Head movement as PF-Raising/Lowering: Evidence from Swahili RCs

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1 Introduction

This work explores derivational timing with respect to Late Insertion accounts of overflow auxiliary patterns.

- The Late Insertion approach suggests that an overflow auxiliary is inserted late to pick up stranded inflection features (Bjorkman, 2011)
- However, recent work from Pietraszko (2023) suggests an alternative approach to representing Swahili overflow auxiliaries, called *cyclic selection*.
  - Pietraszko (2023) argues that cyclic selection has an empirical advantage to capturing the surface order of the auxiliary verb *kuwa* in Swahili relative clauses (RCs), with respect to C-agr. morphology.
- We argue that the Aux. position in Swahili RCs can still be explained by a Late Insertion approach, when coupled with T-to-C PF-raising (utilizing the morphological selection features of Harizanov and Gribanova 2018).

2 Overflow auxiliaries

Two patterns of auxiliaries: the *additive* pattern and the *overflow* pattern.

The additive pattern: one-to-one mapping between inflectional categories and auxiliary verbs, such as the English examples in (1–3).

(1) a. She **has** worked. perfect *have*
b. She **had** worked.
c. She will **have** worked.

(2) a. She **is** working. progressive *be*
b. She **was** working.
c. She will **be** working.

(3) She will **have been** working. perfect *have* + progressive *be*

- There is an Aux "**be**" that reliably corresponds progressive inflection (1), and an Aux "**have**" that reliably corresponds to perfective inflection (2).
- Both auxiliaries show up together, when both inflections are expressed (3).

The overflow pattern: Auxiliaries are needed only in *certain combinations* of inflectional categories.

(4) Swahili progressive aspects
a. ni **-∅** -na -soma.
1SG **-PRES** -PROG -read.
'I am reading.'
b. ni **-li** **-kuwa** ni -na -soma
1SG **-PST** **-AUX** 1SG -PROG -read
'I was reading.'
c. ni **-ta** **-kuwa** ni -na -soma
1SG **-FUT** **-AUX** 1SG -PROG -read
'I will be reading.'

(5) Swahili perfective aspects
a. ni **-∅** **-me** -soma
1SG -PRES **-PERF** -read
'I have read.'
b. ni **-li** **-kuwa** ni **-me** -soma
1SG **-PST** **-AUX** 1SG **-PERF** -read
'I had read.'
c. ni **-ta** **-kuwa** ni **-me** -soma
1SG **-FUT** **-AUX** 1SG **-PERF** -read
'I will have read.'

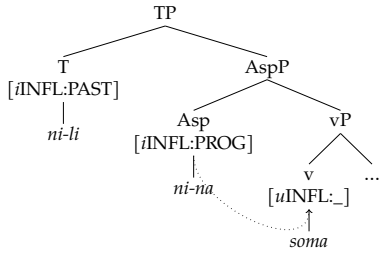
- The aux *kuwa* appears only when past or future tense co-occurs with a progressive infl. (4b, 4c), or perfective aspect (5b, 5c).
- Note that the auxiliary does not occur for either the progressive or perfective, when tense is present (4a, 5a).

3 Insertion analysis (Bjorkman, 2011)

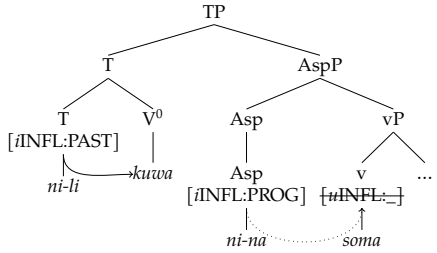
The overall idea is that Merge creates a structure WITHOUT an auxiliary, but one may be later inserted (to pick up a stranded feature).

(6) Stranded past tense INFL feature (a) triggers AUX insertion (b)

a.



b.



