ABA Generalizes to Monotonicity: An argument from verb stem syncretism

Sedigheh Moradi

Stony Brook University

1. Introduction

The *ABA generalization of Bobaljik (2012) states that, given a fixed order of cells in a morphological paradigm, two cells cannot be syncretic to the exclusion of any cells between them. The *ABA generalization in adjectival suppletion holds for a positive-comparative-superlative order. Bobaljik (2012) shows that, cross-linguistically, AAA, ABB, and ABC patterns are abundant but one cannot find AAB, where positive and comparative share a root distinct from superlative, and ABA, where the positive and superlative share a root distinct from the comparative (1). Within the Containment Hypothesis (Bobaljik 2012, p. 7), this gap is due to the fact that a superlative morpheme does not directly attach to adjectival roots because the superlative always embeds a comparative (2).

(1)

LANGUAGE	POSITIVE	COMPARATIVE	SUPERLATIVE	PATTERN
Persian	xub	xubtar	xubtarin	AAA
English	good	better	best	ABB
Latin	bonus	melior	optimus	ABC
*Latin	bonus	melior	*bonissimus	*ABA
*English	good	*gooder	best	*AAB

(2) a. Positive: [ADJECTIVE]
b. Comparative: [[ADJECTIVE] COMPARATIVE]]
c. Superlative: [[[ADJECTIVE] COMPARATIVE] SUPERLATIVE]]

While Bobaljik is mostly concerned with the absence of ABA patterns in adjectival gradation, he also briefly discusses tense syncretism in verb stems. He draws on Wiese (2005)'s

*The author wishes to send special thanks to Mark Aronoff and Thomas Graf for their constructive input and guidance.

analysis of ablaut in German verbs to explain German stem alternations within the same framework. He notes that no verbs in English and German display ABA patterns if one assumes an order of Present-Perfect Participle-Past (3).

(3)

	PRS.1SG	PERFECT PARTICIPLE	PAST.3SG	PATTERN
German	sprech-e	ge-sproch-en	sprach	ABC
	gieβ-e	ge**goss**en	**goβ**	ABB
	geb-e	ge-**geb**-en	gab	AAB
English	sing	sung	sang	ABC
	shine	**shone**	**shone**	ABB
	come	**come**	came	AAB
	walk	**walk**ed	**walk**ed	AAA

Wiese (2005, p. 29) and Bobaljik (2012, p. 234) explain the gap in the data, i.e., the unattested identicality of present and past to the exclusion of participle, using the Containment Hypothesis within the hierarchy in (4) .

(4) a. present $<$ perfect participle $<$ past

(5) a. Present: []
b. Participle [[] PAST]]
c. Past [[[] PAST] FINITE]]

In (5), the present tense is the default tense, so it does not contain any features. The participle is contained in the past sharing the [past] feature with it. The preterite, the highest in the hierarchy, contains the [finite] feature in addition to its [past] feature (Bobaljik 2012, p. 235).

Bobaljik's approach makes two predictions under the natural assumption of a single containment hierarchy for tense: (i) Present and Past are never syncretic to the exclusion of Participle, and more generally (ii) all tenses can be linearly ordered across languages so that no ABA patterns ever arise. In what follows, I show that Bobaljik's prediction is only partially borne out once one considers a wider range of data: ABA patterns do arise, but only if one also considers future tense. This is problematic for Bobaljik's system, but can be readily explained via a partial order of morphological tenses in the monotonicity framework of Graf (2018 (in press). Crucially, this partial order is induced by the tense system of Reichenbach (1947) and thus arises from third factor principles (Chomsky 2005).

The *ABA generalization has also been found in other domains of morphology. The reason there is no similar generalization for AAB patterns is that not every context that excludes ABA will necessarily exclude AAB. For example, Bonami and Boyé (2002) show that the only unattested pattern in the stem suppletion of the French verbs' present tense paradigm is ABA. Similarly, Smith (2016) and Harbour (2015) show that languages with

pronouns may use the same pronoun for all person values (AAA), or they may have the same form for the first and second (AAB), or the second and third persons (ABB), or simply have separate forms for all three persons (ABC), but they will never use the same pronoun for the first and third persons (*ABA). AAB patterns are also attested in case syncretism (Caha 2009). In Caha's arrangement of the case order, the representation of Genitive properly contains that of Accusative, which in turn properly contains Nominative, etc. (Nominative $<$ *Accusative* $<$ *Genitive* $<$ *Dative* $<$ Instrumental). Thus, for example, Accusative and Dative cannot be syncretic to the exclusion of Genitive (*ABA), but an AAB arrangement can be possible (e.g., where Nominative and Accusative are syncretic to the exclusion of Genitive).

