

Verb doubling and the order of operations at PF

The case of Asante Twi*

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Claim: I argue that the difference between an asymmetric pattern of verb doubling as in Asante Twi (and other Kwa languages) and a typical, symmetric one as in Hebrew derives from the order of the two operations Chain Reduction (CR) and Head-to-head movement (HHM) at PF. For every language, either CR precedes HHM in a bleeding manner giving rise to an asymmetric pattern, or CR follows HHM in a counter-bleeding manner resulting in a symmetric pattern.

Roadmap

1. Introduction
2. Syntactic properties of Asante Twi predicate clefts
3. An analysis
4. Extending the analysis
5. Conclusions

1 Introduction

Verb doubling denotes a situation in what are commonly called predicate clefts (usually predicate focus/topicalisation, Aboh, 2006) where the main verb occurs twice in two different positions in the sentence. One verb token appears in the topic/focus position (often in the sentence periphery) while a second verb token is found in the base position. This phenomenon occurs in quite a few languages (e.g. Vata and Nweh, Koopman, 1984, 1997; Yoruba, Manfredi, 1993; Gungbe, Aboh, 1998, 2006; Tuki, Biloa, 1997; Buli, Hiraiwa, 2005; Ewegbe, Ameka, 1992; Ga, Dakubu, 2005; Dàgáárè, Hiraiwa and Bodomo, 2008; Hebrew, Landau, 2006; Yiddish, Cable, 2004; Russian, Abels, 2001; Aboh and Dyakonova, 2009; Polish, Bondaruk, 2009, 2012; Brazilian Portuguese, Bastos-Gee, 2009; Spanish, Vicente, 2007, 2009; Hungarian, Ürögdi, 2006; Vietnamese, Trinh, 2011; to name only a few).

*I am indebted to my informant Sampson Korsah for providing his native speaker grammaticality judgements on all Asante Twi examples in this article. Further, I would like to thank Martin Salzmann, Andrew Murphy, Gereon Müller, Fabian Heck, Doreen Georgi, and the participants of the colloquium ‘Neuere Arbeiten zur Grammatiktheorie’ in Leipzig for helpful comments and discussions. This research was carried out as part of the DFG-funded graduate school *Interaktion grammatischer Bausteine* ‘Interaction of grammatical building blocks’. All errors are, of course, mine.

(1) *V fronting*

- a. **Liknot**, hi **kanta** et ha-praxim. (Hebrew, Landau, 2006:37)
buy.INF she buy.PST ACC DEF-flowers
'As for buying, she bought the flowers.'
- b. **Wypić** (to) Marek **wypije** herbatę, ale nie wypije kawę. (Polish, Bondaruk, 2012:55)
drink.INF TO Marek drink.FUT tea but not drink.FUT coffee
'As for drinking, Marek will drink tea, but he will not drink coffee.'
- c. **Dááó** lá ká ní dà **dà** bóó. (Dàgáàrè, Hiraiwa and Bodomo, 2008:803)
buy.NMLZ FOC COMP 1.SG PST buy goat
'It is buying that I did to a goat (as opposed to e.g. selling it).'

Some languages also allow fronting of the verb and its arguments such that the verb is doubled but only one token of the object occurs in the fronted position. (Other languages front the verb and its arguments and show doubling of both; e.g. Yiddish. I will not be concerned with these since they seem to be in the minority and call for a different analysis anyway, cf. Cable, 2004.)

(2) *VP fronting*¹

- a. **Liknot** et ha-praxim, hi **kanta**. (Hebrew, Landau, 2006:37)
buy.INF ACC DEF-flowers she buy.PST
'As for buying the flowers, she bought (them).'
- b. **Wypić** herbatę (to) Marek **wypije**, ale nie wypije kawę. (Polish, Bondaruk, 2012:55)
drink.INF tea TO Marek drink.FUT but not drink.FUT coffee
'As for drinking tea, Marek will drink it, but he will not drink coffee.'
- c. **Bóó dááó** lá ká ní dà **dà**. (Dàgáàrè, Hiraiwa and Bodomo, 2008:805)
goat buy.NMLZ FOC COMP 1.SG PST buy
'It is buying a goat that I did (as opposed to e.g. selling a hen).'

What is to be noted here (but no surprise since it seems so natural) is that the pattern of verb doubling is symmetric: the verb is doubled no matter whether the fronted constituent is the verb alone or the verb and its internal argument. Hence one might state the following generalisation for languages that allow both V and VP fronting:

Generalisation: If a language has verb doubling in V fronting it also has verb doubling in VP fronting. ??

Asante Twi predicate clefts

However, there is evidence from Asante Twi (AT), a dialect of the Kwa language Akan (Niger-Congo) spoken in Ghana, that contradicts this generalisation. Consider the examples in (3) which show an asymmetric pattern of verb doubling.²

- (3) a. **Si**-(e) na Kofi **a-si**/*a-yɔ dan. V fronting
build-NMLZ FOC Kofi PRF-build/PRF-do house
'Kofi has BUILT a house.'
- b. Dan **si**-e na Kofi ***a-si/a-yɔ**. VP fronting
house build-NMLZ FOC Kofi PRF-build/PRF-do
'Kofi has BUILT A HOUSE.'

¹A remark on terminology: I will use the terms (bare) V fronting and VP fronting to refer to surface configurations where a verb alone or respectively a verb and its internal argument(s) occur sentence-initially with a focus or topic interpretation, irrespective of whether the fronted constituent is syntactically a V-head or a complex V-*v*-head and a VP or a *v*P. The terms V(P) or *v*(P) movement will be used to denominate the actual syntactic constituents in displacement.

²Nominalisation is obligatory with focussed verb phrases while it is optional with focussed bare verbs. This difference, however, is not tied to the choice of *yɔ* vs. main verb in base position: *Yɔ* is ungrammatical with a fronted bare verb be it nominalised or not. Likewise, a fronted non-nominalised verb phrase is ungrammatical, irrespective of whether there is *yɔ* or a copy of the main verb in base position.

- c. Kofi a-si dan. simple transitive
 Kofi PRF-build house
 ‘Kofi has built a house.’
- d. Dan na Kofi a-si. object focus
 house FOC Kofi PRF-build
 ‘It is a house that Kofi has built.’

In V fronting, two instances of the main verb are present, one fronted and nominalised/non-finite, the other in the base position and finite. In VP fronting, in contrast to the other languages, the latter instance is replaced by the dummy verb *yɔ* (translatable as ‘do’) which takes on the regular inflection.

