

Multiple Spell-Out, Label-free Syntax, and PF-Interface*

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Abstract

In this paper, I propose a theory of syntax-phonology mapping within the framework of the Minimalist Program incorporating Multiple Spell-Out and Label-free phrase structure (Chomsky 2001a, b, Collins 2001, Uriagereka 1999). I claim that a phonological string mapped to the phonological component by Spell-Out corresponds to a phonological phrase. I argue that the initial element in the domain of Spell-Out should escape the mapping to the phonological component in order to establish a linear order between the two units of Spell-Out, and remain accessible to the next Spell-Out.

Keywords: Syntax-phonology interface, Phonological Phrasing, Multiple Spell-Out, Label-free Syntax.

1. Introduction

In this paper, I propose a theory of syntax-phonology mapping within the framework of the Minimalist Program (Chomsky 2001a,b). Specifically, I propose that a phonological string mapped to the phonological component by Spell-Out corresponds to a phonological phrase within a label-free theory of phrase structure and Multiple Spell-Out theory (Chomsky 2001a,b, Collins 2001a,b, Uriagereka 1999, cf. McGinness 2001, Seidl 2001). The proposed theory is a null hypothesis in the sense that it requires no particular mapping algorithm that creates a phonological phrase by referring to syntactic information such as maximal

projections (cf. Nespor and Vogel's (1986) Relation-based theory and Selkirk's (1986, 1995) Edge-based theory).

This paper is organized as follows. In section 2, I point out some theoretical problems with the previous theories of syntax-phonology mapping, and propose that a unit of Spell-Out that is sent to the phonological component corresponds to a potential phonological phrase. In section 3, I give an analysis of phonological phrasing in Ewe, Chichewa, Italian and Kinyambo within the proposed theory. Section 4 concludes the discussion.

2. Phonological Phrasing and the Label-free Syntax

2.1. Previous Theories

In this section, I discuss two major theories of phonological phrasing, Relation-based theory (Nespor and Vogel 1986) and Edge-based theory (also called End-based theory. Chen 1987, Selkirk 1986).¹ I argue that these theories do not fit with the current syntactic assumptions, and propose a theory of phonological phrasing within the framework of the Minimalist Program.

2.1. Background

It is generally assumed that prosodic structure consists of the prosodic constituents, which are hierarchically ordered (Selkirk 1984, Nespor and Vogel 1986, Hayes 1989):

$$\begin{aligned}
 (1) & \quad (\quad \quad \quad)_U \\
 & \quad (\quad \quad \quad)_I (\quad \quad \quad)_I \\
 & \quad (\quad \quad)_\phi (\quad \quad)_\phi (\quad \quad)_\phi (\quad \quad)_\phi \\
 & \quad (\omega \omega)_C \quad (\omega)_C (\omega)_C \quad (\omega \omega)_C \quad (\omega)_C (\omega)_C (\omega)_C
 \end{aligned}$$

Here, U = utterance, I = intonational phrase, ϕ = phonological phrase, C = clitic group,² and ω = phonological word. Of these, the phonological phrase (or *p-phrase*) is the prosodic category that is defined by the syntax-phonology mapping.³ In the prosodic structure, each constituent is properly contained in the next higher prosodic constituent (*Strict Layer Hypothesis*, Selkirk 1984, Nespor and Vogel 1986, Hayes 1989). Thus in (1) a phonological word ω is properly contained in the next higher prosodic category clitic group C , and the C is properly contained in the next higher prosodic category p-phrase ϕ , and so forth. Given this hypothesis, prosodic structure is always non-recursive in that it does not allow the recursion of the same prosodic level.⁴

In the next two sections, I will discuss the two major theories of syntax-phonology mapping that are formulated under Strict Layer Hypothesis: Relation-based Theory and Edge-based Theory.

2.1.2. Relation-based Theory

Under the Strict Layer Hypothesis, Nespor and Vogel (1986) propose the following Relation-based theory of syntax-phonology mapping:

(2) Phonological Phrase Formation (Nespor and Vogel 1986:168)

a. *ϕ domain*

The domain of ϕ consists of a C which contains a lexical head (X) and all C s on its nonrecursive side up to the C that contains another head outside of the maximal projection of X .

b. *ϕ construction*

Join into an n-ary branching ϕ all C s included in a string delimited by the definition of the domain of ϕ .

Here ϕ is a p-phrase and C is a clitic group. Under these formulations, let us consider the following syntactic structure:

$$(3) \quad [_{IP} \quad NP_{Subj} \quad Infl \quad [_{VP} \quad V \quad NP_{Obj}]]$$

Suppose that Subj, Infl, V and Obj all correspond to Cs. First, we locate lexical heads. In (3), there are three lexical heads: The head of NP_{Subj} , V, and the head of NP_{Obj} . Since (3) is head initial, the non-recursive side is the left side. Thus, NP_{Subj} and NP_{Obj} correspond to their own p-phrases. V is phrased with Infl since Infl is on the non-recursive side of V and is a non-lexical category. Note that NP_{Subj} is not phrased with V even though it is on the non-recursive side of V since it is a C that has a lexical category N as a head. Based on these, (2b) maps (3) to the following p-phrases:

$$(4) \quad (NP_{Subj})_{\phi} \quad (Infl \quad V)_{\phi} \quad (NP_{Obj})_{\phi}$$

Nespor and Vogel (1986) also propose the following optional rule.

$$(5) \quad \phi \text{ restructuring (optional)} \quad (\text{Nespor and Vogel 1986:173})$$

A nonbranching ϕ which is the first complement of X on its recursive side is joined into the ϕ that contains X.

Thus, in (7), $(NP_{Obj})_{\phi}$ may be restructured into the preceding p-phrase if it is non-branching since it is the first complement of V on its recursive side:

$$(6) \quad (NP_{Subj})_{\phi} \quad (Infl \quad V \quad NP_{Obj})_{\phi}$$

Note that $(NP_{\text{Subj}})_\phi$ may not restructure into the following p-phrase even if it is non-branching since it is not a complement of Infl or V, nor on the recursive side of Infl or V.

2.1.3. Edge-based Theory

Following Chen (1987), Selkirk (1986) proposes the Edge-based theory of syntax-phonology mapping (See also Selkirk 1995: 444 and Truckenbrodt 1995, 1999 for the formulation of this theory within the framework of *Generalized Alignment* (McCarthy and Prince 1993). In this theory, the right or left edge of a syntactic category is mapped to the right or left edge of a prosodic category. The following formulation is adopted from Truckenbrodt 1999:223, where ϕ is a p-phrase and XP is a maximal projection of a lexical category:

(7) a. Align-XP, R: Align (XP, R; ϕ , R)

“For each XP there is a ϕ such that the right edge of XP coincides with the right edge of ϕ .”

b. Align-XP, L: Align (XP, L; ϕ , L)

“For each XP there is a ϕ such that the left edge of XP coincides with the left edge of ϕ .”

