Cyclic Selection
Auxiliaries are merged, not inserted

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Abstract

Traditional approaches to verbal periphrasis (compound tenses) treat auxiliary verbs as lexical items that enter syntactic derivation like any other lexical item, i.e. via Selection/Merge. An alternative view that has received much attention in recent years is that auxiliary verbs are not base-generated but rather *inserted* in a previously built structure (i.a. Bach 1967; Embick 2000; Arregi 2000; Cowper 2010; Bjorkman 2011; Arregi and Klecha 2015). Arguments for the insertion approach to auxiliaries include their last-resort distribution and the fact that, in many languages, auxiliaries are not systematically associated with a given inflectional category (the "overflow" distribution discussed in Bjorkman 2011). In this paper, I argue against the insertion approach. First, I demonstrate that the overflow pattern and last-resort distribution follow from Cyclic Selection (Pietraszko 2017) – a Merge-counterpart of Cyclic Agree (Béjar and Rezac 2009). And second, I show that the insertion approach makes wrong predictions about compound tenses in Swahili, a language with overflow periphrasis. Under the approach advocated here, an auxiliary verb is a verbal head externally merged as a specifier of a functional head, such as T. It then undergoes m-merger with that head, instantiating an external-merge version of Matushansky's (2006) conception of head movement.

1   Introduction

An increasing body of work on verbal periphrasis has proposed that auxiliary verbs used in compound tenses (typically *be* or *have*) are not base-generated via the basic structure building operation (Merge), but rather that they arise due to an insertion process, syntactic or postsyntactic (i.a. Bach 1967; Embick 2000; Arregi 2000; Cowper 2010; Bjorkman 2011; Arregi and Klecha 2015; Fenger 2019, 2020; Calabrese 2019). An extensive argument against the base-generation view was given by Bjorkman (2011), who argues that syntactic merge of auxiliaries would mean that they are in a selectional, and thus a systematic, cooccurrence relation with a given syntactic category/feature. Despite this being true in some well studied languages, including English, there is robust evidence showing that there is no such systematicity crosslinguistically. Instead, default auxiliaries often show a distribution which can only be captured by referring to *combinations* of categories/features– a distribution that Bjorkman calls *the overflow pattern* of auxiliary use.

This paper argues that syntactic merge of auxiliaries is not incompatible with the overflow pattern. The Cyclic Selection account proposed in Pietraszko 2016, 2017, in which auxiliary verbs are merged as specifiers, derives this pattern in the same way as other existing accounts (i.e. via featural underspecification), despite the fact that auxiliaries are selected and undergo Merge. Cyclic Selection is a phenomenon in which the selected category (in this case, V) is merged as a specifier only in configurations where a selectional feature of a head cannot be checked by an element c-commanded by that head. Cyclic Selection is, then, analogous to Cyclic Agree (Rezac 2003;
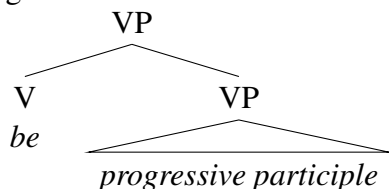
Béjar and Rezac 2009): in both, an operation (Merge and Agree, respectively) applies cyclically, making interaction with a specifier the last resort case. The Cyclic Selection approach to verbal periphrasis has several advantages: it eliminates the need for an auxiliary insertion mechanism and for defining stranded inflection (which requires auxiliary-support), while still deriving the over-flow pattern. Moreover, the phenomenon of Cyclic Selection is expected to exist given two fairly standard assumptions in current syntactic theory: bare phrase structure and cyclicity of syntactic operations.

Section 2 reviews existing approaches to verbal periphrasis, focusing on the predictions they make about the distribution of auxiliary verbs. In section 3, I present the Cyclic Selection account (Pietraszko 2016, 2017) and argue that it not only captures the overflow distribution but also is motivated by other aspects of the theory. Section 4 develops the final, empirical argument for a Cyclic Selection account of default auxiliaries based on the interaction between periphrasis and T-to-C movement in Swahili. In brief, Swahili T-to-C movement applies before the auxiliary in Spec,TP undergoes m-merger with T, which results in T-to-C movement stranding the auxiliary inside TP.

2 Approaches to default periphrasis

The term *default periphrasis* refers to constructions in which a dummy verb (typically *be* or *have*) appears in addition to the lexical verb in certain inflectional contexts. These constructions are often called compound tenses:

(1)   a.   She is working.   b.   She has worked.

Another feature of default periphrasis is its sensitivity to inflectional complexity. Descriptively, a default auxiliary is required when there is "too much" inflectional morphology to be expressed on the lexical verb alone (2). Finally, default periphrasis is impossible unless necessary (3).

(2)   a.   She i-**s** work-**ing**.   (3)   a.   She work-**s**.
        b.   *She work-**ing**-**s**.   b.   *She i-**s** work.

Due to this distribution of auxiliaries, default periphrasis is often characterized as a last-resort phenomenon.

2.1 Against base-generation of auxiliary verbs

Traditional analyses of compound tenses assume that auxiliary verbs are, like any other category, part of syntactic structure (i.a. Ross 1967, 1969; Huddleston 1974; Emonds 1978; Pollock 1989; Déchaine 1993; Déchaine 1995; Roberts 1998; Schütze 2003; Harwood 2014b). Specifically, auxiliary verbs are of category V (or V_{Aux}, Aux) and select for another verb, requiring it to bear a particular inflection (e.g. *-ing*/*-en* in English). Other implementations of the base-generation approach treat auxiliaries as functional elements (i.a. Hoffman 1966; McCawley 1988; Tenny 1987; Cinque 1998, 1999, 2001). For instance, the English progressive auxiliary *be* has been analyzed as being of category Asp_{Prog}.

(4) Base-generation as a V:

```
          VP
         /  \
        V    VP
        be   /‾‾‾‾‾\
         progressive participle
```

(5) Base-generation as a functional head:

```
          AspP
         /   \
       Asp    VP
        be    /‾‾‾‾‾\
          progressive participle
```
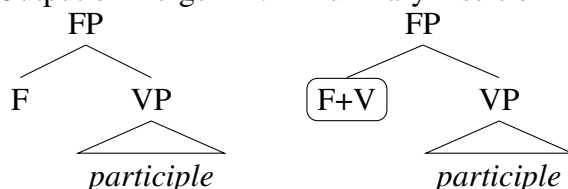
Even though the base-generation structures above are still frequently assumed, a growing body of literature has proposed to abandon them (Embick, 2000; Arregi, 2000; Cowper, 2010; Bjorkman, 2011; Arregi and Klecha, 2015; Pietraszko, 2016, 2017; Fenger, 2019, 2020; Calabrese, 2019; Cruschina and Calabrese, 2021). Instead of merging auxiliaries in syntax, many of these works propose that they are *inserted* into an independently built syntactic structure – an idea going back to Bach (1967). Said insertion has been implemented in various ways in the literature (e.g. as syntactic or postsyntactic), but the unifying claim is that, in present-day terms, auxiliaries do not become part of the structure via Merge. Rather, Merge creates a structure without an auxiliary, but the structure may be *altered* so that it contains one. This is schematized below.

(6) Output of Merge → Auxiliary insertion

```
      FP                      FP
     /  \                    /   \
    F    VP              [F+V]    VP
         /‾‾‾\                    /‾‾‾\
        participle             participle
```

A common argument for insertion and against base-generation is the last-resort profile of auxiliary distribution, discussed above. Assuming that Merge is determined by selectional features, the base-generation structures in (4)-(5) indicate that the auxiliary c-selects for an XP containing a particular kind of participle (for simplicity, I assume that this XP is a VP). As c-selection is a lexical property of heads, we might expect a fair amount of variation in the distribution of auxiliaries crosslinguistically. For instance, we should find languages in which auxiliaries select for VPs only in simple tenses (giving rise to something like the English *is work instead of *works* (3)), but not in progressive tenses, where the lexical verb would itself bear both tense and aspect inflection (*workings instead of *is working*). In contrast to these predictions, the appearance of default auxiliaries correlates with increased inflectional complexity – a generalization crosslinguistically robust, if not exceptionless.