Issue

Taking the Asante Twi data into account, we see that *do*-support is a viable way for a language to deal with issues that arise due to displacement of the main verb such as ‘stray affixes’ (cf. Lasnik, 1981). This leads to the typology of verbal fronting in (4). Note that the reverse Asante Twi pattern, *do*-support in V fronting and verb doubling in VP fronting is not attested. (The German pattern of the *tun*-periphrase will be discussed later.)

(4) Attested patterns in verbal fronting

		V fronting	
		V doubling	<i>do</i> -support
VP fronting	<i>do</i> -support	<i>asymmetric</i> Asante Twi	<i>symmetric</i> German
	V doubling	<i>symmetric</i> Hebrew	<i>asymmetric</i> —

Treatments of verb doubling hitherto either have not taken into account the VP fronting cases or have been concerned with a symmetric pattern. In this talk, I will propose an account that derives the Hebrew and Asante Twi patterns by means of an order of operations at PF. Further, I will show that with minor modifications, this approach is able to capture the German pattern as well. The unattested pattern is, crucially, underivable in this account which explains its absence from the typology.

2 Syntactic Properties of Asante Twi predicate clefts

Three properties of predicate clefts in Asante Twi bear on the analysis:

1. They involve \bar{A} movement (rather than base generation, cf. Cable, 2004),
2. the fronted constituent in V fronting is a bare head (rather than a remnant phrase), and
3. the V(P) is fronted (rather than the ν (P)).

\bar{A} movement

There are two strong arguments in favour of an analysis of AT predicate clefts as an \bar{A} dependency. First, the dependency can cross finite clause boundaries (5) and is sensitive to islands such as the *wh*-island (6.1), the complex NP island (6.2), the subject island (6.3), the relative clause island (6.4), and the adjunct island (6.5).

- (5) a. Si-(e) na Ama ka-a sɛ Kofi a-si dan.
 build-NMLZ FOC Ama say-PST COMP Kofi PRF-build house
 ‘Ama said that Kofi has BUILT a house.’

- b. Dan si-e na Ama ka-a se Kofi a-yɔ.
house build-NMLZ FOC Ama say.PST COMP Kofi PRF-do
'Ama said that Kofi has BUILT A HOUSE.'

(6.1) *Wh-island*

- a. *Si-(e) na Ama bisa-a se dabɛn na Kofi si-i dan.
build-NMLZ FOC Ama ask-PST COMP when FOC Kofi build-PST house
'Ama asked when Kofi BUILT a house.'
- b. *?Dan si-e na Ama bisaa se dabɛn na Kofi yɔ-ɔɛ.
house build-NMLZ FOC Ama ask.PST COMP when FOC Kofi do-PST
'Ama asked when Kofi BUILT A HOUSE.'

(6.2) *Complex NP island*

- a. *Si-(e) na me-n-te-e atetesɛm biara se Kofi a-si dan.
build-NMLZ FOC 1SG-NEG-hear-PST rumour.PL any COMP Kofi PRF-build house
'I didn't hear any rumours that Kofi has BUILT a house.'
- b. *?Dan si-e na me-n-te-e atetesɛm biara se Kofi a-yɔ
house build-NMLZ FOC 1SG-NEG-hear-PST rumour.PL any COMP Kofi PRF-do
'I didn't hear any rumours that Kofi has BUILT A HOUSE.'

(6.3) *Subject island*

- a. *Si-(e) na se Kofi a-si dan no ma Ama ani gye.
build-NMLZ FOC COMP Kofi PRF-build house CLAUSALDET give Ama eye collect
'That Kofi has BUILT a house made Ama happy.'
- b. *Dan si-e na se Kofi a-yɔ no ma Ama ani gye.
house build-NMLZ FOC COMP Kofi PRF-do CLAUSALDET give Ama eye collect
'That Kofi has BUILT A HOUSE made Ama happy.'

(6.4) *Relative clause island*

- a. *Si-(e) na Ama bisa-a ɛda aa Kofi si-i dan.
build-NMLZ FOC Ama ask-PST day REL Kofi build-PST house
'Ama asked for the day that Kofi BUILT a house.'
- b. *?Dan si-e na Ama bisa-a ɛda aa Kofi yɔ-ɛ.
house build-NMLZ FOC Ama ask-PST day REL Kofi do-PST
'Ama asked for the day that Kofi BUILT A HOUSE.'

(6.5) *Adjunct island*

- a. *Si-(e) na Kofi nom nsuo efirise ɔ-a-si dan.
build-NMLZ FOC Kofi drink water because 3.SG-PRF-build house
'Kofi drinks water because he has BUILT a house.'
- b. *?Dan si-e na Kofi nom nsuo efirise ɔ-a-yɔ.
house build-NMLZ FOC Kofi drink water because 3.SG-PRF-do
'Kofi drinks water because he has BUILT A HOUSE.'

Second, there are a number of TAM constructions and some morphosyntactic processes in Asante Twi that lead to tonal changes on the verb (Boadi, 2008; Paster, 2010). Among these changes is a process of low tone raising on verbs with underlying L tones. It is triggered in certain syntactic environments, all of which typically involve A'-movement, like *ex situ* wh-questions (7-b), object focus (7-c), and relative clauses (7-d). It raises all L tones on the verb and attached aspectual (but not tense) affixes. The following examples illustrate this for the L toned verb *di* 'eat' and the L toned progressive aspect affix *re-*.

- (7) a. Ama **re-di** bayéré
Ama PROG-eat yam
'Ama is eating a yam.'
- b. Déén na Ama **ré-dí**?
what FOC Ama PROG-eat
'What is Ama eating?'
- c. Bayéré na Ama **ré-dí**.
yam FOC Ama PROG-eat
'It's yam that Ama is eating.'

- d. [DP Bayéré nó_i [CP áa Ama ré-dí t_i nó]] **da** pónó nó só.
 yam DEF REL Ama PROG-eat CD lie table DEF top
 ‘The yam that Ama is eating is on the table.’

Tonal changes as reflexes of movement are well-attested cross-linguistically (Lahne, 2008; Georgi, 2014), which leads Korsah and Murphy (2015) to analyse low tone raising on verbs in Asante Twi as a reflex of successive-cyclic A'-movement. Crucially, this tonal change also occurs on the lower verb copy and its affix in predicate cleft constructions (8) indicating that these, too, involve A'-movement.

