Models of Reduplication in Vietnamese

Alexis Baird

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Introduction

Reduplication is arguably a universal phenomenon. On a morphological level, reduplication appears to behave like most affixes. However, what makes reduplication unique is that in place of having specified segments the way most affixes do, it adopts the segments from the stem to which it attaches to and creates a copy (or partial copy) of its stem. To further complicate matters, as first observed by Wilbur (1973), certain unpredicted effects appear in some reduplicated words in which phonological rules appear to under-apply or over-apply.

While there have been many different theories to account for reduplication, in my work, I intend to focus both on Optimality Theory (OT) as articulated by Correspondence Theory (McCarthy and Prince 1995) and a generativist model as articulated by the Minimalist Approach (Raimy 2000).

Correspondence Theory (McCarthy and Prince 1995) involves the application of Optimality Theory to reduplication. In Correspondence Theory the reduplication affix is a template that attaches to the base. The subsequent form that this template adopts is governed by a series of ranked constraints, just as all other inputs would be under Optimality Theory. Four main constraints govern reduplication: base-reduplicant identity, input-output faithfulness, well-formedness constraints, and alignment constraints. The base-reduplicant identity IDENT-BR constraint is a cover term for a family of constraints that together require that the base and the reduplicant resemble one another. The IDENT-IO constraint is also a cover term for a family of constraints that together require the input to resemble the output. The well-formedness constraints dictate a preference for unmarked elements that may involve violating the correspondence between the base and the reduplicant. Finally, the alignment constraints determine the position of the reduplicant in relation to the base. The ranking of the constraints IDENT-BR and IDENT-IO determine over-application and under-application effects.

The Minimalist Approach (Raimy 2000) applies generative grammar to reduplication and to account for reduplication without invoking a mechanism that is specific to reduplication. Under the Minimalist Approach precedence structures can be used to account for reduplication. The Minimalist Approach makes explicit the assumption that there is linear precedence in phonology. Thus, "bæt" and "tæb" are not equivalent given their different precedence relationships—in spite of containing the same segments. Under this approach, precedence is represented by arrows "→", while the symbols "#" and "%" are used to signify the beginning and end, respectively, of a string of segments. The precedence structure itself is a series of time-slots that then become associated to segments and tones. After all affixation has occurred, linearization takes place to produce the final surface form. The Minimalist Approach posits that reduplication is a morpheme that adds a loop to the precedence relationship and thus behaves similarly to other affixes, differing only in the specifics of how it manipulates the precedence relationship. Under the Minimalist Approach there is not the distinction between the base and the reduplicant made by an OT approach. The so-called over-application effects in reduplication can be explained by the fact that, due to precedence relations and the reduplication loop, certain segments can appear in two environments simultaneously. For languages with over-application effects one environment is enough to trigger the rule. The lack of over-application effects in some languages can be explained by the fact that some languages specify that all environments must meet the conditions to trigger a phonological rule.

Vietnamese offers abundant examples of reduplication and is therefore a good case study for any model that wishes to account for reduplication. In my work, I intend to focus on the two approaches detailed above: an Optimality Theory approach as described by McCarthy and Prince (1996) and applied to Vietnamese by Vu (1998); and a Minimalist Approach proposed by Raimy (2000).

Vietnamese reduplication is extensive and contains multiple patterns. Many of these patterns were most likely productive at one point, but have become lexicalized and are no longer productive. Of the seemingly non-lexicalized forms of reduplication, there are still multiple patterns. Vu identifies four types of productive reduplication, but this analysis is be open to interpretation. In my work, I intend to focus on two patterns of reduplication: full reduplication—in which all segments and tones from the stem are copied exactly—and reduplication that involves tone change.

I argue that both the Optimality Theory approach and the Minimalist Approach can be effective in accounting for patterns of reduplication involving full reduplication and tone change. However, both approaches require a certain amount of ineloquent explanation. Assuming a goal of linguistic analysis is efficiency, ultimately, the OT Approach is less compelling, given that it requires invoking co-phonologies as well as reduplication-specific mechanisms that have no parallel elsewhere in the language.

