On Edge Features and Perfect Extraction

Jason Kandybowicz
Swarthmore College

1. Problems and goals

A puzzle perennially observed in the Nupe (Niger-Congo: Nigeria) literature is that extraction from tensed clauses is possible, but extraction from perfect clauses is not (Smith 1967, Kandybowicz and Baker 2003). This is illustrated below.

(1) a. Ke Musa pa ___ o? [Past TP[1]]
what Musa pound o
'What did Musa pound?'

b. Ke Musa è pa ___ o? [Present TP]
what Musa PRS pound o
'What is Musa pounding?'

c. Ke Musa à pa ___ o? [Future TP]
what Musa FUT pound o
'What will Musa pound?'

d. *Ke Musa á pa ___ o? [Perfect TP]
what Musa PRF pound o
'What has Musa pounded?'

This article investigates this extraction restriction and explores its theoretical consequences for the notion of EDGE FEATURE in the current Minimalist framework. To this end, we confront two types of goals. Our *empirical* goal is simply to derive the extraction facts laid out in (1), while our *theoretical* goal is to determine the extent to which Minimalist technology facilitates an adequate explanation of the Nupe perfect extraction restriction. With respect to the article's theoretical goal, we will advance two positions. First, the existence of Edge Features (Chomsky 2005, 2006) allows for an elegant account of Nupe's restriction on perfect extraction. Second, contrary to Chomsky's conception of them, Edge Features come in two varieties, namely, EXTERNAL EDGE FEATURES (*inherently active* features that drive External Merge) and INTERNAL EDGE FEATURES (*dormant* features requiring activation that drive Internal Merge).

2. Deriving the Nupe perfect extraction restriction

2.1. The syntax of perfect and tensed clauses in Nupe

We begin by laying out an account of Nupe clause structure. The analysis presented here will form the backbone for future syntactic discussion. With one or two minor twists, the syntactic analysis presented in this section is the analysis put forth by Kandybowicz and Baker (2003).

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[1] Unlike other tense markers in the language, the past tense morpheme in Nupe is pronounced ∅.

Although the structures in (1) appear to be identical, one can show quite easily that they are not. To reach this conclusion, however, a few observations are in order. First, both VO and OV word orders are attested in Nupe. In a manner very much reminiscent of Vata and Gbadi (Koopman 1984), the surface word order of a Nupe clause depends on the clause's tense/aspect specification.

(2) a. Musa è/à si dukùn. [VO]
Musa PRES/FUT buy pot
'Musa is buying/will buy the pot.'

b. Musa á dukùn si. [OV]
Musa PRF pot buy
'Musa has bought the pot.'

c. Musa á le kata-o. [VO]
Musa PRF sleep house-LOC
'Musa has slept in the house.'

Second, tense markers are independent particles, not verbal prefixes. Evidence comes from the fact that VP-initial adverbs necessarily fall between tense morphemes and the verb, not before T^0. In this way, we have evidence that verbs do not raise to T^0 in the language.

(3) Musa (*dàdà) à dàdà ba (*dàdà) nakàn.
Musa quickly FUT quickly cut quickly meat
'Musa will quickly cut the meat.'

A third (and crucial) observation is that the perfect marker *á* is the exponent of a head lower than T^0. Support for this claim comes from the fact that the same VP-initial adverbs that necessarily follow T^0 (cf. (3)) must precede the perfect morpheme (cf. (4a) below). Additionally, certain tense markers may co-occur with the perfect particle (cf. (4b) below), illustrating that the two items are not in complementary distribution.

(4) a. Musa dàdà á (*dàdà) nakàn du.
Musa quickly PRF quickly meat cook
'Musa has quickly cooked the meat.'

b. Musa (g)à dàdà á nakàn ba aní.
Musa FUT quickly PRF meat cut already
'Musa will have quickly cut the meat already.'