- (8) a. Di na Ama ré-dí bayéré.
 eat FOC Ama PROG-eat yam
 ‘Ama is EATING yam.’
 b. Bayéré di-e na Ama ré-yó.
 yam laugh-NMLZ FOC Ama PROG-do
 ‘It is eating yam that Ama does.’

Bare head fronting

Is the fronted constituent in V fronting a bare head (Koopman, 1984; van Riemsdijk, 1989; Larson and Lefebvre, 1991; Holmberg, 1999; Fanselow, 2002; Landau, 2006; Harbour, 2008; Bastos-Gee, 2009) or rather a remnant VP or ν P (den Besten and Webelhuth, 1990; Grewendorf and Sabel, 1994; Koopman, 1997; Takano, 2000; Abels, 2001; Hinterhölzl, 2002; Aboh and Dyakonova, 2009; Bondaruk, 2012; Müller, 2014).

- (9) a. Kofi a-si dan.
 Kofi PRF-build house
 ‘Kofi has built a house.’
 b. *Kofi dan a-si.
 Kofi house PRF-build
 ‘Kofi has built a house.’
 (10) a. Kofi ma-a mmofra no krataa.
 Kofi give-PST children DET book
 ‘Kofi gave the children a book.’
 b. *Kofi ma-a krataa mmofra no.
 Kofi give-PST book children DET.
 ‘Kofi gave a book to the children.’

Asante Twi shows no evidence for any VP/ ν P evacuating scrambling or licensing movements. This is illustrated in (9) for transitive and in (10) for ditransitive sentences. (9-a) and (10-a) exemplify the basic word order, whilst (9-b) and (10-b) show the ungrammaticality of object movement across the verb and across another object. I will take it as the most natural assumption to regard the fronted constituent in V fronting as a head.

V(P) rather than ν P

As can be observed, no aspect marking appears on the fronted verb or verb phrase. This also holds for fronted bare verbs that are not nominalised. Overt aspectual marking even leads to ungrammaticality (11).

- (11) (*A-)Si-(e) na Kofi a-si dan.
 (PRF-)build-NMLZ FOC Kofi PRF-build house
 ‘Kofi has BUILT a house.’

Under the assumption that aspect features are encoded on ν one can conclude that ν is not part of the fronted constituent. Under the alternative assumption that aspect is a separate head, Kandybowicz (2015) argues for it to be above the verbal root but below ν in the Asante Twi clause structure. Fronting of ν (P) would then entail fronting of the aspect head predicting aspect marking to occur on the fronted constituent, contrary to fact. Hence, under either assumption, the fronted constituent in Asante Twi must be V(P).³

³Under the former assumption, this entails that complements of phase heads are allowed to move, contrary to Abels (2003). If Abels were correct, one would expect that the VP as a complement of the phase head ν was not able to move to SpecCP alone but had to be fronted as part of the larger ν P or pied-pipe the ν head. This, however, would leave the ungrammaticality of aspect features in fronted position (11.2) unaccounted for. The issue does not arise under the latter assumption where the aspect head prevents VP from being the complement of ν .

3 An analysis

Preliminaries

- I assume the **Copy Theory of movement** (Chomsky, 1993, 1995) under which verb doubling can be easily accounted for as being a consequence of **spell-out of two copies of the verb** (Abels, 2001; Nunes, 2004).
- Usually, **only one link/copy in a movement chain is pronounced, namely the head** of that chain, while the others are left unpronounced (Brody, 1995; Bobaljik, 1995; Groat and O'Neill, 1996; Pesetsky, 1997, 1998). I will adopt Nunes' (2004) approach in the following insofar as I assume an operation **Chain Reduction** that applies to movement chains at PF and deletes lower copies. However, I reject the full identity requirement. A chain consists of positions that are related by syntactic movement (chain links) and asymmetric c-command. Chain Reduction simply deletes the elements (copies) that occupy the lower positions where these elements can also be only a subset of the highest copy (cf. Muñoz Pérez, 2015).
- In predicate clefts, **the verb actually moves twice** creating two distinct parallel chains whose respective heads are spelled out while their shared tail is deleted (Aboh, 2006; Collins and Essizewa, 2007; Chomsky, 2008; Kandybowicz, 2008; Aboh and Dyakonova, 2009).
- One movement is A'-movement into SpecCP (either as a bare head or as part of the whole VP) in order to satisfy the focus feature on C and the other is head movement to *v* and/or T. Hence, **A' head movement into a specifier position is legitimate syntactic movement** (Koopman, 1984; Vicente, 2007, 2009) and obeys the standard constraints on movement (Minimal Link Condition, Phase Impenetrability Condition).
- On the other hand, **Head-to-head movement (HHM) is a PF operation** (Chomsky, 1995; Brody, 2000; Hale and Keyser, 2002; Bury, 2003; Harley, 2004; Platzack, 2013). I further assume that PF-movement does not leave any copies (or traces) (Boeckx and Stjepanović, 2001; Sauerland and Elbourne, 2002).
- **CP and *v*P are phases under the weak version of the PIC** (Chomsky, 2001); i.e. the domain of a phase is sent off to PF when the next higher phase head is merged.

Order at PF

Following the recent line of research on the order of application of operations at the University of Leipzig (Müller, 2009; Georgi, 2014; Murphy and Puškar, 2015; Assmann et al., to appear), I assume that there is a strict order of operations at PF.

Proposal: For each language, operations at PF apply in a strict and invariable order. Either Chain Reduction precedes Head-to-head movement, or Head-to-head movement precedes Chain Reduction.

The order CR > HHM leads to an asymmetric pattern of verb doubling while the reverse order HHM > CR results in a symmetric one in the following way.

3.1 CR > HHM: asymmetric verb doubling

VP fronting → *do*-support

- (12.1) Dan si-e na Kofi *a-si/a-ɔ.
 house build-NMLZ FOC Kofi PRF-build/PRF-do
 'Kofi has BUILT A HOUSE.'

- V has to \bar{A} head move to Spec ν P to remain accessible for later movement to SpecCP.
 - When C is merged, VP is transferred to PF. CR and HHM apply vacuously.
 - In syntax, V \bar{A} head moves to SpecCP, then TP is shipped off to PF where CR applies and deletes the lower Subj copy (13.2-a).
- !!! It cannot delete the lower V copy because that copy is not part of a chain. This is due to the Chain Uniformity Condition.

Chain Uniformity Condition (Chomsky, 1995)

A chain is uniform with regard to phrase structure status.