Depending on the language, one of these two alignment constraints is chosen. Thus Align-XP, R is chosen in Kimatumbi (Cowper and Rice 1987, cf. Odden 1987, 1990, 1996), and Align-XP, L is chosen in Japanese (Selkirk and Tateishi 1991, Nagahara 1994).⁵

Consider the following syntactic structure:

(8) [_{IP} NP_{Subj} Infl [_{VP} V NP_{Obj}]]]

Here, we have three maximal projections of lexical categories: NP_{Subj} , VP and NP_{Obj} . Suppose that Align-XP, R is chosen in this language. The right edges of these categories are mapped to the right edges of phonological phrases. Thus, the right edge of NP_{Subj} corresponds to the right edge of a p-phrase, and the right edge of VP, as well as that of NP_{Obj} , corresponds to the right edge of a p-phrase:

$$(9) \quad (NP_{\text{Subj}})_\phi \quad (\text{Infl} \quad V \quad NP_{\text{Obj}})_\phi$$

2.1.4. Summary

So far, we have seen how Relation-based theory and Edge-based theory work. The predictions made by these theories are reproduced below:

$$(10) \quad \begin{array}{l} \text{a. } (NP_{\text{Subj}})_\phi \quad (\text{Infl} \quad V)_\phi \quad (NP_{\text{Obj}})_\phi \\ \text{b. } (NP_{\text{Subj}})_\phi \quad (\text{Infl} \quad V \quad NP_{\text{Obj}})_\phi \end{array}$$

Relation-based theory predicts (10a) and optionally (10b), while Edge-based theory predicts (10b) with Align-XP, R (see Cowper and Rice 1987, Bickmore 1990 for discussion of branching category within the framework of Edge-based theory). Notice that even though the two theories have different predictions concerning the phrasing of the object, both of them predict that the subject is phrased alone. Putting aside whether NP_{Obj} is phrased alone or not, these predictions hold true cross-linguistically, as shown by the large literature on syntax-phonology interface (see references cited in section 3, for example).

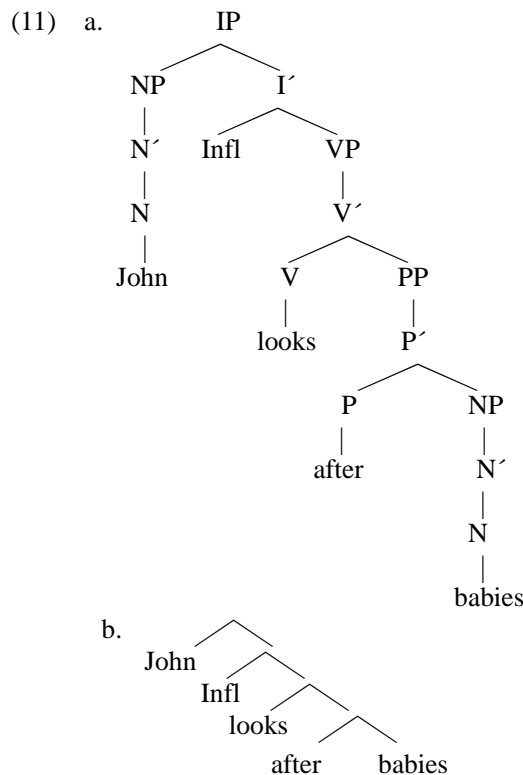
In the next section, I will point out theoretical problems with those theories that arise within the restricted theory of phrase structure in the Minimalist Program.

2.2. Problems with the Previous Theories

Within the framework of Bare Phrase Structure theory (Chomsky 1995a, and

subsequent work), phrase structure is constructed derivationally through the application of the structure-building operation Merge, which applies to lexical items that are taken from the Lexicon. As a result, the phrase structure consists of only lexical items. That is, features that are not intrinsic to the lexical items may not appear in the phrase structure. Accordingly, phrasal notions such as “maximal projections” or “bar levels” are not primitive notions, unlike in X-bar theory (Chomsky 1970, Jackendoff 1977), rather, they are derivative notions defined on the representation.

Collins (2001a) argues that labels and projections should be eliminated from the phrase structure of syntax (see also Chomsky 2001b). Thus, the traditional X-bar schematic phrase structure shown in (11a) should take the form of (11b):



In the label-free theory, the phrasal notations like IP, VP, V', V are reduced to the properties of the derivation and the syntactic relations that hold among lexical items. Under this restrictive theory of phrase structure, it is impossible to formulate a theory of grammar that refers to the labels and projections. Thus, in (11b), we cannot say that V selects PP; rather, we say look selects after, for instance (see Collins 2001a for detailed discussion).

Given this, let us consider the formulation of the Relation-based theory (2)/(5) and the Edge-based theory (7). Both theories make a crucial reference to projections of phrase structure by referring to a maximal projection. These theories are successful in that they provide very accurate descriptive devices, but they are theoretically undesirable in that they refer to projections.

Moreover, as Inkelas and Zec (1995:536-537) point out, the access to syntactic information should be restricted to a minimum in a sufficiently constrained theory of phonological phrasing. From this perspective, the Relation-based theory and the Edge-based theory would not be very desirable. The Relation-based theory refers to syntactic notions such as “branchingness,” “complement,” and “recursive side,”⁶ and the Edge-based theory refers to “XP,” and the directionality in syntax, that is, “right/left edge of XP,” which does not exist in the Bare Phrase Structure theory.

2.3. Proposals

2.3.1 Multiple Spell-Out and Phase

Within the framework of the Minimalist Program (Chomsky 2001b:3-6), the operation Spell-Out relates syntax with phonology. Lexical items with phonological, semantic, and syntactic features are taken out of the Lexicon, and undergo a structure-building operation Merge creating a phrase structure cyclically in the component of narrow syntax NS. At some point, an operation TRANSFER

sends the derivation of narrow syntax D_{NS} to the phonological component Φ and the semantic component Σ , generating a pair $\langle PHON, SEM \rangle$. PHON and SEM are accessed by sensorimotor SM system and conceptual-intentional C-I system, respectively. The operation that sends D_{NS} to Φ is called *Spell-Out*. Specifically, Spell-Out strips away the phonological features of the lexical items, and sends them to the phonological component Φ , generating PHON. Since PHON is accessed by the SM system, it has to be legible to it.

Collins (2001a:section 4) suggests that in a label-free theory of syntax, phonological phrasing should be accounted for in terms of Multiple Spell-Out (Chomsky 2000, 2001a,b, Uriagereka 1999). More precisely, he suggests that the phonological string that corresponds to the unit of Spell-Out be marked as a potential p-phrase. In this way, the phonological phrasing can be defined without recourse to maximal projections as long as Spell-Out does not refer to them. Note that this is a null hypothesis. Since Spell-Out is the only interface operation that connects syntax with Φ , the output unit of Spell-Out is the only unit that may correspond to some local domain in Φ . The introduction of any other mechanism would be a departure from the null hypothesis.

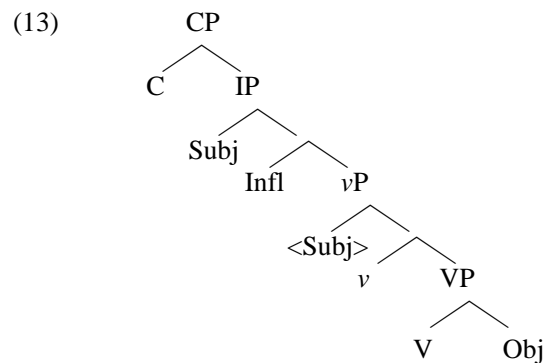
In Multiple Spell-Out theory of Chomsky (2001a,b), Spell-Out applies to the sister of a strong phase head. It is assumed that “vP” and “CP” are phases.

(12) The sister of a strong phase head is Spelled-Out.