Bjorkman (2011) develops another distribution-based argument against base-generation, one that appears especially strong. In languages such as English, we observe systematic cooccurrence between auxiliaries and a particular type of inflection. For instance, progressive aspect always requires the auxiliary *be*:

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

This systematicity is compatible with the idea that the progressive auxiliary is base-generated, either as V or Asp$_{\text{Prog}}$, as shown in (4)-(5) above. Similarly, perfect aspect always requires an auxiliary in English (8), a fact also compatible with base generation of the perfect auxiliary (9).

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

(9)

```
                PerfP/VP
              /         \
         Perf/V          VP
          have      /         \
                   -EN participle
```

This systematic cooccurrence can be straightforwardly captured by selection: *-en/-ing* participles can only be selected by *have* and *be*, respectively; the auxiliaries themselves can be selected by any T.

Bjorkman's argument against base-generation is that, in many languages, there is no such correlation between a particular inflection and an auxiliary. Compare the English progressive and perfect tenses above with progressive and perfect tenses in Swahili:[1]

(10) Swahili progressive tenses

      a. ni-li-kuwa   ni-**na**-soma
          1SG-PST-AUX 1SG-IMPF-read
          'I was reading'.

      b. ni-ta-kuwa   ni-**na**-soma
          1SG-FUT-AUX 1SG-IMPF-read
          'I will be reading'.

      c. ni-∅-**na**-soma   (*ni-∅-kuwa ni-**na**-soma)
          1SG-PRES-IMPF-read
          'I am reading'.

(11) Swahili perfect tenses

      a. ni-li-kuwa   ni-**me**-soma
          1SG-PST-AUX 1SG-PERF-read
          'I had read reading'.

      b. ni-ta-kuwa   ni-**me**-soma
          1SG-FUT-AUX 1SG-PERF-read
          'I will have read'.

      c. ni-∅-**me**-soma   (*ni-∅-kuwa ni-**me**-soma)
          1SG-PRES-PERF-read
          'I have read'.

As we see above, neither progressive nor perfect aspect systematically cooccur with an auxiliary. They do in past and future tenses, but not in the present tense. This is rather puzzling under the selection-based account sketched above for English. If progressive participles are selected by an auxiliary, we predict that it should be so irrespective of tense since, at the point in the derivation

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[1] Unless otherwise noted, Swahili data come from the author's fieldwork.

when Asp/V_{Aux} is merged with the lexical verb, T is not yet part of the structure. One might concoct a more intricate selection-based analysis to derive this countercyclic effect. Consider the following selection-based analysis of the progressive paradigm in Swahili (12). (Here, I treat the auxiliary as the functional head Asp, but (12) could be restated in terms of VP_{Aux}.)

(12)   A base-generation analysis of the overflow pattern in (10)

    a.   Asp: [Sel:VP_{ing}]

    b. T_{Past}: [Sel:VP or AspP]

    c. T_{Fut}: [Sel:VP or AspP]

    d. T_{Pres}: [Sel:VP or VP_{ing}]

According to this analysis, the auxiliary (Asp) selects for a progressive participle (VP_{ing}). Future and Past Ts select for either a bare VP (lexical verbs) or for AspP (auxiliary), giving rise to simple and progressive tenses respectively. The key part of (12) is that present tense T does *not* select for AspP, which is why an auxiliary is impossible in the present tense. In return, T_{Pres} can itself select for a progressive participle, giving rise to a synthetic (rather than a periphrastic) progressive tense (10-c).

Such an analysis lacks any explanatory value and is immediately called into question by the fact that perfect aspect in Swahili shows exactly the same pattern: we observe periphrasis in the past and the future, but Present Perfect is obligatorily synthetic. The selection based analysis of the progressive in (12) makes no predictions about what perfect tenses should look like. Accounting for perfect tenses requires positing a new set of selectional features, for PerfP, that would incidentally mirror the set in (12), only replacing AspP with PerfP and VP_{Prog} with VP_{Perf}.[2] To make things worse, all languages that exhibit the overflow pattern of auxiliary use seem to behave the exact same way: they are synthetic in the present tense and periphrastic in other tenses (Bjorkman, 2011). The selection-based analysis entirely misses this generalization.

To derive the last-resort and overflow distribution of auxiliaries insertion approaches abandon the problematic selection-based analysis. Instead, they propose that a structure (built without auxiliaries) is evaluated for inflectional complexity, understood as the number of morphosyntactic features in the TAM domain. A dummy verb is inserted if and only if there are more such features than the lexical verb can itself host/express. The next subsection demonstrates how some existing insertion accounts derive the overflow pattern.

2.2 Insertion accounts

To capture the overflow nature of default periphrasis, many authors propose to treat it as a repair process (Embick 2000; Bjorkman 2011; Arregi and Klecha 2015; Fenger 2019, 2020; Calabrese 2019; Cruschina and Calabrese 2021). In order to be expressed synthetically with the verb, inflectional features must end up in a single complex head with a V. This can be done via head movement

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[2] Note that it is not possible to treat progressive and perfect aspect as the same head with different features (by analogy to $T_{Pres/Past/Fut}$). It is well known that so called perfect aspect is a different category than viewpoint aspect (perfective, imperfective) – the two are not in complementary distribution, as in the English *has been working* (Iatridou et al. 2003; Pancheva 2003; Bošković 2014; Harwood 2013, 2014a; Ramchand and Svenonius 2014; Aelbrecht and Harwood 2015). A more accurate description of the perfect aspect is as a non-finite/embedded past tense (Hoffman, 1966; Bach, 1967; McCawley, 1971, 1988; Klein, 1994; Stowell, 2007; Arregi and Klecha, 2015).

([Embick 2000](); [Bjorkman 2011](); [Fenger 2019](), [2020](); [Calabrese 2019](); [Cruschina and Calabrese 2021]()), via feature transmission ([Arregi and Klecha 2015]()) or via agreement ([Bjorkman 2011]()).[3] In Simple Past, for instance, there is only one (marked) inflectional feature: [Infl:PST]. In this configuration, T can establish a relation with V and the result is a synthetic expression of V and T, like the English Simple Past [(13)](). Following [Bjorkman](), I encode this relation as Infl-agreement.

(13)   Simple Past (e.g. English *worked*): synthesis of V and [Infl:PST]
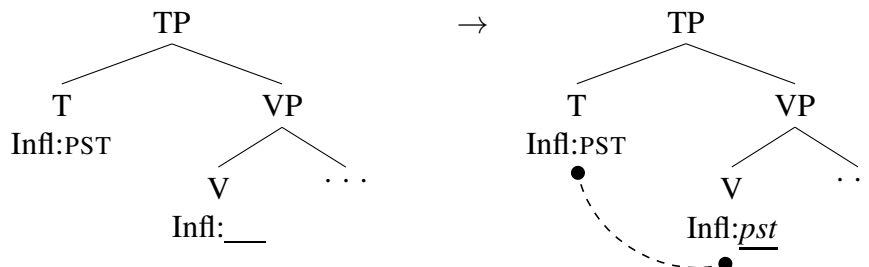
Periphrasis arises when an inflectional head is not in a relation with the verb. In Past Progressive in English, for example, T is such a stranded inflection:

(14)   Compound tense: Output of syntactic derivation
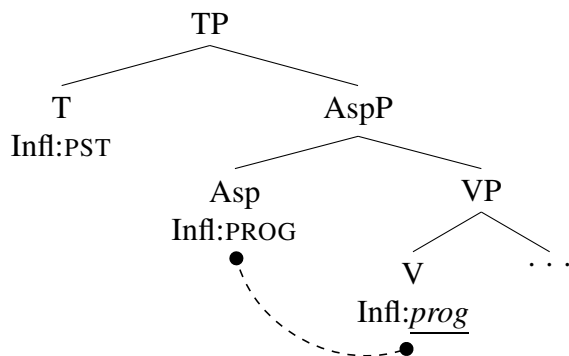
The reason why T in this configuration does not establish a relation with V is that, when T is merged, V's Infl-feature has already been valued by Asp and so V no longer has the relevant probe.[4,5]

The structure in [(14)]() is syntactically well-formed and the auxiliary verb appears at only at PF. [Bjorkman 2011](); [Fenger 2019](), [2020]() and [Calabrese 2019]() implement it as insertion of a V node at PF:

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[3] In Bjorkman's system, head movement may also play a role in creating synthetic expression, in addition to Infl-agreement. This is, however, the case only in the fairly rare languages in which the lexical verb may express more than one inflectional feature (as in Latin, where e.g. Past Perfect is synthetic). These cases have no additional bearing on the present discussion and I omit them for reasons of exposition.

