is given in (10) [28].
(9)

<table>
<thead>
<tr>
<th>i</th>
<th>y</th>
<th>u</th>
<th>e</th>
<th>ə</th>
<th>ɔ</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>low</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>back</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>round</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

(10) ə < i y u < e ɔ < a

In order to reinforce the suffix, the renewal form tends to a more sonorant vowel. Since the featural change should be economical, the original feature [+back] of segment ə is preserved and the candidates which are [+back] and more prominent than ə include [u], [ɔ] and [a]. In the cross-linguistic study of vowel inventories, in Maddieson’s [31] study, the phonetically back vowels are usually rounded, and there are totally 901 round vowels out of 964 back vowels (93.5%). From this point of view, when schwa ə evolves a more sonorant segment, it tends to be a rounded vowel, therefore almost all the rime-changed forms end with [+back, +round] segments in north Henan Province. Further, in terms of naturalness, [i, a, u] are the most widespread vowels in world languages. As for frequency, [u] is much more natural and possible than other segments in the inventory to perform as the degenerated affix.

The emergence of this degenerated affix could be also inspected from the well-formedness of Chinese rime. In most varieties of Chinese the maximal syllable structure is CGVX, where C is a consonantal segment, G a glide, V the nucleus and X a nasal or a post-nuclear glide. Here I adopt the syllable structure illustrated by Cheng [32] and Lin [33], as given in (11). When the schwa ə is merged into the stem rime, it tends to fit into the position of X under the constraint of Chinese syllable structure, which only allows the post-nuclear glides [i] and [u]17, or nasal coda.

(11)

The previous parts discuss the emergence and evolution of the degenerated affix [-u]. There is a rather special case, however, in Huojia Chinese. For the zi rime change in Huojia, which is to some extent different from that in other places of north Henan, the rime-changed forms there always end with [ɔ] or [o], and some examples are given in table 5 [12].

<table>
<thead>
<tr>
<th>Stem</th>
<th>Zi noun</th>
<th>Stem</th>
<th>Zi noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>ʨei</td>
<td>ʨiou</td>
<td>ʨei</td>
<td>ʨiou</td>
</tr>
<tr>
<td>ʨe</td>
<td>ʨeu</td>
<td>‘chicken’</td>
<td>ʨe</td>
</tr>
<tr>
<td>fiou</td>
<td>‘colt’</td>
<td>ku</td>
<td>ʨuo</td>
</tr>
<tr>
<td>li</td>
<td>liou</td>
<td>‘prickly heat’</td>
<td>ʨia</td>
</tr>
<tr>
<td>FileManager</td>
<td>‘chestnut’</td>
<td>mau</td>
<td>‘hat’</td>
</tr>
<tr>
<td>pa</td>
<td>ʰp</td>
<td>‘shoehorn’</td>
<td>ʰpiau</td>
</tr>
<tr>
<td>ia</td>
<td>i</td>
<td>‘duck’</td>
<td>ʰuai</td>
</tr>
<tr>
<td>xua</td>
<td>x钨</td>
<td>‘flower’</td>
<td>kai</td>
</tr>
</tbody>
</table>

Though these data are in narrow transcription, certain traces from a underlying form could still be observed. According to Li [34], the southern area of 37ºN, [au] underwent a reduction and changed into ə since North Song Dynasty (around the 10th century A.D.), and in most dialects of

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17 In traditional Chinese literature, the pre-nuclear and post-nuclear glides are transcribed as [i] and [u], instead of [j] and [w], respectively.
Henan Province, especially west Henan, [ɔ] is a part of the vowel inventory (cf. [16]). Notice when the stem has a [+high] nucleus or ends with a high glide (especially [i] and [y]), [u] is affixed, which is similar to the data in table 1; if the nucleus of the stem is a non-high vowel (usually [a], [e], [ɛ] and [ɔ]), the rime-changed forms will be [ɔ] or [o], which I personally consider as the coalescence of [au] ([eu], [yu] or [eu]).

In general, it is the degenerated affix [u] that appears in the rime-changed forms of north Henan dialects. The evolutionary process is a gradual reduction from the syllabic suffix to a degenerated affix. In the later stages, the tendency to preserve the semantic function of zi suffix forces the segmental affix to be more prominent when it merges into the stem rime.

5. Concluding Remarks

Based on the geographical distribution of zi forms in Hebi area, this paper makes an attempt to argue that zi rime change in north Henan Province is originated from [ts], and the idea of ‘tou’ origin is not that convincing. Although the ‘expected’ intermediate links between [ɔ] and [u] have not been observed yet, this change is nevertheless possible, as is discussed in section 4.2.

However, for the study of zi rime change, there are still many problematic issues to be concerned. The emergence of zi rime change is probably a relatively recent event (in Ming Dynasty, as is claimed in section 3.1) and zi-changed finals are still in consistent evolution in many dialects. Even within one dialect, the members of the inventory of zi-changed finals may be not on the same evolutionary stage (cf. [5]). Therefore, when we are analyzing and theorizing zi rime change, it is not wise to treat all the members synchronically and ignore the diachronic relationship between the members, especially for some seemingly exceptional cases. The change pattern of nasal rimes, for instance, is quite puzzling and inconclusive across different dialects, and they are not discussed here due to the limitation of space. Nevertheless, these cases still need careful investigation and interpretation.

Another important issue in the study of zi rime change is the data and source. First, most published data are collected in town centres or city centres, which have relatively easier access. The dialects in the mountainous area, however, are always ignored, which should be more valuable and noteworthy. Therefore, the dialects in some remote areas are necessary to be paid more attention, especially in the diachronic studies of zi rime change. The second problem about the data is the transcription. Many fieldworkers have made great efforts to describe and transcribe this special sound change in Chinese languages, but the transcriptions made by different researchers are various even for the same dialect. As is mentioned by Lin [2], many linguistic analyses on Chinese affixal phonology are based on the secondary sources. These sources are indeed important but further confirmation is still necessary. It is necessary to collect more authentic data for more precise information with the help of experimental phonetics, and provide further analysis with phonetic grounds.

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