Note that in (12) I refer to a particular “head,” but it is used as an absolute notion in that it refers to a lexical item without any reference to labels or projections. Note also that here and below, I use notations like “vP” or “CP” to refer to some specific constituent in a phrase structure just for convenience, and they do not confirm the existence of labels and projections. Thus, “vP” or “CP” should be taken to be a constituent that is saturated at a certain point of derivation

(see Collins 2001a). Given these, Spell-Out can be defined without a reference to maximal projections.

Now consider the phrase structure shown in (13):⁷



Here, *v* is responsible for theta-role assignment of Subj and Case-checking of Obj, and Subj moves to the Spec of Infl to check an OCC feature of Infl.⁸ Under (12), the sisters of *v* and C (i.e., VP and CP) undergo Spell-Out.

In the Minimalist Program, the phrase structure is built by Merge in a bottom-up fashion, and Spell-Out applies as the derivation goes on. Thus, the structure in (13) is constructed as follows:

- (14) a. V and Obj are Merged, creating [_{VP} V Obj]
 b. *v* is merged with the VP, creating [_{vP} *v* [_{VP} V Obj]]
 c. Subj is merged with *vP*, creating [_{vP} Subj *v* [_{VP} V Obj]]
 d. The sister of *v* is spelled-out.
 e. Infl is merged with *vP*, creating [_{IP} Infl [_{vP} Subj *v* [_{VP} V Obj]]]
 f. Subj is (internally) merged with IP,
 creating [_{IP} Subj Infl [_{vP} <Subj> *v* [_{VP} V Obj]]]

g. C is merged with IP,

creating $[_{CP} \ C \ [_{IP} \ \text{Subj} \ \text{Infl} \ [_{vP} \ \langle \text{Subj} \rangle \ v \ [_{VP} \ V \ \text{Obj}]]]]]$

h. The sister of C is spelled-out.

First, the verb and the object are merged as in (14a). Then v is merged with the VP that was created at the previous step of the derivation, and we get a constituent vP , as in (14b), and the subject is merged with the vP created at the previous step of the derivation, as in (14c). At this point of the derivation (14d), the sister of v is spelled-out.⁹ Then, Infl is merged with the vP as in (14e), and the subject is internally merged with the IP created at the previous step of the derivation and checks the OCC feature of Infl, as in (14f). Then C is merged with the IP as in (14g), and the sister of C is spelled-out, as in (14h).

I assume that Spell-Out defines a linear order among lexical items when it sends D_{NS} to Φ . In Φ , a phonological string X is obtained for a unit of Spell-Out. Then it is reasonable to assume that the phonological string X corresponds to some local domain in Φ where post-lexical phonological rules apply. I assume such a domain is a p-phrase:

(15) A phonological string mapped to Φ by Spell-Out corresponds to a p-phrase.

Under the Strict Layer Hypothesis, the phonological strings created by Spell-Out should be mapped to a flat representation where there is no hierarchical relation among p-phrases. Then the following phonological phrasing is predicted:

(16) $(C)_{\phi} \ (\ \text{Subj} \ \ \ \ \ \text{Infl} \ \ \ \ \ \ v)_{\phi} \ (\ \ V \ \ \ \ \ \ \text{Obj})_{\phi}$

Here, V and Obj are phrased together, Subj, Infl and v are phrased together, and C

is phrased alone. Note that it is generally assumed in the literature (e.g. Chomsky 1995b) that V raises to *v*. Then the prediction is that Subj and V are phrased together, and Obj is phrased alone.

$$(17) (\text{Subj} \quad \text{Infl} \quad \text{V-}v)_\phi (\langle V \rangle \quad \text{Obj})_\phi$$

This is different from the predictions made by Relation-based theory and Edge-based theory, repeated here.

$$(18) \text{ a. } (\text{Subj})_\phi (\text{Infl} \quad V)_\phi (\text{Obj})_\phi$$

$$\text{ b. } (\text{Subj})_\phi (\text{Infl} \quad V \quad \text{Obj})_\phi$$

One crucial difference between (17) and (18) is that Subj is phrased with V (and Infl) in (17) while it is phrased alone in (18).

So far I have been presupposing that the unit of Spell-Out corresponds to a p-phrase as it is. However, as I will argue in the next section, the unit of Spell-Out may not correspond to a p-phrase directly due to the linearization between two units of Spell-Out.

2.3.2. Assembly Process

I assume that Spell-Out defines linear order since it connects the narrow syntax NS, where there is no linear order among lexical items, with the phonological component Φ , where phonological strings are linearly ordered:

$$(19) \text{ Spell-Out defines linear order.}$$

I assume that the linear order is defined in the following way, without referring to labels and projections (see Collins 2002, Collins and Ura 2001, cf.

Kayne 1994, 2003):¹⁰

- (20) a. If X checks an OCC feature of Y, X precedes Y.
b. If X asymmetrically c-commands Y, X precedes Y.

Consider the following phrase structure, where Subj checks Infl's OCC features:^{11, 12}

- (21) [_{CP} C [_{IP} Subj Infl [_{VP} v [_{VP} V Obj]]]]

Suppose that Spell-Out applies to the sister of *v*. Suppose also that Obj is branching in the sense that it is constructed as a result of the application of Merge. Then, the linear order within this constituent is defined by virtue of the fact that V c-commands Obj:

- (22) Spell-Out (Sister of *v*)
Linear Order: V << Obj

Here, "<<" stands for "precedes." Suppose that the sister of C is spelled-out:

- (23) Spell-Out(Sister of C)
Linear Order: Subj << Infl << v

Note that V and Obj were spelled-out before and they are not available to this Spell-Out.¹³ In the domain of the Spell-Out of the sister of C, the linear order Subj << Infl << v is defined. First, Subj checks the OCC feature of Infl, and the former precedes the latter. Second, Infl asymmetrically c-commands v, and the former precedes the latter.

The next step is to give a linear order between the linear string $V \ll \text{Obj}$ defined by the Spell-Out applying to the sister of v and the linear string $\text{Subj} \ll \text{Infl} \ll v$ defined by the Spell-Out applying to the sister of C . However, it is not clear how these two strings are ordered with respect to each other. There is no a priori reason to assume that the string that is created later in the derivation precedes the string created earlier. Let us call this problem *Assembly Problem*.¹⁴

In order to give the linear order between two linear strings, it is necessary to have a shared member in them. Suppose that there are two linear strings L where $n \ll o \ll p$ and L' where $p \ll q \ll r$, as in (24a) and (24b), respectively.

- (24) a. $L = \{ \langle n, o \rangle, \langle n, p \rangle, \langle o, p \rangle \}$
 b. $L' = \{ \langle p, q \rangle, \langle p, r \rangle, \langle q, r \rangle \}$

Here, each set of pairs is transitive, total and antisymmetric. Notice that p is shared by the two sets L and L' . It is the final element in L , and the initial element in L' . I propose that the two strings L and L' in (24) are linearly ordered by virtue of the shared member p so that the resulting linear order for $\{n, o, p, q, r\}$ is consistent with each linear order:

- (25) *Assembly Process:*

The linear order between the two linear strings is defined by virtue of the shared member so that it is consistent with each local string.

Thus, given (24), we obtain the following linear order for $\{n, o, p, q, r\}$:

- (26) $n \ll o \ll p \ll q \ll r$

Notice that any other ordering of the members of $\{n, o, p, q, r\}$ than (26) is

inconsistent with (24). Consider the following linear order for example:

(27) $n \ll o \ll p \ll r \ll q$

This is inconsistent with (24b).

