



A phonetically based hypothesis on the evolution of *zi* rime change: Evidence from the Xiaxian dialect

基于语音的子变韵演化路径假说：来自夏县方言的证据

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Poster & References

Highlights

- Acoustic data confirm vowel lengthening in Xiaxian *zi* rime change in all four speakers.**
声学数据证实：夏县子变韵中的元音延长见于全部四位发音人。
- Some speakers add a **backed offglide** (a short “tail”) after high front vowels.**
部分发音人在高、前元音之后出现一个后移滑音。
- This tail may be where the **/u/ ending** of other dialects comes from.**
这个后移滑音可能是其他方言语子变韵中 /u/ 尾的来源。

1. Background: *zi* rime change

Zi rime change (子变韵): the meaning of the Mandarin suffix -*zi* (子) is expressed by an alternation in the **rime of the root**.

Dialect	root	zi noun	type
Xunxian (Henan)	tɕua ²⁴	tɕuau ²⁴	concatenation 拼合
Huojia (Henan)	tɕua ⁷³³	tɕuo ³³	fusion 融合
Xiaxian (Shanxi)	p ^h ɤ ³³	p ^h ɤ ³³	lengthening 长音
Wenxi (Shanxi)	p ^h ə ⁵³	p ^h ə:u ⁵¹	lengthening + concat. 长音+拼合

‘table’ in four dialects (example (1); F. Wang 1999 types)

Puzzle: In many dialects, the rime-changed forms end in a **back rounded** segment (/u/, /o/), yet *zi* suffixes contain an apical vowel or schwa ([tsɿ], [təʔ], [tə]). **Where does /u/ come from?**

Received pathway (after H. Wang 2004, 2008)

CV + tsɿ → ... → CV + ə → CV:ə → ? → CV:u

CV: (→ fusion) Henan
CV: (Shanxi)

- Length-only dialects such as **Xiaxian** = a **late stage**, after loss of /u/.
- The step ə → u (?) remains controversial.

2. Xiaxian *zi* rime change & RQs

Xiaxian (夏县), Yuncheng, southern Shanxi; Fenhe group of Zhongyuan Mandarin. Fieldwork in Yaofeng Town (瑶峰镇), 2024 & 2026.

- 36 basic finals; 32 have rime-changed forms
- Previous descriptions: lengthening only
- New:** a backed offglide

	item	basic	rime-changed	gloss
a.	裤	k ^h u ³³	k ^h u:u ³³	‘pants’
	刀	taw ⁵²	ta:w ⁵²	‘knife’
	桌	p ^h ɤ ³³	p ^h ɤ ³³	‘table’
b.	梯	t ^h i ⁵²	t ^h i:X ⁵²	‘ladder’
	女	n ^h y ²³	n ^h y:X ²³	‘girl’
	身	sɛj ⁵²	sɛ:X ⁵²	‘body’
	柜	k ^h wej ³³	k ^h we:X ³³	‘wardrobe’

a. lengthening; b. lengthening + offglide.

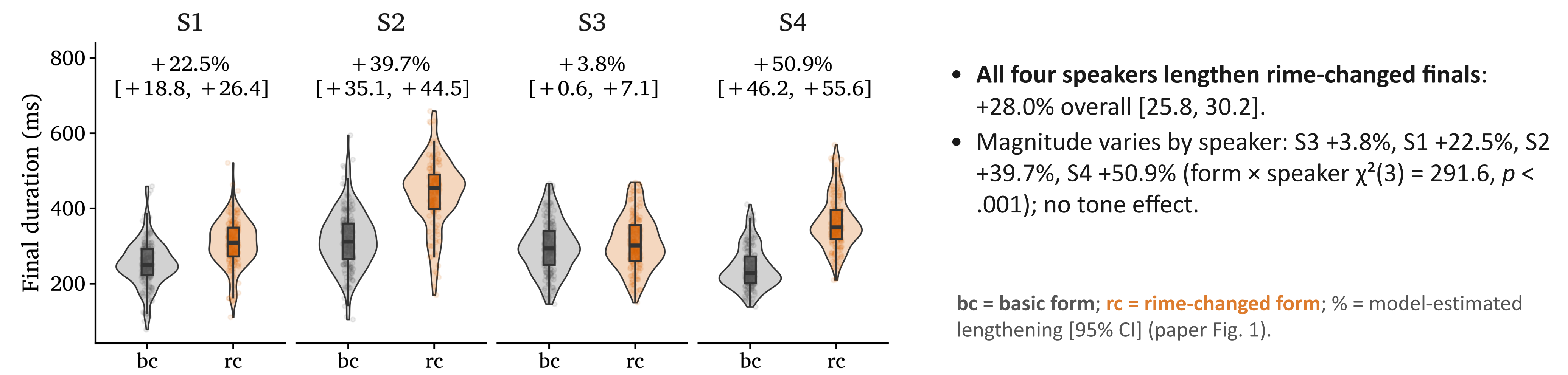
- [X] = backed offglide:** auditorily central to back, with narrowing of lip aperture; salient for some speakers, weak or absent for others. Not reported in earlier descriptions.
- Its distribution appears regular, related to vowel height and frontness.