Background

In this paper I have chosen the terms "stem", "reduplicant", and "base" to differentiate among the various parts of the data. If we assume that "$\rightarrow$" indicates the process of reduplication then the following indicates the pattern of reduplication found in the data: $X_1 \rightarrow Y\ X_2$ where the "stem" is X_1 and is defined as the original word that provided the input for the reduplicated word, Y is the "reduplicant" and is used to indicate the part of the reduplicated form that does not resemble, and X_2 is the "base". In this particular work, the base is defined as the element of the reduplicated form that is identical to the stem. However, I recognize that though the data does not reflect such trends, there may be situations in Vietnamese in which the base is not identical to the stem. This is certainly the case in other languages. I also acknowledge that various theories are implicit in the use of these terms. However, I intend them to be as neutral as possible and invoke them only to distinguish parts of the data.

Vietnamese contains six contrastive tones. These tones utilize the features ± high register ([±H]) and have three different possible contours: l, h, and lh. Bao argues that register in Asian tonal systems is specified for the feature [±stiff vocal cords] where [+stiff] is equivalent to [+H] and that this is functionally equivalent to Yip's feature [±upper]. Bao posits that contour is specified for the feature [±slack vocal cords] where [-slack] is equivalent to the h-contour. Bao also argues that this feature is again functionally equivalent to Yip's feature [±raised]. (Bao 1999; Yip 1980, 1989) The tones, as well as their notations, are detailed in the following chart:

(1)

		l	h	lh
Register		Contour:		
	[+HIGH]	a	á	ả
	[-HIGH]	à	ạ	ã

As mentioned above, Vietnamese reduplication can involve complete reduplication of all segments and their associated tones. There are examples of this type of reduplication for all six tone types where (a) is the reduplicated form and (b) is the assumed stem.

(2) a. mau-mau 'very rapidly'

b. mau 'rapidly'

(3) a. rồi rồi 'be completely finished'

b. rồi 'be finished, over with'

(4) a. hết hết 'be completely used up'

b. hết 'be used up'

(5) a. đợi đợi 'wait a little while'

b. đợi 'wait'

(6) a. nhỏ nhỏ 'be rather small'

b. nhỏ 'be small'

(7) a. đã-đã 'ages ago'

b. đã 'previously

In addition to being copied exactly, Vietnamese reduplication can also involve a tone change in which the segments are copied exactly, but the tone itself changes in the reduplicant. When we consider that the reduplicant can appear before or after the base (where "base" is defined as the element identical to the stem) and that there are no instances of both the reduplicant and the base taking on a novel tone that did not already appear in the stem, there are sixty different possible combinations. Each of the six tones can combine with each of the other five bases, producing thirty different combinations. These combinations are then doubled by the fact that the reduplicant can appear either before or after the base. However, according to my data (compiled from multiple sources), there are at most only thirteen of these patterns represented in the data. These patterns are as follows (in which (a) is the reduplicated form and (b) is assumed to be the stem):

A. (+H, h) → (+H, l) (+H, h) (á → a á)

a. cưng-cứng 'be somewhat tough'

b. cứng 'be tough'

B. (+H, lh) → (+H, l) (+H, lh) (ả → a ả)

a. long-lỏng 'be somewhat fluid'

b. lỏng 'be fluid, liquid'

C. (-H, h) → (-H, l) (-H, h) (ạ → à ạ)

a. lành-lạnh 'be a bit cold'

b. lạnh 'be cold'

D. (-H, lh) → (-H, l) (-H, lh) (ã → à ã)

a. loàng loãng 'be rather diluted'

b. loãng 'be diluted'

E. (+H, h) → (+H, h) (-H, h) (á → á ạ)

a. nhớt-nhợt 'be very viscous'

b. nhớt 'be viscous'