- The analysis is formally represented in Bjorkman (2011) with an operation called Reverse Agree, which we will not go into too much detail here.
- What is crucial is that the system limits options for v to Agree with when both T and Asp carry interpretable INFL, resulting in v only establishing a Probe/Goal relationship with the lower Asp head.
- This leaves an un-valued inflectional feature in T, [PST] or [FUT], triggering auxiliary insertion (6).
- Present tense is unmarked, and so no auxiliary is needed to rescue a stranded feature for a present tense construction.

4 An alternative: cyclic selection (Pietraszko, 2023)

The overflow pattern does not *need* Late Insertion in order to be accounted for.

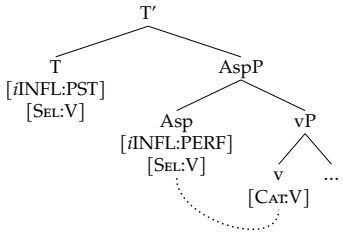
- Pietraszko (2023) provides an external-merge analysis of auxiliaries utilizing under-specification of present tense and *cyclic selection*, via a process of external merge as a specifier, and then m-merger (Matushansky, 2006)
  - The analysis utilizes the selectional V-features of Cowper (2010)

In *cyclic selection*, C-selectional features trigger structure building.

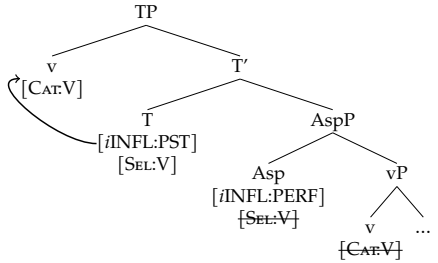
- The overflow auxiliary pattern is a result of a [SEL:V] feature on inflectional heads like T and Asp. [SEL:V] on T triggers External Merge of Aux *kuwa*. See derivation in (7).

(7) *Cyclic selection*

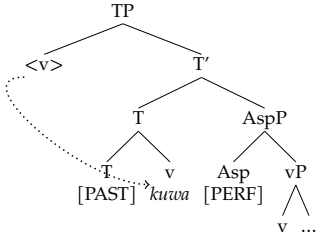
a. [SEL:V] Agrees with [CAT:V]



b. [SEL:V] Merges AUX in Specifier



c. *M-merger* of AUX to T in PF



- After external merge, M-merger (Matushansky, 2006). The parallel:
  - M-merger: internal merge of a head as a specifier
  - Cyclic Selection: external merge of a head as a specifier

Swahili RCs: a problem for Late Insertion Accounts

Pietraszko (2023) observes that the Late Insertion account of the overflow pattern makes the wrong prediction for the surface ordering of morphemes in Swahili RCs, giving *cyclic selection* an empirical edge.

- Swahili RCs can be formed with or without an overt complementizer. Regardless of whether the complementizer is overt, C will agree with the relative head.
- See an example RC with overt complementizer in (8), and one without in (9). The morphological content assumed to diagnose the location of the C head is boxed.

(8) kitabu [$_{CP}$ **amba**-cho a-li-ki-soma]
7book [$_{CP}$ COMP-C7 1SG-PST-7o-read]
'The book that he read'

(9) kitabu [$_{CP}$ **a-li**-cho -ki-soma]
7book [$_{CP}$ 1SG-PST-C7- 7o-read]
'The book (that) he read'

- when there is no overt complementizer (9), T-to-C movement is obligatory. With no *amba*, it is ungrammatical to leave T low, represented by the past tense with subject agreement *a-li* in (10), and also ungrammatical to do full roll-up movement of V-to-T-to-C (11).

(10) * kitabu [$_{CP}$ cho **a-li**-ki-soma]
7book [$_{CP}$ -C7 3SG-PST-7o-read]
Intended: 'The book (that) he read'

(11) * kitabu [$_{CP}$ a-li-ki-soma-cho]
7book [$_{CP}$ 3SG-PST-7o-read-C7]
Intended: 'The book (that) he read'

Insertion accounts assume auxiliaries to be inserted directly into T, predicting that an overflow auxiliary will participate in obligatory T-to-C movement.

