

Multiple Exponence in Non-inflectional Morphology

by

Sunghwa Lee

BA, Busan National University, 1987

MA, York University, 2004

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of

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in the Department of Linguistics

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Abstract

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This dissertation examines multiple exponence (ME) phenomena in the non-inflectional morphology of three languages: Nuu-chah-nulth (Wakashan), Central Yup'ik (Eskimo), and Korean (language isolate or Altaic). These languages exhibit a common property: ME comprised of a non-inflectional suffix and one or more base modifications. The base modifications involve a vowel length change and reduplication in Nuu-chah-nulth, various types of deletion in Central Yup'ik, and vowel shortening in Korean.

This dissertation pursues four research questions: (1) what criteria diagnose morphophonological alternations as ME and do the criteria apply to all cases of ME to the same degree? (2) Does derivational ME differ from inflectional ME? (3) Does one exponent play a more significant role in expressing semantic/syntactic information than another? (4) How is derivational ME formally accounted for?

In pursuit of these research questions, this study proposes, based on Matthews's (1972) study, four criteria to distinguish ME from other phonological alternations. Only the two criteria, *Non-phonological condition* and *Consistent co-occurrence* are obligatory; two others, *Phonological Consistency* and *No exceptions on base selection*, may be violated, suggesting that ME parameters occur along a continuum. This dissertation also proposes derivational classes according to patterns of base modification. Derivational classes play an important role in formulating Word Formation Rules (WFRs), in that they provide the morphological conditions for the structural description of base modification rules. Significantly, semantic/syntactic information is encoded in suffixation, capturing the fact that the large number of meanings that suffixes carry (approximately 500) cannot be mapped onto a limited number of base modifications (ranging from two to fourteen). The evidence that suffixes convey meaning supports the

claim that ME requires two different types of WFR, a suffixation rule that conveys semantic/syntactic information, and base modification rules that do not. Also, this study suggests that suffixes are the main exponent of ME because they make the main contribution to the meanings conveyed through ME.

This study contributes to a theory of morphology not only in that seemingly distinct processes receive a unified analysis as ME, but also in that the distinct processes are formally accounted for, expanding the WP approach to derivational morphology.

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Abbreviations

1	first person
2	second person
3	third person
ACC	accusative
AH	addressee honorific
APPL	applicative
BFR	buffer consonant
CAS	causal connective
CAUS	causative
CER	certainty
CLT	clause-type
CON	connective
DC	declarative sentence-type suffix
DEF	definite
DEIC	deictic
DIM	diminutive
DIST	distributive
DUR	durative
FUT	future
GRAD	graduative
INC	inchoative
IND	indicative
INF	inferential
INT	intransitive
MD	mood
MDL	modal expressions
MOM	momentaneous
N	nominative
NEG	negation
NOM	nominaliser
PASS	passive
PERF	perfective
PL	plural
POSS	possessive
PRO	pronoun
PST	past tense
RED	reduplication
QUO	quotative
REF	referential base
REL	relative
REP.ITE	repetitive iterative
S	single argument of canonical intransitive verb
SENT	sentence-type
SEQ	sequential

SH	subject honorific
SPO.ITE	sporadic iterative
TEL	telic
TEM	temporal
TRN	transitive
VLA	vowel length adjustment

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Dedication

*I would like to dedicate this dissertation to my daughters, Heejung and Sojeong,
who literally grew up with my Ph.D. studies.*

CHAPTER 1 Introduction

This dissertation is a study of base-internal modifications (base modifications henceforth) accompanied by suffixes. The base modifications in the current study, whether they are adjacent to a suffix or not, always occur with a suffix. Therefore, the alternations are arguably morphologically conditioned. For instance, in Nuu-chah-nulth (a Wakashan language), a base vowel is lengthened when certain suffixes are added to the base (e.g., *ʔu-yuk-ʔiš* → *ʔuuyukʔiš* 'on the head'). The same vowel in the base, *ʔu-* is not lengthened when other suffixes are affixed (e.g., *ʔu-yúk-šič* → *ʔuyúksič* 'be an offspring of sb'). The vowel lengthening in Nuu-chah-nulth is one example of morphophonological alternations that have been observed cross-linguistically. A special property of this alternation, however, is that vowel lengthening is not phonologically conditioned. The two examples above are very similar in terms of prosodic constituents and segmental environment. There is no evidence that the base vowel in *ʔuuyukʔiš* is lengthened in order to build a well-formed foot, since *ʔuyúksič* shows the same foot structure as *ʔuyukʔiš*. Also, there is no evidence that the base vowel length alternation occurs due to the particular phonotactics of Nuu-chah-nulth, as the segmental composition of the two forms (*ʔuuyuk* vs. *ʔuyúk*) is the same except for the glottalized sonorant, *y̥*. This non-phonologically conditioned vowel length adjustment (VLA) does not accord with the well-known assumption that vowel lengthening/ shortening occurs to build well-formed foot shapes (Kager 1993; Hayes 1985, 1987, 1995; McCarthy and Prince 1990, among others).

Morphophonological alternations that are not associated with phonological conditioning, such as vowel length adjustment in Nuu-chah-nulth, need to be considered

separately from phonologically conditioned morphophonological alternations. Finnish assibilation is a case in which base modification is triggered by a suffix, but the phonological environment plays an important role in the presence/absence of the alternation. In Finnish /t/ becomes /s/ when followed by the past tense affix *-i*, as in (1a). This assibilation process, however, does not occur when /t/ is followed by an affix other than the affix *-i* (1b) or when the segment *i* is not an affix (1c).

- (1) a. /halut-i/ → [halusi] ‘want-PST’
 b. /halut-a/ → [haluta] ‘want-INFINITIVE’
 c. /koti/ → [koti] *[kosi] ‘home’
 (Kiparsky 1973 cited in Wolf, 2008:6)

In Finnish, the base modification occurs in a certain phonological environment (i.e., between vowels when the following vowel is a high front vowel) and is conditioned morphologically (i.e., the high front vowel must be a suffix). Thus, assibilation in Finnish is a morphologically motivated phonological process.

In this dissertation, I argue that the two types of morphophonological alternation are distinct and I propose that a triggering suffix and a non-phonologically conditioned base modification (e.g., vowel lengthening in Nuu-chah-nulth) together constitute Multiple Exponence (ME). ME or extended exponence (Alderete, 2001a, b; Anderson, 2001; Caballero, 2008; Harris, 2009; Matthews, 1972, 1991; Zwicky, 1988; Xu, 2007, among others) refers to a phenomenon in which two or more exponents are used simultaneously to express a particular morphosyntactic value in a word. Herein, the term *exponent* refers to the phonological representation of a morphosyntactic property (Matthews, 1972).

This dissertation examines ME phenomena observed in the non-inflectional morphology of three languages that belong to distinct language families: Nuu-chah-nulth

(Wakashan), Central Yup'ik (Eskimo), and Korean (considered by some linguists to be a language isolate and as Altaic by others). These three languages exhibit a common property: ME comprised of a non-inflectional suffix and one or more base modifications. The base modifications involve a vowel length change and reduplication in Nuu-chah-nulth, various types of deletion in Central Yup'ik, and vowel shortening in Korean. Non-inflectional morphology here refers to canonical derivational morphology (e.g., morphology that changes a word-class and/or linguistic units with lexical-like meanings) and Aspect (see § 3.2.3 for reasoning)¹. In what follows, examples of non-inflectional ME in each language are provided.

First, in Nuu-chah-nulth, the initial consonant and vowel of the base are copied, as in (2a), or the whole lexical base of a monosyllabic lexical base is reduplicated, as in (2b). A lexical base, i.e., a root in the morphemic approach, refers to a linguistic unit to which no affixes are added. The copied segments are attached to the leftmost edge of the lexical base. Note that the reduplication always occurs with certain lexical suffixes or aspectual suffixes.

(2) Reduplication in Nuu-chah-nulth (Fieldwork, 2006)

- a. ta-taanaqayukʔiʃ
 RED-taana-qa-yuk [R]²-ʔiʃ
 RED-money-for-to.cry-3S.IND
 's/he is pouting for money'
- b. miitxmiitxaʔiʃ
 RED- mitx-(y)a³[RL+L]-ʔiʃ
 RED-to.spin-REP.ITE-3S.IND
 's/he spins repeatedly.'

¹ Derivational morphology is sometimes used as the cover term for non-inflectional morphology.

² [R] denotes that the suffix triggers reduplication

³ -ya occurs after vowels, and -a occurs after consonants.

Besides reduplication, when certain lexical suffixes or aspectual suffixes are added, the vowel in the first syllable (3a), the second syllable (3b), or both syllables (3c) may be lengthened depending on the suffix added. Other vowels are not affected. Vowel length change may occur concomitantly with reduplication, as seen in (3b) and (3c).