[4] It is assumed here that Infl-agreement may involve upward probing ([Adger 2003](); [Bjorkman 2011](); [Wurmbrand 2011]()).

[5] Some details of analysis are omitted here. For instance, Bjorkman proposes that Asp also has an Infl-probe, valued by T. In either case, the [Infl:PST] feature does not end up on V. See section [4]() for a discussion of why this specific detail is problematic for Swahili.

(15)   Periphrasis as a PF repair of stranded inflection
       Output of syntax: →   PF insertion of V

```
              TP                                    TP
            /    \                                /    \
        ┌───────┐  AspP                      ┌───────┐  AspP
        │   T   │  /  \                      │  T+V  │  /  \
        │Infl:PST│ Asp   VP                   │Infl:PST│ Asp   VP
        └───────┘ /  \   / \                  └───────┘ /  \   / \
  stranded Infl  Asp  VP V  ...                        Asp  VP V  ...
        Infl:PROG    Infl:prog                    Infl:PROG    Infl:prog
```
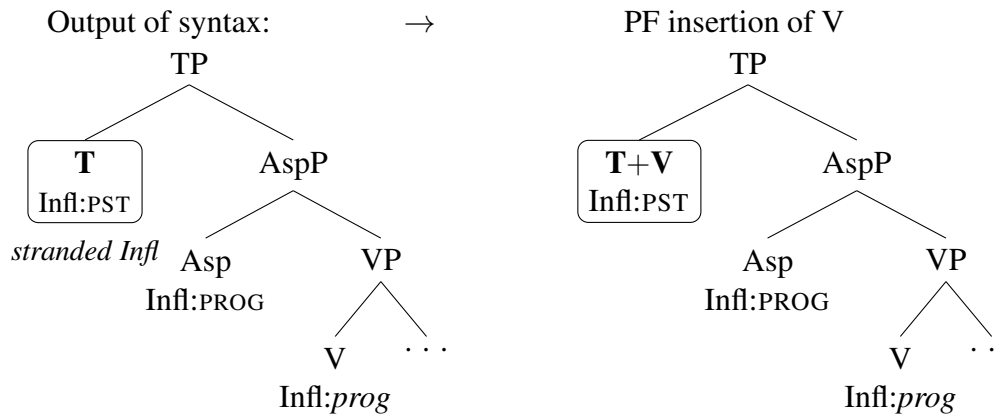
A similar insertion mechanism has been proposed in Embick 2000; Cowper 2010 and Arregi and Klecha 2015, though for these authors the insertion takes place in syntax, rather than at PF. Cowper's proposal differs from the others in that it models auxiliary insertion as satisfaction of a selectional feature, making this process of V insertion a bit closer to syntactic structure building.

Cowper assumes that Infl-features on inflectional heads are bundled with a selectional V feature, [Sel:V] (Cowper's uV), and adopts the implementation of c-selection as feature checking (i.a. Svenonius 1994; Holmberg 2000a; Julien 2002; Adger 2003; Matushansky 2006; Adger 2010; Adger and Svenonius 2011). The [Sel:V] feature is checked by [Cat:V], borne by verbs. Importantly, V-checking can only take place under Infl-agreement. In the Past Progressive, the derivation proceeds as follows:

(16)   V-checking implementation (Cowper 2010, details adapted)
       →

```
              TP                                        TP
            /    \                                    /    \
          T      AspP                               T      AspP
     ⎡Infl:PST⎤  /  \                          ⎡Infl:PST⎤  /  \
     ⎣Sel: V ⎦ Asp   VP                         ⎣Sel: V ⎦ Asp   VP
            ⎡Infl:PROG⎤ / \                          ⎡Infl:PROG⎤ / \
            ⎣Sel: V  ⎦ V  ...                        ⎣ Sel: V ⎦ V  ...
                    ⎡Infl:  ⎤                                ⎡Infl:prog⎤
                    ⎣Cat: V ⎦                                ⎣Cat: V  ⎦
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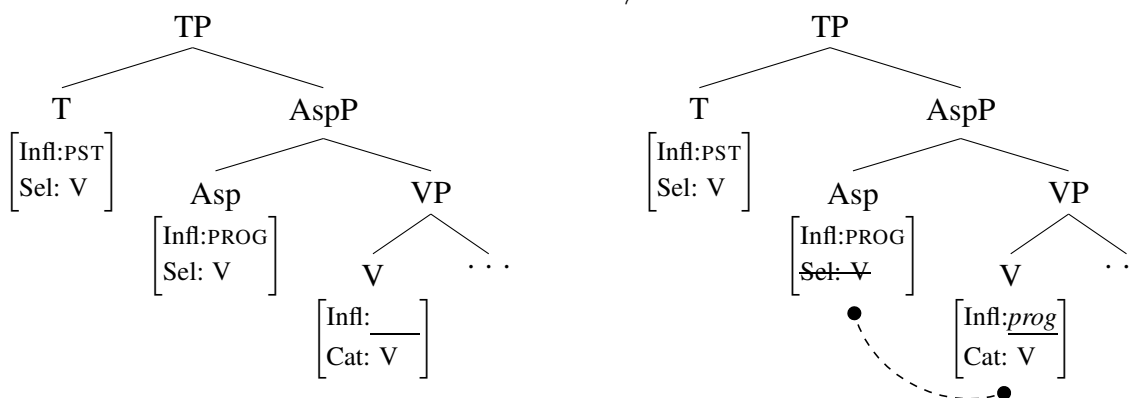
The unvalued Infl-feature of V is valued by the most local inflection, here Asp. Through this relation, Asp's selectional V feature is checked. Once T is merged, there is no unvalued Infl-probe in the structure, which in turn means that T's selectional V feature cannot be checked against the main verb and it remains unchecked. For Cowper, it is the unchecked selectional V-feature that counts as stranded inflection and triggers auxiliary insertion:

(17)   Cowper (2010): auxiliary insertion
       a.   **Stranded on Merge:** A head is stranded on Merge, or Merge-stranded, if it has a [Sel:V] feature that cannot immediately be checked.

7

b. **BE-support**: The verb *be* is inserted immediately in a Merge-stranded inflectional head.

In (16), [Sel:V] on T is Stranded on Merge, triggering the immediate repair of BE-support (i.e. auxiliary insertion).

Returning to Swahili, recall that, unlike in English, Present Progressive and Present Perfect are synthetic tenses, not periphrastic. All the insertion-based analyses discussed above can derive this overflow pattern via featural underspecification. This is made explicit in Bjorkman 2011, and is at least an implicit possibility in the other accounts. Assuming that inflectional contrasts can be privative, a three-way tense system requires only 2 tense features: e.g. PST and FUT, with present tense being the absence of a feature. Similar privative contrasts can be made for Aspect: e.g. IMPF vs no feature (=perfective), and for Voice: PASS vs no feature (=active). In a language that encodes present tense has an absence of a tense feature, the present tense T does not trigger periphrasis since there is no Infl-feature to be stranded and repaired by auxiliary insertion. This is the case in Swahili, a language in which both Present Perfect and Present Progressive are simple tenses.

In languages with periphrastic present tenses (e.g. English), all three tense interpretations (present, past, future) are featurally marked, i.e. are specified with a tense feature. Thus, the tense feature inventory in English differs from that of Swahili as in (18).

(18) a. English: [Infl:PST/PRES/FUT]
      b. Swahili: [Infl:PST/FUT] (no feature = present tense interpretation)

In Cowper's V-checking implementation, unmarked inflections, such as present T in Swahili, must lack the entire feature bundle containing the Infl-feature and the V-feature.[6] Compare the derivations of Present Perfect in English and Swahili, based on the feature inventories in (18).

(19) *Present Perfect in English*
      I have gone.
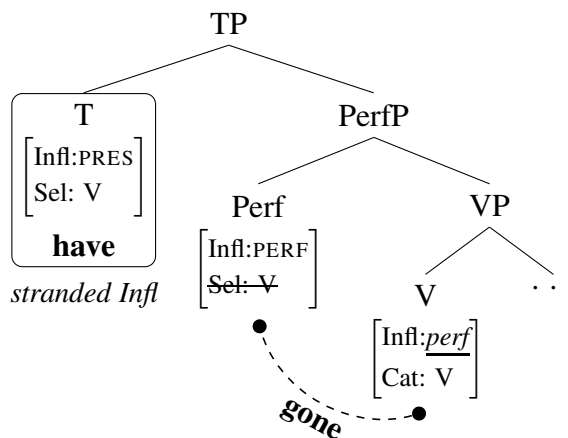
(20) *Present Perfect in Swahili*
      ni-∅-me-soma
      1sg-PRS-PERF-read
      'I have read'

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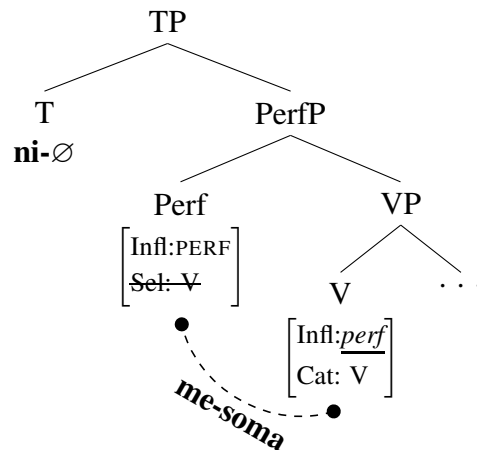
[6] To be precise, Cowper assumes that functional heads without Infl-features may still have a [Sel:V] feature, which is checked without Infl-agreement. It's not clear how this would extend to overflow patterns, which Cowper does not discuss. For this reason, I simply assume that the entire feature bundle is absent in unmarked heads.

At this point, it is worth noting the role that c-selection plays in structure building in Cowper's system. One might argue that, given that T has a [Sel:V] feature, its sister should be a VP. Why does T merge with AspP instead? In fact, Cowper assumes that it is s-selectional features that trigger Merge, while c-selectional features are checked immediately at merge. Thus, T and AspP are merged via s-selection, and c-selectional features behave like agreement features: they are checked (immediately) after they appear in the structure. A different account of how T and AspP are merged has to do with extended projections and will be discussed in the next section.

I argue in the next section that the same, underspecification-based account of the overflow pattern is possible without resorting to an insertion mechanism for auxiliaries. Combining Cowper's V-selection component with other common assumptions in current syntactic theory gives rise to a system that generates auxiliary verbs in the syntax via regular structure building and derives the overflow pattern.

3 Cyclic Selection

Building on insights in Cowper 2010, I propose in Pietraszko 2016, 2017 that default auxiliaries are merged in response to selectional V-features borne by inflectional heads. Following previous work, I assume that c-selection underlies structure building, but not of extended projections, which are predefined, largely universal hierarchies (i.a. Abney 1987; Grimshaw 1991, 2000; Cinque 1998, 1999; Svenonius 1994; Starke 2001; Williams 2003; Svenonius 2012; Adger and Svenonius 2011; Adger 2013; Ramchand and Svenonius 2014). The idea that extended projections are built in a special way goes back to Abney (1987), who argues that c-selection should only be posited for those instances of structure building that exhibit lexical idiosyncrasies.[7] For instance, the fact that the English verb *devour* requires a DP object but *eat* does not is a lexical c-selectional property of each verb. In contrast, the cooccurrence and relative order of Voice, Asp and T in the clausal spine is immensely regular, within a language and crosslinguistically. Idiosyncrasies of the *devour* vs. *eat* kind are not found. (For instance, there appear to be no languages in which imperfective Asp can select for passive, but not active Voice.) A specific implementation of this distinction was developed by Adger (2010), who proposes two structure-building operations (*HoP* stands for Hierarchy of Projections):

(21)   Two types of structure building (Adger, 2010)
    a.   *Sel-Merge:* c-selection-triggered Merge
   b.   *HoP-Merge:* Merge determined by a fixed order of functional projections

Functional heads that belong to the same extended projection are merged by HoP-Merge, not by Sel-Merge. This in turn means that, if a functional head additionally has a c-selectional feature, this feature must be satisfied by a specifier. As an illustration, consider little v which, by assumption, is part of the same extended projection as V and Voice, as shown below:

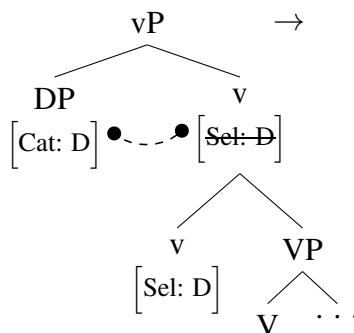(22)   A fragment of the verbal extended projection: ⟨ ... Voice, v, V ⟩

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[7] Abney uses the term *thematic relation* for lexically idiosyncratic selectional relations, and *f-selection* for the relationship between functional heads. A different set of relations is given in Pesetsky 1982, who argues that c-selection (Chomsky 1965's subcategorization) is unnecessary given certain assumptions about case licensing and independent concepts of s-selection and l-selection. Following Svenonius (1994), I treat all instances of idiosyncratic selection as c-selection.

HoP-Merge maps this list of functional heads to a head-complement sequence. This happens irrespective of what c-selectional features those heads may have. In fact, since little v often introduces an argument, it may have a c-selectional D-feature.[8] This feature will not trigger merge of a DP complement since v's complement must be a VP by (22). Assuming Bare Phrase Structure (Chomsky 1994), the unchecked selectional feature projects to the root node, as in (23), from which position it triggers Sel-Merge of a DP (24) (see also Wood and Marantz 2017). Since the output of Sel-Merge is a vP, further building of the verbal extended projection may proceed normally (25).
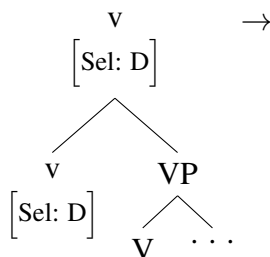
(23) HoP-Merge(v,V) (24) Sel-Merge(v,D) (25) HoP-Merge(v,Voice)
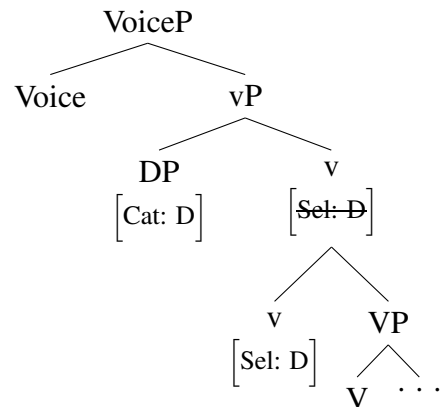
Thus, c-selectional features of functional heads trigger Merge of a specifier, not a complement.

Under this account of periphrasis, auxiliaries are merged due to a c-selectional feature of a functional head. Given the HoP/Sel-Merge distinction discussed above, this means that auxiliaries are merged as specifiers. Two assumptions adopted from Cowper are: i) clausal functional heads bear the feature bundle [Infl:VAL, Sel:V] and ii) V-checking takes place under Infl-agreement. Thus, Asp in (26) checks its [Sel:V] against V, but T does not. As a result, T's selectional feature projects to the root node and triggers merge of a default/expletive element of the selected category (27). This account of periphrasis does not require defining "stranded inflection", nor positing a special rule of auxiliary insertion.

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[8] Other notations include [uD/uN] (Julien 2002; Adger 2003), [D] (Holmberg, 2000b; Schäfer, 2008; Wood, 2015), [S:D] (Wood and Marantz, 2017) and sometimes EPP (Chomsky, 1995).

(26)