- This is not the case, however. In (12), the grammatical surface ordering of morphemes shows that *kuwa* does NOT surface in the anticipated position.

(12) a. kitabu [$_{CP}$ ni-li- -cho -**kuwa** ni-na-soma]
7book [$_{CP}$ 1SG-PST-C7-**AUX** 1SG-PROG-read]
'The book (that) I was reading'

b. * kitabu [$_{CP}$ ni-li-**kuwa**- cho ni-na-soma]
7book [$_{CP}$ 1SG-PST-**AUX**-C7 1SG-PROG-read]
'The book (that) I was reading'

Cyclic Selection accounts for the RC pattern straightforwardly.

- In Pietraszko (2023)'s analysis, *kuwa* is inserted as a specifier, thereby off the chain of head movement, and so it follows that *kuwa* will not appear in a complex head with C, as long as M-Merger applies after T-to-C movement.

5 A derivational timing issue

There is some debate in the literature about how to characterize head movement (Chomsky 2001; Matushansky 2006; Roberts 2010, etc)

- for example, whether head movement is a syntactic operation (e.g. utilizing M-Merger, Matushansky 2006), or whether there are avenues for understanding some instances of head movement to be post-syntactic (Harizanov and Gribanova, 2018))
- The choice of head movement characterization plays a crucial role in understanding the (lack of) participation that auxiliaries take in the roll-up T-to-C movement

Regardless of framework, a successful derivation of Swahili RCs requires commitment to the timing of adding Aux to the structure occurring *prior* to head movement

- As long as there is a way to ensure that: 1) the auxiliary is added to the structure before head movement, and 2) does not participate in head movement, Swahili RC surface order can be generated.

In Pietraszko (2023), this is accomplished with the following steps:

- selection features Merge the overflow auxiliary immediately into the structure, as requested by the stranded tense feature.
- M-Merger is ordered after syntactic head movement, effectively leaving aux *kuwa* behind in a specifier position.

We show that our account can accomplish this, at least as well as the account in Pietraszko (2023) can. We require the following steps:

1. post-syntactic head movement still follows Aux insertion, ensuring that auxiliary *kuwa* is added to the structure in the critical location (under C).
2. Aux insertion 'tucks under' the stranded infl in T, such that the Aux is still sufficiently off the chain of movement.

The strength of our analysis, then, is to preserve Last Resort approaches to overflow auxiliaries as a viable theoretical alternative that still has equivalent empirical coverage to a cyclic selection approach.

5.1 Two Kinds of Head Movement

Harizanov and Gribanova (2018) argue that the syntactic phenomena traditionally classified as instances of head movement actually break down into two empirically distinct classes:

1. syntactic head movement
   (an example: Aux inversion in English polar questions)
2. post-syntactic amalgamation
   (an example: V-to-T movement in French)

Under a traditional view of head movement as some sort of upward displacement (e.g. Baker 1985), subject to a locality constraint (e.g.), we expect a head that has undergone head movement to be a proper subpart of some head adjunction structure (i.e. a complex head).

- This has not been shown to hold consistently cross-linguistically (e.g. Abels 2003a; Brody 2000; Harley 2013b; Adger et al. 2009 and Hall 2015)
- Harizanov and Gribanova (2018) also note that, when looking across many different languages, we see that complex heads can be pronounced in different positions along the clausal spine (See Fig. 1).

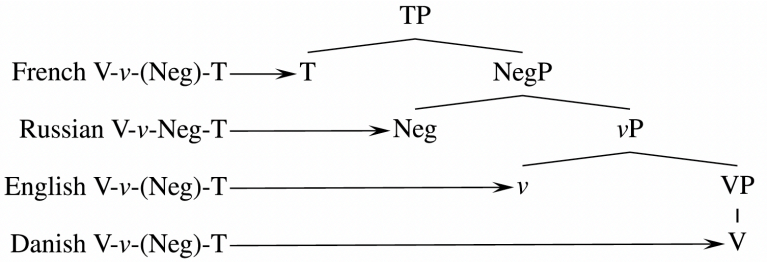


Figure 1: Different loci of complex head pronunciations across languages (from Harizanov and Gribanova 2018)

Given these inconsistencies, Harizanov and Gribanova (2018) propose two different classes of head movements, which are predicted to differ along the empirical dimensions listed in Figure 2.