In what follows, I present the data collected on verbal stems and the 10 possible alternations they demonstrate in §2, and explain why an *ABA restriction over a linear order cannot account for all types of verbal stem alternations. Then, drawing on Graf (2018 (in press)'s reanalysis of the *ABA generalization as an outcome of monotonicity in §3, I introduce monotonicity as the restriction on a partial hierarchy of tense. In §4, I show that this hierarchy is independently motivated by Reichenbach's tense system. §5 summarizes how monotonicity can reinterpret the *ABA generalization and build a formal upper bound on the range of typological variations. §6 concludes the paper.

2. Cross-Linguistic Corpus of Tense Syncretism

The results reported here are based on a typologically diverse opportunity-sample of tense syncretism in more than 20 languages, drawn from Altaic, Germanic, Indo-Iranian, Romance, and Slavic, among others. The comparison of tense suppletion is sometimes complicated by person/number suppletion within a single tense paradigm. For simplicity, I assume that two tenses have distinct stems if their stems differ for at least one person/number cell. This decision does not affect the core claims with respect to (i) and (ii).

Before presenting the data, however, a short discussion on the meaning of stem in this context is in order. Kroeger (2005, p. 248) defines the term 'stem' as part of a word that contains no inflectional morphology, consisting of a root and any optional derivational morphemes. Thus, a stem can be a single root or more than a root. Within each paradigm, different stem forms can either be fully or partially related. To make this clear, look at the following examples from Persian:

(6) a. **xor**.PRS – **xor**d.PST – **xor**de.PRTCPL 'eat'
b. bin.PRS – **did**.PST – **did**e.PRTCPL 'see'

The difference between the two sets of forms in (6) is that in (6a) all stem forms are partially related. That is, although the stem forms are slightly different, they all share the same root *xor*, whereas in (6b), the present stem *bin* is not related to the other two. A situation where paradigms do not use the same stem throughout is called suppletion. What all suppletive inflectional relations share is that their forms must be listed (or partially so), even though their meanings are perfectly regular (Aronoff 2012, p.33). An important aspect of this relationship is that, as Carstairs-McCarthy notes, listedness can be used as a clue to

the way in which the inflected forms of a word are related to each other systematically all through the paradigm (Carstairs-McCarthy 1994, p.4410). In the Italian verb *andare*, for instance, the distribution of the two stems: *va(d)-* and *and-* is phonologically determined. *Va(d)-* is used in forms where the stem is stressed, while *and-* is used elsewhere. So, the present subjunctive emerges as (7):

(7) vád-a, vád-a, vád-a, and-iámo, and-iáte, vád-ano

Following this introduction, let's next look at the data deemed to show the same kind of relationship in different verbal paradigms. In what follows, the term 'Participle' is used as a short form for the 'Past Participle'.

2.1 Patterns of Tense Syncretism

(8) *All Stems have the Same Root*

Language	Past	Participle	Present	Future	Gloss
Azeri	**gæl**dɪ	**gæl**miʃ	**gæl**ir	**gæl**æçæx	come
Korean	**pone**tta		**pone**ta	**pone**l kʌʃita	send
Turkish	**gel**di	**gel**miʃ	**gel**ijor	**gel**eçek	come

Other languages showing this pattern include Urdu, Gujrati, Sindhi (Indic); Persian, Laki (Iranian); English, German (Germanic); French, Spanish, Italian (Romance); Armenian (Western and Eastern); and Russian.

(9) *Same Root for Past and Participle; Same Root for Present and Future*

Language	Past	Participle	Present	Future	Gloss
Japanese	**ʃit**a	**ʃit**eita	**suru**	**suru**	do
Western Arminian	**ger**a	**ger**ə	g **ud**e	bidi **ud**e	eat

This is the second most frequent pattern found in the data, used by 10 languages: Japanese; Urdu, Gujrati, Sindhi (Indic); Kurdish, Laki (Iranian); English (Germanic); French, Italian (Romance); Armenian (Western and Eastern).

The rest of the patterns are much less common than the first two. The languages associated with each pattern are listed below.