- (3) Vowel length change in Nuu-chah-nulth (Fieldwork: 2006)
- a. Vowel lengthening in the first syllable
 ʔuuk^wiɬči⁴ ʔaʔaatuu ʔumʔi
 ʔu-čiɬ [L]⁵-či ʔaʔaatuu ʔumʔi
 REF-doing.to-2S.IMP ask mom
 ‘Ask your mom.’
- b. Vowel lengthening in the second syllable (with reduplication)
 ʔuʔuu^wyukʔiš Ken
 RED ʔu-yuk [R+L]-ʔiš Ken
 RED REF-to.cry-3S.IND Ken
 ‘Ken is crying.’
- c. Vowel lengthening in the first and second syllable (with reduplication)
 ʔuuʔuuk^wiɬʔiš Ken
 RED-ʔu-čiɬ [RL+L]-ʔiš Ken
 RED REF-to.blame-3S.IND Ken
 ‘Ken is blaming ’

In Central Yup’ik, segments are deleted when followed by particular suffixes. For example, in (4a), a consonant undergoes deletion when the suffix, *-neq* ‘the activity’ is added. In some cases, a base-final sequence of vowel and consonant is deleted, as seen in (4b). These processes are always accompanied by certain suffixes that have lexical-like

⁴ č in čɬ ‘doing’ becomes *k^w* after a round vowel-final stem.

⁵ [L] denotes that the suffix triggers vowel lengthening in the base; [R+L] reduplication and vowel lengthening in the base; [RL+L] reduplication and vowel lengthening in the reduplicant as well as in the base.

meanings, such as *-neq* ‘activity’ and *-ir* ‘occurring’, as shown below (deleted segments are indicated in bold).

- (4) Yup’ik (Jacobson 1984)
- a. Consonant deletion
 ayaneq
 ayag–neq
 to.leave-the.activity
 ‘leaving, departure’

 - b. Vowel and consonant sequence deletion
 agluryirtuq
 aglury**aq**-ir-(g/t)uq
 rainbow-occurring-3S.IND.TRN
 ‘There is a rainbow.’

In Korean, a base vowel undergoes vowel shortening when followed by certain suffixes, such as *-li* ‘causative marker’ and *-i* ‘nominalizer’, as can be seen in (5).

- (5) Korean: Vowel shortening
- a. **salli**
sa:l-li
 live-CAUS
 ‘save’

 - b. **keli**
ke:l-i
 hang-NOM
 ‘hanger’

All the cases above show that base modification co-occurs with a suffix. Previous studies on above mentioned processes (Davidson, 2002; Kim, 2003a; Sapir and Swadesh, 1939; Stonham, 20004; Huh, 1965; and Martin, 1992, among others) consider them to be triggered by suffixes. I propose that the base modifications co-occur with suffixes *as a part of multiple exponence*. I describe such processes as being ‘accompanied by’, rather

than ‘triggered by’ suffixes, so that the base modifications in ME can be acknowledged as having a status that is equivalent or near-equivalent to that of suffixes, rather than involving a process separate from suffixation.

In order to distinguish ME from phonologically conditioned morphophonological processes such as Finnish assibilation, it is important to establish a set of criteria to diagnose ME. I propose the following criteria based on Matthews’s (1972) study to distinguish ME from other morphologically conditioned phonological processes.

(6) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

- (i) ***Non-phonological condition***: no exponents are phonologically conditioned;
- (ii) ***Consistent co-occurrence***: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) ***Phonological consistency***: phonological representations of the co-occurring exponents are consistent.
- (iv) ***No exceptions on base selection***: an exponent may appear on any lexical base of a morphological category.

One of the crucial criteria among the four proposed above is that an exponent (base modification) must not be phonologically conditioned. This essential criterion is intended to clearly distinguish between base modifications that occur as part of ME and base modifications that result from phonologically conditioned morphophonological processes. Another crucial criterion, *Consistent co-occurrence* is obligatory in that it is defining property of ME. The other two criteria (i.e., *Phonological consistency* and *No exceptions on base selection*) may be violated in some cases. In this sense, parameters to

determine ME may vary to some degree, depending on processes or/and languages. These patterns will be examined through the three case studies.

In addition to testing the above-proposed criteria for ME, this study examines and characterizes non-inflectional ME, especially those types that comprise alternation(s) and a derivational affix. Since instances of ME in this dissertation include internal-base modification and affixation, one might wonder whether both exponents play the same role in expressing ME. In other words, one exponent may contribute more significantly to the syntactic and/or semantic expression of ME than others. If so, we may classify the exponents as ‘main’ versus ‘subsidiary’, adopting the terms used by Matthews (1991). Also, this dissertation identifies a morphological model to best account for ME—a significant challenge, given that alternations include both reduplication and subtractive morphology.

In summary, the research questions pursued in this dissertation are as follows:

- (i) What criteria diagnose morphophonological alternations as ME? Do the criteria apply to all cases of ME to the same degree?
- (ii) Does derivational ME differ from inflectional ME? In other words, what are the characteristics of derivational ME?
- (iii) Does one exponent play a more significant role in expressing semantic and syntactic information than another? If so, is it necessary to distinguish between main and subsidiary exponents?
- (iv) How is derivational ME formally accounted for?

As for the first research question, the criteria for ME are proposed by examining the study of Matthews (1972), as mentioned earlier. Also, three case studies reveal that

the criteria *Non-phonological condition* and *Consistent co-occurrence* must be satisfied for an alternation to be considered as ME. The other two criteria, *Phonological consistency* and *No exceptions on base selection* are not always observed. The following are the other main claims of the dissertation.

First, examination of the morphology of the three languages reveals some key characteristics of derivational classes (§ 2.3.1). Building on previous studies that group derivational classes according to the types of base modification (Alderete, 2001a, b; Aronoff, 1976; Kiparsky, 1982, 1985, among others), this study suggests one useful way to identify derivational classes in languages that exhibit ME in derivational morphology: derivational classes are organized according to the shapes of base-internal modification. By this definition, there are similarities and differences between inflectional classes and derivational classes. Inflectional and derivational morphology are similar in that classes are identified by phonological shapes. Inflectional classes are identified by the phonological shapes of inflection markers (e.g., English past tense [t], [d], or [əd]), and the derivational classes in the current study are identified by phonological modifications of the base (e.g., Nuu-chah-nulth [R], [R+L], or [RL+L]), as demonstrated in (3) above). By contrast, the nature of the forms that cluster into classes differs significantly. An inflectional class refers to a group of *lexemes* that contain phonologically identical inflection markers (e.g., in English, verbs that belong to a class that form the past tense via the inflectional marker [t]: *bake*, *walk*, *cook*, etc). However, in this study, a derivational class consists of a group of *affixes* that accompany non-phonologically conditioned base modifications (e.g., affixes that belong to Class II in Nuu-chah-nulth: – *miik^w* 'getter of', –*panač* 'moving around', –*h^wink^w* 'use'). Derivational classes are

identified by patterns of base modification, so the number of classes is equivalent to the number of attested non-phonologically conditioned base modifications in each language. Fourteen, six, and two classes are proposed in Nuu-chah-nulth, Central Yup'ik, and Korean, respectively.

Identifying derivational classes has significant implications for a formal analysis. This method provides the basis for having two different types of Word Formation Rule (WFR), since the two elements of ME (i.e., suffixation and base modification) differ in terms of the presence or absence of semantic/syntactic information: suffixes carry such information, whereas base modifications do not. Given that any one base modification may co-occur with a variety of possible suffixes (e.g., In Nuu-chah-nulth, base vowel lengthening (Class 2) may co-occur with any of approximately 120 suffixes), it is unlikely that base modifications contain the same semantic/syntactic information as suffixes. Therefore, two different types of WFR are proposed: suffixation rules with semantic/syntactic information and base modification rules with no such information. In addition, as will be discussed in Chapter 2, affix classes play an important role in formulating WFRs, in that they provide the morphological conditions for the rules.

Second, in relation to the two components of derivational ME, I propose that the main exponent is a suffix and the subsidiary exponent is a base alternation (§ 2.2.3). I claim that the main exponent is the one that provides semantic and syntactic information, such as meaning and morphological category. As discussed above, in this study, suffixation mainly delivers such information. In addition, affixation is less marked than base modification cross-linguistically (Dressler, 2005). For these reasons, I propose that suffixation is the main exponent and base modification the subsidiary exponent. Section

2.2.3 also discusses other studies in which the distinction between the main exponent and the subsidiary exponent is not straightforward.

Third, the Word-and-Paradigm (WP) model (Anderson, 1992; Matthews, 1991), the theoretical framework for this dissertation, has a few advantages over other morphological models, both conceptually and practically. Firstly, the WP model considers a word or a stem as a unit of word formation. Thus, conceptually, this definition makes it possible to see a combination of co-occurring base modification(s) and suffix as a single constituent, rather than as separate morphemes. Secondly, the WP model does not restrict the number of applications of WFRs that can apply to a single form. Practically, this characteristic makes it possible to account for the realization of more than one exponent. Thirdly, the WP model can properly account for a phenomenon observed in Nuu-chah-nulth. In Nuu-chah-nulth, reduplication or vowel lengthening occurs only once, even when there are two or more triggering suffixes in the same form (§ 3.4.2), preventing the occurrence of double reduplication or a triple-long vowel. For instance, the base is reduplicated only once in (7a), although both *-yimʔ* and *-apa* accompany reduplication when used individually. In (7b), vowel lengthening occurs only once in the base, along with reduplication.