F. (-H, h) → (+H, h) (-H, h) (ạ → á ạ)

a. bứ-bự 'be very big'

b. bự 'be big'

G. (-H, lh) → (+H, l) (-H, lh) (ã → a ã)

a. ro-rõ 'be rather clear'

b. rõ 'be clear'

H. (-H, h) → (+H, lh) (-H, h) (ạ → ả ạ)

a. lẳng-lặng 'be very shriveled'

b. lặng 'be shriveled'

I. (+H, l) → (+H, lh) (+H, l) (a → ả a)

a. cỏn-con 'be very small'

b. con 'be small'

J. (+H, l) → (+H, l) (+H, lh) (a → a ả)

a. đen đẻn 'be rather black'

b. đen 'be black'

K. (-H, l) → (+H, h) (-H, l) (à → á à)

a. ngấm-ngầm [Gloss not given]

b. ngầm 'do smth in secret'

L. (+H, lh) → (+H, lh) (+H, l) (ả → ả a)

a. mảy-may [Gloss not given]

b. mảy 'a tiny amount'

M. (-H, l)→ (+H, lh) (-H, l) (à → ả à)

a. hoải-hoài 'incessantly'

b. hoài 'constantly'

It should be noted that a native speaker only confirmed the first eight of the above patterns (A-H). It should also be noted that tone patterns (I), (K), (L), and (M) are only reflected in the data in one example each, while there are multiple instances of tone patterns (A)-(G).

From these data, several trends can be observed. With one questionable exception (tone pattern (K)), the h-contour never appears in the reduplicant unless it was already present in the stem. In all but three cases (tone patterns (E), (J), and (L)), the reduplicant appears to the left of the base. Of the thirteen patterns illustrated above, five involve a change of register in which the stem is –H and the reduplicant is +H and only one involves a change of register in which the stem is +H and the reduplicant is –H: (E). A related pattern emerges with the registers: when the registers in the reduplicant and base differ, a high register ([+H]) is always followed by a low register ([-H]) and never the other way around. There are examples in which only the register changes, examples in which only the contour changes, and examples in which both the register and contour change. There are no examples in which the stem has a different tone from both the reduplicant and the base, but given that the relationship between the stem and the reduplicated form may not be readily obvious, this could be simply a gap in the data collected rather than an actual gap in the language.

Within patterns (A) and (B), another pattern emerges.

(8) a. men-mét 'be rather pale'

b. mét 'be pale'

(9) a. chăng chắc 'more or less certain'

b. chắc 'certain'

(10) a. ăm ắp *'plein , tout plein'*

b. ắp *'plein à déborder'*

(11) a. cùn-cụt 'be rather short'

b. cụt 'be short'

(12) a. sành-sạch 'be rather clean'

b. sạch 'clean'

(13) a. xùm xụp *'avaler bruyamment un potage'*

b. xụp [no gloss given]

When this tone change pattern is used all stems containing a stop in the coda position become homorganic nasals in the reduplicant.

There are also examples in which a stem can adopt two different kinds of reduplication:

(14) a. trắng trắng 'be whitish'

b. trăng trắng 'be whitish'

c. trắng 'be white'

(15) a. đẹp đẹp 'be rather pretty'

b. đèm đẹp 'be rather pretty'

c. đẹp 'be beautiful'

The same stem can either be fully reduplicated or can follow tone pattern (A) or (C)—assuming that the stop-nasal alternation is a subset of pattern (C). From the data, it is not clear whether these different patterns of reduplication necessarily coexist in one dialect or whether they reflect dialectal variation.

An Optimality Theory Approach

The Optimality Theory approach to reduplication as applied to Vietnamese is articulated by Vu (1998). Vu adopts an Optimality Theory approach that seeks to explain several patterns of reduplication through differing rankings of constraints.