The phrase structure status of the V in the base position is minimal but not maximal since it is a head and projects a VP. That of the next higher V copy in Spec ν P is both minimal and maximal since it is a head and does not project. A chain between these two elements would violate Chain Uniformity. Hence, although movement has taken place, no chain has been created to which Chain Reduction could apply.

- Next, HHM can move the surviving V to ν and the complex V- ν to T (13.2-a).
- When the rest of the CP arrives at PF, CR deletes the V copy in Spec ν P which is the lower copy in a chain with the V in SpecCP (both are minimal and maximal, hence a chain exists between them). HHM applies vacuously (13.2-b).
- There are two copies of V in the final structure, one in SpecCP and the other as part of the complex V- ν -T head.

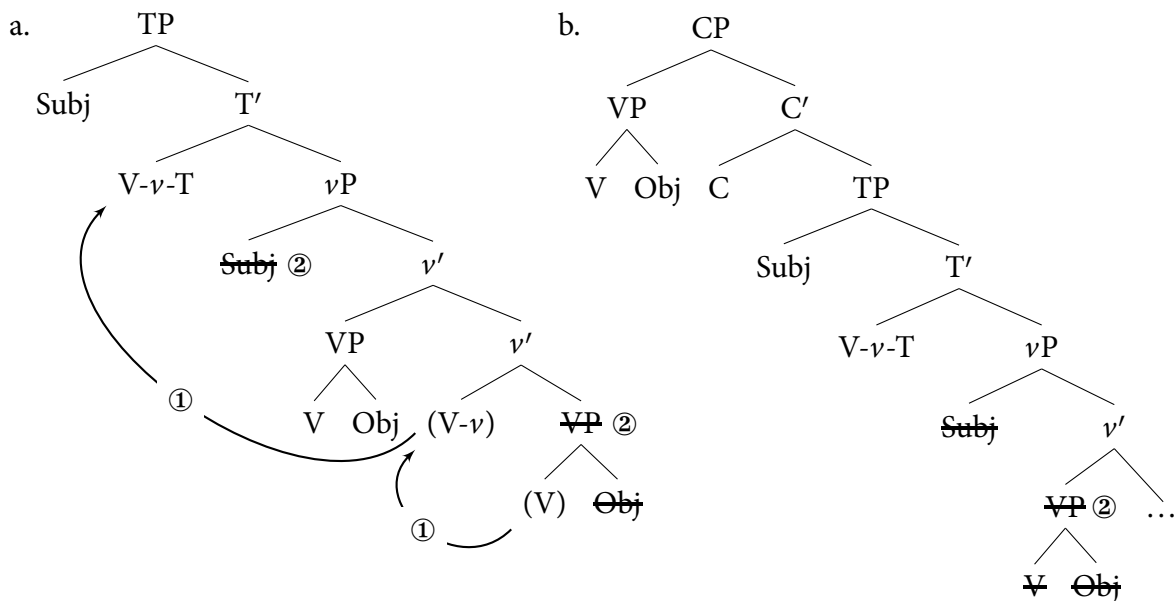
3.2 HHM > CR: symmetric verb doubling

VP fronting \rightarrow verb doubling

(14.1) Liknot et ha-praxim, hi kanta. (Hebrew, Landau, 2006:37)

buy.INF ACC DEF-flowers she buy.PST
 ‘As for buying the flowers, she bought (them).’

(14.2) HHM > CR in VP fronting: verb doubling



- VP has to move to Spec ν P to remain accessible for later movement to SpecCP.

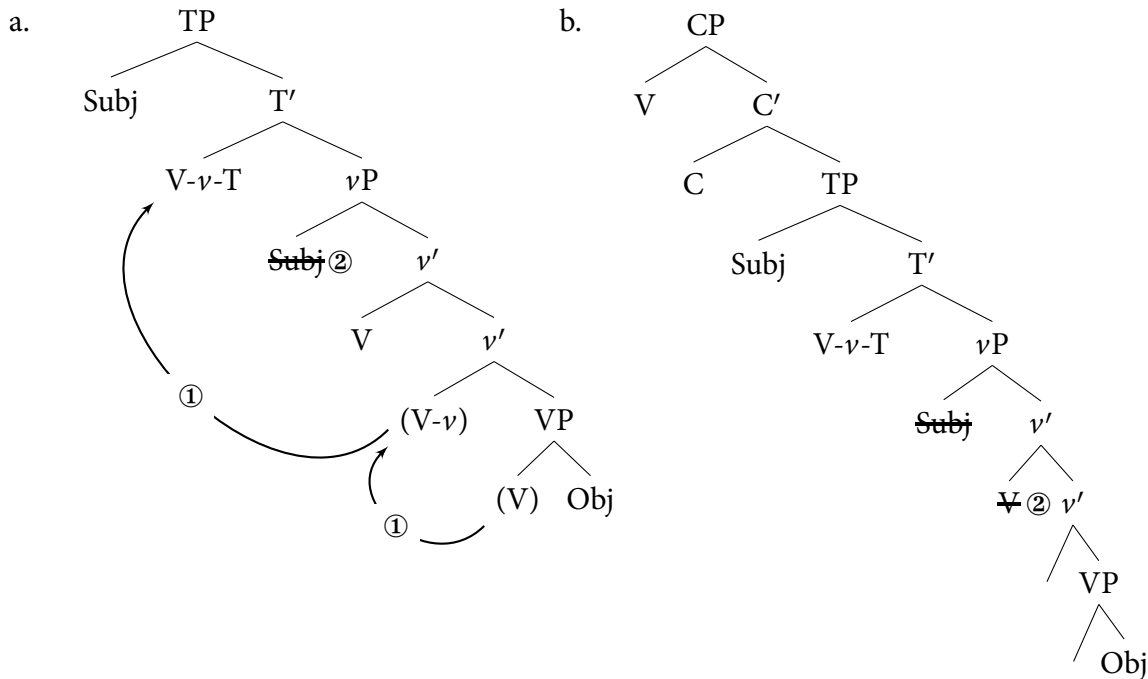
- When C is merged, VP is sent off to PF. HHM and CR apply vacuously.
- In syntax, VP moves to SpecCP, then TP is sent off to PF where HHM moves V to ν and the resulting complex head V- ν to T. Subsequent CR deletes the lower Subj copy and the lower VP copy which no longer contains the lower V copy (14.2-a). Importantly, CR can delete the lower VP copy even though it is not identical to the higher one because it is a subset of the latter.
- The rest of the CP arrives at PF, HHM applies vacuously and CR deletes the VP copy in Spec ν P (14.2-b).
- There are two copies of V in the final structure, one in the VP in SpecCP, and the other as part of the complex V- ν -T head.