(7) Multiple occurrence of suffixes (Rose, 1981: 341-342)

- a. m̩aam̩aaʔyimʔap
 RED m̩aʔ-yimʔ [R]-apa [RL+L]
 cold-at.shoulder-really
 'He is really cold in the shoulders.'
- b. ʔuuʔuuk^waʔap
 RED ʔuk-aaʔuʔ [R+L]-apa [RL+L]
 broad-at.leg-really
 'His legs are really big'

The WP model adopted in the current study is able to derive the attested forms (§ 3.5.2.2), while other models, particularly templatic approaches (Kim, 2003b; Davidson, 2001; Stonham, 2004), have difficulty in formally accounting for this aspect of ME in Nuu-chah-nulth, violating the Template satisfaction condition (McCarthy and Prince, 1990) of prosodic morphology. Stonham's (2007) Stratal OT account successfully explains the occurrence/inactivity of double reduplication. However, the analysis has difficulty accounting for the patterns of base modification. Thus, empirically, the WP model demonstrates its superiority over other models (§ 2.5).

Lastly, the case studies of three languages (Nuu-chah-nulth, Chapter 3; Central Yup'ik, Chapter 4; Korean, Chapter 5) examine parts of the morphology and phonology of each language, with particular focus on base modification and triggering suffixes. These case studies are significant both theoretically and practically. From a theoretical perspective, this study is innovative in that distinct processes in each language receive a unified explanation in terms of ME. Processes observed in the case studies (i.e., reduplication, VLA, and deletions) that might seem to differ between the languages are shown to be similar in terms of motivation. Also, while the attested languages belong to distinct language families, the WP framework is able to provide a unified analysis of the observed phenomena as ME. From a practical perspective, it is hoped that the current morphophonological study contributes to increased understanding of two less-studied languages (Nuu-chah-nulth and Central Yup'ik). Also, since the Korean vowel length contrast has almost disappeared, this study plays a role in documenting the process of base vowel shortening.

The remainder of this dissertation is structured as follows. Chapter 2 examines the phenomenon of ME and suggests criteria to diagnose ME. Features of derivational ME are also explored. Morphological models for a formal account of the attested ME are examined. Based on the features of derivational ME, it is proposed that the WP model serves best for a formal analysis. A WP analysis for derivational ME is illustrated.

Chapter 3 presents patterns of ME attested in Nuu-chah-nulth. Various types of base modification (e.g., reduplication, VLA, reduplication plus vowel lengthening, etc.) occurring with lexical suffixes in Nuu-chah-nulth are examined according to the criteria established in Chapter 2. Fourteen derivational classes are proposed in accordance with patterns of base modification. Two types of WFR (i.e., one for suffixation and the other for base modification) are identified and given a formal analysis within WP. In particular, it is demonstrated that the WP model is effective in accounting for the multiple occurrence of triggering suffixes and the patterns of the accompanying modification, which, to date, no morphological models have successfully addressed.

Chapter 4 examines postbases and suffix-triggered deletions in Central Yup'ik. Several varieties of base modifications occur in this language, including different types of deletion (e.g., final consonant deletion, or *te*-verb deletion). This subtractive form of ME provides evidence that undermines Kurisu's (2001) OT analysis. Based on the observation that instances of ME meet the established criteria to varying degrees, I argue that the parameters for ME are structured along a continuum. Six derivational classes are proposed and ME are formally analyzed within the WP framework.

Chapter 5 explores Korean vowel shortening (VS) in verb or adjective bases. I propose that base VS in inflectional morphology and base VS in derivational morphology

should be treated differently: VS in inflectional morphology is a phonologically conditioned process, whereas VS in derivational morphology is an instance of ME. I argue that discrepancies in the analysis of base VS in previous literature stem from a lack of awareness of different functions at two levels of the morphology. I provide a formal account that is consistent with the other case studies in this dissertation within the framework of WP.

Finally, Chapter 6 summarizes this dissertation and presents contribution of the current study to a theory of word formation and to the languages studied.

CHAPTER 2 Multiple Exponence in Non-inflectional Morphology

2.1 Introduction

The main goal of this chapter is to examine properties of non-inflectional multiple exponence (ME) and to provide a formal morphological model to account for non-inflectional ME. Since Matthews's (1972) study of Latin, in which he identified ME (extended exponence in Matthews' term), many cases of ME in inflectional morphology have been reported (Cable, 2010; Harris, 2009; Noyer, 1997; Stump, 2001; Xu, 2007, among many others). In contrast to studies of inflection, which have received considerable attention, the issue of ME in derivational morphology has only recently come into focus (Caballero, 2008, 2011, Caballero and Harris, 2012). In their typological study of ME, Caballero and Harris (2012: 168) suggest expanding the definition of ME by including the derivational category as follows:

- (1) Multiple (or extended) exponence is the occurrence of multiple realizations of a single feature, bundle of features, or derivational category in more than one position in a domain.

In Caballero and Harris's study, most instances of derivational ME exhibit valence-change morphology, such as causative or applicative. Examples in (2) illustrate causative (2a) and applicative (2b) in Choguita Rarámuri (an Uto-Aztecan language). Also, the phenomena of derivational ME observed in their study involve mostly two affixes (e.g., *-r-ti* and *-n-ki*).

(2) a. ne mi haré wási ko'í-**r-ti**-ma orá
 1S.N 2S.ACC some cows kill.PL-CAUS-CAUS-FUT.S CER
 'I will make you kill some cows'

b. ne mi sú-**n-ki**-ma sipúcha
 1S.N 2S.A sew-APPL-APPL-FUT.S skirt
 'I will sew a skirt for you'

(Caballero, 2011: 7-8)

In contrast to the cases examined by Caballero and Harris, the cases of non-inflectional ME in this dissertation differ in that all instances of ME involve particular base modifications and their accompanying affixes. Importantly, the base modifications discussed here are not phonologically conditioned. The criterion *Non-phonological condition* is indispensable and draws a sharp distinction between morphophonological alternations as ME and phonologically conditioned morphophonological alternations, which are not ME.

The remainder of this chapter is organized as follows. §2.2 describes the phenomenon of ME, using Matthews's (1972) examples of inflectional ME in Latin and proposes four criteria to diagnose ME. §2.3 examines inflectional ME. §2.4 explores two properties of derivational ME. First, *derivational classes* are proposed according to observed patterns of base modification accompanied by suffixes. Second, the distinction proposed in this study between main exponent and subsidiary exponent is explained. Suffixation is referred to as a main exponent, while base modifications are considered as subsidiary exponents. §2.5 examines morphological models that may (or may not) work for derivational ME. Since this study involves ME that includes reduplication and subtractive morphology (deletion), it is very challenging to find a proper formal vessel to account for all the attested data. I propose that a Word-and-Paradigm (WP) approach

employing Word Formation Rules (WFRs) is such a model. Item-and-Arrangement and Item-and-Process approaches are critically reviewed. §2.6 demonstrates how a WP model using WFRs works in derivational morphology. WFRs are useful tools to account for reduplication, vowel lengthening/shortening, and deletion. Also, I demonstrate that applying a set of WFRs to a single base makes it possible to account for ME. Finally, §2.7 summarizes and concludes the chapter.

2.2 ME in inflectional morphology and criteria for ME

With a view to developing diagnostic criteria for ME in derivation, this section examines ME in inflectional morphology, in which the definition of ME is well-established. The Latin perfective in Matthews's (1972) study is used to illustrate ME. Based on the examination of Matthews's study, I propose four criteria for ME that can be used for both inflectional and derivational morphology.

In his study of Latin, Matthews (1972) raises questions about the principle of one-to-one mapping between function and form. ME is a challenge to this principle, because it involves the occurrence of more forms than grammatical functions. As an illustration of the problem, consider *re:ksistis* 'you (pl) ruled'. The word *re:ksistis* can be segmented into units as illustrated below.

(3) /reg/⁶ 'rule' + Perfective + [2nd plural]
 | | |
 re:k + s + is + tis

⁶ /e/ in /reg/ undergoes vowel lengthening when followed by *g* and *s* or *t*; and /g/ becomes voiceless when followed by a voiceless consonant.

In this example, three units denote semantic or grammatical meaning, but there are four segmented units, including an extra unit *is* that seems not to be associated with any meaning. *-tis* refers to the 2nd plural (cf. *fer-tis* ‘you (pl) carry’). Also, *-s* appears to be the perfective suffix used independently, as it represents the perfective in *re:k-s-i*: ‘I ruled’. Consequently, *is* appears to be an instance of meaningless segments (i.e., an empty morph): it has a phonological form but no meaning.

However, Matthews points out that *is* is not an empty morph for the following reasons. First, *is* is not a series of epenthetic segments inserted for phonological reasons. We might consider the possibility that *is* is inserted before a suffix with a CVC structure or before a suffix that begins with a *t*; however, these segments do not appear before the CVC suffix in *re:k-s-i-mus* ‘we ruled’ or before the *t* in *re:k-s-i-t* ‘[he, etc.] ruled’. We might also assume that *is* is inserted before *tis*, 2nd plural altogether. However, this account is implausible, since *is* does not appear in the 2nd plural imperfective (*fer-tis* ‘you (pl) carry’). Rather, *is* always appears with the perfective paradigm, regardless of whether the perfective suffix is *s* (4a), *u* (4b), or zero-morph (4c and 4d).