- RQ1** Are rime-changed finals consistently longer than basic finals?
- RQ2** What are the acoustic properties of the backed offglide, as reflected in formant trajectories?
- RQ3** What are the phonetic conditions on its occurrence?

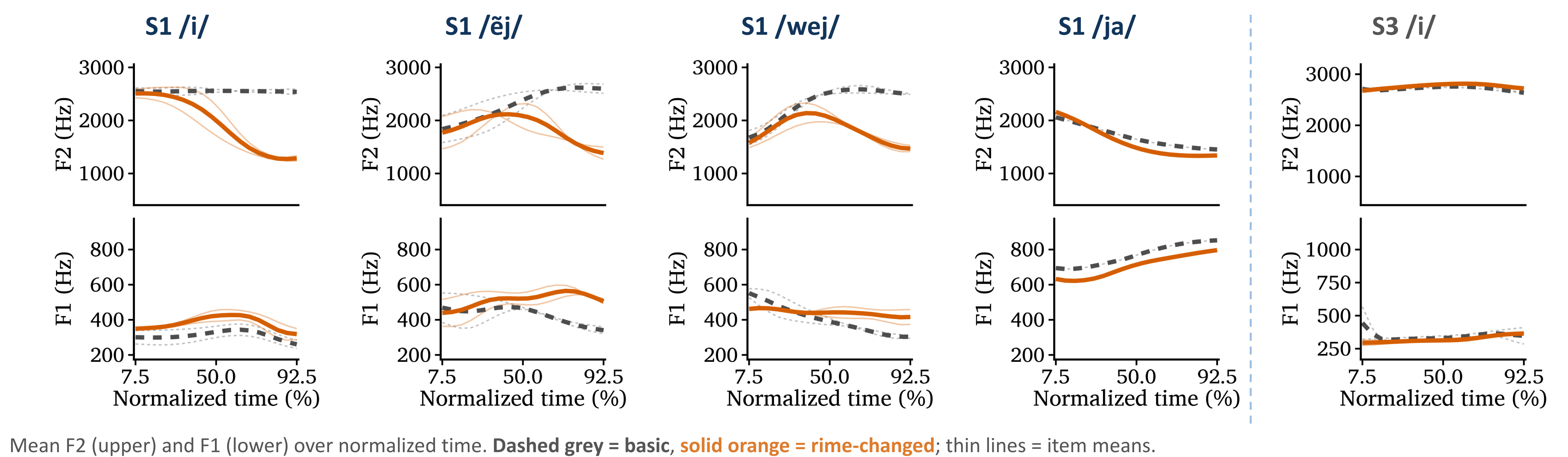
3. Method

- Speakers:** S1–S4 (2 F, 2 M), aged 69–74, lifelong residents of Yaofeng Town.
- Materials:** 59 items, 31 basic finals.
 - Each item as **basic form (bc)**, read in 这是 ____ ‘This is ____’, and **rime-changed form (rc)**, naming a pictured object in the same frame.
 - 3 repetitions.
- Data:** 1,371 tokens after quality control (707 bc, 664 rc). MFA alignment, manual correction in Praat.
- Measures:** final duration; F1, F2 at 20 time-normalized points.
- Analyses:**
 - RQ1 mixed-effects model of log duration.
 - RQ2 offset backing and Δ F2 decline.
 - RQ3 Spearman ρ per speaker, Holm-adjusted.