Table 1 Properties of syntactic head movement and postsyntactic amalgamation

	Postsyntactic amalgamation	Syntactic head movement
Produces head-adjunction structures (which map to words)	Yes	No
Driven by morphological properties of heads	Yes	No
Obeys the Head Movement Constraint	Yes	No
Obeys constraints on phrasal movement	No	Yes
Potential for interpretive effects	No	Yes

Figure 2: Properties of syntactic head movement and postsyntactic amalgamation (from Harizanov and Gribanova 2018)

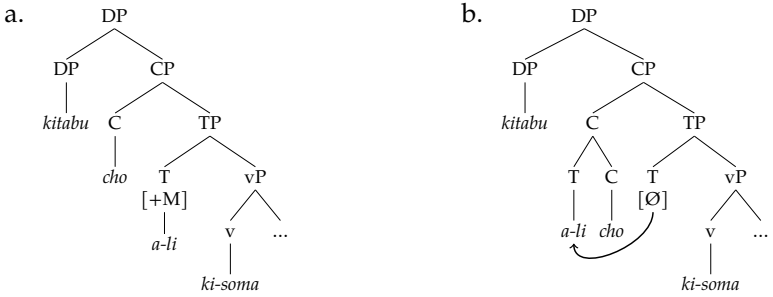
- Analyzing T-to-C movement in Swahili RCs as an example of postsyntactic amalgamation gives us the opportunity to ressurect a Late Insertion account of overflow auxiliaries.

6 Swahili T-to-C as postsyntactic amalgamation

The T-to-C head movement observed in Swahili RCs fits the profile of postsyntactic amalgamation defined by Harizanov and Gribanova (2018): it produces head-adjunction structures, is driven by morphological properties of heads, appears to be strictly local, and lacks interpretative effects.

Option 1: Raising of T to C in PF

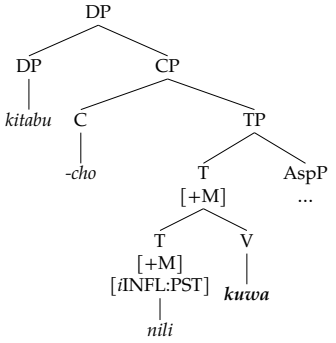
(13) Raising of T to C in PF



T has [+M] feature, triggers raising of T to C (13).

- we cannot directly insert the auxiliary *kuwa* into T, regardless of whether Insertion happens before or after (14).

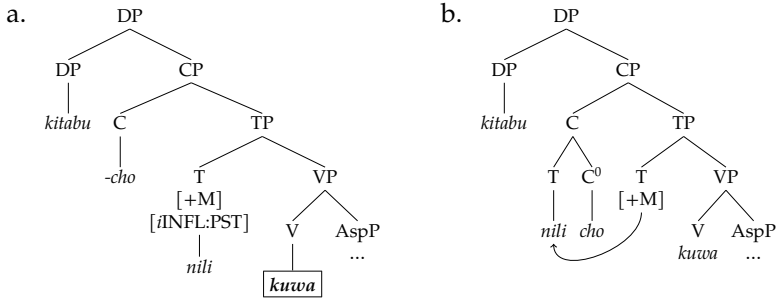
(14) Illicit position for Aux insertion. Inserting *kuwa* directly in T creates a complex head structure.



Excorporation (i.e. not sub-extracting from the complex head structure) raises a potential issue here.

- we would want to have only T (to the exclusion of the adjoined C), raise up to C.
- One could assume alternative aux *kuwa* inserts directly under T (e.g. 15).