The first type of reduplication is what Vu identifies as "Full Reduplication" or FR. Full reduplication results in an exact copy of the base that yields identical segments and tone in the base and the reduplicant. The result of this reduplication is one prosodic word with one foot and two syllables and a predictable stress pattern. Vu argues that the stress pattern as well as the syntactic inseparability of the base and reduplicant results from the fact that reduplication occurs at the syllabic level (not the foot or prosodic word level). As mentioned above, there are examples of all six tones being copied with their corresponding segments. This pattern would be predicted in FR.

Vu's approach to the FR form of reduplication is significant in the rankings of constraints. The IDENT-BR constraint is ranked highly, thus yielding an output in which the reduplicant is identical to the base. It is this ranking of the constraints that differentiates it from the second type of reduplication discussed below.

The second type of reduplication that Vu identifies is reduplication involving The Emergence of The Unmarked or TETU.

(16) a. long-lỏng 'be somewhat fluid'

b. lỏng 'be fluid, liquid'

(17) a. chầm chậm 'to be somewhat slow'

b. chậm 'to be slow'

(18) a. sam sám 'to be grayish'

b. sám 'to be gray'

(19) a. loàng loãng[1] 'rather diluted'

b. loãng 'diluted'

This pattern of reduplication has almost identical properties to FR—the same number of syllables in the input and output, the same stress pattern, no syntactic separability, and the reduplicant is minimally different from the base. The main difference between TETU

[1] In his work, there are several instances in which Vu writes tonal features that do not match with his data. In particular Vu uses the example "loang loãng" as an instance of a (-H, lh) tone changing to a (-H, l) in the reduplicant. I will assume that the discrepancy is a typographical error and will assume the word is "loàng loãng" and thus conforms to the pattern that he is demonstrating. This corrected form was confirmed by a native speaker. Where Vu's data did not match with the features he wrote, I've attempted to use other examples that still reflect the patterns he describes.

and FR, however, is the emergence of unmarked segments and tone in the RED. Specifically, Vu argues, the feature [-stiff vocal cord] is unmarked. This results in the emergence of tones with l-contour (Ngang tone (+H, l) and Huyền tone (-H, l)).[2]

Vu argues that this unique behavior results from the relatively high ranking of a markedness constraint. The idea of markedness is not unique to OT—many other linguistic theories, including generative phonology, subscribe to some sort of notion of markedness. According to all of these theories markedness is a universal phenomenon but the degree to which given features and prosodic categories are marked relative to others is language-specific. Thus *MARKED is a cover term for a family of constraints, one of which identifies l-contour tones as unmarked. This particular markedness constraint is subsequently ranked above the IDENT-BR constraint in the TETU pattern of reduplication identified by Vu. Other markedness constraints that don't apply to the reduplicated form are then ranked below IDENT-BR.

What makes the TETU reduplication unique is its ranking of the *MARKED constraint above the IDENT-BR constraint—a ranking not found in any of the other patterns of reduplication, according to Vu. The TETU pattern would have the following ranking of constraints:

(20) *MARKED >> IDENT-BR

Other patterns of reduplication in Vietnamese would have the reverse ranking:

(21) IDENT-BR >> *MARKED

While Vu does manage to account for the data he proposes, his approach is nonetheless problematic. Vu's theory of reduplication in Vietnamese requires a

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[2] Vu also argues that the features [-labial], and [-dorsal] will emerge due to their unmarkedness. Thus one would expect a preference for [-lab] and [-dor] vowels in the reduplicant to appear. However, it's not clear to me why Vu would argue this given that he provides no data in which this is the case.

reduplication-specific mechanism as well as many stipulations to account for different types of reduplication.

Vu must invoke cophonologies to account for seemingly conflicting rankings of constraints within a single language. In his defense, Vu points to other instances of cophonologies: "differences in the status of different kinds of borrowed words in a language with respect to a core-periphery distinction". (Vu 1998) But Vu himself says that such differences are the direct result of historical processes. This would then imply that cophonologies in reduplication are somehow historical. If historical evidence could show that the TETU pattern entered Vietnamese at a very different time (or was influenced by a very different source) from other patterns of reduplication, then Vu's argument would be bolstered. However, further work would need to be done to confirm this hypothesis.