Given that it is a reduced form of the light/serial verb *lá* meaning 'take' as in many West African languages (cf. Stahlke 1970) and that the natural home for light verbs is v^0, we assume that perfect *á* is generated in little v.[2]

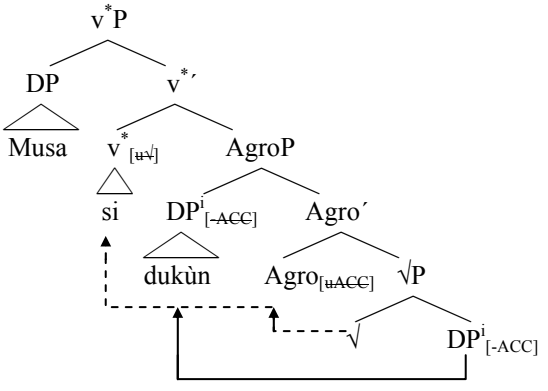
Putting together these observations, we can derive the tense/aspect-contingent word order variations in Nupe. Following Koizumi (1995) and Baker and Collins (2006), among many others, we assume that DPs are case-marked/licensed by functional projections that split or divide the vP layer. DPs check their uninterpretable accusative case features by entering into Agree relations with these functional heads and subsequently raise into their specifier positions. Other case-bearing DPs, including locative DPs, do not Agree/raise in this way. We also assume, as is fairly standard, that verb Roots raise to v^0 unless that head is filled by the perfect marker. This movement, we take it, is

[2] We assume that little v is present in all transitive and unergative clauses, where it plays a role in assigning the external theta role. As such, little v (i.e. v^*) constitutes a phase head in these cases. Whether it is also present in unaccusative clauses is more controversial. We assume that it is, but does not assign a theta role in that context (cf. Bowers 1993, Baker 2003, Chomsky 2001, 2005, among others). As such, little v is not a phase head when V is unaccusative.

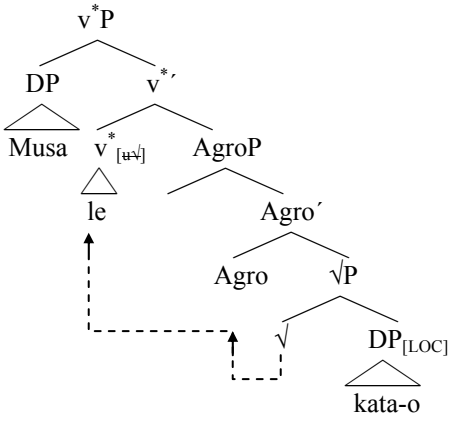
triggered by unvalued uninterpretable √ features on null (i.e. non-perfect) v^0. Essentially, this ensures that non-perfect v^0 is lexically filled in the narrow syntax. Put another way, null v^0 is analyzed as a probe. Under this analysis, head-initial accusative verb phrases (i.e. VO_{ACC} syntax (cf. (2a))) are the result of Root raising to v^0 and case movement. This is illustrated below.

(5) VO_{ACC} syntax = Raising to v^0 + Case movement

a. Musa si dukùn.
Musa buy pot
'Musa bought the pot.'



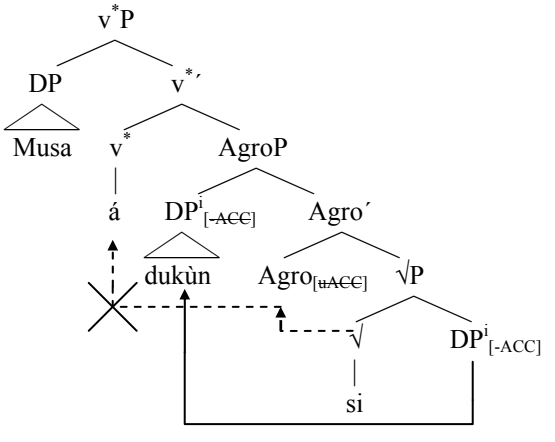
b. Musa le kata-o.
Musa sleep house-LOC
'Musa slept in the house.'