```
                        T
                   ⎡Infl:PST⎤
                   ⎣Sel: V  ⎦
                  /          \
                 T            AspP
            ⎡Infl:PST⎤       /      \
            ⎣Sel: V  ⎦      Asp      VP
                        ⎡Infl:PROG⎤  /  \
                        ⎣S̶e̶l̶:̶ ̶V̶   ⎦  V    ···
                              •   ⎡Infl:prog⎤
                                  ⎣Cat: V   ⎦
                                      •
```

(27)

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                 /        \
                V          T
          ⎡Infl:pst⎤  •  •  ⎡Infl:PST⎤
          ⎣Cat: V  ⎦       ⎣S̶e̶l̶:̶ ̶V̶  ⎦
                          /          \
                         T            AspP
                    ⎡Infl:PST⎤       /      \
                    ⎣Sel: V  ⎦      Asp      VP
                                ⎡Infl:PROG⎤  /  \
                                ⎣S̶e̶l̶:̶ ̶V̶   ⎦  V    ···
                                      •   ⎡Infl:prog⎤
                                          ⎣Cat: V   ⎦
                                              •
```
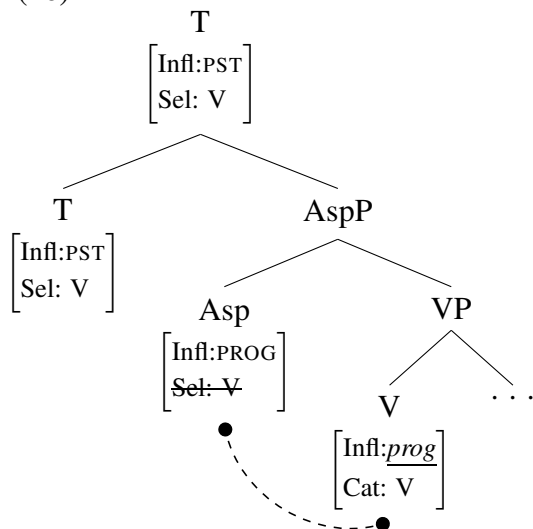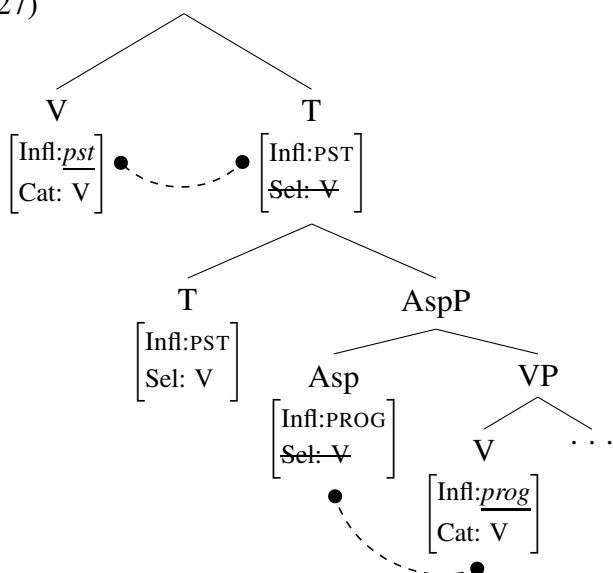
   The process is called *Cyclic Selection*, by analogy to Cyclic Agree (Rezac 2003; Béjar and Rezac 2009), since the two share fundamental properties. In both, an operation (Merge or Agree) is triggered as soon as the probe is merged. If the probe finds an accessible goal in its c-command domain, it establishes a relation with it and becomes deactivated/valued. If, and *only if*, no goal is located in the c-command domain, does the probe project to the root node, from which position it can interact with the specifier (for other examples of this type of cyclicity in agreement see e.g. Toosarvandani and van Urk 2014; Carstens 2016; Keine and Dash 2018). This underlying parallel between Cyclic Agree and Cyclic Selection is responsible for the fact that both show the same last-resort profile. For Cyclic Agree, consider the following paradigm from Georgian, where an agreement probe on v searches for a DP with participant (1/2person) features (Béjar and Rezac 2009):

(28) A Cyclic Agree paradigm (data from Halle and Marantz 1993:117)

    a. <u>*Object accessible → agreement with object*</u>
       g-xatav   [[$_v$ φ_{PART}:___]   [$_{VP}$ DP$_{PART}$]]]
       2sg-draw
       'I draw you'

    b. <u>*Object accessible → agreement with subject impossible*</u>
       *****v**-xatav   [$_{vP}$ DP$_{PART}$ [$_v$ φ_{PART}:___]   [$_{VP}$ DP$_{PART}$]]]
       1sg-draw
       Intended: 'I draw you'

    c. <u>*Object inaccessible → agreement with subject required*</u>
       v-xatav   [$_{vP}$ DP$_{PART}$ [$_v$ φ_{PART}:___]   [$_{VP}$ DP]]]
       1sg.s-draw
       'I draw him'

(29) A Cyclic Selection paradigm

    a. <u>*Main V accessible → checking by main V (synthesis):*</u>
       She work-**s**.   [[$_T$ Sel:V]   [$_{VP}$ Cat:V]]]

    b. <u>*Main V accessible → checking by Aux V (periphrasis) impossible:*</u>
       *She i-**s** work.   [$_{TP}$ Cat:V [$_T$ Sel:V]   [$_{VP}$ Cat:V]]]

    c. <u>*Main V inaccessible → checking by Aux (periphrasis) required:*</u>
       She is working.   [$_{TP}$ Cat:V [$_T$ Sel:V]   [$_{AspP}$ ...]]]

In both paradigms, a relation with a specifier is possible and required if and only if no goal is accessible inside the probe's complement. This last-resort profile is a natural effect of cyclicity of syntactic operations, be it Agree or Merge.

    There is one obvious difference between Cyclic Agree and Cyclic Selection. While c-selectional features trigger structure building, agreement probes do not. This means that, after failing the search of its c-command domain, an agreement probe will be valued by its specifier only if such a specifier is independently merged. If it isn't, the probe will remain unvalued and likely give rise to default agreement morphology (Preminger 2011, 2014). In the case of c-selection, the unsatisfied probe is a selectional feature, i.e. a feature that triggers structure building. This means that merge of an appropriate specifier is derivationally inevitable.

    Like insertion approaches, Cyclic Selection derives the overflow pattern by featural under-specification. In languages with the overflow pattern, certain inflectional contrasts are encoded privatively. Assuming that inflectionally unmarked heads (like present tense T in Swahili) lack the [Infl:val, Sel:V] bundle, they do not trigger Merge of a verb. The derivation of Present Perfect in Swahili is then the same as in Copwer's system (20).

    Note, finally, that the merge of an auxiliary verb in the specifier position does not interfere with

the shape of the extended projection. Since the auxiliary is a selectee, not a selector, it does not project, and the root node is of the same category as before auxiliary selection. This in turn means that the functional category (here TP) can participate in further building of the functional spine according to the Hierarchy of Projections.

A noteworthy aspect of the Cyclic Selection approach is that it involves merging a head in a specifier position. This type of configuration has been argued to arise due to (certain types of) head movement (Kayne, 1991; Fukui and Takano, 1998; Toyoshima, 2001; Matushansky, 2006; Vicente, 2007; Harizanov, 2016). If head movement is internal merge of a head as a specifier, Cyclic Selection of an auxiliary is simply the external-merge counterpart of head movement of a verb. Like head movement in Matushansky 2006, Cyclic Selection of an auxiliary is followed by m-merger with the selecting head. M-merger of an auxiliary is schematized in (30) for the Swahili Past Perfect. (It is assumed here that TAM heads such as T and Asp each have a φ-probe (Carstens 2001; Pietraszko 2018b).[9]

(30)   *M-merger* of an auxiliary (Swahili Past Perfect)
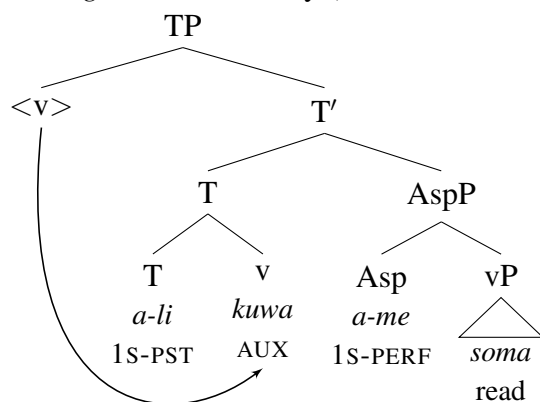
A further parallel between auxiliary merge and Matushansky's theory of head movement is that both are triggered by c-selectional features, rendering external and internal merge of a head in the same specifier position mutually exclusive. We thus predict complementarity between merging an auxiliary with a functional head F and moving the lexical verb to F. This prediction appears to be vastly correct (with apparent exceptions in cases where auxiliaries are clitics forming a prosodic unit with a lexical verb, as in Turkish (Kornfilt 1996) or Slavic languages (Borsley and Rivero 1994; Migdalski 2006)). In the remainder of the paper, I assume Matushansky's theory of head movement for all types of head movement (long and local). I do so, however, largely for simplicity – the data and analysis discussed below are compatible with there being more than one operation displacing heads (Rizzi and Roberts 1989; Embick and Noyer 2001; Hein 2018; Harizanov and Gribanova 2019, Arregi and Pietraszko 2021).