(15) Possible position of inserted Aux *kuwa*, assuming [+M] feature on T.

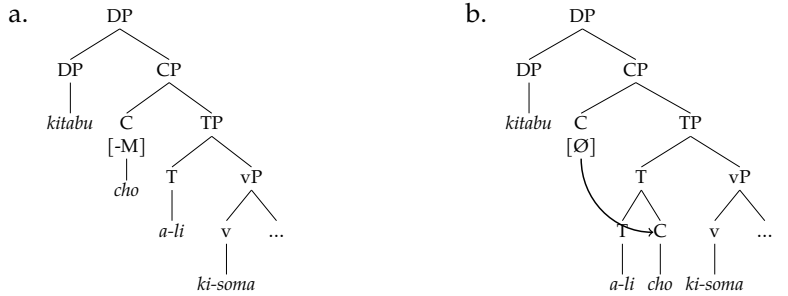


Option 2: Lowering of C to T in PF

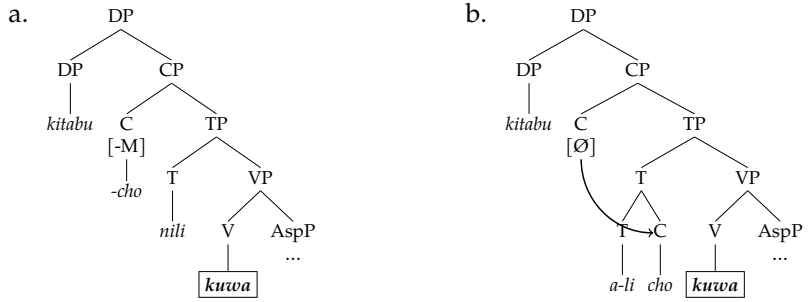
C has [-M] feature, triggers lowering of C to T (16).

- The same concern about excorporation still applies, so we posit *kuwa* insertion as inserted below T (17).

(16) Lowering of C to T in PF



(17) Aux inserts below T, with PF-Lowering of C to T. Bjorkman 2011



Both raising and lowering are equally plausible on conceptual grounds, but data on negation in RCs in Swahili, from Ngonyani (2006), provide additional empirical support for the Lowering analysis.

- Ngonyani (2006): In non-RC clauses, there is marking of negation that utilizes two morphemes, and in RCs with the overt complementizer *amba*, this way of marking negation is licensed (18).

(18) vitabu [$_{CP}$ amba-vyo **ha**-tu-**ja**-vi-soma] tu-ta-vi-uza
8book [$_{CP}$ COMP-C8 **NEG**-2PL-**NEG**-8o-read] we-FUT-8o-sell
'The books that we have not read, we will sell.'

- In RCs which lack *amba*, the same ones which demonstrate obligatory T-to-C movement, this type of negation marking is impossible (19).

(19) * kitabu [$_{CP}$ ha-tu-ku-cho -ki-soma]
7book [$_{CP}$ NEG-2PL-NEG-C7 -7o-read]
'Intended: The books we have not read'

- Instead, the negative morpheme *-si-* appears (20, 21) with the following surface order: NEG - C - T - VERB.

(20) vitabu [$_{CP}$ tu-**si-** vyo -soma] tu-ta-vi-uza
8book [$_{CP}$ 2PL-NEG-C8 -read] 2PL-FUT-8o-sell
'The books we do not read, we will sell.'

(21) kitabu [$_{CP}$ tu-**si-** cho -ki-soma]
7book [$_{CP}$ 2PL-NEG-C7 -7o-read]
'the book which we do not read'

The Lowering account, which assumes [-M] on C, straightforwardly predicts C to amalgamate with Neg; T has no M features.

7 Conclusions

Ordering aux insertion before Vocabulary Insertion

More could be said about how exactly the insertion of Aux below T is licensed, given that we are assuming both Aux Insertion and Head Movement are post-syntactic.