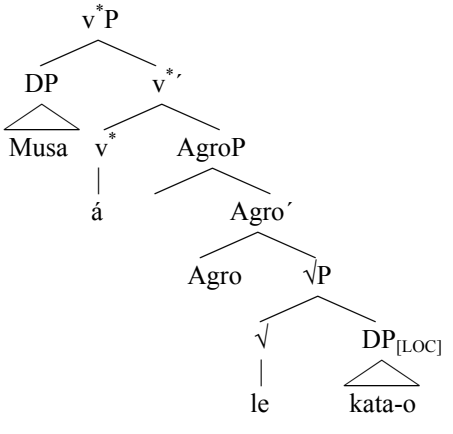
By contrast, head-final accusative verb phrases (i.e. $O_{ACC}V$ syntax (cf. (2b))) result when case movement proceeds as before, but raising to little v is blocked (perfect v^{*0} has content and is thus not a probe). The derivation of OV word order in Nupe is illustrated below.

(6) $O_{ACC}V$ syntax = Case movement - raising to v^0

a. Musa á dukùn si.
Musa PRF pot buy
'Musa has bought the pot.'



b. Musa á le kata-o.
Musa PRF sleep house-LOC
'Musa has slept in the house.'



The upshot of this discussion, then, is that the structures in (1), although seemingly identical, differ with regard to the hierarchical position occupied by the verb Root. In the non-perfect sentences (i.e. (1a-c)), the verb Root occupies v^{*0}. In the perfect construction (i.e. (1d), where extraction is blocked), the Root does not occupy v^{*0}.

2.2. Perfect extraction redux

Nupe perfect extraction is more complicated than initially indicated. It turns out that not all instances of extraction from perfect clauses are blocked. More specifically, subjects and high (TP-level) adverbs may be extracted in the perfect.[3]

(7) a. Panyi lèé, Musa á nakàn ba. [Neutral]
before past Musa PRF meat cut
'A long time ago, Musa had cut the meat.'

b. Musa panyi lèé ___ á nakàn ba o. [Subject focus/extraction]
Musa before past PRF meat cut o
'A long time ago, MUSA had cut the meat.'

c. Bagi na ___ á nakàn ba na [Subject relativization]
man REL PRF meat cut REL
'The man that had cut the meat'

d. Panyi lèé ___ Musa á nakàn ba o. [High adverb focus/extraction]
before past Musa PRF meat cut o
'A LONG TIME AGO, Musa had cut the meat.'

Objects and low adverbs/adjuncts, however, may not be extracted in the perfect construction, unless the vP from which they originate does not count as a (strong) phase.

(8) a. *Nakàn Musa á ___ ba karayín o. [* Direct object focus/extraction]
meat Musa PRF cut carefully o
'Musa had cut the MEAT carefully.'

b. *Etsu Musa á ___ yà èwò o. [* Indirect object focus/extraction]
chief Musa PRF give garment o
'Musa has given THE CHIEF a garment.'

c. *Kata bo Musa á le ___ o. [* Locative object focus/extraction]
room LOC Musa PRF sleep o
'Musa has slept in THE ROOM.'

d. *Nakàn na bagi á ___ ba na [* Object relativization]
meat REL man PRF cut REL
'The meat that the man has cut'

e. *Karayín Musa á nakàn ba ___ o. [* Low adverb focus/extraction]
carefully Musa PRF meat cut o
'Musa had cut the meat CAREFULLY.'

f. Ke Musa á nikin ___ ni na o? [√ Extraction of unaccusative adjunct]
how Musa PRF fall EMPH na o
'How has Musa fallen?'

(8a-c) above shows that neither themes, goals, nor locative objects may escape from perfect v*P. Likewise, (8d-e) illustrates that when vP counts as a phase, objects may not be relativized and low

[3] For some speakers, the data in (7b-d) are acceptable, but only marginally so. For others, the same sentences are deemed grammatical/natural. Nonetheless, the same speakers that find (7b-d) marginal judge (8a-e) to be considerably worse and unquestionably ungrammatical.

adverbs may not be extracted. Crucially, however, when vP is non-phasal as in the unaccusative construction in (8f), otherwise illicit extractions become possible.[4]

A better characterization of the Nupe perfect extraction restriction, then, is that movement from *inside* (phasal) v*P (that is, movement from a non-v*P edge position) is blocked in the perfect. Further support for this characterization comes from another extraction asymmetry in the language, this time centering on the predicate cleft construction, which, as argued by Kandybowicz (2006), involves the extraction of √P (i.e. a vP-internal projection). The data in (9) below show that in the perfect construction, predicate clefting is only blocked when vP counts as a phase. In this case, non-edge aligned √P has illegally evacuated the v*P phase (9a). By contrast, when vP does not count as a phase (as in an unaccusative construction) the same extraction becomes possible in the perfect (9b).