- (4)
- | | | |
|----|----------------------|--------------------|
| a. | <i>re:k-s-is-tis</i> | ‘you (pl) ruled’ |
| b. | <i>mon-u-is-tis</i> | ‘you (pl) advised’ |
| c. | <i>tul-is-tis</i> | ‘you (pl) carried’ |
| d. | <i>kekin-is-tis</i> | ‘you (pl) sang’ |

Furthermore, as shown above, this sequence of segments *is* has the same phonological form in words with any verbal base, whether the verbs are monosyllabic (4a-c) or multisyllabic (4d). For these reasons, Matthews argues that *is* contributes to the expression of the perfective. In other words, *is* is a signal of the perfective; Matthews proposes that *s* and *is* in *re:ksistis* are multiple (extended) exponents that together encode the perfective.

To summarize, the segment sequence *is* is considered as one of the perfective exponents for the following reasons: (i) it is not phonologically conditioned; (ii) it always occurs with perfectives regardless of the shape of other perfective affixes; (iii) its phonological representation is invariant, and (iv) it can occur with any lexical base of the same morphological category (i.e., verbs in this case).

Based on the above line of reasoning, I propose four criteria for ME.

(5) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

- (i) ***Non-phonological condition***: no exponents are phonologically conditioned;
- (ii) ***Consistent co-occurrence***: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) ***Phonological consistency***: phonological representations of the co-occurring exponents are consistent.
- (iv) ***No exceptions on base selection***: an exponent may appear on any lexical base of a morphological category.

To explain each of the four criteria, the first criterion, *Non-phonological condition*, indicates that exponents of ME are not sensitive to the phonological environment of a form with which they occur. In other words, for instance, phonologically conditioned alternations are not part of ME. This criterion draws a sharp line between morphophonological alternations as ME and phonologically conditioned morphophonological alternations as non-ME.

The second criterion stipulates that exponents that signify a single function or meaning must invariably co-occur. One of the exponents may appear as an allomorph, but its co-occurrence must be regular. Thus, in the current study, an instance of apparent ME that shows an optional co-occurrence of two forms is not identified as ME. The first

two criteria in (i) and (ii) must be satisfied for a set of co-occurring forms to be identified as ME.

The third criterion, *Phonological consistency*, is satisfied when the phonological shapes of all exponents are invariant and regular. However, this criterion is not always met. For instance, in the above examples of Latin perfectives, an exponent of the perfective *is* is, on the one hand, phonologically consistent in the paradigm. On the other hand, other exponents of the perfective in (4) show phonological variations such as *s*, *u*, or zero-morph. Since not all exponents show phonological regularity, the criterion, *Phonological consistency* is not met in Latin perfectives. In other words, when a suffix or base modification appears as an allomorph, then the criterion is not satisfied.

The fourth criterion, *No exceptions on base selection* concerns the lexical base with which exponents occur. The term ‘lexical base’ refers to a linguistic unit to which derivational or aspectual markers are attached, a unit which is referred to as a root in Item-and-Arrangement models. If exponents occur with a given lexical category such as verbs or adjectives, then the same exponents can occur on any lexical bases of that lexical category. The case study of Central Yup'ik indicates that *Phonological consistency* and *No exceptions on base selection* do not apply for every case of ME. In short, the third and fourth criteria may or may not be satisfied.

2.3 Word and Paradigm in inflectional morphology

This section examines ME in inflectional morphology, focusing on Anderson's (1992) and Matthew's (1991) WP model for inflectional morphology. The purpose of this review

is to explore the fundamental principles of WP and to provide a basis for understanding the derivational WP model employed in the current study, which will be discussed in §2.6.

2.3.1 Inflectional classes

This subsection defines inflectional classes and how they are organized, since class information plays an important role in the formulation of WFRs.

An inflectional class refers to a set of lexemes that employ phonologically identical inflectional markers. A lexeme here is an abstract unit of vocabulary that shares a common meaning (e.g., the lexeme COME: *come, came, comes, coming*). English verbs, as illustrated in (6), can be organized into classes by means of past tense conjugation.

(6)	Present	Past
	Class I	
a.	bake	baked
	walk	walked
	cook	cooked
b.	Class II	
	break	broke
	speak	spoke
	steal	stole
c.	Class III	
	beat	beat
	bet	bet
	cut	cut
d.	Class IV	
	catch	caught
	buy	bought
	bring	brought

As an illustration (note that this is not an exhaustive classification), Class I is assigned for regular verbs (6a); Class II for vowel modification (6b); Class III for no markers (6c); and Class IV for vowel modification and [t], i.e., multiple exponence.

The class information is encoded on the lexeme and is provided in the morphological description of a WFR, an issue that will be discussed in the following subsection.

2.3.2 Word Formation Rules, Blocks, and Rule ordering

This subsection discusses components of WFRs in inflectional morphology and how WFRs operate on stems to derive surface forms. A WFR comprises two components, as illustrated in (7): the Structural Description (SD), which specifies the base to which a given rule applies; and the Structural Change (SC), which stipulates how the base is altered. Details of the two components are as follows.

(7) Schema of inflectional WFRs

$$\left[\begin{array}{c} \text{MSD} \\ \text{SC} \end{array} \right] \quad /X/ \quad \rightarrow \quad /Xn/$$

(a) **Structural Description:**

Morphosyntactic Description
(MSD:) e.g., *Classes of lexemes,*
Tense, Case, Person, Plurality, etc
Phonological Description:
The base is X

(b) **Structural Change :**

Phonological Change:
e.g., *The base X becomes Xn*

As seen in (7a), the SD of inflectional WFRs contains two types of description: a morphosyntactic description and a phonological description. Assuming that inflectional morphology has access to syntax, Anderson (1992) proposes that each word is associated

with a morphosyntactic description that characterizes the properties expressed by the word. Features in the morphosyntactic description that are available to syntactic rules may include class information, tense, case, person, plurality, and so on. In the case of English verbs shown above, the relevant features included in the SD would be class and tense. The phonological description specifies the phonological representation of the stem to which the rule applies. X here denotes a variable of a stem.

The Structural Change (SC) in (7b), includes only information on phonological change, since nothing in the morphological description changes. The stem X above has been changed to Xn , which in this case denotes a variable of inflection.

To illustrate how WFRs derive surface forms, I will again use the (non-exhaustive) example of the English past tense paradigms in (6). For the past tense formation, four WFRs are required. Rule 1 accounts for Class I and Class IV verbs, where verbs are inflected with /t/ for past tense. In the phonological condition of Rule 2, C_n denotes any sequence of consonant. The rule specifies that a vowel occurring between any consonants becomes [ou] and crucially applies to Class II. Rule 3, which applies to Class III, shows that there is no phonological change. Rule 4 contains two changes: a vowel becomes [ɔ:] and any consonants following the vowel are deleted. This rule applies to Class IV.

(8) Rule 1

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class I, Class IV} \end{array} \right]$$

$$/X/ \rightarrow /Xt/$$

(9) Rule 2

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class II} \end{array} \right]$$

$$/X/ = /C_nVC_n/ \rightarrow /C_nouC_n/$$

(10) Rule 3

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class III} \end{array} \right]$$

$$/X/ \rightarrow /X/$$

(11) Rule 4

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class IV} \end{array} \right]$$

$$/X/ = /C_nVC_n/ \rightarrow /C_n\text{ɔ:}/$$

These rules are organized into *blocks* (Anderson, 1986, 1992). This device prevents the application of some rules and at the same time may allow two or more rules to operate on the same base. On the one hand, rules that belong to the same block are disjunctively ordered, so they never apply to the same base. The four rules above, for instance, are organized into two blocks. Rule 1, Rule 2, and Rule 3 belong to the same block, since each rule applies to a different morphological description; Rule 4 must be organized into a distinct block. The *elsewhere principle*, which blocks the application of a more general rule when a more specific rule is applied (Anderson, 1992: 132, Kiparsky, 1973), plays an important role within the same block. Among the three rules in the same block, when a more specific rule, Rule 2 or Rule 3 is applied, the regular past tense rule (Rule 1), which is more general, does not apply. On the other hand, rules in distinct blocks may apply to the same base. Rule 4 is in a distinct block from others in order to

derive Class IV verbs (the instance of ME), in which Rule 1 and Rule 4 apply to the same base. In this case, and others like it, rule ordering is crucial.

Using the four rules in (8)-(11), let us examine an instance of inflectional ME (Class IV), which involves two rules: Rule 1 and Rule 4. Class information is inherently embedded on the verb base. Rule ordering is important for this ME derivation: Rule 4 must apply prior to Rule 1 because a prior operation of Rule 1 will cause both consonants (/tʃ/ and /t/) to be deleted, resulting in the incorrect form */kɔ:/. This unacceptable form occurs when Rule 1 applies to the base, /kæʃt/, deriving /kæʃt/, to which Rule 4 then applies, deriving the ill-formed */kɔ:/.