Given the Assembly Process, let us return to the linear order between the unit of Spell-Out applying to \underline{v} and the unit of Spell-Out applying to C . Suppose that the initial element in the linear string is available to the next Spell-Out. Thus, in (23), V is still available. In order for an element in the domain of Spell-Out to be available to the next Spell-Out, the initial element should remain to be sent to the phonological component Φ .

To formulate this idea, I propose that the initial element in the string defined by Spell-Out escape the mapping to Φ . I assume that Spell-Out maps the string to Φ except for the initial element.

(28) Spell-Out sends a linearly ordered string to Φ except for the initial element in the string.

Given these considerations, let us reconsider the Spell-Out in the derivation of (21), repeated here.

(29) $[_{CP} C [_{IP} \text{Subj Infl } [_{vP} v [_{VP} V \text{ Obj }]]]]$

First, Spell-Out applies to the sister of \underline{v} .

(30) S-O(Sister of v)

a. Linear Order: $V \ll \text{Obj}$

- b. Mapping to Φ : Obj
 c. In Φ : (Obj) _{ϕ}

Spell-Out defines the linear order, as in (30a), and this linear order is mapped to Φ as in (30b), and Obj corresponds to a p-phrase, as in (30c). When the mapping occurs in (30b), the initial element in the linear order (i.e., V) escapes the mapping under (28), and still remains accessible to the next Spell-Out.

Next, the sister of C is spelled-out:

(31) S-O(Sister of C)

- a. Linear Order: Subj << Infl << v << V
 b. Mapping to Φ : Infl << v << V
 c. In Φ : (Infl v V) _{ϕ} (Obj) _{ϕ}

First, linear order is defined as in (31a). Here, V, which was not mapped to Φ in the previous Spell-Out, is still accessible, and therefore it is part of the linear string in (31a). Then this linear string undergoes the mapping to Φ . Notice that the initial element Subj escapes the mapping under (28). That is, the string “Infl << v << V” is mapped to Φ , as in (31b). In the process of this mapping, the string “Infl << v << V” is ordered with respect to Obj in terms of the linear order in (30a) that was defined by the previous Spell-Out. In Φ , the mapping results in a p-phrase (Infl v V) _{ϕ} , which precedes (Obj) _{ϕ} , as in (31c).

The next step is to spell-out the rest of the structure:

(32) S-O(Root)

- a. Linear Order: C << Subj
 b. Mapping to Φ : C << Subj

c. In Φ : $(C \text{ Subj})_{\Phi} (\text{Infl } \nu \text{ V})_{\Phi} (\text{Obj})_{\Phi}$

Since Subj escaped the mapping to Φ in the previous Spell-Out, it is accessible here. Thus linear order “C << Subj” is defined since C asymmetrically c-commands Subj, as in (32a), and Subj is mapped to Φ , as in (32b). Note that since this is the Spell-Out of the root, C could be mapped together here.¹⁵ In this mapping process, Subj is ordered with respect to “Infl << ν << V” in terms of the linear order (31a) defined by the previous Spell-Out. In Φ , the phonological phrasing shown in (32c) is obtained.

As a result of the linearization and mapping to Φ by Spell-Out, the following phonological phrasing is obtained:¹⁶

(33) $[_{CP} \quad C \text{ } [_{IP} \text{ Subj Infl } [_{\nu P} \nu \text{ } [_{VP} \text{ V Obj }]]]]$
 $(C \text{ Subj})_{\Phi} (\text{Infl } \nu \text{ V})_{\Phi} (\text{Obj})_{\Phi}$

Here, Obj is not phonologically phrased with V, and Subj is not phonologically phrased with the elements that follow it. This is exactly the same as the prediction made by the Relation-based theory of phonological phrasing, repeated here.

(34) $(\text{Subj})_{\Phi} (\text{Infl } \nu \text{ V})_{\Phi} (\text{Obj})_{\Phi}$

In the next section, I will argue that the following phrasing predicted by the Edge-based theory and the optional application of restructuring in the Relation-based theory is obtained by the restructuring of p-phrases for purely phonological reasons or by the syntactic movement of Obj to the Spec of ν and syntactic movement of V to Infl:

restructuring, which is parameterized.

3.1. Ewe and Chichewa

3.1.1. Ewe

In this section, I examine the phonological phrasings in the ANlɔ dialect of Ewe. The phonological phrasing in Ewe exhibits the pattern where S, V and O are phrased separately.

Clements (1978) discusses the phonological phrasing in the Aɲlɔ dialect of Ewe. He shows that mid tone (M) raising applies within a p-phrase. *M raising* is formulated as follows:

(37) *M Raising*

$M \rightarrow R / H _ H$ (Clements 1978: 47)

M tone is raised to extra-high tone (R) if it is surrounded by H tones. Thus in (38), the underlying form in (38a) is realized as in (38b).

(38) a. /àtyí mēgbé/

tree behind

‘behind a tree’

(Clements 1978: 24)

b. [àtyí mēgbé]

(Clements 1978: 25)

Note that the environment for M raising here is met across a word boundary. The H that precedes M is in the preceding word. Note also that there are two other rules applying in this example: *R Spread* and *Cadence* (Clements 1978:25, 49). *R Spread* spreads an R tone both rightward and leftward until M or L, and *Cadence* changes an R-R sequence in the domain-final position to R-H. Clements assumes that these rules apply in the following order.

- (39) àtyí mēgbé → apply M Raising →
 àtyí mēgbé → apply R Spread →
 àtyí mēgbé → apply Cadence →
 àtyí mēgbé (Clements 1978:25)

Given these background assumptions, let us first see whether the M Raising applies between the subject and the element that follows it. Consider the following:

- (40) mí ā-dzó
 we T-leave
 ‘we will leave’ (Clements 1978:62)

Here, the M tone is surrounded by H tones. If *mí* and *ā-* belonged to the same p-phrase, the M would be raised to the extra-high R. However, it is not raised, indicating that the M tone does not satisfy the environment in (37). That is, there is a phonological phrase boundary between the subject and the tense morpheme on the verb and the environment in (37) is not met within the domain or p-phrase. Therefore, the subject is not phonologically phrased with the verb.

Let us next consider whether the object is phrased with the preceding verb:

- (41) a. kpó ānyí
 see bee
 ‘saw a bee’ (Clements 1978:24)
 b. kpó ānyí (Clements 1978:25)
 c. *kpó ńnyí (Clements 1978:25)

(41a) shows the underlying form, which is realized as in (41b). If *kpó* ‘see’ and

ānyí ‘bee’ belonged to the same p-phrase, they would satisfy the environment in (37) since the M is surrounded by H’s. However, M is not raised in (41b). As (41c) shows, if M is raised, the result is unacceptable. Therefore, there is a phonological phrase boundary between the verb and the object.

To summarize, the phonological phrasing in Ewe is as follows:

$$(42) (S)_\phi (V)_\phi (O)_\phi$$

Following Collins (1993), I assume that the transitive construction has the following syntactic structure:

$$(43) [_{CP} C [_{IP} Subj Infl [_{VP} V-v [_{VP} <V> Obj]]]]$$

Here, the object stays in situ, and the verb moves to *v*. As we have seen in section 2.3.3, the phonological phrasing in (42) is obtained in a straightforward way in the proposed theory (see (33)), by spelling-out the sisters of *v* and C.