An OT approach to Vietnamese reduplication requires mechanisms specific to reduplication that are not used anywhere else in the grammar. An OT approach is forced to invoke constraints such as the BR-IDENT in reduplication and then utilize cophonologies to account for differing patterns of reduplication.

Phenomena such as the case in which the nasals and stops seem to interact with tone would require further constraints that Vu does not mention. It would be possible to invoke a markedness constraint, if it could be proven that nasals—or more specifically nasals in coda position—are less marked. However, under this analysis, there should be no data in which the reduplicant maintains the stop in the coda. This is not the case:

(22) a. xẹ́p-xẹp 'be completely flattened'

b. xẹp 'be flattened, become flat'

One could argue that this tone change pattern has a different ranking of constraints in which the stop-markedness constraint is not ranked above the identity constraints. However this analysis would fail to acknowledge the interaction of tone with the stop-nasal alternation. OT would have to invoke a constraint specifically banning stops in the coda of syllables that had a tone other than the h-contour tones. However, this constraint in and of itself cannot account for the homorganic nasal. Another constraint (or possibly the same constraint with a modification) would have to specify that the stop becomes the homorganic nasal when in the environment specified above.

The OT approach has no way to show the relative relation between two patterns. In patterns (E) and (F), the surface form is the same and the two types of reduplication seem semantically related. However, OT would have to invoke completely different sets of alignment constraints to account for the fact that the bases are different and thus each pattern would completely distinct.

Under OT, accounting for the gaps in the tone patterns of the data is complicated. OT could account for all sixty possible combinations with at worst sixty different constraints (though many of these constraints can be collapsed into fewer constraints), but has no way to explain why there would be gaps in the data. OT predicts that reduplicants will always show a preference for the unmarked, when not constrained by faithfulness constraints. (Kager 1999) However, this does not explain why some unpredicted patterns that violate both markedness and faithfulness constraints would emerge while others do not.

If markedness is a gradient rather than an absolute for both tone and segments and can be determined based on frequency as Vu argues, then there should be a higher representation of l-contour, followed by h-contour, followed by lh-contour. In fact the h-contour never appears in the reduplicant unless it was already present in the stem. However, the lh-contour (the most marked contour according to Vu) does in fact appear in several reduplicants when it was not present in the stem—thus violating both the markedness constraint and the identity constraints. There would have to be a separate constraint ranking in which both of these were ranked below a third constraint that somehow specified the emergence of this lh-contour—similar to the emergence of the homorganic nasal discussed above.

Ultimately, the largest flaw in Vu's argument is that it is inadequate to explain the data. While it may be that no single analysis will ever be able to account for all of the data in Vietnamese, it remains that much of the data—specifically other patterns of tone change—are unaccounted for under Vu's analysis. There is at least one example of tone change that appears to follow the TETU pattern in every way, except that the reduplicant appears after the base:

(23) a. mảy-may [no gloss given]

b. mảy 'a tiny amount'

This particular pattern could be explained by invoking a different alignment constraint. However, this then would require a completely different set of constraints for this particular pattern of reduplication.

The most striking example of this limitation in Vu's analysis is the emergence of so-called marked tones in the reduplicant when the base contains an unmarked tone:

(24) a. cỏn-con 'be very small'

b. con 'be small'

(25) a. đen-đèn 'be rather black'

b. đen 'be black'

There are also examples in which the base contains a marked tone and the reduplicant takes on a different, but still marked tone:

(26) a. mết-mệt 'be somewhat tired, vague'

b. mệt 'be tired'

(27) a. sít sịt 'be very close together'

b. sít 'be close together'

One possible explanation for these two patterns involves melodic over-writing: the template that attaches to the stem is specified for a particular tone that is able to over-ride the tone in the base as well as any constraints that would alter the tone. One could also argue that in each of these cases, the word belonged to a separated co-phonology in which the constraints were manipulated such that each of the tones emerged in the reduplicant. However, both of these analyses appear messy given that their effects are too powerful and have no limitation to what they cannot do.