One of Matushansky's core arguments for treating head movement as movement to a specifier position comes from constructions in which m-merger apparently does not apply, leaving a head in the specifier position. In the next section, I argue that the same kind of evidence is available for verbs *externally* merged in the specifier position. The evidence comes Swahili relative clauses.

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[9] Alternative analyses of multiple agreement in compound tenses include head-to-head φ-agreement (Baker and Willie, 2010) and head-to-head concord (Henderson, 2006).

4 Swahili T-to-C movement: an argument for Cyclic Selection of auxiliaries

Under the Cyclic Selection account, default auxiliaries are verbal heads merged as specifiers of inflectional projections, e.g. TP. As such, they are externally merged counterparts of verbs that move to these positions under Matushansky's theory of head movement. In this section, I present an empirical argument for the Cyclic Selection analysis of auxiliaries. In Swahili, auxiliaries normally undergo m-merger with T. However, m-merger is bled in constructions involving syntactic T-to-C movement, which leaves the auxiliary behind.

Matushansky proposes that every step of head movement is immediately followed by m-merger. This is necessary to capture the pervasive absence of excorporation in head movement. Combining this with the Cyclic Selection account of auxiliaries in English, the auxiliary is m-merged with T before T undergoes movement to C (31), giving rise to subject-auxiliary inversion (32).[10]

(31) a. $[C [_{TP} Aux [_{T'} T \ldots]]] \xrightarrow{\text{M-merger}} [C [_{TP} [_{T'} Aux+T \ldots]]]$

b. $[C [_{TP} [_{T'} Aux+T \ldots]]] \xrightarrow{\text{T to C}} [Aux+T+C [_{TP} [_{T'} \text{Aux+T} \ldots]]]$

(32) Is she <is> working?

If the operations in (31) applied in the reverse order, i.e. T-to-C movement before m-merger, we would expect the auxiliary to not invert with the subject. Only the inflectional affix would then be expected to move to C, in which case it would trigger do-support in C:

(33) *Do-es $[_{TP}$ she $[_{T'}$ be $[_T$ <-es>] working]]?

The ungrammaticality of (33) leads us to conclude that m-merger of the auxiliary in English applies before T-to-C movement. Given this, the originalmSpec,TP position of the auxiliary is difficult to detect. Subject-auxiliary inversion equally follows from a theory in which the auxiliary is inserted directly in T, whether by some auxiliary-insertion process or by GB-style head movement from a lower position. One way to empirically distinguish the two analyses is by identifying cases in which m-merger does not apply or does not apply immediately after head movement. I demonstrate below that the latter is the case in Swahili compound tenses. T to C movement in Swahili gives rise to the counterpart of the ungrammatical English example in (33).

Swahili relative clauses may be formed with or without an overt complementizer (Barrett-Keach 1985). Whether overt or not, the relative C agrees with the relative head, here *book*. The overt complementizer has the form *amba*:

(34) kitabu $[_{CP}$ ⌐amba-cho⌐ a-li-ki-soma   ]
      7book   COMP-C7   1S-PST-7o-read
      'the book that he read'

When the relative C is null, some head undergoes movement to C (Kinyalolo 1991; Ngonyani 1999; Demuth and Harford 1999; Henderson 2003; Ngonyani 2006), bringing T to the left of the relative agreement suffix. Interestingly, only the material in T inverts with C, leaving the verb to the right of the complementizer:

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[10] This order of operations is equally necessary under the view that the auxiliary is base-generated below TP and undergoes Matushansky-style head movement to T.

(35) a. kitabu [$_{CP}$ a-li-⬚cho⬚- ki-soma]
          7book   1S-PST-C7- 7O-soma
          'the book that he read'

     b. *kitabu [$_{CP}$ a-li-ki-soma-⬚cho⬚   ]
          7book   1S-PST-7O-soma-C7

The standard analysis of this pattern is based on an independently motivated claim that, in most Swahili clauses, V does not move to T (Buell 2002; Henderson 2003; Ngonyani 1999, 2006; Pietraszko 2018a). Henderson (2003); Ngonyani (1999, 2006) argue that the absence of V-to-T is responsible for the absence of V-to-C movement. Thus, T to C movement in relative clauses inverts T and C only, leaving the verb behind (36).[11]

(36)   Derivation of (35-a)
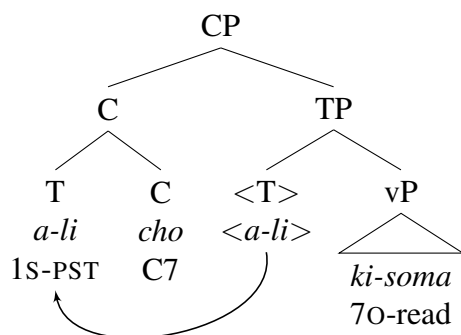
As we will see shortly, auxiliary verbs are similarly stranded under T-to-C movement in relative clauses. Before that, however, I present three pieces of evidence for the "verbless" T-to-C movement in (36) as they will serve as diagnostics for "auxiliary-less" T-to-C movement in the same constructions.

The first argument comes from affix order in relative forms of verbs. Ngonyani (2006) observes that V-to-T-to-C movement should create a complex head in which V precedes both T and C. This follows if we assume that movement can only result in left-adjunction (the LCA, Kayne 1994). Importantly, the attested [T-C-V] affix order is problematic even if we assume, as I do here, that morphemes can have idiosyncratic prefix/suffix status. V-to-T-to-C movement would create a complex head in which V and T form a constituent to the exclusion of C. Consequently, V and T cannot be linearized on different sides of C (Mirror Principle, Baker 1985, 1988). Assuming that syntactic operations apply cyclically, Mirror Principle violations can only arise due to an interaction of two (or more) operations displacing heads (Harley 2010; Myler 2013, 2017; Harizanov and Gribanova 2019; Zyman and Kalivoda 2020, Arregi and Pietraszko 2021). V-to-T-to-C head movement can-

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[11] This analysis seems to predict that preverbal subjects should intervene between the [T-C] complex (here: *alicho*) and the verb stem (here: *kisoma*). The fact is that subjects of relative clauses follow all verbal elements. If the relative clause additionally contains an in-situ object, the subject must follow it, too (Ngonyani 2006). I adopt Ngonyani (2006)'s analysis of this word order as remnant fronting of the constituent immediately below the subject. More specifically, I assume that preverbal subjects are in Spec,AgrS, which itself selects a TP. The TP, including all verbs and objects, undergoes remnant movement to a position above AgrSP but below C. I do not represent this derivational step to avoid unnecessary complication. This movement does not affect the way in which the Swahili data are relevant to the present discussion, i.e. as evidence that auxiliary verbs do not move to C together with T (see below).

not derive this affix order.