V fronting → verb doubling

(15.1) Liknot, hi kanta et ha-praxim.
 buy.INF she buy.PST ACC DEF-flowers
 ‘As for buying, she bought the flowers.’

(Hebrew, Landau, 2006:37)

(15.2) HHM > CR in V fronting: verb doubling



- V has to \bar{A} head move to Spec ν P to remain accessible for later movement to SpecCP.
- When C is merged, VP is transferred to PF. HHM and CR apply vacuously.
- In syntax, V \bar{A} head moves to SpecCP, then TP is shipped off to PF where HHM applies and moves V to ν and the resulting complex head to T (15.2-a).
- CR deletes the lower Subj copy. It cannot delete the lower V copy because it is not in a chain with the V copy in Spec ν P due to the Chain Uniformity Condition. Also, even if there were a chain, its lower link position would be empty due to prior HHM. Thus CR could not determine which element it had to delete.
- When the rest of the CP arrives at PF, HHM applies vacuously and CR deletes the V copy in Spec ν P (15.2-b) which is the lower copy in a chain with the V in SpecCP (both are minimal and maximal, hence a chain exists between them).

- There are two copies of V in the final structure, one in SpecCP and the other as part of the complex V- ν -T head.

Interim summary

The asymmetric pattern comes about because:

- In VP fronting, V is deleted as part of the VP before it can move, which leads to *do*-support.
- In V fronting, peculiarities of \bar{A} head movement w.r.t. formation of chains protect V from deletion, which leads to verb doubling.

The symmetric pattern comes about because:

- In VP fronting, V leaves the lower VP copy before it is deleted, which leads to verb doubling.
- In V fronting, peculiarities of \bar{A} head movement protect V from deletion, although it would have left the (hypothetical) lower chain link before application of CR, anyway, giving rise to verb doubling.

4 Extending the analysis

4.1 ν (P)

A problem

Landau (2006) convincingly argues that the fronted constituent in Hebrew is actually ν P or V- ν respectively. The same holds for Spanish (Vicente, 2007, 2009). This poses a problem for the ordering account: Copies are created only when an element is moved in the syntax but this element cannot be a complex V- ν head because complex heads are created by HHM, which applies only after syntax at PF. If it is only the ν that moves and leaves copies in the syntax it remains puzzling why we get two tokens of the lexical verb.

A solution: Entire phases at PF

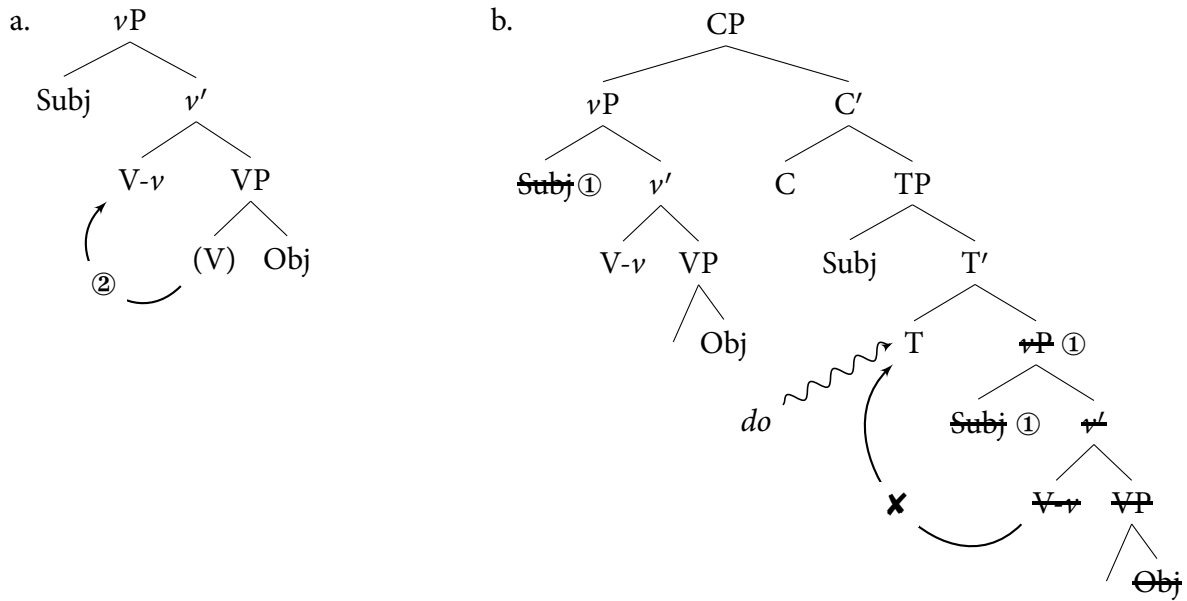
In order to integrate V- ν doubling into the ordering account it is necessary to allow the output of HHM of V to ν to serve as the input to syntax such that the whole complex head can be copied and moved. This is only possible if the entire phase is sent off to PF with its head and edge but not its domain accessible to further syntactic operations as argued for by Fox and Pesetsky (2003, 2005); Svenonius (2004, 2005); Fowlie (2010); Richards (2011) and Aelbrecht (2012). The patterns resulting from different orders remain the same.⁴

⁴Crucially, V/VP movement and the effects that an order of PF operations has on it also remain unaffected by this modification. The interaction of the different orders of PF operations with V- ν / ν P movement is the same as with V/VP movement: HHM before CR gives rise to symmetric verb doubling while the reverse order CR before HHM results in asymmetric verb doubling.