(12) Derivation of Class IV

a. Rule 4

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class IV} \end{array} \right]$$

$$/X/ = /C_nVC_n/ \rightarrow /C_nɔ:/$$

Application of Rule 4

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class IV} \end{array} \right]$$

$$/kæʃt/ \rightarrow /kɔ:/$$

b. Rule 1

$$\left[\begin{array}{l} +\text{Past} \\ \text{Class I, Class IV} \end{array} \right]$$

$$/X/ \rightarrow /Xt/$$

Application of Rule 1

$$\left(\begin{array}{l} +\text{Past} \\ \text{Class IV} \end{array} \right)$$

$$/k\text{ɔ:}/ \rightarrow /k\text{ɔ:t}/$$

This subsection has briefly illustrated the application of the WP model of inflectional morphology. In what follows, the attributes of derivational ME observed in the case studies in this dissertation are examined. Also, I discuss how derivational ME differs from inflectional ME.

2.4 Two properties of multiple exponence in derivational morphology

This section explores two properties of derivational ME examined in the current study relating to the identification of classes and the distinction between main exponence and subsidiary exponence.

2.4.1 Classes of derivational affixes

In contrast to the topic of inflectional classes, which has been extensively examined in the literature, few discussions have focused on defining derivational classes. In her study of English morphology, Siegel (1974) proposed the division of English suffixes into two classes, based on the boundary distinction among suffixes presented in Chomsky and Halle (1968). Siegel classifies derivational suffixes in English according to whether a given affix causes stress shift (Class I: *-ity*, *-ion*, *-ate*, etc.) or not (Class II: *-ment*, *-ing*, *-ship*, etc.). This classification of English derivational suffixes has been acknowledged and

adopted by many scholars (Aronoff, 1976; Kiparsky, 1982, 1985, among others).

Alderete (2001a, b) also proposed that affixes can be classified according to whether or not they trigger a given process in the base, such as, for example, accenting, de-accenting, or accent shifting in Tokyo Japanese.

Building on previous work and with my observations of base modification patterns in derivational affixes in the three case studies in this dissertation, I suggest that derivational suffixes can be classified into groups in accordance with the type of base modification with which they occur. Thus, a derivational class can be defined as a set of affixes that are associated with the same derivational morphology. The derivational morphology used to identify derivational classes may differ across languages. As briefly mentioned above, English derivational classes are identified by the behaviour of suffixes, specifically in terms of whether or not they cause a stress shift by Siegel's (1974) classification. In the current study, the derivational morphology employed to identify derivational classes refers specifically to patterns of co-occurring base modification. This is one useful way to classify derivational affixes in languages that have derivational ME.

To illustrate the classification of derivational morphology, consider derivational affixes in Nuu-chah-nulth as an example. The affixes in (13) are grouped into a class if the suffixes accompany the same type of base modification.

(13) Derivational classes in Nuu-chah-nulth (not exhaustive)

Class 1	Suffixes with no base modification
Class 2	Lexical suffixes (LS) with vowel lengthening (VL) in the 1st σ
Class 3	LS with VL in the 1st σ and vowel shortening (VS) in the 2nd σ
Class 4	LS with VS both in the 1st and 2nd σ
Class 5	LS with reduplication (RED)
Class 6	LS with RED and VL in the 1st σ
Class 7	LS with RED and VL in the 2nd σ
Class 8	LS with RED and VL in both 1st σ and 2nd σ

A total of 14 Classes are suggested according to combinations of the above processes (See § 3.4.1). For instance, Class 1 is assigned to suffixes that do not accompany any base modification; Class 2 is assigned to lexical suffixes that accompany vowel lengthening in the first syllable, and so on.

The classification of derivational affixes and inflectional affixes is similar in some respects, and different in others (see §2.3.1 for inflectional classes). On the one hand, derivational and inflectional affixes are classified by similar means. Specifically, inflectional affixes are classified in accordance with the phonological representation of inflectional markers (e.g., /t/, /ou/, or /ɔ:/+t/ for the English past tense) and derivational affixes are classified by patterns of base modification. On the other hand, inflectional classes and derivational classes differ significantly in terms of what gets classified. An inflectional class is a set of *lexemes* that employ the same inflectional markers, whereas a derivational class is a set of *affixes* that employ the same (non-phonologically conditioned) base modification. For instance, as discussed in §2.3.1, the inflectional classes comprise verbs that are conjugated in the same way, i.e., *bake*, *walk*, and *cook* are Class I; *break*, *speak*, and *steal* are Class II, and so on. In contrast, the derivational classes in (13) above consist of affixes that accompany the same base modification. Thus, suffixes that do not accompany base modification, such as *-p'iq* 'at the summit' and *-iyoqλ* 'in the mouth' are Class 1; suffixes that accompany vowel lengthening are Class 2 (e.g., *-hwaʔ* 'using' and *-(q)has* 'along the edge'), and so on.

2.4.2 Main and subsidiary exponents

While few discussions have focused on the distinction between main and subsidiary exponents for ME, this study considers, for two main reasons, that affixation is the main exponent and base modification is the secondary exponent. First, affixation plays the main role in conveying semantic and/or syntactic information, as evidenced by the disparity between the number of affixes and the number of base modification patterns. There are approximately 500 suffixes in each language represented in the case studies, while base modification patterns range in number from two to fourteen. Some suffixes do not accompany any base modification (i.e., non-ME) and exhibit a one-to-one mapping between sound and meaning/function, whereas most base modifications do not exhibit these properties. In addition, 500 suffixes are grouped into at most 14 classes according to patterns of base modification, which implies that one class (or a pattern of modification) comprises a number of suffixes. In a class, therefore, when a suffix and a base modification have a one-to-one correlation between form and meaning (i.e., together, they constitute an instance of ME), the meaning comes from the suffix, rather than from the base modification.

Second, affixation is less marked than base modification cross-linguistically.

Within the theory of Natural Morphology, which conceives of language changes and processes in terms of universal laws of naturalness, Dressler (2005) argues that affixation is more natural than base modification because affixation is more frequent and productive than base modification and because morphological categories are rendered more transparent by affixation (e.g., *walk-ed* or *cat-s*) than by base modification (e.g., *sang* or *men*).

In summary, this study suggests that affixation is the main exponent in that suffixes mainly express meaning and also are more unmarked than base modification. This distinction is useful because the two exponents of ME play different roles in WFRs, which will be discussed in §2.6.1.

2.5 Theoretical models for multiple exponence in derivational morphology

This section discusses the feasibility of various theoretical models in accounting for attested processes and ME phenomena. While this dissertation succeeds in providing a unified account of ME for the three language case studies considered, the attempt to devise a unified formal account encounters several challenges, in that it must account for the following phenomena:

- (i) Reduplication (Nuu-chah-nulth)
- (ii) Vowel lengthening (Nuu-chah-nulth)
- (iii) Vowel shortening (Nuu-chah-nulth and Korean)
- (iv) Deletion (Central Yup'ik)
- (v) Multiple exponence that comprises base modification(s) and a suffix (Nuu-chah-nulth, Central Yup'ik, and Korean)
- (vi) In the presence of more than one modification-accompanying suffix, base modification occurs only once. (Nuu-chah-nulth)

The current study calls for a formal device that accounts for ME in addition to processes (i-iv) mentioned above. In what follows, I propose that a Word-and-Paradigm (WP) approach employing Word Formation Rules (WFRs), which successfully accounts for

inflectional ME as shown in §2.3, is an appropriate model for the attested processes in this study. I also briefly review two other morphological approaches, Item-and-Arrangement (IA) and Item-and-Process (IP) in the sense of Hockett (1954), and discuss why these models are not appropriate as a formal account in the current study.

To account for attested phenomena in the three case studies in this dissertation, a model is required that assumes the independent analysis of morphological and phonological representations of a given process and that also allows applications of the analysis of each process to the same base. WP models (Matthews, 1972, 1991; Anderson, 1986, 1992) offer such an approach, since their main assumptions include:

- (14) The morphology of a language is "more adequately represented ...by relations or processes than by discrete lexical-item affixes" (Anderson, 1992:69); the morphology comprises WFRs (rather than an inventory of affixes) that describe relations between forms.

In a WP model, as briefly shown in §2.3 for inflectional morphology, one or more WFRs provide an account of a process. WFRs can account for the wide range of base modifications, such as reduplication (i), vowel length adjustment (ii and iii), and deletion (iv). In addition, instances of ME that comprise suffixation and base modification (v) can be accounted for by applying multiple WFRs to the same base. While multiple applications of WFRs are allowed, a WFR describing a single process applies just once to the base in the WP model. For example, although a form may include more than one suffix that accompanies reduplication, the WFR that derives reduplication applies only once. Thus, reduplication would occur only once at the end of a derivation, rather than twice, which could result in double-reduplication. This outcome is desirable, since in

Nuu-chah-nulth, neither double-reduplication nor triple-long vowels are attested in the presence of a form with two suffixes that accompany reduplication or vowel lengthening (vi). The details of a WP approach to derivational morphology will be presented in the following section.