3.1.2. Chichewa

In this section, I discuss the phonological phrasing in Chichewa (Bresnan and Kanerva 1989, Bresnan and Mchombo 1987, Kanerva 1990). In Chichewa, the subject is not phonologically phrased with the following verb just like Ewe, while the object is phonologically phrased with the verb unlike Ewe:

$$(44) \text{ a. Mwaána} \quad \text{anaményá} \quad \text{nyuúmba}$$

$$\text{child} \quad \text{SM-hit} \quad \text{house}$$

$$(\quad)_\phi \quad (\quad)_\phi$$

‘The child hit the house’

$$\text{ b. Mwaána} \quad \text{anaményá} \quad \text{nyumbá} \quad \text{ya} \quad \text{bwiíno}$$

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child SM-hit house of good
()_φ ()_φ
‘The child hit the good house.’

Sam Mchombo (personal communication)

In Chichewa, the tone on the final vowel of the phonological phrase is retracted to the penultimate (see Bresnan and Kanerva 1989, Kanerva 1990).¹⁷ Thus in (44a) and (44b), the subject would be *mwaná* with the high tone remaining on the final vowel if it were not in the final position of the p-phrase, and the verb would be *anaméénnya* with the final tone retracted to the penultimate if it were in the final position of the p-phrase:

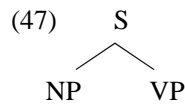
(45) (S)_φ (V O)_φ

Let us first consider the phrasing of the subject. Assuming that the subject is in the Spec of IP and the verb is in Infl (see Kinyalolo 1991:35ff. on Kilage, and Baker 2003 on Kinande), the phonological phrasing of the subject is accounted for (see (33)). Since the subject is in the initial position in the unit of Spell-Out applying to the sister of C, it is not mapped to Φ with the verb in Infl. Therefore, it is not phonologically phrased with the verb.

Let us next consider how the verb and the object are phrased together in Chichewa. Note that the object is not phrased with the verb if the verb bears an Object Marker (OM):

(46) Mwaána ana-í-méénnya nyuúmba
child SM-OM-hit house
()_φ ()_φ ()_φ
‘The child hit it, the house.’ (Kanerva 1990: 159)

In (46), the verb ‘hit’ bears an OM, and its final vowel is retracted to the penultimate, in contrast with (44). That is, the verb ‘hit’ is not phrased with the object ‘house’ in (46). Bresnan and Mchombo (1987:745) argue that the OM is an incorporated pronoun that is anaphorically linked to the topic NPs. They assume that a topic NP is generated under S in the following structure:



Thus, the topic object is out of VP and not phonologically phrased with the verb.¹⁸ Then, the next question is where the object stays when it is not a topic, as in (44).

Collins (2003b) proposes that Agree gives rise to movement in Bantu (called *Agreement Parameter*). Thus, if v enters into an Agree relation, the object moves to the Spec of vP . Along these lines, I assume that v has an OCC feature in Chichewa when it has phi-features to be checked (see Seidl 2001:93-94, see also McGinnis 2001 and Ura 2000:45ff.):

(48) v has an OCC feature in Chichewa.

Now suppose that the incorporation of the object pronoun is triggered by the OCC feature when the object NP is a topic. That is, the OCC feature of v is checked by a pronoun, which shows up as an OM within the verbal morphology. If the verb does not bear the OM, then the OCC feature of v has to be checked by some other element than the (incorporated) pronoun. I suggest that the object NP checks it when there is no OM. That is, the object moves to Spec of v when it is not a topic.

Given these considerations, let us consider how the verb and the object are

phonologically phrased together in the absence of the OM as in (44a). The phrase structure looks like (49) (with English words):

(49) [_{CP} C [_{IP} child hit-*v*-Infl [_{vP} house <*v*> [_{vP} <hit> <house>]]]]

The object ‘house’ moves to the Spec of *vP* to check the OCC feature, and it precedes *v* because of the OCC-feature checking, and follows Infl, which asymmetrically *c*-commands it. When Spell-Out applies to the sister of C, the subject escapes the mapping to the phonological component Φ , as we have seen above, and the verb in Infl and the object in the Spec of *vP* are mapped to Φ together within the proposed theory of syntax-phonology mapping (see (33)). Therefore, they form a single *p*-phrase, in which the verb occupies the non-final position, and hence no tone retraction.¹⁹

If Collins’ Agreement Parameter is correct, it is predicted that the object is phonologically phrased with the verb if it is not a topic in Bantu languages. To my knowledge, this prediction seems to hold true in many Bantu languages (see Bickmore 1989, 1990 on Kinyambo, Hyman, Katamba, and Walusimbi 1987 on Luganda, Kisseberth and Abasheikh 1974 on Chi-Mw:ni, McHugh 1999 on the Vunjo dialect of KiChaga, and Odden 1987, 1990, 1996 on Kimatuumbi, see also McGiniss 2001 and Seidl 2001 for extensive discussion about the phonological phrasing of objects in Bantu).

3.2. More on Anlo Dialect of Ewe

In this section, I compare the proposed theory with the previous theories. Collins (1993:Chapter 2) shows the following word order variation in Ewe progressive.

(52) mē kpé flē-gé → mē kpé flé -gé (Clements 1978:47)
 I stone buying- PRT
 ‘I’m going to buy a stone’

(53) a. ākōdú (Clements 1978:48)
 ‘banana’
 b. m’ ākōdú flé-gé (Clements 1978:48)
 ‘I’m going to buy a banana’

In (52) and (53b), the M tone on the verb is raised because of the preceding H tone on the object. That is, the object that precedes the verb is phonologically phrased with the verb, unlike the object that follows the verb (cf. (41)). The movement of the object to the Spec of *v*P creates the environment in which M Raising applies.

Given these data, let us compare the proposed theory with the Edge-based theory and the Relation-based theory.

Selkirk (1986: 391) argues that the phonological phrasing in Ewe can be accounted for under the assumption that the left edge of XP corresponds to the left edge of a p-phrase. Here XP is a maximal projection of a lexical (but not functional) category. Selkirk (1986:391) assumes the following VP structures for VO and OV orders in Ewe:

(54) a. [_{VP} V NP_{Obj}]
 b. [_{VP} NP_{Obj} V]

As Selkirk shows, the alignment of the left edges of XP gives the correct phonological phrasing for the syntactic structures in (54).

(55) a. (V)_φ (O)_φ

b. (O V)_φ

As we have seen before, the OV order in Ewe is derived from the VO order by moving the object over the verb. Note that it is unlikely that the object moves over the verb within the same VP (see Collins 2003a for a condition that prohibits such movement). Moreover, the head V does not trigger such movement since it is a lexical category; Movement is triggered by uninterpretable features of a functional category (Chomsky 1995b). Thus the structure (54b) where the preverbal object stays within VP is not an adequate syntactic analysis. The object has to move out of the VP to a Spec of a functional category, unlike (54b). As I discussed above, I assume that the relevant functional category is *v*:

(56) NP_{Obj} *v* [VP V <NP_{Obj}>]

Assuming that the verb moves to *v* in transitive constructions, we have the phrase structure (57), for OV order in Ewe:

(57) [_{vP} NP_{Obj} V-*v* [_{VP} <V> <NP_{Obj}>]]

Under the alignment of the left edge of XP, the correct phrasing shown in (55b) is obtained since the left edges of the VP and the moved object NP correspond to the left edges of p-phrases.