4. RQ1: Longer duration in *zi* rime change



5. RQ2: The backed offglide in formant trajectories



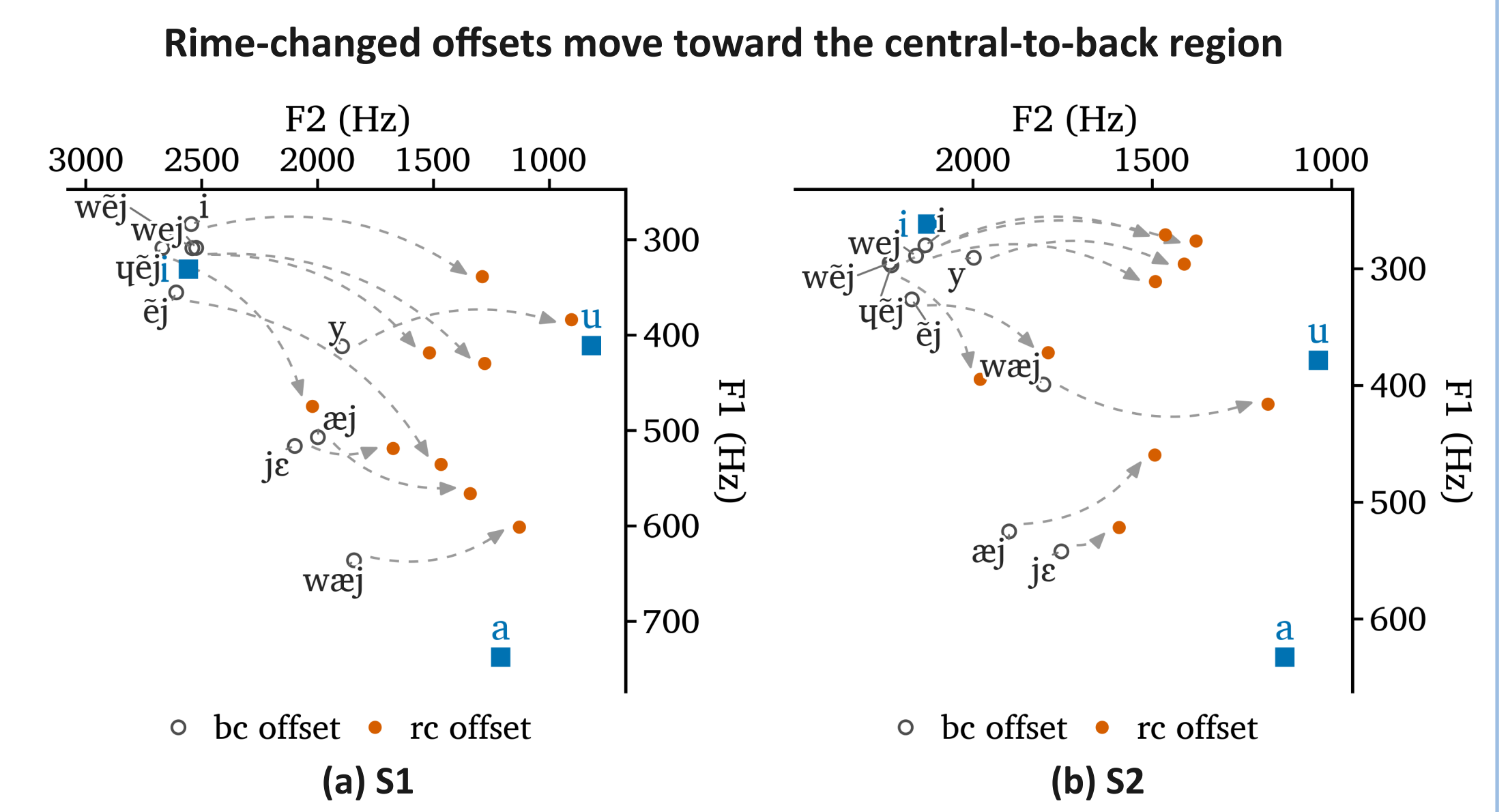
Mean F2 (upper) and F1 (lower) over normalized time. Dashed grey = basic, solid orange = rime-changed; thin lines = item means.

- S1 and S2:** clear F2 lowering toward the offset in some rime-changed finals.
- S3:** bc and rc trajectories largely overlap. **S4:** a weaker offglide, with smaller offset backing (e.g., /i/, /wěj/).
- The offglide is **gradient and unstable**: its size varies by final and speaker, and end points do not converge on one target (they depend on the basic final). F1 changes too (S1, S4).