In contrast to WP, Morpheme-based morphological models or Item-and-Arrangement (IA) models presuppose a one-to-one mapping between function/meaning and form. The IA approach assumes that

[a]ny utterance in a given language consists wholly of a certain number of minimum grammatically relevant elements, called morphemes, in a certain arrangement relative to each other. The structure of the utterance is specified by stating the morphemes and the arrangement (Hockett 1954: 387).

In other words, under IA models, if there is a form, there should be a meaning, and vice versa (e.g., a word, *walked* consists of two units, *walk* and *ed* ‘past tense’), and the forms are attached linearly by means of affixation. IA models have difficulty accounting both for subtractive morphology, which has no phonological substance, and for ME, in which one function may be associated with more than one form⁷.

In order to overcome the theoretical challenges of accounting for one-to-many mapping between function and form, McCarthy (1981) provided an insightful and influential approach for reduplication. McCarthy (1981) and Marantz (1982) represent the formation of reduplication using two distinct tiers: a morphological tier and a phonological (CV skeletal) tier, in line with autosegmental phonology (Goldsmith, 1976, 1990; Clement, 1976). In this way, they successfully treat reduplication as affixation.

⁷ Other issues raised by the IA approach include zero morphemes (there is meaning but no form); empty morphemes (there is form but no meaning); and cumulative exponence (portmanteau morphemes). For discussions of these issues, see Hockett (1954), Matthew (1972: Chapter 7, 1991), Anderson (1992: Chapter 3), and Beard (1995: Chapter 2), among others.

With respect to ME, in Distributed Morphology, Noyer (1997) uses an extra device to account for inflectional ME: a *primary exponent* and a *secondary exponent*. Each exponent that indicates the same grammatical function is realized in two different layers, thus allowing two exponents to be realized simultaneously. Halle and Marantz (1993), who originally proposed Distributed Morphology, did not admit the existence of ME in languages, claiming that “[t]here is no ‘multiple exponence’ of features from a single syntactic or morphological node (p. 138).

Although some IA models have developed special measures to account for mismatches between function and form, subtractive morphology, in which the absence of phonological material corresponds to a morphological function, presents a serious challenge to some IA models. Various types of deletion in Central Yup'ik are a case in point. To the best of my knowledge, to date, no formal account for deletion in Central Yup'ik has been attempted. Cases of subtractive morphology also can be found cross-linguistically. For instance, as shown in (15) below, in Koasati (a Muskogean language), the deletion of a rhyme (15a) or a coda (15b) from the singular form of indicative verbs results in a plural form.

(15)	Koasati Singular > Plural	(Horwood, 2001: 1)	
	<i>singular</i>	<i>plural</i>	<i>gloss</i>
a.	ataká:-li-n	aták-li-n	‘to hang something’
	albití:-li-n	albít-li-n	‘to place on top of’
	apotó:-ka-n	apót-ka-n	‘to sleep with someone’
b.	asikóp-li-n	asiko:-li-n	‘to breathe’
	†atóf-ka-n	†ató:-ka-n	‘to melt’
	akapóskan	akapó:kan	‘to be pinched’

In the examples above, it is difficult to parse the form of plurality since plurality is conveyed by deletion. Most IA models that assume one-to-one association between form

and meaning have difficulties in accounting for subtractive morphology because of the absence of phonological form. Horwood (2001) accounts for the Koasati plural by adopting Anti-Faithfulness constraints (Alderete, 2001a, b), which require a change in the base. However, the existence of such examples provides evidence to argue against the IA approach and has led researchers to formulate alternative approaches that conceive word formation as a process (Martin, 1988; Kimball, 1986; Kosa, 2008).

Item-and-Process models (Hockett, 1954) assume that words are formed not only by adding segments linearly to a base, but also by modifying the base. Also, because the IP model does not necessarily require that a grammatical/semantic unit correspond to phonological content, it is an appropriate device to account for subtractive morphology. In accounting for ME, this approach has an obvious benefit over IA models because it accounts for both affixation and base modification, whereas IA models account only for affixation. IP models include early generative analyses that employ transformational rules (Carrier, 1979; Lieber, 1981; Carrier-Duncan, 1984) and analyses that employ WFRs (Aronoff, 1976; Anderson, 1992; Matthews, 1991; Zwicky, 1987 among others).

One problem with IP models is that transformation rules can be overly powerful, producing forms that are not attested in natural languages. Thus, it seems necessary to impose some reasonable restrictions on the model. In fact, by supplementing the unrestrictiveness of the IP approach with well-established phonological faithfulness constraints in Optimality Theory (Prince and Smolensky, 1993), Kurisu (2001) accounts for non-concatenative processes and for cases of ME, which contain two phonological exponents.

In his model, Kurisu uses the constraint, Realize Morpheme, which is satisfied when a morpheme in the underlying representation receives some phonological property on the surface. He proposes that while morphologically distinct forms must be phonologically different, they do not necessarily need phonological shape. Thus, morphological information can be conveyed by base modification (including subtractive morphology) as well as affixation. Also, he proposes that base modification signifies grammatical information when it occurs with affixation because the affix is invisible to the constraint, Realize Morpheme. This phenomenon, named Double Morphemic Exponence, is accounted for by employing Sympathy Theory (McCarthy, 1999).

However, Kurisu's model encounters serious empirical problems. In his analysis of Double Morphemic Exponence, Kurisu makes two important theoretical predictions with respect to restrictiveness that are imposed by his model: the phonological exponent of a single functional unit can neither exceed two exponents nor be subtractive. He suggests that natural languages attest neither multiple exponence with more than two exponents nor subtractive exponence; however, such cases are found in Nuu-chah-nulth and Central Yup'ik, respectively. In Nuu-chah-nulth, ME may contain up to four secondary exponents. In Central Yup'ik, ME involves the deletion of one or more sounds in a base. Thus, although Kurisu's model imposes restrictions on the IP model, it is not appropriate for the attested processes in the current study.

In summary, this section has reviewed three formal approaches, IA, IP, and WP in the sense of Hockett (1954). IA models, even with special measures, are not appropriate for all the phenomena mentioned in (i)-(v) above. While IP models may be able to

account for the attested processes, they may include overly powerful transformation rules.

In what follows, the WP model is explored in greater depth as a formal account of ME. The theoretical power that may produce unnatural rules is constrained by deriving a form through a set of Word Formation Rules (WFRs), rather than through one transformation rule. If two or more processes co-occur in a form, each process is described by a separate rule and then a set of rules derives a form that contains multiple processes. Thus, the WP approach offers many of the advantages of the IP model, while imposing the restrictiveness on the IP model.

2.6 Word-and-Paradigm

This section provides a formal model that accounts for derivational ME within the WP framework as set out by Anderson (1992) and Matthews (1991). Building on Anderson's (1992) suggested format for derivational morphology, WFRs are formulated by examining base modifications and the properties of the derived word. Also, the similarities and differences of models of inflectional versus derivational morphology are discussed.

2.6.1 Schemas of Word Formation Rules

In this study, WFRs for ME can be divided into two types. One rule derives suffixation, a main exponent; the other set of rules accounts for base modifications that belong to a subsidiary exponent. The two types of rule differ with respect to the presence/absence of

semantic and syntactic information in their Structural Description (SD) and Structural Change (SC). Suffixation rules include morphological and phonological descriptions as well as syntactic and/or semantic information. In contrast, rules for base modification do not contain syntactic and semantic information, but only include morphological and phonological descriptions. Before moving to a detailed discussion of this difference, let us examine the formalization of affixation rules for derivational morphology proposed in Anderson (1992).

In his A-morphous morphology, in which he develops a WP model for inflectional morphology, Anderson suggests a possible extension of the model to derivational morphology. Anderson (1992) points out that the SD of derivational rules refers to "the content of (classes of) lexical items", while the SD of inflectional rules refers to "Morphosyntactic representations". Anderson's suggested specification of derivational WFRs (1992: 185) is presented in (16).

- (16) a. A formal Structural Description, specifying the class of input stems the rule can apply to and any additional conditions (such as membership in specified subclasses of forms);
- b. A formal Structural Change, specifying the alternation the rule performs in creating the phonological form of the derived stem from the form of the input stem;
- c. A Syntactic Structural Description and Change (e.g., '[Adj] → [Noun]; '[+___] → [+___NP]'; and
- d. A semantic Structural Description and change (e.g., "property' → State of having property')

(Anderson, 1992:185)

The rule in (17) illustrates how each part of the description is applied to the actual rule.

- (17) WFR: [X]v --> [Xəbl]Adj (for words such as *breakable*, *movable*, *inflatable*, etc)
- a. *Condition*: [X]v is transitive (i.e., [+__NP])
 - b. *Syntax*: 'Object' argument of [X]v corresponds to 'Subject' of [Xəbl]Adj
 - c. *Semantics*: '(VERB)' --> 'capable of being VERBED' (ibid: 186)

A derivational WFR may specify the class or subclass(es) of input stems (16a); the condition in (17a) shows that the verb must be transitive. The phonological change from input stem to derived stem must be specified in the rule (16b); this is illustrated in (17), showing that the phonological variant [X] becomes [Xəbl]. The syntactic description and change (16c) and the semantic description and change (16d) are specified independently in (17b) and (17c), respectively.