(9) a. *Bi-ba Musa á ___ nakàn ba o.
RED-cut Musa PRF meat cut o
'It was CUTTING that Musa had done to the meat (as opposed to, say, cooking).'

b. Ni-nikin Musa á ___ nikin ni na o.
RED-fall Musa PRF fall EMPH na o
'It was FALLING that Musa had done (as opposed to, say, stumbling).'

The generalization that interphasal extraction from non-phase edge positions is blocked in the perfect construction suggests that the PHASE IMPENETRABILITY CONDITION (PIC - Chomsky 2000, 2001) is somehow lurking behind this constellation of facts.

2.3. Phase effects

The PIC represents an attempt to return to a strong form of subjacency. Under the PIC, only occurrences residing in the edges of phases are accessible to operations like agreement and movement.

(10) PHASE IMPENETRABILITY CONDITION (Chomsky 2001)

In phase α with head H, the domain of H is not accessible to operations outside α. Only H and its edge (specifier(s)) are accessible to such operations.

Phase = {v*P, CP}

In this way, the edge of a phase is syntactically transparent, while the complement of a phase head is syntactically opaque. Under the PIC, evacuation from a phase is therefore contingent on an intermediate stage in the derivation in which the displaced occurrence occupies a position at the edge of the phase. Insofar as it has been shown to represent a promising avenue of research, the PIC offers a window through which we can attempt to reconcile the extraction facts laid out in the previous section.

Consider first those instances in which perfect extraction is tolerated. Regarding extraction of the subject (cf. (7b,c)), the DPs in question are presumably merged in Spec, v* by the VP-internal subject hypothesis and thus their displacement proceeds unproblematically from the edge of the v* phase. In the case of TP-level adverb extraction (cf. (7d)), the constituents are base merged outside the v* phase. Thus, their extraction is not limited by the PIC. When vP does not count as a phase, as in unaccusative constructions (e.g. (8f), (9b), cf. den Dikken 2006a, but contra Legate 2003), extraction is once again unrestricted by the PIC.

Under the lens of the PIC, now consider those cases in which perfect extraction is blocked. Regardless of which variety (cf. (8a-d)), Nupe objects inhabit non-phase edge positions within the split v*P structure (cf. (5) and (6)). Thus, if they are to extract, object DPs must first move to the edge of

[4] The reader may wonder whether similar extraction patterns obtain in perfect passive and raising-to-subject constructions (i.e. cases when v^0 fails to assign an external theta role and thus instances in which the vP does not count as a phase). Unfortunately, Nupe does not have a passive construction/operation nor does it have biclausal infinitival constructions, so these cases cannot be tested.

v^*P in compliance with the PIC. Low adverbs/adjuncts share the same fate as Nupe objects. Since they do not occupy phase head/edge positions, they must cyclically raise through the v^*P edge to evacuate. Although they cannot escape v^*P in nominative perfect constructions, objects and low adjuncts can be extracted from v^*Ps in all other tenses in the language. Consider the following data.

(11) a. Nakàn Musa è ba ___ o. [Compare with (8a)]
meat Musa PRS cut o
'Musa is cutting the MEAT.'

b. Nakàn na bagi ba ___ na [Compare with (8d)]
meat REL man cut REL
'The meat that the man cut'

c. Karayín Musa à ba nakàn ___ o. [Compare with (8e)]
carefully Musa FUT cut meat o
'Musa will cut the meat CAREFULLY.'