There are also examples of tone change in which the l-contour emerges on the reduplicant, but the register also changes:

(28) a. ro-rõ 'be rather clear'

b. rõ 'be clear'

(29) a. se-sẽ 'be rather soft, gentle'

b. sẽ 'be soft, gentle'

This particular pattern could be explained by arguing that there is a *MARKED constraint that discourages –H register tones. In that case, however, this particular constraint could only be ranked highly for this particular pattern of reduplication, thus preventing the emergence of +H register in other patterns.

Though at least some of the patterns mentioned above appear to be productive, one could argue that all of these examples are lexicalized reduplication and therefore not productive, and beyond the scope of analysis for any theory seeking to account for reduplication.

The Minimalist Approach

Under the minimalist approach, full reduplication in Vietnamese is easily accounted for.

(30) a. nói nói 'keep talking and talking'

b. nói 'talk'

→ n → ɔ́ → I → %

→ n → ɔ́ → I → n → ɔ́ → I → %

Given that the tone is always copied exactly in this form of reduplication, it seems clear that the tone is already associated to the segments when the loop applies and is thus copied along with the segments when the loop is added.

The Minimalist Approach can also account for other reduplication in Vietnamese. Vu identifies a pattern of reduplication in which the reduplicant takes a tone that has the least marked contour (in this case, l), but retains the register of the tone on the base.

(31) a. long-lỏng 'be somewhat fluid'

b. lỏng 'be fluid, liquid'

(32) a. chầm chậm 'to be somewhat slow'

b. chậm 'to be slow'

(33) a. sam sám 'to be grayish'

b. sám 'to be gray'

(34) a. loàng loãng 'rather diluted

b. loãng 'diluted'

In this particular pattern of reduplication, the reduplicant takes the l-contour, but the register and segments remain the same. On the surface this would seem to be problematic for a Minimalist Approach analysis.

One possible solution would involve a floating l-contour. There would be a floating l-contour above the RED loop that, after the linearization process, floats above the segments between the base and its reduplicant and then links onto the reduplicant. (Raimy p.c.) This approach requires several assumptions.

First, it will be assumed that Vietnamese has two X-slots for every tone. Bao (1999) argues that this must be the case for East Asian tone languages. Second, it will be assumed that tone in Vietnamese is specified for low rather than high tone, thus making the h-contour the default rather than the l-contour as Vu (1998) and Nhan (1984) assume. Hence the sắc (+H, h) and nặng (-H, h) tones are the default rather than the ngang (+H, l) or huyền (-H, l) tones. This analysis is supported by the fact that with the exception of one questionable example, none of the tone patterns involve the appearance of an h-contour in the reduplicant when no h-contour was present in the stem. Also, the fact that stop-codas may only co-occur with the h-contour tones further supports the argument that the h-contour is the default contour.

While this approach deviates from most representations of tone in Asian languages, there is evidence to suggest that some languages may specify for low tone. Kim (1999) proposes that low pitch must be specified in the Neruda dialect of Japanese in order to account for tonal differences between that dialect and the Tokyo dialect. Once low tone is specified in the Neruda dialect, the phonology is easily accounted for. With this precedence in mind, it is then not such a leap to assume that the l-contour is specified in Vietnamese.

Once the linearization process has occurred the floating l-contour is somewhere between the base and the reduplicant. It then associates to the left, attaching to the rhyme of the reduplicant. The base then receives the default contour. This analysis assumes that the segments are already associated with a register and are unspecified only for contour.

(35) l

$\# \rightarrow s \rightarrow a \rightarrow m \rightarrow \%$

l h

$\# \rightarrow s \rightarrow a \rightarrow m \rightarrow s \rightarrow a \rightarrow m \rightarrow \%$

While the current representation doesn't seem to support this analysis of a "floating contour", there is precedence for such a concept. Raimy and Harrison (2004) use similar floating vowels to account for certain patterns of vowel harmony in reduplication in Tuvan.