Anderson points out that the purpose of derivational WFRs is to specify the partially systematic relations among lexical items, rather than to produce actual derivations. Then, he presents instances in which the rule in (17) cannot generate a correct outcome due to variations occurring in bases. Consider a couple of phonological alternations that the rule in (17) cannot account for. The bases in words such as *navigable* (navigate + able), *demonstrable* (demonstrate + able), and *formulable* (formulate + able) undergo truncation of *-ate*. Also, the stems in *applicable* and *multiplicable* exhibit the base modification: [ply]--> [plic]. Such alternations are not reflected in the rule in (17) and further modification is required. In his study, Anderson suggests that derivational WFRs have two distinct functions: (1) to create new lexemes, as shown above; and (2) to parse existing units of the lexicon, as in the cases of *affable*, *capable*, and *credible*, which are not derived from existing bases. The latter is achieved by relating a given word

(e.g., *affable*, *capable*) to other words (e.g., *breakable*, *movable*) in terms of their forms and meanings. Anderson points out that in some cases, WFRs may simply record common properties among words with respect to phonology, syntax and semantics. It would seem that Anderson considers the primary function of derivational WFRs to lie in relating the properties of lexical items rather than to generate actual words.

The current study builds on Anderson's (1992) description of derivational WFRs and attempts to make actual derivations by employing WFRs. In the current study, the WFRs differ significantly from those described by Anderson in two ways. First, I propose two different types of WFR: Suffixation Rules and Base Modification Rules. This approach addresses the observation that, in the current study, all cases of ME comprise exponents that involve two distinct processes. Crucially, these two exponents differ in terms of the presence/absence of semantic and syntactic information. Only suffixation rules, which relate to main exponents, include such information. As discussed earlier (§2.4.2), languages have a limited number of base modifications, compared to the number of accompanying suffixes. While Nuu-chah-nulth, Central Yup'ik, and Korean have approximately 500 affixes each, they have only fourteen, six, and two base modifications, respectively. Thus, while affixes are associated with 500 meanings, the number of distinct meanings with which base modifications are associated ranges from two (Korean) to fourteen (Nuu-chah-nulth). The relatively small number of base modifications is not sufficient to suggest that base modification provides semantic and syntactic information in each case of ME.

Second, while the morphological description in Anderson's SD, as seen in (16a), specifies the base, the morphological description in the current study specifies the affix.

This difference stems from the fact that class information in inflectional morphology is inherently encoded on a base, whereas suffixes in the current study contain such information (see §2.4.1). Therefore, a mechanism is required to assign a class to the base. I propose that the class of suffix is assigned to a base when the suffix is added to the base. Thus, class information appears in the SC of suffixation rules, rather than in the SD. In what follows, I discuss schemas of rules for suffixation and base modification.

In (18), I propose a schema for suffixation rules.

(18) Schema for Suffixation Rule

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

(a) **Structural Description:**

Phonological Description: X

Syntactic Description:

Lexical category of the base

Semantic Description:

Meaning of the base

(b) **Structural Change:**

Phonological Change: XZ

Syntactic Change:

Lexical category of the derived form

Semantic Change:

Meaning of the derived form

Morphological Description:

Classes of affixes

On the left side of the suffixation rule, the SD (18a) includes the phonological properties of the base (i.e., 'X'). The base 'X', a variant of a given phonological shape, undergoes a phonological change to 'XZ' in the SC ('Z' here refers to a suffix presented in the SC).

The SD may include lexical category and/or subcategorization of the base. The syntactic description may or may not be changed. Any changed syntactic information is presented in the SC. Change in the semantic interpretation of the input base (i.e., 'meaning of X') in the SD is reflected in the SC (i.e., 'meaning of XZ'). Importantly, as mentioned earlier, a

class is assigned to the base when the suffix Z is added to the base. Thus, the base has the same class information as the suffix Z.

In addition to the suffixation rule, another type of rule is required to account for base modification. Based on the properties of base modification observed in the case studies in this dissertation, I propose a schema for base modification rules as follows:

(19) Base modification Rule

$$\begin{array}{ccc} \left(\begin{array}{c} \text{CLASS(ES)} \\ \text{(Aspect)} \end{array} \right) & & \\ [X]_{\text{B}}Z & \rightarrow & [X']_{\text{B}}Z \end{array}$$

(a) **Structural Description:** (b) **Structural Change :**
Morphological Description: *Phonological change:*
Class of affix Z; Aspect *The base X is modified to X'*
Phonological Description:
The base is X

The SD in (19a) includes the morphological description (i.e., [Class I, Class II]) that specifies the class of the base assigned by the suffix. Base modification rules must be applied after suffixation rules. This rule ordering is crucial because class assignment is made when a suffix Z is added, as demonstrated in (18b). The class assigned in the suffixation, then, becomes the morphological description in the base modification rule(s). Also, the morphological description in the SD may include language-particular morphological information, if any, e.g., [+Stative] in Central Yup'ik. Note that for the purpose of rule formation, the morphological category Aspect is considered as a morphological description rather than semantic information. The semantic description is provided only in the suffixation rule and specifies the meaning of affixes. This classification is in line with the fact that other morphological categories, which may be

claimed to have semantic information, such as Tense or Gender, are considered as morphological information (Anderson, 1992; Matthews, 1991).

As for the phonological description in the SD, the lexical base X is a variant of the phonological representation, as explained in the suffixation rule. The base X undergoes a phonological change to X' in the SC (28b). X' denotes that the base X is modified. Notice that the phonological modification of the base X takes place only within the domain of the lexical base (i.e., root), which is denoted by the domain specification, []_B. Cross-linguistically, the lexical base or root has a special status within a word, in the sense that the lexical base is the only obligatory unit (Alderete, 2001a, Aronoff, 1994; Czaykowska-Higgins, 1998; Matthews, 1972, among others). Additional evidence that the lexical base constitutes a domain for some morpho-phonological processes can be found in the current study. Base modifications, such as different types of deletion in Central Yup'ik and vowel shortening in Korean, occur within the lexical base, which will be discussed in detail in Chapter 4 and Chapter 5, respectively.

The domain specification, []_B, however, does not seem to apply to all languages in the same way. Rather, I argue that the domain specification is a language-particular parameter, based on the observation that each language in the three case studies shows different patterns in terms of the domains in which base modification occurs. Although processes in the three languages are similar in terms of the secondary exponence of ME, the morphology and phonology of the languages are distinct. Thus, it is natural that the domain of some processes in a given language differs from the domain of those processes in other languages. In what follows, I discuss how the three languages

(Central Yup'ik, Nuu-chah-nulth, and Korean) differ in terms of base modification domains.

For Central Yup'ik, it is necessary to specify the domain of base modification to account for deletion as a base modification. Various types of deletion make reference to the lexical base, a morphological unit, while being insensitive to the phonology of the language, such as stress assignment (see §4.2 for details). The deletion of one or more segments always occurs on the boundary between base and suffix. Therefore, the phonological environment in the SD of the base modification rule needs to be restricted to the base, in order to exclude suffixal segments from the environment of the rule. A phonological variant that is exclusively present in the bracket of []_B undergoes base modification, while the suffix is disregarded as part of the phonological environment of the WFR for base modification.

In contrast, base modification in Nuu-chah-nulth is not limited to the lexical base, because vowel length adjustment may occur on a suffix if the suffix occurs as the second syllable of a derived form. Rather, reduplication and vowel length adjustment occur exclusively within the window of the initial disyllable (Kim, 2004; Lee, 2008) (see §3.3.1 for a detailed description). Thus, in Nuu-chah-nulth, these processes are sensitive to the phonology of the language in terms of the domain in which they occur. It is not uncommon for a morphological process to occur within a prosodically identified domain (McCarthy and Prince, 1990; McCarthy and Lombardi, 1993; McCarthy, 2000). Also, many studies report that a phonological unit, the disyllable in the case of Nuu-chah-nulth, is not necessarily isomorphic to morphological structure (Cohn, 1989; Czaykowska-Higgins, 1996, 1998; Inkelas, 1989; Rice, 1991). The domain specification []_B is not

applicable to the language, since base modification in Nuu-chah-nulth does not make reference to the lexical base, but rather, is sensitive to the phonological domain. For the purpose of formulating WFRs in the current study, the phonological domain is to be disregarded. However, an alternative approach employing Prosodic Circumscription (McCarthy and Prince, 1990; McCarthy and Lombardie, 1993; McCarthy, 2000) based on the phonological domain will be discussed in §3.6.3.

As for vowel shortening in Korean, the domain affects neither the process nor the formalization of the WFRs, although vowel shortening occurs within the lexical base. The process always occurs on the first syllable of the verb or adjective base and no evidence is found that vowel shortening is associated with a prosodic domain. The presence/absence of the domain specification does not affect the outcome of WFRs because the process does not affect segments on the base-suffix boundary.