This suggests that Nupe objects/adjuncts can *in principle* access the v^* phase's edge position in non-perfect clauses, but for whatever reason, the edge of the v^* phase is not accessible in perfect constructions. To make sense of this claim and the forthcoming analysis it engenders, we turn now to a discussion of Edge Features.

2.4. Edge features

Chomsky (2005, 2006) proposes that all Merge operations are driven by features he dubs EDGE FEATURES (EFs). As such, EFs are claimed to be irreducible primitives of Universal Grammar. Chomsky maintains that EFs belong to the class of uninterpretable features, yet unlike other uninterpretable features they are undeletable (up to the point of Transfer). In this way, unbounded Merge (i.e. recursion) is accounted for within the computational system. With the exception of interjective occurrences, EFs are said to be present on all nodes/lexical items and must be satisfied at least once during the course of a convergent derivation by way of some variety of Merge.

Chomsky (2005:11, 2006:17) also proposes that although there are necessarily (and minimally) two types of Merge (External Merge (EM) and Internal Merge (IM)), there is only one species of EF. In his 2006 system, the fundamental difference between EM and IM reduces to a difference between phase heads and non-phase heads with regard to EFs. To be precise, EFs on non-phase heads drive EM, while EFs on phase heads drive IM, specifically, A-bar movement. However, because A-movement involves IM to a non-phase head, Chomsky is forced to stipulate the existence of a feature inheritance operation under which A-movement is driven by Agree plus EF inheritance from a higher phase head (e.g. the A-movement driving EFs of T^0 are inherited from C^0). We will return momentarily to present a possible way around making such a stipulation, while at the same time deriving EM and IM from EFs. For the time being, we can close this subsection by pointing out one other important facet of EFs, which is that EFs on phase heads seem to instantiate the current version of Chomsky's (2000) GENERALIZED EPP FEATURES.

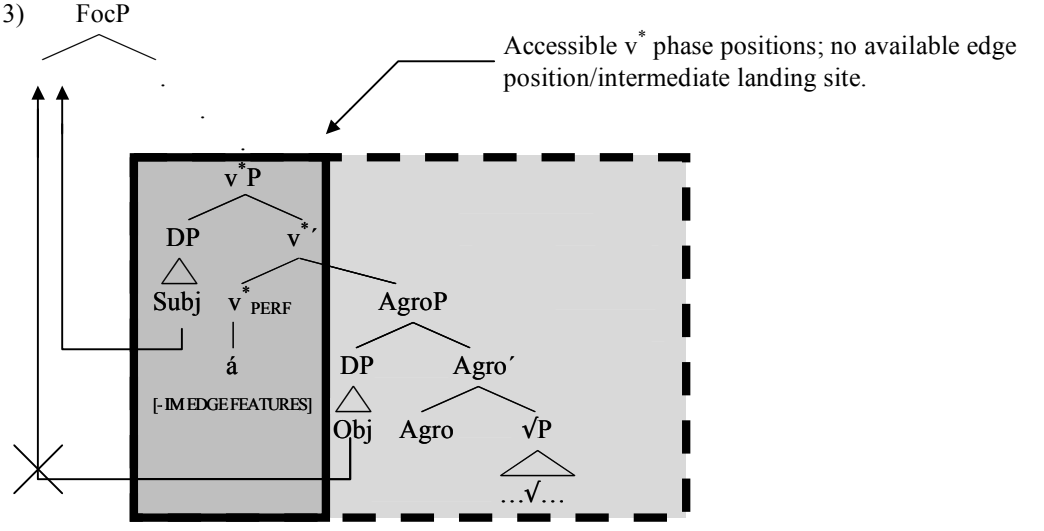
2.5. A first pass at an analysis of the Nupe perfect extraction restriction

Given the current Minimalist perspective on phases and Edge Features outlined in the two previous subsections, the most straightforward way to derive the observed extraction asymmetry in Nupe would be to state that in agentive perfect clauses, v^* is simply merged without IM-driving EFs, unlike v^* in non-perfect clauses. This would be consistent with Chomsky's older claim that EFs are *optional* properties of phase heads.