(10) *Same Root for Past, Participle and Future; Separate Root for Present*

Language	Past	Participle	Present	Future	Gloss
Persian	**did**	**did**e	**bin**	xɑhad **did**	see
SerboCroatian	**hte**o sam	**hte**o	**ho**ću	**hte**ću	want

(11) *Distinct Roots for all Stems*

Language	Past	Participle	Present	Future	Gloss
Italian	diss	detto	diç	dir	say
German	warf	geworfen	wirf	werfen	throw
French	fu	été	suis.1SG	ser	be

(12) *Same Root for Past and Participle; Distinct Roots for Present and Future*

Language	Past	Participle	Present	Future	Gloss
SerboCroatian	**iʃa**o sam	**iʃa**o	idem	ići ću	go
Sindhi	**wa**yo	**wa**yo ho	wanje t^ho	wiindo	go
Southern Kurdish	**ber**d	**ber**ɪɑ	beid	bad	carry

(13) *Same Root for Past, Participle and Present; Separate Root for Future*

Language	Past	Participle	Present	Future	Gloss
French	**all**	**all**	**all**	ir	go

(14) *Same Root for Present and Future; Distinct Roots for Past and Participle*

Language	Past	Participle	Present	Future	Gloss
Kurdish	xwɑrd	xorɪɑ	**xweid**	**xweid**	eat

(15) *Same Root for Participle and Future; Distinct Roots for Past and Present*

Language	Past	Participle	Present	Future	Gloss
German	gab	ge**geben**	gib	**geben**	Give
Spanish	fu	**Ø**i	v	**Ø**ir	go

(16) *Same Root for Participle, Present and Future; Separate Root for Past*

Language	Past	Participle	Present	Future	Gloss
English	went	**go**ne	**go**	will **go**	go

(17) *Same Root for Participle and Present; Distinct Roots for Past and Future*

Language	Past	Participle	Present	Future	Gloss
French	vin	**ven**	**ven**	viend-r	come

In sum, with an ordering of Past-Participle-Present-Future, the following patterns are attested in the data:

(18) *Attested patterns of tense syncretism*

(1) AAAA: Turkish: **gel**di, **gel**miʃ, **gel**ijor, **gel**eçek
(2) AABB: Japanese: **ʃit**a, **ʃit**eita , **suru**, **suru**
(3) AABA: Serbo-Croatian: **hte**o sam, **hte**o, **ho**ću, **hte**ću
(4) ABCD: German: warf, geworfen, wirf, werfen

(5) AABC: Sindhi: **wa**yo, **wa**yo ho, wanje t^ho, wiindo
(6) AAAB: French: **all**, **all**, **all**, ir
(7) ABCC: Kurdish: xwɑrd, xoriɑ, **xweid**, **xweid**
(8) ABCB: Spanish: fu, **∅**i, v, **∅**ir
(9) ABBB: English: went, **go**ne, **go**, will **go**
(10) ABBC: French: vin, **ven**, **ven**, viend-r

2.2 Data Analysis

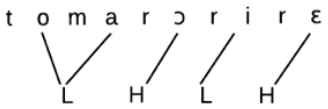
Out of all logically possible patterns, only 5 are unattested: ABAX (where Future is A, B, or C), ABBA, and ABCA. The absence of ABAX patterns shows that syncretism of Present and Past to the exclusion of Participle is not attested. The behavior of Future is problematic, though. While Future is never syncretic with Past to the exclusion of either Present or Participle, AABA and ABCB violate the *ABA generalization. Note that there is no way of totally ordering all four tenses such that there are no ABA configurations. But if one allows for partial orders, ABA patterns with Future can be accounted for in terms of Graf (2018 (in press)'s monotonicity constraint.

3. Monotonicity

A mapping from x to y is monotonic if it preserves the relative order of x and y based on their internal structure. A linguistically familiar example useful to explain monotonicity is the ban against crossing branches in autosegmental phonology (Goldsmith 1976). Autosegmental structures are usually presented in tiers, and within each tier segments are linearly ordered. For example, in a tonal language like Kikuyu, there are two tiers: one for segments and one for tones. The ban on crossing branches assures that all mappings from tones to segments follow the linear order of the two tiers. This ban is observed in (19a) but violated in (19b) (Graf 2018 (in press) .

(19)

a)



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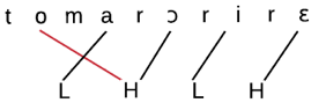


(20) *Monotonicity:*
Let f : A → B be a function and let $\leq_A$, $\leq_B$ be partial orders on sets A and B, respectively. Then: $\forall x, y \in A, x \leq_A y$ implies $f(x) \leq_B f(y)$.