Now let us consider the VO order:

(58) [_{vP} V-*v* [_{VP} <V> NP_{Obj}]]

The alignment of the left edges gives the phrasing in (55a), where the verb and the object are phrased separately, since the left edges of VP and the object NP

correspond to those of the p-phrases.

However, under this approach, it is predicted that the subject is phonologically phrased with the verb in \underline{v} in SVO order:

$$(59) \quad [_{IP} \text{NP}_{\text{Subj}} \quad \text{Infl} \quad [_{vP} \quad \text{V-}\underline{v} \quad [_{VP} \quad \langle \text{V} \rangle \quad \text{NP}_{\text{Obj}}]]]$$

$$(60) \quad (\text{S} \quad \text{V})_{\phi} (\text{O})_{\phi}$$

Here, the left edges of the subject NP, VP, and object NP correspond to those of the p-phrases. Note that the left edge of vP does not correspond to the left edge of a p-phrase since v is a functional category. However, as we have seen in (40), the subject is not phrased with the verb in Ewe. That is, the phrasing in Ewe cannot be accounted for under the Edge-based approach, given the proper syntactic analyses.

Now, let us consider the same data within the Relation-based theory of Nespov and Vogel (1986). The phonological phrasings are repeated here:

$$(61) \quad \text{a. } (\text{S})_{\phi} \quad (\text{V})_{\phi} (\text{O})_{\phi}$$

$$\text{b. } (\text{S})_{\phi} \quad (\text{O} \quad \text{V})_{\phi}$$

Nespov and Vogel (1986: 168) propose that a lexical head X is phrased with all the clitic groups on its nonrecursive side until another lexical head is reached outside of the maximal projection of X (see (2)). They (p.180) propose that restructuring of p-phrase is not allowed in Ewe.

Given the following syntactic structure that I am adopting, the phrasing in (61a) can be accounted for:

$$(62) \quad [_{IP} \quad [_{NP} \quad \text{Subj}] \quad \text{Infl} \quad [_{vP} \quad \text{V-}v \quad [_{VP} \quad \langle \text{V} \rangle \quad [_{NP} \quad \text{Obj}]]]]]$$

Here, the object is not phrased with the verb even though the verb is on the nonrecursive side of the verb since the verb is a lexical head that is outside of the NP. Similarly, the verb is not phrased with the subject. However, it is not clear how the phrasing in (61b) is accounted for given the present syntactic assumptions:

(63) [_{IP} NP_S Infl [_{vP} [_{NP} Obj] V-*v* [_{vP} <V> <Obj>]]]

Under Nespors and Vogels formulation of the phonological phrase formation, the verb is phrased with another lexical head that is inside the maximal projection of the verb. In (63), the verb is adjoined to *v*, and does not head its own projection in that place. Since the object is in the Spec of a functional projection *vP*, the literal interpretation of their formulation gives the phonological phrasing where the verb and the object are phrased separately since the object on the nonrecursive side of the verb contains the lexical head N that is outside of the maximal projection of the verb, VP.

Note that the object in the Spec of *vP* may not restructure into the p-phrase containing the verb in (63) within the Relation-based theory because the restructuring of X to Y is allowed only when X is a complement of Y, and the moved object is not a complement of the verb any more (see (5)).

Since neither Nespors and Vogels (1986) nor Selkirks (1986) discuss the verb movement and the status of the maximal projection of a functional category to which the verb is adjoined, the conclusion reached so far should be considered to be tentative. However, it seems that the reference to maximal projections causes the problems when the verb movement to a functional head is involved. In (59)/(60), the reference to the subject “NP” results in a (wrong) phrasing where the subject and the verb are phrased together, and in (63) the reference to the maximal projection of the verb makes it unclear what counts as a maximal projection of the verb after it moves out of the VP. In the current syntactic theory where functional

categories play a central role in deriving syntactic derivation, it seems that the reference to maximal projections of lexical heads would cause some problems such as the one discussed here. In the proposed theory, no such problem arises since there is no reference to the maximal projection, or in fact, there exist no projections at all.

3.3. Italian and Kinyambo

3.3.1. Italian

In this section, I examine the phonological phrasing in Italian. According to Nespor and Vogel (1986:38), *Raddoppiamento Sintattico* is observed in central and southern varieties of Italian.²² It is a phonological rule that applies between words within a p-phrase. In a sequence of word1 word2, the initial consonant of word2 is lengthened (i) if word1 ends in a vowel with the main stress of the word, and (ii) the initial consonant of word2 is followed by a non-nasal sonorant. (The following formulation is adapted from Nespor and Vogel 1986:170, see also Frascarelli 2000:20):

(64) *Raddoppiamento Sintattico*

$$C \rightarrow [+long] / [\dots [\dots V]_w [_ [+son, -nas] \dots]_w \dots]_\phi$$

(where the vowel V bears the main stress of the word)

Given (64), let us consider (65):

(65) a. Papá mangia

daddy eat.3SG

()_ϕ ()_ϕ

‘Daddy is eating’

(Ghini 1993:43)

- b. La cecità può essere guarita
 the blindness can.3SG be cure.PP
 ()_φ ()_φ
 ‘Blindness can be cured’ (Ghini 1993:44)

In all of these examples, the subject ends in a stressed vowel, and the following word (verb or auxiliary verb) starts with a consonant that is followed by a non-nasal sonorant. However, Raddoppiamento Sintattico fails to apply, indicating that there is a phonological phrase boundary between the subject and the verb or the auxiliary verb.

Let us next consider the following example:

- (66) Venderá questo leopardo in dicembre
 sell.FUT.3SG this leopard in December
 ()_φ ()_φ ()_φ
 ‘He will sell this leopard in December’ (Nespor and Vogel 1986:173)

Here, the verb ends in a vowel that bears a main stress of the word, and the object phrase begin with a consonant followed by a non-nasal sonorant. So Raddoppiamento Sintattico would apply if the verb and the object belong to the same p-phrase. However, according to Nespor and Vogel (1986:172-3), Raddoppiamento Sintattico does not apply to the initial consonant *q-* of *questo* in (66), indicating that there is a phonological phrase boundary between the verb and the object.

In sum, the phonological phrasing in Italian is just like Ewe:

- (67) (S)_φ (V)_φ (O)_φ

Assuming that the object stays in situ (see Belletti 1990, Ogawa 2001) and that the verb moves to \bar{v} or to Infl if there is no auxiliary verb there (see Pollock 1989), this phrasing can be accounted for straightforwardly in the present theory (see (33)): Spell-Out applying to the sister of \bar{v} yields a p-phrase consisting of the object, Spell-Out applying to the sister of C yields a p-phrase consisting of the verb (65a), or the verb and the auxiliary verb (65b), and Spell-Out of the root yields a p-phrase consisting of the subject.

However, if the object is non-branching or consists of one word, Raddoppiamento Sintattico applies optionally to the initial consonant of the object:

- (68) Se prenderá qualcosa prenderá tordi
 if catch.FUT.3SG something catch.FUT.3SG thrushes
 () $_{\phi}$ () $_{\phi}$ () $_{\phi}$ () $_{\phi}$
 () $_{\phi}$ () $_{\phi}$
 ‘If he catches something, he will catch thrushes.’