(12) The head of a phase *may* be assigned an EPP feature. (Chomsky 2000:109)

On this analysis, if perfect v^{*0} fails to bear IM-driving EFs, then vP-internal XPs extracted from non-edge positions (i.e. objects/adjuncts) will move to their targets in one fell swoop, violating the PIC. On the other hand, because subjects and vP-external adjuncts are merged either at the edge of the v^* phase or outside it as the case may be, their extraction will comply with the PIC and comes for free, so to speak. In this way, an account of the Nupe perfect extraction asymmetry emerges.

(13)



We can ask how well the above proposal fares on grounds of descriptive and explanatory adequacy. Optionality of EF assignment yields descriptively adequate results but its stipulative nature renders it explanatorily suspect. In fact, the optionality approach misses an important generalization about Nupe extraction, which is that movement to v^{*0} is a precondition for extraction from v^*P in Nupe, itself an observation very much akin to Holmberg's Generalization (Holmberg 1986, 1999). In the perfect construction, the perfect marker *á* blocks raising to v^{*0} (cf. (6)) and consequently, non-edge vP material fails to extract. In all other tenses, however, raising to v^{*0} proceeds and non-edge vP material is extractable. The most tenable analysis should be able to derive this generalization.

2.6. A more tenable analysis

The theoretical problem posed by Nupe perfect extraction is that contra Chomsky (2005, 2006), some phase heads appear to lack IM-driving EFs. Intuitively, the solution we are looking for is one in which the existence of EFs on v^{*0} is contingent in some way on head raising to this position. We propose, therefore, that IM-driving EFs are *dormant* features, that is, features that are lexically/structurally present, but that require activation in the narrow syntax. In the case at hand, this would mean that for whatever reason, the EFs of the perfect v^*P phase in Nupe are dormant (inactive), preventing phase-internal (i.e. non-edge) extraction from v^*P, while the EFs of non-perfect v^*P phases are somehow active, thus allowing extraction across the board from within v^*P.

If this hypothesis is on the right track, there is an immediate corollary, namely, that contra Chomsky (2005, 2006), there must be a typology of Edge Features. Specifically, if the EFs that drive IM are dormant, there must be another type of EF distinct from the IM-driving variety that conditions EM. This conclusion follows from the trivial fact that the EFs underlying EM are certainly non-dormant; otherwise, unbounded Merge would be both unexpected and exceedingly difficult to derive. In other words, if we maintain the existence of dormant IM-driving EFs, basic Minimalist considerations force the postulation of a second type of EF that is non-dormant and EM-driving. We therefore propose the following EF typology.

(14) **EXTERNAL EDGE FEATURES** (EEFs) drive EM and do not require activation.
INTERNAL EDGE FEATURES (IEFs) drive IM and are dormant (i.e. require activation).

This, of course, raises an important question. What is the activation condition for IEFs? Our hypothesis is that IEFs are activated by Agree. The Holmberg-style generalization laid out at the end of the previous section now follows. In Nupe, ∅ v^{*0} is a probe bearing unvalued uninterpretable features satisfied by the verb Root (the goal) [cf. (5) and the discussion in section 2.1]. The two enter into an Agree relation triggering (a) activation of v^{*0}'s IEFs, (b) head movement of the Root to v^{*0} in satisfaction of those IEFs, and (c) toleration of IM to the edge of the phase. Perfect v^{*0} *á*, on the other hand, is not a probe (perhaps because *á* is verbal in some sense - cf. the historical considerations below (4)). Since it is not a probe, it does not Agree. Hence, its IEFs fail to be activated and Root raising to v^{*0} does not proceed. Consequently, non-edge extraction across this head results in a violation of the PIC due to the impossibility of successive cyclic movement through the edge of the v^{*} phase.

Further supporting evidence for this proposal comes from the fact that even when the launching site of the movement is external to the v^{*} phase, all extraction across the perfect morpheme in v^{*0} is impossible. That is, successive cyclic movement cannot obtain due to the fact that the edge of an intermediate phase is unavailable. The data in (15) below illustrates that the subject-object/low adjunct extraction asymmetry previously observed in the perfect construction is neutralized in such instances.