While this analysis works nicely for some of the data it has difficulty in accounting for other parts of the data. Even the other so-called TETU patterns which involve a stem with lh-contour are problematic for the above analysis given that the lh-contour is not the default and therefore would need to be specified along with the l-contour on the reduplicant. However, this analysis would require the contours to spread in two different directions.

In order to account for the other patterns, a different representation of tone will be adopted that involves using Simplified Bracketed Grid. (Idsardi 1992) This representation requires two slots for tone and, in fact, Bao argues that this is actually the case with all East Asian tone languages. (Bao 1999) Under this representation, it will be assumed that the TBU is the mora—as argued by Bao—and not the syllable—as argued by Yip. (Bao 1999, Yip 1995) If low register is specified by a right parenthesis ")" and it is still assumed that the h-contour is the default then the contours would be represented as the following:

(36)	l-contour	* *)
	lh-contour	*) *
	h-contour	* *

It will be assumed that the low register is the default and that the high register is specified and is represented by a left parenthesis "(". The registers would be represented as the following:

(37) High Register (* *

Low Register * *

All six tones would then be represented as follows:

(38)

Register	Contour: l	h	lh
High	(* *)	(* *	(*)*
Low	* *)	* *	*) *

Under this new representation the data for which the floating l-contour was invoked can be accounted for by substituting a right parenthesis ")" for the l-contour. The right parenthesis ")", like the floating l-contour proposed earlier, is part of the reduplication loop. After the linearization process the right parenthesis ")" is between the reduplicant and the base and thus associates to the reduplicant, causing the different tone pattern. (Raimy p.c.)

(39) sám → sam sám

(+H, h) → (+H, l) (+H, h)

(* *   (* *)   (* *

→ s → a → m → %   → # → s → a → m → s → a → m → %

)

Again, the register is already associated and thus is copied along with the segments. This representation can be applied to the other TETU patterns as follows:

(40) chậm → chầm chậm

(-H, h) → (-H, l) (-H, h)

)

* * → * *) * *

The lh-contour tones work in a similar way if one assumes that *) *) is equivalent to * *). While the phonological representations may differ, their phonetic realizations will be equivalent and thus the two representations will be used interchangeably.

(41) lỏng → long-lỏng

(+H, lh) → (+H, l) (+H, lh)

)

(*) * → (*) *) (*) * → (* *) (*) *

(42) loãng → loàng loãng

(-H, lh) → (-H, l) (-H, lh)

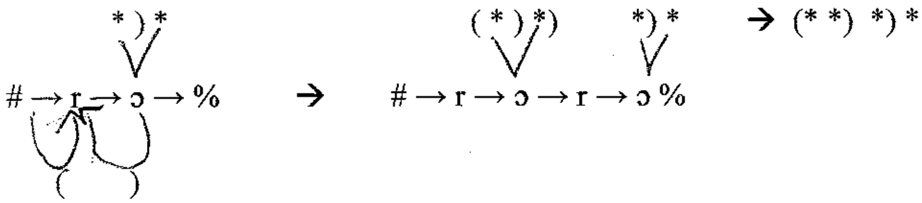
)

*) * → *) *) *) * → * *) *) *

The above patterns all account for Vu's TETU reduplication. The test then becomes whether this analysis can be applied to other patterns of reduplication. Patterns in which the register and contour change can still be accounted for by specifying both a register and a contour and using two loops in the precedence structure. The register is specified on a loop that applies to the beginning of the precedence structure and thus only applies to the first TBU. Then, another reduplication loop is added that specifies for contour and causes a loop in all of the segments. (Raimy, p.c.)