(Nespor and Vogel 1986:172)

Here, *q-* of *qualcosa* and *t-* of *tordi* may be lengthened by Raddoppiamento Sintattico:

- (69) (S) $_{\phi}$ (V O) $_{\phi}$ if O is non-branching

Since the phrasing in (69) is optional, and since it is allowed only if the object is non-branching, I assume, following Nespor and Vogel (1986:173), that (69) results from the restructuring of (67).²³ Thus, the p-phrase containing a non-branching object restructures into the preceding p-phrase, resulting in a p-phrase containing the verb and object:

$$(70) (V)_\phi (O)_\phi \rightarrow (V O)_\phi$$

Inkelas and Zec (1995) propose the following constraint on phonological phrasing:

$$(71) (\omega \omega)_\phi$$

(71) says that “a preferred phonological phrase is one which consists of at least two phonological words” (Inkelas and Zec 1995:544). This constraint is purely phonological or prosodic in that it does not refer to any syntactic information, unlike Nespor and Vogel’s theory (5). Therefore, I adopt this constraint to account for the restructuring of phonological phrasing. I propose that (71) is parameterized, so that it is respected in some languages while it is not in the others. Thus, in Ewe it is not respected and the object is not phrased with the verb even if it is non-branching (see (41)), while in Italian it is respected and the restructuring may apply.

Note that in Italian the restructuring applies because the p-phrase containing the object is non-branching, but not because the p-phrase containing the verb is non-branching. The p-phrase containing only the verb is not restructured into the p-phrase containing the branching object ((see (66)). Therefore, I propose that if (71) is respected, the direction of the restructuring is parameterized so that it applies to the left or right:

$$(72) \text{Restructuring applies to the left or right.}$$

I assume that the restructuring is to the left in Italian (I will discuss the rightward restructuring in the next section). Thus in the derivation of (68), when the representation shown in (73a) is obtained, the p-phrase containing the non-

branching object is restructured into the one containing the verb, as in (73b).

- (73) a. (catch)_φ (something)_φ → Restructuring
b. (catch something)_φ

In the derivation of (66), the p-phrase containing the object does not restructure since it is branching, and the p-phrase containing the verb does not restructure either, since such restructuring would be rightward:

- (74) a. (see)_φ (this leopard)_φ → No Restructuring
b. * (see this leopard)_φ

Now suppose that the subject is non-branching. Then it may not restructure into the following p-phrase in Italian since such restructuring would be to the right. However, if the VP is non-branching, then we obtain the following phonological phrasing (see (65a)):

- (75) (S)_φ (V)_φ

At this point, (V)_φ does not satisfy (71), and it could restructure to the left, resulting in the p-phrase (S V)_φ. However, this is not allowed in Italian, as in (65a).

John Whitman (personal communication) pointed out to me that the subject is usually interpreted as a topic in the languages that allow *pro*-drop. Alexiadou and Anagnostopoulou (1998) argue that, based on the adverb placement, the pre-verbal subject in null-subject languages occupies an A-bar position, which is outside of the IP (pp.501-4), and that it shows scopal ambiguity if it is a quantificational element, indicating that it is in an A-bar position (pp.504-511). Therefore, I assume that the (pre-verbal) subject does not occupy the Spec of IP in Italian, but it

is topicalized.²⁴ Frascarelli (2000) shows that in Italian a topic is always mapped to an Intonational Phrase, which properly contains a p-phrase under the Strict Layer Hypothesis. If so, a p-phrase containing only a verb may not restructure into a p-phrase containing a subject because of the topichood of the subject.

If this is the case, it is predicted that a p-phrase containing only a verb may be restructured into a p-phrase containing a subject in the languages that respects (71), and that do not allow *pro*-drop.

English is such a language. Nespor and Vogel (1986) argue that for many English speakers, *Rhythm Rule* is sensitive to phonological phrasing. It shifts the main stress in the presence of the following word within a p-phrase. English does not allow *pro*-drop unlike Italian, it allows the restructuring of the non-branching object to the verb like Italian, as in (76), and it also allows the restructuring of the non-branching verb phrase to the subject unlike Italian, as in (77).²⁵

- (76) a. John réproduces prints
 ()_φ ()_φ
- b. John reprodúces óld prints
 ()_φ ()_φ ()_φ
- (77) a. Ànnemarié (Inkelas and Zec 1995: 543)
 b. Ànnemarié áte sandwiches.
 ()_φ ()_φ
- c. Ánnemarié áte. (Inkelas and Zec 1995: 543)
 ()_φ

The non-branching object may be phonologically phrased with the verb as in (76a) while the branching object may not be phrased with the verb as in (76b). (77a) is the word in isolation. *Annemarie* does not undergo the Rhythm Rule in (77b), indicating that there is a phonological phrase boundary between the subject and the

branching VP. It undergoes the Rhythm Rule in (77c), indicating that there is no phonological phrase boundary between the subject and verb. That is, the non-branching p-phrase containing only the verb may restructure to the one containing the subject in English. Nespor and Vogel (1986) accounts for the fact that the non-branching p-phrase containing only the verb does not restructure into a p-phrase containing the subject by referring to a purely syntactic notion, complement: X may restructure into Y if X is a complement of Y (see (5)). However, such an account is theoretically implausible because of the reference to the syntactic information. Also, it does not account for the English data shown in (77c) where a p-phrase containing only the verb restructures into the one containing the (non-branching) subject. It does not account for the Kinyambo data where the non-branching subject restructures to the verb either (see below). Given these considerations, I assume that the p-phrase containing only the verb may not restructure to the one containing the subject in Italian for independent reasons, topichood.

3.3.2. Kinyambo

Let us finally discuss the rightward restructuring. Bickmore (1989, 1990) shows that Kinyambo has a phonological rule that is sensitive to phonological phrasing.²⁶ The rule is *High Deletion*, formulated in (78).

(78) *High Deletion*

$$H \rightarrow \emptyset / [\dots [\dots _ \dots]_{\omega_1} [\dots H \dots]_{\omega_2} \dots]_{\phi}$$

(ω = word, ϕ = phonological phrase)

Bickmore (1990:9)

The H tone in a word ω_1 is deleted if there is another word ω_2 containing H after ω_1 within a p-phrase.

Let us consider (79).

- (79) a. abakózi
 ‘workers’
 b. bákajúna
 ‘they help’
 c. abakozi bákajúna
 ‘the workers helped’
- Bickmore (1990:11)

(79a) and (79b) show the words in isolation. Both words have a H tone. (79c) shows that the H tone of *abakózi* ‘workers,’ which is a subject, is deleted because of the following verb. That is, the (non-branching) subject and the verb are phonologically phrased together in Kinyambo:

- (80) (S V)_φ

However, if the subject is branching in the sense that it has two (or more) words in it, then the subject is not phrased with the verb.

- (81) abakozi bakúru bákajúna
 workers mature they-helped
 ‘The mature workers helped’
- Bickmore (1990:14)

Here, the H tone of *abakózi* ‘workers’ is deleted but that of *bakúru* ‘mature’ is not, indicating that there is a phonological phrase boundary after the subject phrase but that there is no boundary between *abakozi* and *bakúru* within the subject:

- (82) (abakozi bakúru)_φ (bákajúna)_φ

Given this, I conclude that the subject is phrased with the verb if it is non-

branching in Kinaymbo (see Bickmore 1989, 1990).

- (83) a. (S)_φ (V)_φ
b. (S (V)_φ) if the subject is non-branching

Note that the branchingness of the verb is irrelevant here. In both cases, the verb is non-branching. Therefore, the difference in phrasing in (83) is solely due to the branchingness of the subject.²⁷ I suggest that the difference between (83a) and (83b) is accounted for in terms of the rightward restructuring of p-phrases. Thus in (83b), the rightward restructuring applies when the subject is mapped to Φ so that the subject and the verb are phonologically phrased together, while in (83a), such restructuring does not apply since the subject is branching.