(15) a. *Nana Musa á gan gànán ___ pa eci o.
Nana Musa PRF say COMP pound yam o
'Musa has said that NANA pounded the yam.'

b. *Eci Musa á gan gànán Nana pa ___ o.
yam Musa PRF say COMP Nana pound o
'Musa has said that Nana pounded THE YAM.'

c. *Karayín Musa á gan gànán Nana pa eci ___ o.
carefully Musa PRF say COMP Nana pound yam o
'Musa has said that Nana pounded the yam CAREFULLY.'

Our proposal is also supported by recent findings by Gallego (2006), Gallego and Uriagereka (2006), and den Dikken (2006b, 2007) that the Edge Feature properties of phase heads are variable and crucially depend on head movement/Agree in the narrow syntax.

3. Theoretical ramifications

The proposal on offer has a number of attractive theoretical consequences. For one, the mismatch between the varieties of Merge and the number of types of EFs in UG is eliminated. Under this framework, there are two types of EFs and two attendant types of Merge. Another ramification is that Chomsky's (2006) stipulation that A-movement is driven by Agree plus inheritance of EFs can be eliminated. Under the current proposal, A-movement is driven by Agree alone because Agree activates the IEFs of non-phase heads. This is desirable because the core operations of the computational system can be kept to a bare minimum. We needn't add the operation Inherit to the already minimal set of operations {Merge, Copy}, but under Chomsky's proposal this move would become necessary.

In this article, only one case of IEF dormancy was presented; however, others can be found. One such instance is characterized by restrictions on IM to the edges of non-interrogative/focal C phases. In the following examples, embedded C^0 is not a probe and thus does not enter into an Agree relation. As such, C^0's IEFs remain dormant, preventing gratuitous IM to its edge.

(16) a. *Smith thought [$Chomsky_i$ that t_i wrote Barriers].
b. *Smith knows [$will_i$ Chomsky t_i write a book on phases].

In this way, restrictions on IM to various phase edges can now be straightforwardly explained.

The fourth and fifth theoretical ramifications raise issues that are beyond the scope of the present article and are thus left for future research. The first of these is that because IM is driven by IEFs and because IEFs are activated by Agree relations, there can be no movement without Agree. But what about the inverse? Can there be Agree without movement in this system? The difficulty in answering

this question stems from the fact that the possibility of lower copy spell-out at PF often obscures the detection of a movement operation. Thus, what might appear on the surface to be an instance of Agree without IM might in fact turn out to be Agree + IM + lower copy spell-out. The final theoretical ramification also takes the form of a question. Why should some but not all EFs (i.e. IEFs) be dormant/require activation? Can this be explained by appealing to interface conditions or principles of computation not indigenous to the Language Faculty? Again, we leave these questions for future work.

4. Summary

In Nupe, restrictions on extraction from v^*P ultimately hinge on whether Agree(v^{*0}, $\sqrt{}^0$) (and subsequently, verb raising to v^{*0}) has taken place. Subjects and high adjuncts can extract regardless; objects and low adjuncts can only extract if the verb Root is the Goal of a v^{*0} probe. Although Roots are the goals of v^{*0} probes in non-perfect constructions, they are not goals in perfect constructions. Because v^*P counts as a phase on virtually all approaches to cyclic spell-out, extraction from v^*P must respect the PIC. Edge Features lie at the heart of PIC compliance. If v^{*0} lacks EFs, then both lower phase-external and non-peripheral phase-internal material (i.e. objects and low adjuncts) will fail to occupy an intermediate position at the phase edge, preventing extraction beyond the v^*P layer. We proposed two varieties of EFs that correspond exactly to the two types of Merge operations in natural language. These features are differentiated on the basis of whether or not they need to be activated. Internal Merge is driven by IEFs, features that require activation. External Merge is driven by EEFs, features that do not require activation. We claimed that EF activation is triggered by Agree. The Nupe perfect morpheme in v^{*0} is not a probe; therefore, it neither Agrees nor activates the phase head's IEFs. In this way, the restrictions on extraction in the Nupe perfect follow directly from the PIC.

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