6. RQ3: The offglide occurs mainly after high front finals

Final	S1		S2		S3		S4	
	OB	ΔD	OB	ΔD	OB	ΔD	OB	ΔD
wěj	1261	710	855	532	-26	-31	375	-40
i	1256	1180	669	490	-78	-23	278	147
ěj	1143	671	380	271	-29	46	169	34
wej	1006	559	667	431	-70	-18	118	-34
y	990	430	587	304	695	58	201	12
wæj	713	97	626	243	-33	87	284	36
æj	658	569	406	112	-55	30	268	-21
qěj	648	158	248	161	-124	2	-22	107
je	424	295	161	63	97	176	191	265
u	194	358	135	166	-194	87	-30	55
a	24	-69	15	43	75	-30	-12	13
ej	-80	18	48	3	-84	-25	-64	17

OB = offset backing (bc – rc offset F2); ΔD = Δ F2 decline (rc – bc peak-to-offset F2 decline); Hz. Shading: ≥900, ≥600, ≥300, ≥100. Selected finals.

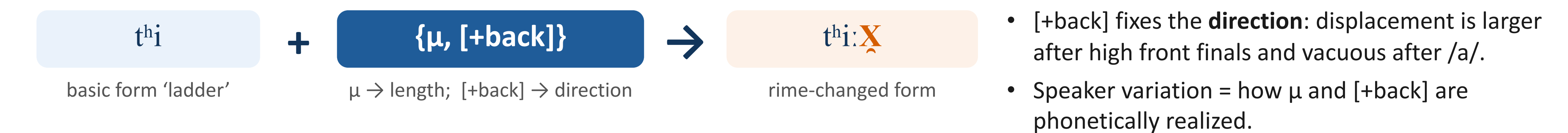


Basic and rime-changed offsets in F1–F2 space for the nine finals, S1 (a) and S2 (b); /i, u, a/ as reference.

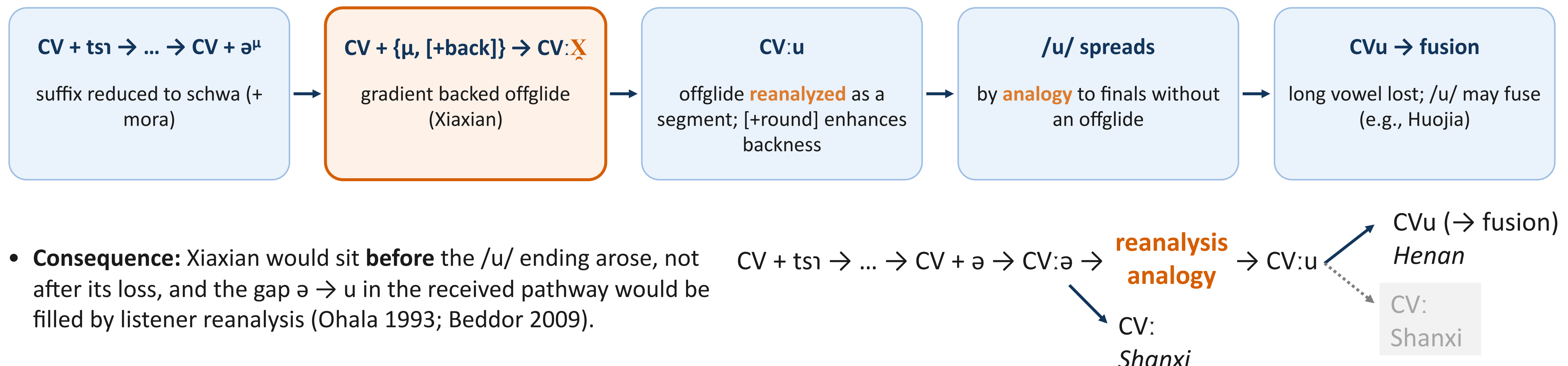
- In **S1 and S2**, /i, y, æj, wæj, ej, je, wej, wěj, qěj/ combine offset backing with a larger F2 decline; rc offsets move toward the **central-to-back** region. **S4:** weak; **S3:** none (except one /y/ item).
- Larger changes after **higher, fronter** basic-form offsets (S1, S2; Spearman $\rho = .60-.68$, Holm $p < .05$).

7. Interpretation and an evolutionary hypothesis

Representation. The Xiaxian *zi* affix = a mora with a floating [+back]: {μ, [+back]} (see also Lin 1993; Yang 2024)



Hypothesized pathway



8. Closing remarks

- Xiaxian *zi* rime change = **lengthening** (all speakers) + a **backed offglide** (mainly S1, S2; only after high front basic finals).
- The offglide is **gradient, unstable** and **tied to morphology** → *zi* affix {μ, [+back]}.
- Hypothesis:** the Xiaxian offglide raises the possibility that the /u/ ending of other dialects arose through listener reanalysis.
- Next:** end points vs. each speaker’s /u/ and /ə/; lip-rounding data; other Shanxi lengthening dialects.