The second argument, implicit in Ngonyani 2006, comes from constructions in which the verb moves to C in Swahili: so called *tenseless relatives*. Crucially, in those constructions the verb is linearized to the left of C, obeying the Mirror Principle:

(37)   kitabu [$_{CP}$ a-ki-soma-⬚cho⬚ <a-ki-soma>]   *reduced (tenseless) relative*
            7book   1S-7O-read-C7
            'the book that he reads'

Swahili tenseless relatives have been analyzed as reduced relative clauses, with a deficient or a missing T (Henderson 2003; Ngonyani 2006). In the absence of T, it is the verb that becomes the target of head movement triggered by the relative C:[12]

(38)   Structure of (37) after m-merger
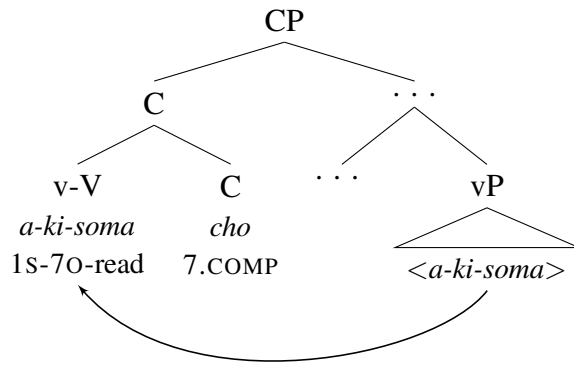
The main point of this comparison is that, when a verb does move to C, it is linearized to its left. This, in turn, supports the non-movement analysis of tensed relatives, in which the verb follows C.

And third, as argued in Ngonyani 1999, 2006; Henderson 2003, the absence of V-to-T-to-C movement in past-tense relative clauses is corroborated by prosody. In Swahili, every prosodic word receives penultimate stress (Barrett-Keach 1986). A verb that moves to C, as in (38), forms a prosodic word with C: there is a single penultimate stress assigned to the material hosted in C (39-a). In contrast, a tensed relative (35-a) bears both a primary and a secondary stress, each assigned on the penultimate syllable of the complex heads that emerge if V does not move to T (39-b).

(39)   a.   [$_{C+V}$ a-ki-soma-cho] → (a.ki.so.ˈma.cho)$_\omega$
               1S-7O-read-C7

        b.   [$_{C+T}$ a-li-cho   ] [$_v$ ki-soma] → (a.ˈli.cho)$_\omega$ (ki.ˈso.ma)$_\omega$ → (a.ˌli.cho.ki.ˈso.ma)$_\omega$
               1S-PST-C7   7O-read

Each complex heads in (39-b) is mapped to a PWord, within which stress is assigned on the

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[12] Note that, despite lacking tense, the fronted lexical verb is inflected for subject agreement. It is important to keep in mind at this point that, in Bantu languages, the presence of a subject agreement morpheme is not indicative of the presence of T. Subject agreement may be reflected on a broad range of functional heads in the clausal spine, including Perf, Asp and Voice/v (i.a. Kinyalolo 1991; Carstens 2001; Henderson 2006; Pietraszko 2017, 2018b).

penultimate syllable (Pietraszko, 2018a).[13] They are then mapped to a single PWord, resulting in the emergence of primary and secondary stress. Following Henderson 2003; Ngonyani 2006; Pietraszko 2018a, I assume that the PWord comprising T, C and V is formed by a post-syntactic operation, such as PF Merger or Local Dislocation (Marantz, 1984; Embick and Noyer, 2001). Primary stress is determined after the [T-C-V] complex head is formed at PF (for a similar analysis of stress and vowel harmony in Turkish, see Fenger 2019, 2020). This means that, even though V does not undergo *head movement* to T and C, it does ultimately form a complex head with T and C at PF. The crucial fact in this discussion is that in past-tense relative clauses, the resulting [T-C-V] complex comprises two stress domains, while in tenseless relatives, it consists of only one. This corroborates the analysis of tenseless relatives as involving V-to-C head movement and of tensed relatives as lacking this movement.

Returning to auxiliaries, recall that the insertion approach posits that the auxiliary is inserted directly in T. The prediction is, then, that auxiliaries should invert with the relative C under T to C movement, just like verbs in tenseless relatives do. This prediction is incorrect:

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

Instead, auxiliaries behave like verbs that do *not* move to T – they follow the T-C complex:

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

In contrast, the Cyclic Selection analysis captures these facts in a straightforward way. They are a case of m-merger not applying immediately after a head is merged in a specifier position. By hypothesis, Swahili differs from English in that the structure is not sent to PF until the CP phase is complete.[14] First, the auxiliary *kuwa* is merged as Spec,TP. Subsequently, T-to-C movement applies, displacing T, but not the auxiliary, to C (42). At PF, m-merger creates a T-C complex head, while the auxiliary forms a complex head on it own.[15]

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[13] An alternative analysis was developed by Henderson (2003), who proposes that stress is assigned in each phase, vP and CP, thus correctly deriving one stress in (39-a) and two stresses in (39-b).

[14] The idea that cross linguistic variation may be the result of different timing of the same set of operations has been advocated in previous literature, e.g. Bruening 2005; van Koppen 2005; Anand and Nevins 2006; Heck and Müller 2007; Sigurðsson and Holmberg 2008; Müller 2009; Asarina 2011; Halpert 2012, 2015; Richards 2013; Georgi 2014; Obata et al. 2015; Obata and Epstein 2016.)

[15] I leave open the question of whether the auxiliary undergoes m-merger with the unpronounced copy of T or not. This determination may depend on the assumed theory of local head movement and it happens to be immaterial here.

(42)   T to C movement (Syntax)
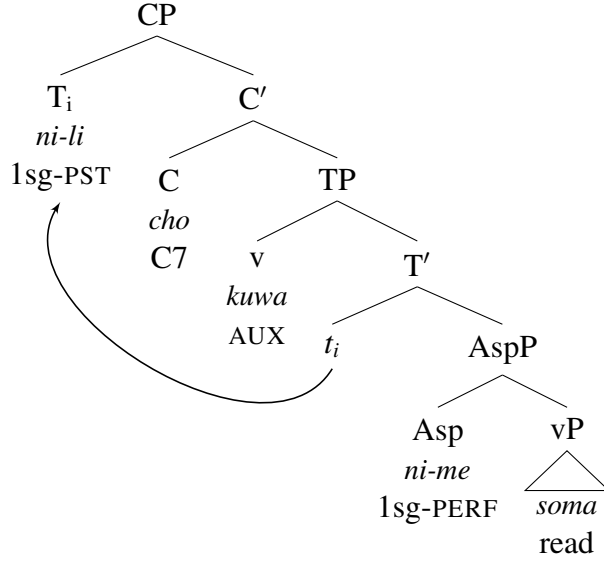

(43)   M-merger (PF)
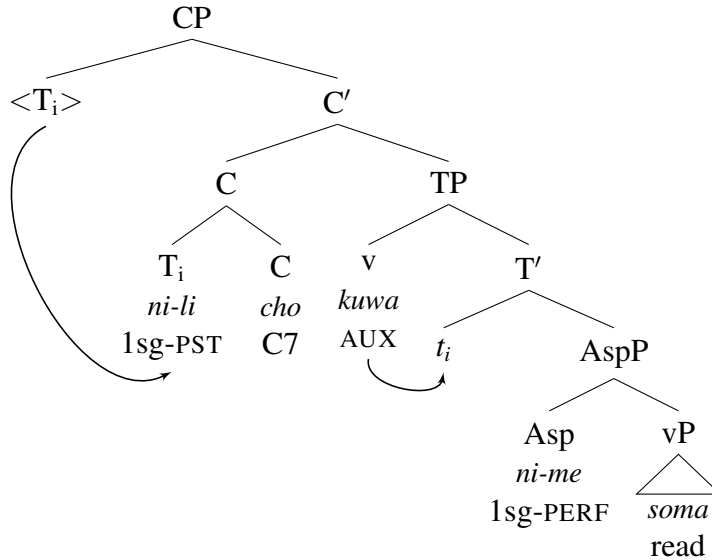
As predicted, the auxiliary and the T-C complex form separate prosodic domains, as evidenced by the presence of a penultimate stress in each. As with lexical verbs, the auxiliary and [T-C] form a complex head at PF, giving rise to a primary and a secondary stress:

(44) $[_{C+T}$ a-li-cho $]$ $[_v$ kuwa $] \rightarrow$ (a.ˈli.cho)$_\omega$ (ˈku.wa)$_\omega \rightarrow$ (a.ˌli.cho.ˈku.wa)$_\omega$
         1S-PST-C7   AUX

The affix order in Swahili relative clauses resists analysis under insertion approaches to verbal periphrasis. If the default auxiliary is inserted in T in syntax, movement of T to C without the auxiliary would require excorporation. Allowing excorporation freely fails to capture the pervasive roll-up nature of head movement that led to the Mirror Generalization. For this reason, I assume, following previous literature (Harley 2010; Myler 2013, 2017; Harizanov and Gribanova 2019; Zyman and Kalivoda 2020, Arregi and Pietraszko 2021), that attested violations of the Mir-

ror Principle are due to other operations, with head movement proper being fully cyclic roll-up movement, which, by itself, can only create Mirror-Principle obeying structures. The Swahili facts are equally problematic for approaches that treat auxiliary insertion as a post-syntactic process (Bjorkman, 2011; Fenger, 2019, 2020; Calabrese, 2019). If the auxiliary is inserted in T at PF, we incorrectly predict that, in cases of T-to-C movement, the auxiliary should appear in C:

(45) Syntax → PF

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        C                C
       / \              / \
      T   C         [T+V]   C
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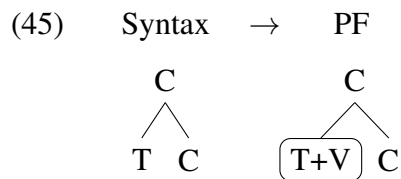
In contrast, the present account derives the affix order in Swahili relative-clause verbs from the relative ordering of head movement and m-merger: unlike in English, T-to-C movement in Swahili precedes m-merger of the auxiliary and T. One might expect that this difference between English and Swahili should correlate with locality effects at the TP boundary. Since m-merger is post-syntactic, we might expect TP to behave like a phase in English, but not in Swahili. This, however, is not exactly the prediction of Matushansky's theory, in which m-merger does not require full spellout. Rather, the structure is sent to PF just for the purposes of m-merger and returned back to syntax before any other PF operations apply. This derivational step is available for every category without causing phasal opacity (with full spellout taking place only at CP and vP). The availability of m-merger at TP in English does not predict that TP is a phase in this language.

A related question is why the Swahili pattern appears to be less common that the English one. Why isn't auxiliary stranding under T-to-C movement more frequently observed? While I do not provide a conclusive answer here, I highlight two relevant issues. First, it is not obvious that the English pattern is indeed the most common way in which auxiliaries interact with T-to-C movement. It appears to be standard in Indo-European languages but a typologically more representative sample would be necessary to evaluate this question accurately. And second, answering this question requires reliable diagnostics that would distinguish the English type of interaction from the auxiliary-stranding interaction found in Swahili. In Swahili, we diagnosed auxiliary stranding by a Mirror-Principle-violating affix order and secondary stress. The latter diagnostic is language-specific and there is no guarantee that every language has a prosodic phenomenon that would diagnose such auxiliary stranding. This leaves us with affix order. Recall that, even though the auxiliary is stranded after T-to-C head movement, it does ultimately form a complex head with [T-C] due to a PF operation. In Swahili, this is evidenced by the fact that the [T-C-Aux] complex bears only one primary stress. The affix-order diagnostic is only useful if the PF operation that puts together [T-C] with the auxiliary happens to produce an MP-violating affix order, i.e. one in which the Aux and T are on different sides of C. But if heads can be idiosyncratically specified as prefixes or suffixes, there are six logically possible affix orders for that complex heads: Aux-T-C, Aux-C-T, T-Aux-C, T-C-Aux, C-T-Aux and C-Aux-T. Of those six orders, only two are MP-violating (T-C-Aux and Aux-C-T). Thus, affix order alone has the potential to diagnose only a third of all possible cases of auxiliary stranding under T-to-C movement. In the remaining two thirds of cases, the non-cyclic structure of the complex head would not be detectable by affix order. Additional obscuring factors may arise at PF, e.g. null exponence of C (common in T-to-C movement), as well as fusional exponence. In sum, the apparent rarity of the Swahili pattern might be an illusion caused by difficulty in diagnosing it. I leave further typological considerations for the future.

Finally, I'd like to address a possible reanalysis of the Swahili facts adopting a particular detail of Bjorkman (2011)'s insertion approach, namely that Asp has both a valued and an unvalued Infl-feature:[16]

(46) a. [$_{TP}$ [iInfl:PST] [$_{AspP}$ [iInfl:PERF], [uInfl:___] [$_{vP}$ [uInfl:___]]]]

    b. [$_{TP}$ [iInfl:PST] [$_{AspP}$ [iInfl:PERF], [uInfl: *pst*] [$_{vP}$ [uInfl: *perf*]]]]

For Bjorkman, only the uninterpretable uInfl features count as stranded inflections, triggering auxiliary insertion when not appearing in a complex head with a V. Thus, the offending Infl-feature in (46) is [uInfl:*pst*] in Asp, not [iInfl:PST] in T. Auxiliary insertion would then insert a dummy verb in Asp. Assuming that there is no Asp-to-T movement in Swahili, this analysis can potentially derive the fact that the auxiliary does not move to C under T-to-C movement.

There is good reason to think, however, that the auxiliary is not inserted in Asp. As discussed above, Asp has its own exponent: the prefix *me-*, preceded by a subject agreement affix. The exponent of Asp forms a unit with the lexical verb, to the exclusion of the auxiliary. For instance, it can be separated from the auxiliary by an adverb:

(47) Ni-li-kuwa   tayari   ni-**me**-ki-soma.
      1sg-PST-AUX already 1sg-PERF-7o-read
      'I had already read it.'

On the other hand, there is evidence that *me* is not the exponent of [uInfl:*perf*] in V. The prefix can be separated from V by morphology exponing heads higher than V, e.g. by object agreement, in (47). The head hosting an object agreement probe is itself fairly high in the argument structure domain – higher than heads introducing applied objects and causees, as these argument control object agreement. Thus, the head exponed by *me-* must be located outside of the argument structure domain. Indeed, the standard analysis of clauses like (47) in Swahili is that in (48) (i.a. Carstens and Kinyalolo 1989; Carstens 2001; Ngonyani 2006).

(48)   …[$_{AspP}$ ni-me   [$_{VoiceP/AgrOP}$ ki- [$_{vP}$ soma]]]
            1sg-PERF   7o-   read

Together, these facts point to the conclusion the auxiliary is not inserted in Asp: the exponent of Asp$_{Perf}$ is *me-*, and it does not form a complex head with the auxiliary. (The same conclusions about Swahili compound tenses was reached by Carstens and Kinyalolo (1989), who also propose that the default auxiliary is inserted in T). On the other hand, these facts are fully compatible with the Cyclic Selection derivation: since the auxiliary is in Spec,TP, (47) is derived by assuming (48) and merging the adverb with AspP.

5 Conclusion

I argued that the overflow pattern of periphrasis does not constitute evidence that auxiliaries are subject to an insertion process different from regular syntactic structure building. I contend, fol-

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[16] In Bjorkman's system, all functional heads have a [uInfl] and an [iInfl] feature except the highest head (here T). See also Adger 2003; Wurmbrand 2011.

lowing previous literature, that this type of distribution necessitates a last-resort analysis of default periphrasis. Such an analysis, however, does not require a new structure building operation ("insertion"). Assuming Bare Phrase Structure and cyclicity, Merge is *predicted* to give rise to last-resort structure building in the right featural context. I then demonstrated that last-resort structure building, called Cyclic Selection, finds empirical support in Swahili, where T-to-C movement strands the auxiliary verb in TP. This type of interaction between T-to-C movement and periphrasis strongly suggests that auxiliary verbs are not inserted in T directly. The present conclusions contribute to the growing body of evidence for the particular notion of cyclicity proposed in Rezac 2003; Béjar and Rezac 2009, i.e. where a probe necessarily searches its c-command domain before searching its specifier. I argued here that this type of cyclicity is not only a property of Agree but also of Merge.

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