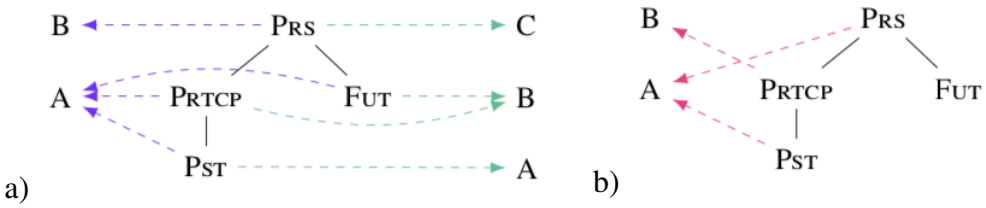
Monotonicity is a mathematical property that corresponds roughly to the linguistic notion of order preservation. Given an ordering $\leq$ over a set $\{p, q, r, s, \ldots\}$ such that $p \leq r \leq s$,

one cannot map both p and s to some A without also mapping r to A. If $\leq$ is a linear order, monotonicity corresponds exactly to the *ABA generalization. But monotonicity is more general because it is also defined for partial orders. Suppose that $p \leq r \leq s$ as before, and $p \leq q$, but q is unordered with respect to r and s. Then a monotonic mapping could map p and r to A but q and s to B. This is allowed because there is no configuration of three linearly ordered elements where the middle piece is not mapped to the same thing as the other two elements.

Graf (2018 (in press) posits monotonicity as a more abstract version of the *ABA principle and shows how it explains typological gaps in adjectival gradation, case syncretism, and the Person Case Constraint, among other morphosyntactic phenomena. Graf deliberately abstracts away from how monotonicity is encoded in the grammar, as this varies greatly across domains. His high-level approach also works for the data presented in §2.

Suppose that Present $\leq$ Participle $\leq$ Past, and Present $\leq$ Future, but Future is unordered with respect to Participle and Past. Then Future can be syncretic with any one of the three tenses to the exclusion of the others, allowing for a limited range of what appear to be ABA patterns. This is illustrated in (21) for the attested *ABA violations AABA and ABCB. Example (21) shows that the unattested ABAX patterns (21b) do not obey monotonicity (crossing branches).

(21)



4. Semantic Motivation

The proposed hierarchy of temporal stems is independently motivated in terms of Reichenbach (1947)'s tense system. In this system, tense denotes a three-way relation between speech time (S), event time (E) and reference time (R). The time of the speech is when the utterance is spoken; the time of the event is the temporal location of the event, and the time of the reference is the point in time from which we are referring to the event.

The reference time can be the same as the speech time, or it can precede/follow it. The position of R relative to S distinguishes the 3 tenses: Past, Present, or Future: E is at R (R = E) and R is located relative to S: before, at or after S, respectively. The position of E with respect to R distinguishes 3 further possibilities: 'posterior' (viewing the situation E from the past, from an earlier point; looking forward), 'simple' (used for the coincidence of R and E) and 'anterior' (viewing the situation E from the future, from a later point; looking backward). This allows for 13 different logical tenses, which can be ordered in terms of their inequality statements.

(22)

R		S		Perfect	(R < S)
	R	S		Past	(R < S)
		R,S		Present	(R = S)
		S	R	Future	(R > S)

Which relations are included in a hierarchy of tense? Clearly, absolute tenses (present, past, future) are part of this hierarchy, but present progressive, for instance, should not be included in it because it is an aspectual relation. The situation with perfects is different. Both Reichenbach and Comrie agree that perfect cannot be viewed as a canonical aspect since it tells us nothing about the internal temporal organization of the situation (Comrie 1981). Perfect is like tense in that it locates an eventuality relative to some reference point. In the sentence *Paniz has eaten the cake*, there is an eventuality to the act of eating. This makes the present perfect very similar to the simple past. In Reichenbach's terms, the simple past expresses a temporal precedence between the Speech time and the Reference time, while the perfect expresses a temporal precedence between the Event time and the Reference time. Another point of difference between the present perfect and the simple past will be apparent once we add a past-oriented adverb to our example: **Paniz has eaten the cake yesterday*. It is unexpected for an anterior temporal relation to be incompatible with a past-oriented adverb (Klein (1992) refers to this situation as "the present participle puzzle").

More in support of positioning perfect among tense relations is the fact that perfect refers to a bundle of meanings that is maintained no matter what absolute tense it is associated with. Generally, three main readings are associated with perfects. These readings make different claims about the location of the underlying eventuality, although in some languages only a subset of them is allowed. For example, in Greek perfect participles are marked as perfective and as a result the universal reading is not possible (Pancheva 2003, p. 278). In the following examples, the universal meaning asserts that an eventuality holds for an interval of time; in the experiential reading, the eventuality holds for a proper subset of an interval; and finally, in a resultative reading the result of the eventuality holds at the speech time (Pancheva 2003).