4.1.1 CR > HHM: asymmetric verb doubling

VP fronting of ν P → do-support

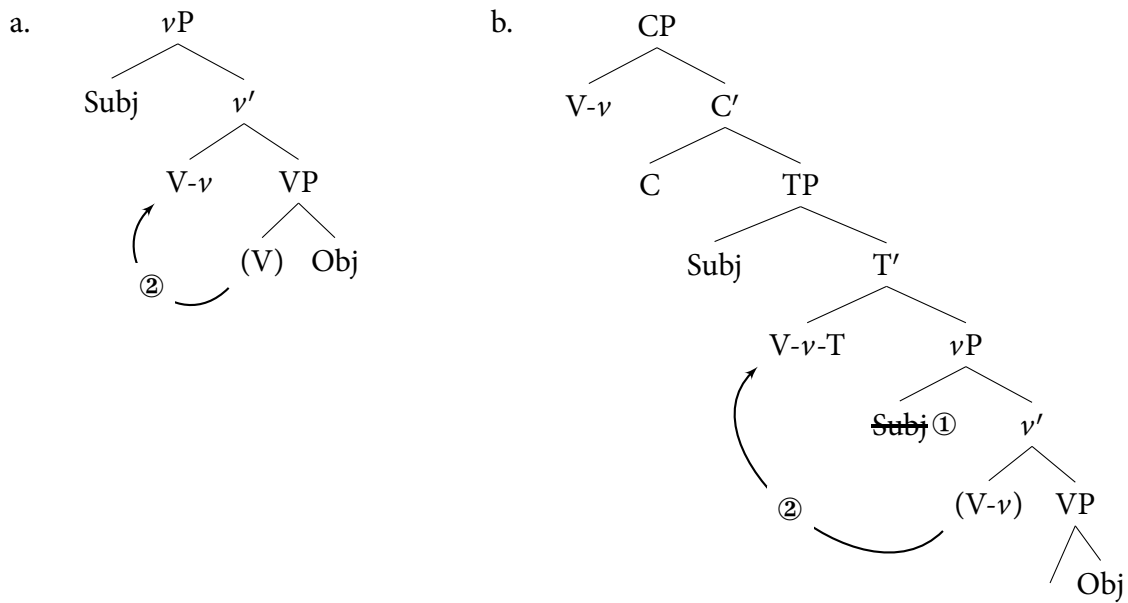
(16) CR > HHM in VP fronting of ν P: do support



- Since it is the whole phase ν P that moves to SpecCP, there is no need for any intermediate landing sites, hence before the final movement to SpecCP there are no copies except for the subject copies in the structure.
- When C is merged, the entire ν P phase is sent off to PF where CR applies vacuously and subsequent HHM moves V to ν (16-a).
- In syntax, the ν P is copied (with the complex V- ν head created in the previous PF step) and moved to SpecCP. The whole CP is then transferred to PF.
- Here, CR encounters a remnant movement configuration: The subject has moved out of ν P and the remnant ν P has moved to SpecCP. Consequently, there are three copies of the subject, two of which (the one in the lower Spec ν P and the one in SpecTP) are in the same chain while the last one (in the higher Spec ν P) is not c-commanded by nor does it c-command any other subject copy. Hence, we'd expect CR to delete only the lowest copy, contrary to fact (there is only one pronounced subject in the sentence).
- As mentioned earlier, a chain consists of movement related positions that are occupied by the same elements (or subsets of elements). The subject chain can be represented as CH=((*Subj*,*T'*),(*Subj*, ν')) where the first part is the element and the second its position, i.e. sister of *T'*/ ν' . According to Nunes (2004), CR inspects the chain and determines that that occurrence of *Subj* which is the sister of ν' is to be deleted. Since there are two instances of *Subj* that fulfill this condition, CR deletes both.
- Also, the lower copy of ν P is deleted. Subsequent HHM cannot move V- ν to T, therefore *do* is inserted to enable spell out of the affix in T. The structure contains only one copy of V- ν in the ν P in SpecCP.

V fronting of V-*v* → verb doubling

(17) *CR > HHM in V fronting of V-*v*: verb doubling*

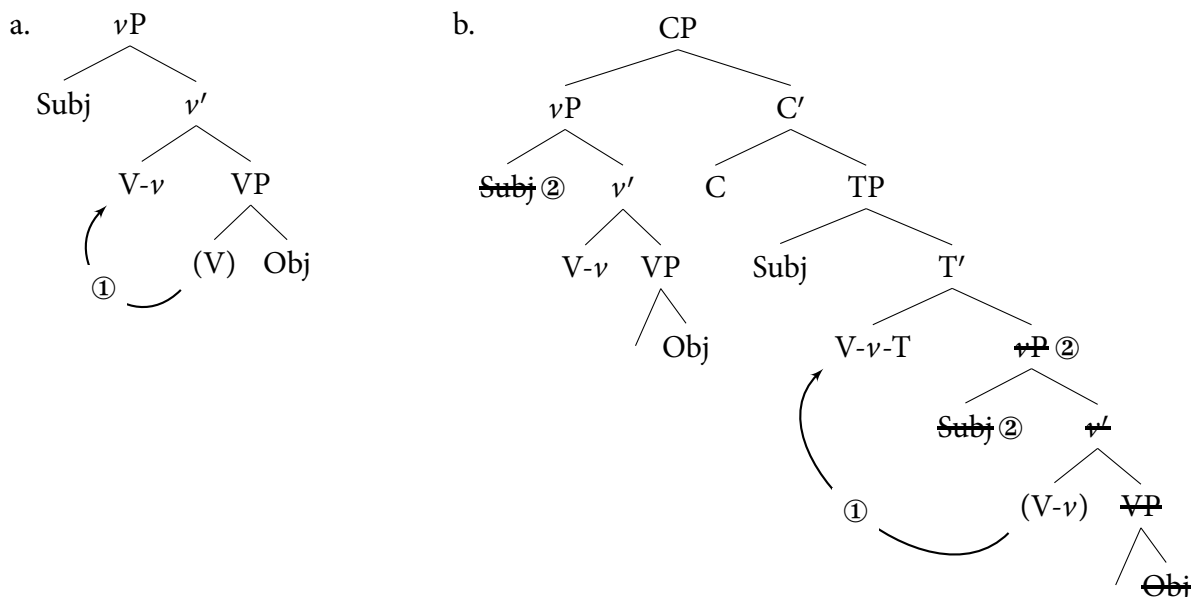


- As was the case for the *vP*, the *v* is also directly accessible from C without moving into some intermediate position. Hence, step (17-a) is the same as in the previous derivation.
- Afterwards, the newly formed *V-v* head moves to SpecCP and the CP phase is transferred to PF.
- First, CR applies and deletes the lower Subj copy. It cannot delete the lower *V-v* copy since it is not in a chain with the higher copy due to Chain Uniformity; the lower copy is minimal but not maximal since it projects a *vP*, while the higher copy is minimal and maximal because it does not project. Subsequent HHM moves *V-v* to T (17-b).
- The final structure contains two copies of *V-v*, one as part of *V-v-T* and the other in SpecCP.