Note that it is not clear whether the phrasing in (83b) is optional like Italian non-branching objects. However, in Chichewa, which is also a Bantu language and has similar syntactic properties, the non-branching subject can be phrased with the verb in a fast speech (Sam Mchombo, personal communication),²⁸ like the non-branching object in Italian (cf. footnote 23). Therefore, I assume that the restructuring is purely phonological in Kinyambo as well as in Chichewa, due to the (prosodic) branchingness of the subject.

3.4. Summary

In this section, I gave an analysis of phonological phrasing in Ewe, Chichewa, Italian and Kinyambo within the proposed theory of syntax-phonology mapping. I argued that the difference between Ewe and Chichewa can be accounted for in terms of syntactic difference, that is, the position of the object. I also argued the restructuring of p-phrases in Italian and Kinyambo should be accounted for in terms of the phonological constraint that prefers a p-phrase containing two or more phonological words, and proposed that the direction of the restructuring should be

parameterized.

4. Concluding Remarks

In this paper, I proposed a theory of syntax-phonology mapping within the Minimalist Program. I argued that the initial element in the string of the unit of Spell-Out should escape the mapping to Φ to resolve the Assembly Problem, and proposed that the unit of Spell-Out sent to Φ correspond to a p-phrase. The proposed theory is a null hypothesis in that it does not require any particular phonological phrase formation algorithm.

It is important to notice that it is quite difficult to construct such a theory within a representational theory of syntax since the mapping algorithm cannot divide the phonological string corresponding to the entire syntactic representation into multiple phonological strings without reference to any syntactic information. Therefore, the proposed theory of phonological phrasing lends a conceptual support for the derivational approach to syntax.

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Notes

- 1) See Inkelas and Zec 1995 for the review of these theories. For much earlier approaches to syntax-phonology mapping, see Clements 1977, Chomsky and Halle 1968, Selkirk 1972, among others.
- 2) See Zec and Inkelas 1991 for the discussion about Clitic Group.
- 3) See Selkirk 1986, 1995, Truckenbrodt 1999:221 for details.
- 4) Cf. Truckenbrodt 1995, 1999 for recursive phonological phrasing. See also Selkirk 1995.
- 5) In the Optimality Theoretic approach, the constraints are universal and the parametric variation is captured by the constraint ranking. For example, Align-XP, L is ranked higher than Align-XP, R in Japanese. See Truckenbrodt 1999:228.
- 6) Note that the “recursive side” can be decomposed into two syntactic notions: “recursivity,” which is independent of the head parameter, and “side,” which is part of head parameter in that it reflects the directionality defined by head parameter.
- 7) Since there are no traces in the Minimalist Program, I use the notation “<X>” to represent the lower occurrence(s) of X (see Rizzi 2001:90). Roughly, <X> corresponds to a trace in the so-called GB theory.
- 8) OCC stands for “occurrence.” It is sometimes called EPP. Originally, EPP or Extended Projection Principle is a requirement that clauses have subjects (Chomsky 1982: 10). However, I use the term OCC in a broader sense than EPP, in that it refers to a formal feature that requires a phrase to be merged in its local position, that is, its specifier. The term EPP is not adequate in the Minimalist Program since the Projection Principle was abandoned (Chomsky 1995:3.3). Also, the term OCC is more adequate in the copy theory of movement generally adopted in the Minimalist Program since its original use is to distinguish two or more occurrences of the same symbol (Chomsky 1975: 109-111). Thus, it can be used to distinguish two or more occurrences of a category or copy in the copy theory of movement (Chomsky 2000: 114-115).
- 9) See Chomsky 2001a, b, Hiraiwa 2002, Nissenbaum 2000 for some proposals about the timing of Spell-Out.

- 10) I do not intend to construct a full theory of linearization in this paper. Syntactic relations other than OCC-feature checking seem to be also relevant to the theory of linearization within the label-free syntax. See Collins and Ura 2001.
- 11) Here, I omit the lower occurrence or trace of the subject externally merged in the Spec of vP .
- 12) In the derivational framework (especially in the label-free syntax) adopted here, the phrase structure is built in a bottom-up fashion. See (14).
- 13) I am putting aside the V-movement to v here. Following Chomsky 1995b:368, I assume that V movement does not take place in narrow syntax.
- 14) Thanks to Chris Collins for suggesting this term to me.
- 15) In Relation-based and Edge-based theory (Align-XP, R), it is also predicted that C is phrased together with Subj.
- 16) If Spell-Out applies at each step of syntactic derivation, as suggested by Epstein et al 1998:157, then a phonological phrase cannot be defined simply as a unit of the mapping to the phonological component since it would be predicted that each terminal element is phonologically phrased alone, contrary to the phrasing in (33). In such a theory, an independent phonological phrasing algorithm would need to be adopted. As shown by the large literature on phonological phrasing, the phrasing in (33) is indeed correct.
- 17) In Chichewa, *Penultimate Lengthening*, *Nonfinal Doubling* and *Prehigh Doubling* are also sensitive to phonological phrasing (see Bresnan and Kanerva 1989, Kanerva 1990).
- 18) See Rizzi 1997 for an analysis of Topic with expanded left periphery. See also Frascarelli 2000 for an extensive discussion of Intonational Phrasing of Topic under the assumptions similar to Rizzi's. Following the basic ideas explored by Frascarelli 2000, I assume that a topicalized phrase corresponds to an Intonational Phrase.
- 19) See McGiniss 2001 and Seidl 2001 for similar approaches. It is not clear how the phonological phrasing of the subject is treated in their theories, though.
- 20) Here, *le* 'am,' which is observed in (50), is dropped (Chris Collins, personal communication).

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- 21) The interpretation of these sentences is given by the present author. Thanks to Chris Collins for his help.
- 22) See also Frascarelli 2000 and Ghini 1993. In northern Italian, *Stress Retraction* (Nespor and Vogel 1986: 174) or *Rhythm Rule* (Frascarelli 2000: 20) is sensitive to phonological phrasing.
- 23) According to Ghini (1993), the restructuring tends to apply as the rate of speech increases.
- 24) Note that the position of the subject in null-subject languages is controversial. See Cardinaletti (1997) and Cinque (1995), Suñer (2001), among many others.
- 25) The restructuring of the p-phrase containing the object to the one containing the verb in (76a), and the restructuring of the p-phrase containing the verb to the one containing the subject in (77c) are optional. Thanks to John Bowers and Bruce Morén for extensive discussion on these data.
- 26) Kinyambo is also known as Runyambo. (Alsina 1994, Rugemalira 1993).
- 27) In this paper, I will not discuss the phrasing of the object in Kinyambo. Like Chichewa, the object is phrased with the verb, regardless of whether it is branching or not (See Bickmore 1989, 1990. See (44) for Chichewa data with branching and non-branching objects.). I assume that the phrasing of the object in Kinyambo is accounted for in a way similar to Chichewa: The verb and object moves up to Infl and the Spec of $\bar{y}P$, respectively, and they are mapped to Φ together, forming a single p-phrase.
- 28) The phrasing of the object with the verb in the absence of the OM is obligatory in Chichewa. See (44).

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Multiple Spell-Out, Label-free Syntax, and PF-Interface