- One avenue for theoretical grounding could be found in the Serial model of DM proposed in Arregi and Nevins (2012).
- This work proposes a serial model of post-syntactic operations, sequenced in a particular order (Fig. 3).
- The application of any operation creates a new representation which can be subject to further operations.

Relevant to our work, we note that auxiliary insertion in Basque is argued by Arregi and Nevins (2012) to be an operation that thakes place in the Module Morphological Concord, which *precedes* Linearization.

- adopting this framework then, requires that auxiliary insertion is not done by the same mechanism as Vocabulary Insertion (the module where terminal nodes are exponed).
- This may not necessarily be an undesirable hypothesis.

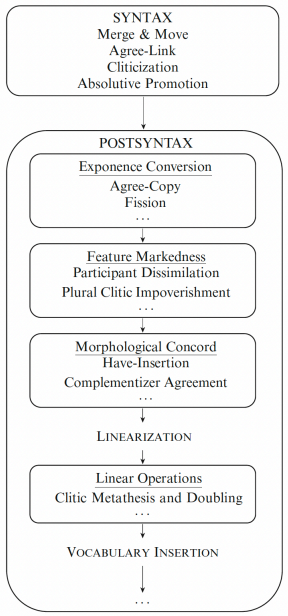


Figure 3: The Structure of Spell-out in Arregi & Nevins (2021)

High level summary

Pietraszko (2023) argues that cyclic selection is empirically superior to a Late Insertion approach to overflow auxiliaries, since Late Insertion is unable to derive Swahili RCs.

- we hope to have demonstrated that it is not the case that Late Insertion cannot find a way to account for Swahili RCs.
- Theory-neutrally, any analysis of Swahili RCs requires some way of ensuring: 1) that the overflow auxiliary is not a part of the head movement chain, and 2) that the overflow auxiliary is inserted *prior* to whatever head movement mechanism is utilized.

We'd like to note that our account of Swahili RCs is not an argument against the analysis proposed by Pietraszko (2023). This work does not endeavor to oppose cyclic selection.

- we simply point out that, for Swahili RCs under discussion, an Insertion account still is, in fact, satisfactory. Exploring the different interactions of current theories of head movement with different types of insertion oper-

ations give us room to envision different alternatives.

- Though we use an approach adopted from Bjorkman (2011) with a reverse Agree system of valuing infl. features, we could have just as well utilized the selectional features from another insertion account, Cowper (2010)
- It is possible that a Merge approach to auxiliary insertion is also compatible with PF-raising/lowering, since amalgamation will still occur after Merge.

We leave the choice point between deciding between the best ways to combine these insights for future work.

Acknowledgements

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References

Arregi, K. and Nevins, A. (2012). *Morphotactics: Basque auxiliaries and the structure of spellout*, volume 86. Springer Science & Business Media.

Baker, M. (1985). The mirror principle and morphosyntactic explanation. *Linguistic inquiry*, 16(3):373–415.

Bjorkman, B. A. M. (2011). *BE-ing default: The morphosyntax of auxiliaries*. PhD thesis, Massachusetts Institute of Technology.

Chomsky, N. (2001). Derivation by phase. In Michael, K., editor, *A life in language*, pages 1–52. MIT Press.

Cowper, E. (2010). Where auxiliary verbs come from. In *Proceedings of the 2010 annual conference of the Canadian Linguistic Association*, pages 1–16. Concordia University, Montreal.

Harizanov, B. and Gribanova, V. (2018). Whither head movement? *Natural Language & Linguistic Theory*, 37:461–522.

Matushansky, O. (2006). Head movement in linguistic theory. *Linguistic Inquiry*, 1:69–109.

Ngonyani, D. (2006). Attract f and verbal morphology in kiswahili. *The Linguistic Review*.

Pietraszko, A. (2023). Cyclic selection: Auxiliaries are merged, not inserted. *Linguistic Inquiry*, 54(2):350–377.

Roberts, I. (2010). *Agreement and head movement: Clitics, incorporation, and defective goals*. MIT Press, Cambridge.