4.1.2 HHM > CR: symmetric verb doubling

VP fronting of *vP* → verb doubling

(18) *HHM > CR in VP fronting of *vP*: verb doubling*



- In the crucial step, here, the complex V-*v* head moves to T before CR deletes the lower *v*P copy (18-b).
- One prediction that the approach makes here is that languages that do not have verb-to-T movement but nonetheless show fronting of *v*P do not exhibit verb doubling. This is because if V-*v* did not move to T, it would be deleted with the lower *v*P.
- The final structure in (18-b) contains again two copies of the V-*v* head, one in the complex T head and another one in the *v*P in SpecCP.

V fronting of V-*v* → verb doubling See the derivation in (17), only with the circled numbers switched.

Interim summary 2

I have shown how the order of operations paired with exceptional properties of \bar{A} head movement (20) can derive the attested patterns of verb doubling (given again in (19)) except for the German *tun*-periphrase.

(19) *Attested patterns in verbal fronting*

		V fronting	
		V doubling	<i>do</i> -support
VP fronting	<i>do</i> -support V doubling	Asante Twi Hebrew	German –

(20) *Pattern depending on order of operations (non-final)*

Surface	Constituent	Order of PF operations	
		HHM > CR	CR > HHM
VP fronting	complete VP/ <i>v</i> P	verb doubling	<i>do</i> -support
V fronting	bare V/V- <i>v</i>	verb doubling	verb doubling
		Hebrew	Asante Twi

4.2 Remnant VP/*v*P movement

As already hinted at in the table above, there are languages like German that exhibit a third logically possible pattern, namely *do*-support in both V and VP fronting as exemplified by the verbal topicalisations in (21-a, b) respectively.

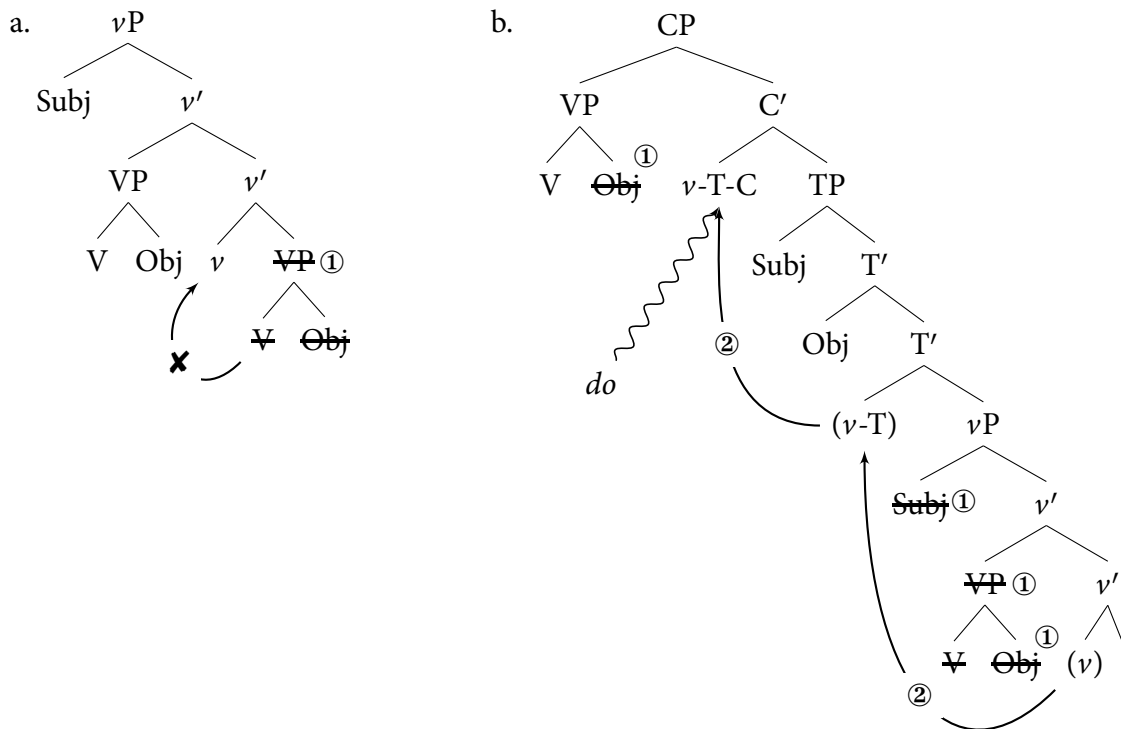
- (21) a. Lesen tut sie Bücher gern. (Aber schreiben nicht.)
 read.INF do.3SG she books gladly (but write.INF not)
 ‘She likes to READ books. But she doesn’t like to write them.’
- b. Bücher lesen tut sie gern.
 books read.INF do.3SG she gladly
 ‘She likes to READ BOOKS.’

In the present approach, *do*-support in VP fronting is a consequence of the order CR > HHM at PF. Therefore, the derivation of the German example (21-b) would proceed as illustrated in (16.2)

German V fronting, however, involves remnant VP movement (den Besten and Webelhuth, 1990; Grewendorf and Sabel, 1994; Koopman, 1997; Hinterhölzl, 2002; Müller, 2014) rather than A’ head movement. Remnant VP movement patterns with full VP movement because it does not have the special property of \bar{A} head movement that protect V from deletion. Therefore, under the order CR > HHM, remnant movement gives rise to *do*-support.

CR > HHM in remnant VP fronting → do-support

(22) CR > HHM in VP fronting of remnant VP: do-support



- (22) abstracts away from head-finality of V, v , and T in German. The VP has to move to Spec v P to remain accessible for further movement to SpecCP. After merge of T, both the subject and the object move to SpecTP.⁵
- When C is merged, v P is sent off to PF. CR deletes the lower VP copy before HHM can move V to v (22-a).
- In syntax, VP moves to SpecCP and the CP phase is shipped to PF. CR deletes object copies that are sisters of V, the lower subject copy, and the lower VP copy in Spec v P. Subsequent HHM moves v to T and the resulting complex head v -T to C (German V2).
- To enable spell out of the tense affix *do* is inserted. Hence, remnant VP movement patterns with full VP movement under the order CR > HHM.