(23) *Present Perfect:*

a. Paniz has lived in Tehran ever since.	Universal Reading
b. Paniz has been in Tehran before.	Experiential Reading
c. Paniz has arrived in Tehran.	Resultative Reading

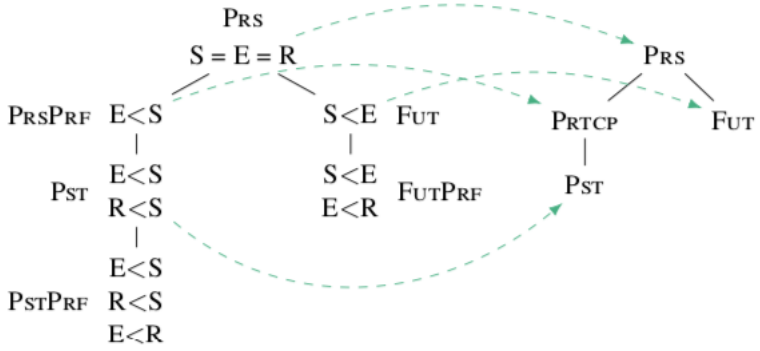
(24) *Past Perfect:*

a. Since 2009, she had lived in Tehran.	Universal Reading
b. She had been in Tehran before that too.	Experiential Reading
c. She had just arrived in Tehran.	Resultative Reading

(25) *Future Perfect:*

a. Next month, Paniz will have lived in Tehran for 3 years. Universal Reading
b. Paniz will have been in Tehran by the next fall. Experiential Reading
c. Paniz will have arrived in Tehran by Friday. Resultative Reading

With these facts in order, I include perfects as part of the tense system (though this should not deny their aspectual properties in some languages). Once one considers only those tenses that are morphologically realized across languages, the order in (26) emerges clearly.



(26)

The only contentious issue is the locus of Participle, which could be associated with present perfect, past perfect, or future perfect. There are three reasons for identifying Participle with present perfect in (26).

1) The present tense, according to Bybee et al. (1994, p. 152), refers to the default situation from which other tenses represent deviations. Along the same line, we can argue that the semantics of the past perfect and the future perfect follow from the semantics of the present perfect, combined with an account of the past tense and the future tense (Musan 2001, p. 356).

2) The claim in (1) is verifiable by comparing the frequency rates of the perfects. The future perfect seems to be the least frequent among the perfects. In a corpus-based study of English perfect constructions, (Bowie and Aarts 2012) show that the present perfect is the most frequently used type of perfect in English. They report a decrease in the usage of the present perfect by 0.8 – 0.9% (due to its shared meaning with the simple past), and in the past perfect by approximately 34% over the data drawn from the Diachronic Corpus of Present-day Spoken English (DCPSE). The change rate is calculated by comparing the earlier DCPSE subcorpus containing around 464,000 words from the London–Lund Corpus (LLC) dating from the late 1950s to the 1970s with the later subcorpus containing around 421,000 words from the British Component of the International Corpus of English (ICE-GB) collected in the early 1990s (Bowie and Aarts 2012, p. 201).

3) The hierarchy of tense is an implicational hierarchy; if a language has a past perfect or a future perfect, it is very likely that it also has a present perfect (whereas the reverse does not necessarily hold). In this hierarchy, the present perfect has the least distance from

the default point ($E = R = S$) with only one shift ($E < R, S$). The future perfect ($S < R < E$) and the past perfect ($E < R < S$) both undergo two shifts from the default. This results in the hierarchical ordering of the tenses.

Once this specific connection between semantic and morphological tenses is made, the availability of some ABA patterns with Future is due to the fact that the semantic relations between morphological tenses only induce a partial ordering.

5. Containment reinterpretation

The monotonicity account can be interpreted as a high-level description of a Bobaljik-style containment system. For example, one could posit two distinct containment hierarchies for tense (Present-Participle-Past and Present-Future), or there might be a single hierarchy Present-Particple-Past where Future can occur at various positions. This does not explain, though, why tense in general and Future in particular behave this way. The monotonicity perspective provides an answer by relating tense syncretism to the conceptual space of tense as expressed by Reichenbach (1947).

6. Conclusion

I have shown that Bobaljik's *ABA generalization holds for tense syncretism across a variety of languages, but only for Present, Participle, and Past. Future does give rise to apparent *ABA violations, but these are expected if one combines monotonicity – a more general notion of *ABA – with a partial order of tenses in the spirit of Reichenbach (1947). This establishes a strong upper bound on the range of typological variation, with the only permitted but unattested pattern being syncretism of Past and Future to the exclusion of the other tenses. Like the absence of AAB patterns in adjectival gradation, this might be due to independent factors, the precise nature of which is left to future work.

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Sedigheh (Sophie) Moradi
sedigheh.moradi@stonybrook.edu