(43) rõ → ro-rõ

(-H, lh) → (+H, l) (-H, lh)



Patterns (E) and (F), detailed in the Background section, pose an interesting problem. Though the tone of the stem differs in each pattern, the tone pattern in the reduplicated form is the same. Though not a very eloquent analysis, a possible explanation could be that the register of the stem in pattern (E) is deleted before the reduplication loop applies and then after reduplication the register is specified for the reduplicant while the base assumes the default register. This particular pattern would require two loops, similar to the pattern above. The first loop would apply only to the beginning of the precedence structure and would contain a left parenthesis for register, while the second loop would apply to the whole precedence structure and would not specify for anything. (Raimy, p.c.) In practice this analysis would look like the following:

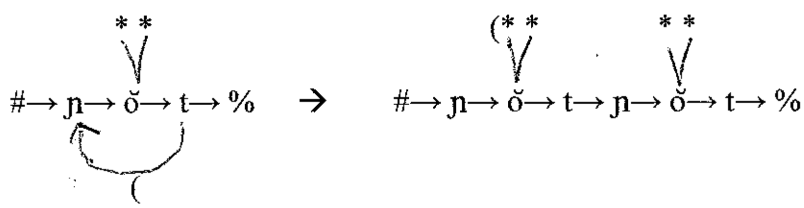
(44) nhớt → nhớt-nhợt

(+H, h) → (+H, h) (-H, h)

Register deletion in stem:

(* * → * *

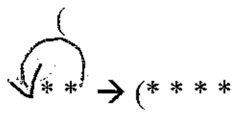
Reduplication loop with floating left bracket applies:



A similar analysis can be adopted for the pattern (F) in which the reduplicated form is the same, but the stem has an unspecified register. In this case, there is no initial register-deletion rule, but the same initial loop with a specified register applies:

(45) bự → bứ-bự

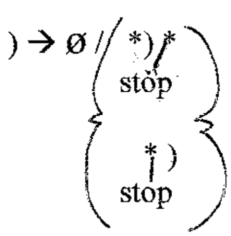
(-H, h) → (+H, h) (-H, h)



This analysis, unlike the OT analysis, has the advantage of explaining both the semantic and phonological similarity of these two reduplicated forms since the same loop applies to both stems—the only difference being the register deletion.

The current analysis should be able to account for the stop-nasal alternation in the so-called TETU patterns. Both Nhan (1984) and Thompson (1965) argue that syllables with a stop in the coda can only co-occur with tones with an h-contour, thus indicating that this is a pattern of the language in general and not specific to reduplication. If we assume that there is a cyclic rule that requires stop-codas to adopt the unspecified contour and a post-cyclic rule in the language that changes stops to nasals when in an environment other than the h-contour tones, then the data is easily accounted for. These rules would be formalized as follows:

(46) Cyclic Rule:



(47) Post-Cyclic Rule:

$$\text{Stop} \rightarrow \text{Nasal} \,/\, \left\{ \begin{array}{c} *)\ \underset{\text{stop}}{\overset{*}{|}} \\ \\ *\ \underset{\text{stop}}{\overset{*}{|}}) \end{array} \right\}$$

After the cyclic rule, the reduplication applies and the new tone pattern triggers the post-cyclic rule.

While there are possibly other productive patterns of tone change in reduplication as noted earlier, this work will be left for future studies.

This analysis has implications for the autosegmental representation of tone. If there are cases in which register and contour work independently of one another (as is the case with the tone change patterns identified here) then this implies that contour and register must be independent in an autosegmental representation of tone. This is not predicted to happen under several theories of Asian tones, including Yip (1995). However, Bao (1999) notes that this would be predictable under a representation of tone in which register and contour are sister nodes. The data given here would seem to support this approach.

Conclusion

Both theories are effective in some capacity in accounting for the data. Though Vu only accounts for four of the tone change patterns, an Optimality Theory approach could account for the other patterns if necessary. As a result of the nature of the data, however, both Optimality Theory and the Minimalist Approach rely somewhat on caveats and solutions that are less than perfectly orderly. Ultimately, however, the Minimalist Approach proves more appealing given that it does not need to rely on co-phonologies or reduplication-specific mechanisms, and is able to account for the data with fewer stipulations than Optimality Theory.

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