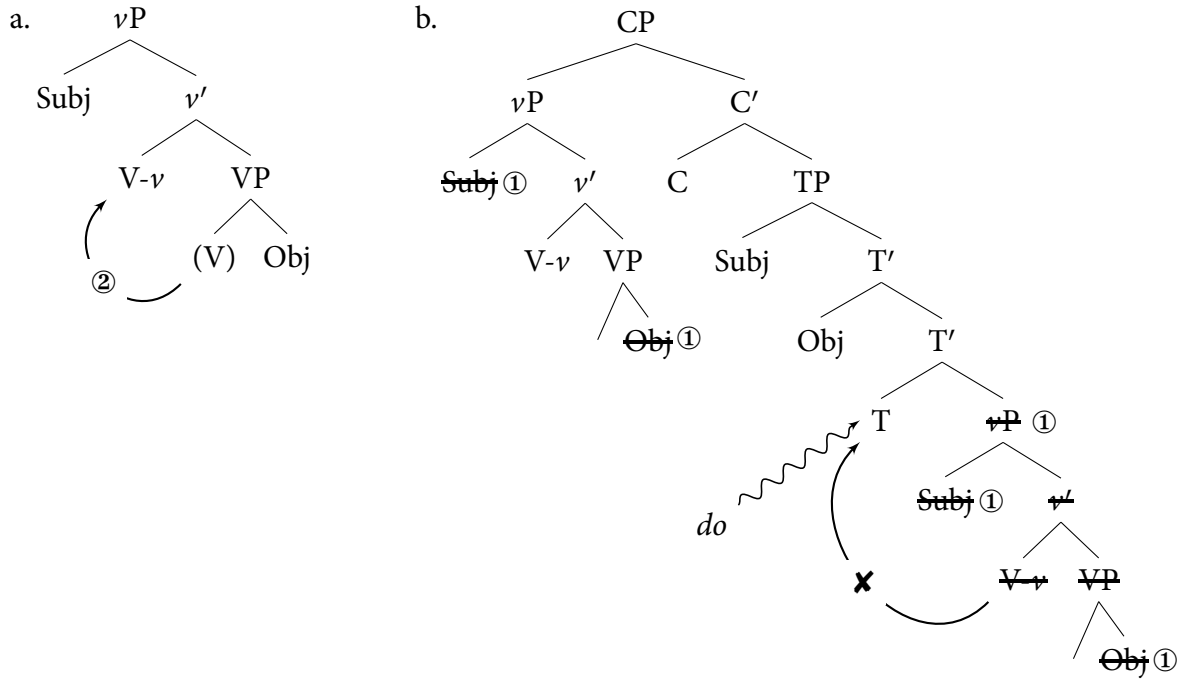
The same result obtains for movement of a remnant v P. The main difference is that v P does not have to move to an intermediate landing site on its way to SpecCP. Note that languages that do not have verb-to-T movement but show (remnant) v P movement are predicted to never exhibit verb doubling, neither in VP nor in V fronting.

⁵There is considerable disagreement in the field about what kind of movement (if at all) scrambling actually is and which position(s) it targets (see Karimi, 2005, for a recent overview). For the sake of explicitness, I will follow Hiraiwa (2010) who derives the condition in (i) from phase theory.

- (i) *Condition on remnant movement* (Hiraiwa, 2010:135)
A remnant movement cannot apply when the operation that extracts x from the remnant is a movement to the edge of a phase.

Since German allows remnant movement it follows from (i) that the remnant creating movement does not target a phase edge like Spec v P or SpecCP. In the case of remnant VP movement, I thus conclude that the object scrambles to SpecTP. This movement does not violate the weak version of the PIC that is presumed in this paper. When T is merged, the domain VP of the phase head v and thus the object is still accessible for syntactic operations because the next phase head C has not yet entered the tree.

(23) CR > HHM in VP fronting of remnant ν P: do-support



HHM > CR in remnant VP fronting → verb doubling

Of course, if there are languages that show remnant VP movement with the order CR > HHM, we also expect there to be languages that have remnant movement and the reverse order HHM > CR. These are expected to show symmetric verb doubling just like Hebrew does. One such language is Polish.

- (24) a. **Wypić** (to) Marek **wypije** herbatę, ale nie wypije kawy. (Bondaruk, 2012:55)
 drink.INF TO Marek drink.FUT tea but not drink.FUT coffee
 ‘As for drinking, Marek will drink tea, but he will not drink coffee.’
- b. **Wypić** herbatę (to) Marek **wypije**, ale nie wypije kawy.
 drink.INF tea TO Marek drink.FUT but not drink.FUT coffee
 ‘As for drinking tea, Marek will drink it, but he will not drink coffee.’

According to Bondaruk (2009, 2012), V fronting involves remnant movement rather than A' head movement in Polish because the language has independently available scrambling movement of the object. Furthermore, the fronted category is claimed to be a (remnant) ν P rather than a (remnant) VP, since the two verb copies have to agree w.r.t. their aspectual specification which is assumed to be hosted on ν .

The derivations basically proceed like those for the remnant VP/ ν P movement cases above, except that since HHM applies before CR, the V/V- ν head can escape the VP/ ν P before it gets deleted.

5 Summary and conclusions

We can summarise the influence of the interaction between the order of operations at PF and the constituency of the fronted element in predicate fronting on the pattern of verb doubling/*do*-support as in (25).

(25) Pattern depending on order of operations and constituency

Surface	Consituent	Order of PF operations	
		HHM > CR	CR > HHM
VP fronting	complete VP/ ν P	verb doubling	<i>do</i> -support
V fronting	remnant VP/ ν P	verb doubling	<i>do</i> -support
	bare V/V- ν	verb doubling	verb doubling

- The order HHM > CR always gives rise to symmetric verb doubling⁶
- The order CR > HHM, on the other hand, leads to *do*-support unless the lower copy of the moved constituent is not part of a chain with the higher copy, which is the case in \bar{A} head movement.

To conclude:

- I proposed that the two PF operations Chain Reduction and Head-to-head movement apply in a strict order in any given language.
- Apart from that, the account rests on minimalist proposals about phrase structure and movement that have independently been argued for in the literature.
- The asymmetric Asante Twi pattern falls out as naturally as the symmetric Hebrew pattern.
- The approach is further able to derive the German pattern with no verb doubling, making the typology of attested patterns in predicate fronting complete.
- In addition, the unattested pattern of *do*-support in V fronting and verb doubling in VP fronting is underivable: In order to show verb doubling in VP fronting, a language would have to have the order HHM > CR (and possibly also V-to-T movement). However, as mentioned above, this order results in verb doubling for V fronting, too, independent of whether it involves A' head movement or remnant movement.

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⁶Caveat: This does not hold for languages that move *vP* and do not have verb-to-T movement. These show either Asante Twi type asymmetric verb doubling if they use \bar{A} head movement in V fronting, or German type symmetric *do*-support if they use remnant *vP* movement in V fronting.

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