To summarize the discussion of derivational WFRs, two different types of WFR are proposed for suffixation and base modification. Semantic and syntactic descriptions are specified only in suffixation rules. Class assignment of the base is made by suffixation; thus, class information appears in the SC of the suffixation rule. The suffixation rule is crucially ordered before base modification rules. In terms of domain specification, it is essential to specify the domain []_B for Central Yup'ik because base modification takes place on the boundary between the lexical base and the suffix. However, it is unnecessary to identify the domain for Korean since vowel shortening occurs on the first syllable, the left edge of the lexical base. As for Nuu-chah-nulth, specifying the domain []_B results in an incorrect derivation; it seems best not to specify a domain, regardless of the morphological or phonological unit.

2.6.2 Rule blocks, rule ordering, and derivation

This subsection demonstrates how WFRs operate in terms of compatibility and ordering of the rules. It is important to state some principles about the application of WFRs. Rule ordering and rule blocks are measures that play an active role in derivation. In what follows, those two key features are discussed and a derivation using WFRs is demonstrated using Class 2 in Central Yup'ik as an example.

The current study assumes that derivational WFRs are organized into *blocks*, following Anderson's (1986, 1992) and Stump's (2001) studies of inflection. WFRs in the same block are mutually exclusive. Thus, only one rule can apply within the same block. By contrast, WFRs in distinct blocks are compatible, and thus may be applied to the same base. Rule ordering among rules that belong to distinct blocks may be required.

To illustrate how WFRs work, consider Class 2 (affixes accompanied with base-final VC-deletion) in Central Yup'ik. The example in (20) belongs to Class 2 and undergoes three processes: suffixation for the main exponent, and for the subsidiary exponents, pre-final vowel deletion in the base and base-final consonant deletion.

- (20) qanir
 qanuk-ir
 snowflake-occurring
 '(it) is snowing'

To fully account for this Class 2 word, we need three rules: a suffixation rule, a base pre-final vowel deletion rule, and a base-final consonant deletion rule. For the subsidiary exponents, two separate rules are proposed, rather than one rule that deletes the base-final VC together because final consonant deletion also occurs in Class 3. Thus, in the current study, final consonant deletion is considered an exponent for which an individual rule is proposed.

First, a schema for a suffixation rule is presented in (21) and applied in (22).

In (22), the SD includes no class information. Class information (CL2) is assigned to the base in the SC when the suffix *-ir* is added. The syntactic information in the SD shows that the base is a noun, which then changes to a predicate. The meaning of the base 'snowflake' changes to 'to be snowing'. The suffixation rule must apply before any base modification rules because otherwise, class information will not be provided.

(21) Schema for Rule 1 [suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

(22) Application of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [\text{qanuk}]_N \\ \text{SNOWFLAKE} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CL 2} \\ [\text{qanuk}]_{\text{PRED ir}} \\ \text{TO BE SNOWING} \end{array} \right)$$

As for base modification rules, Rule 2 is formulated to account for deletion of the base pre-final vowel. (23) presents the application of Rule 2 to the example in (20). This rule must be organized into a different block from Rule 1, since the two rules need to apply to the same base. The morphological description contains the class information. The phonological condition or environment (i.e., $[X]_B = [YVC]_BZ$) indicates that the vowel occurs before a base-final consonant; the phonological change, then, shows that the vowel is deleted (i.e., $[YC]_BZ$). Y refers to any segments that precede the base-final consonant. Z refers to the suffix added in the previous application of the suffixation rule. The domain specification indicates that the base modification occurs within the lexical base.

- (23) Rule 2 [Base pre-final vowel deletion]
 [CL 2]
 $[X]_{BZ} = [YVC]_{BZ} \rightarrow [YC]_{BZ}$

- (24) Application of Rule 2
 [CL 2]
 $[qanuk]_{B\text{ ir}} \rightarrow [qank]_{B\text{ ir}}$

Rule 3 is formulated to account for the deletion of base-final consonants. This rule should also be in a distinct block from the other two rules because the three rules apply to the same base. Rule 3 in (25) indicates that the final consonant is deleted when the stem belongs to Class 2 or 3. Rule 2 must apply before Rule 3 because deletion of the final consonant will bleed the environment for base pre-final vowel deletion. I adopt the Bracket Erasure Convention (Kiparsky, 1982) at the end of the derivation. The Bracket Erasure Convention states that internal brackets are erased at the end of the derivation of a lexical level, so that after applying the convention, derived forms are considered to be underived.

- (25) Rule 3 [Base-final consonant deletion]
 [CL 2, CL 3]
 $[X]_{BZ} = [YC]_{BZ} \rightarrow [Y]_{BZ}$

- (26) Application of Rule 3
 [CL 2]
 $[qank]_{B\text{ ir}} \rightarrow [qan]_{B\text{ ir}}$
 $\rightarrow qanir$

As mentioned earlier, in terms of the organization of rule blocks, when WFRs are introduced, the WFRs formulated for Class 2 above must be members of distinct blocks, since three of them are applied to the same base. Let us assume that the Suffixation rule (R1) is organized into Block I; the Base pre-final vowel deletion rule (R2) is in Block II; and the Base-final consonant deletion rule is organized into Block III. With the exception of Block I, each block may contain other rules (see §4.4 for a full account of Central Yup'ik). (Note that the number of rules and blocks does not correspond to the actual rules used in Chapter 4. The numbers are presented in the above-noted sequence strictly for the purpose of the current discussion.)

Table 1 *Rule Blocks*

Blocks	Rules
Block I	R1 [Suffixation]
Block II	R2 [Base pre-final V-deletion]
Block III	R3 [Base final C-deletion]

WFRs in distinct blocks may need to be ordered. Importantly, the suffixation rule for the main exponent must apply before other rules so that a class can be assigned to the base. As shown above, R2 (Block II) must precede R3 (Block III). In (27), the reverse order produces an incorrect outcome. If the base-final consonant is deleted by the operation of Rule 3 ([qanuk]ir → [qanu]ir), then the vowel *u* is no longer pre-final, bleeding the environment for Rule 2 and rendering the rule inapplicable. The incorrect outcome **qanuir* is derived as a result.

(27) (Rule 1) >> Rule 3 >> Rule 2 (incorrect order)

a. Rule 3 [Base-final consonant deletion]

[CL 2, CL 3]

[X]_BZ = [YC]_BZ → [Y]_BZ

Application of Rule 3

[CL 2]

[qanuk]_B ir → [qanu]_B ir

b. Rule 2 [Base pre-final vowel deletion]

[CL 2]

[X]_{BZ} = [YVC]_{BZ} → [YC]_{BZ}

Application of Rule 2

N/A

[qanu]_B ir

→ *qanuir

To summarize, I have formulated a series of WFRs which need to be ordered. The suffixation rule applies first in order to assign a class to the base. The base pre-final vowel deletion rule must apply before the base-final consonant deletion rule, since the base-final consonant deletion rule bleeds the environment of the base pre-final vowel deletion rule. The three rules must be organized into distinct blocks, so that they can apply to the same base. The proposed rule ordering is summarized in (28).

(28) Rule ordering

Suffixation rule (R1) >> Base pre-final vowel deletion (R2)

>> Base final consonant deletion (R3)

Block I >> Block II >> Block III

The Class 2 word, *qanir* ‘to be snowing’ is derived by applying WFRs following the suggested rule ordering. Each rule accounts for a process; the derivation illustrates that the three exponents together comprise an affix, meaning ‘occurring’.

2.6 Summary

This chapter has examined criteria for, and features of, derivational ME. Also, an analysis of ME within the WP model has been proposed. Two criteria, *Non-phonological condition* and *Consistent co-occurrence* are crucial for a base modification to be considered an instance of ME. In particular, the criterion, *Non-phonological condition* distinguishes ME from a morphologically conditioned phonological process. The other two criteria, *Phonological consistency* and *No exceptions on base selection* are optional properties to diagnose ME.

The current chapter proposes that derivational classes are identified in accordance with patterns of base modification. This classification makes a WP analysis possible and provides the morphological description in WFRs. In WFRs, the syntactic and semantic information of ME is associated with suffixes. In contrast, the WFRs for base modification do not make reference to syntactic and semantic descriptions. This study is meaningful in that it extends the application of a WP model to derivational morphology.

The current study also contributes to establishing ME as part of derivational morphology by creating criteria and by providing guidelines to distinguish between main and subsidiary exponents.

CHAPTER 3 Non-inflectional Multiple Exponence in Nuu-chah-nulth

3.1 Introduction

This chapter explores multiple exponence in Nuu-chah-nulth non-inflectional morphology. Nuu-chah-nulth, a language in the Wakashan family, has lexical affixes that carry a lexical meaning, as illustrated in (1):

- | | |
|-----|---|
| (1) | Lexical affixes (Sapir and Swadesh 1939: 320-326) |
| | -as ‘reaching to, touching on, following close’ |
| | ’-itoʔ ‘dreaming of...’ |
| | -yák ^(w-) ‘...device, instrument’ |
| | -maq- ‘...a plant, bush, tree’ |
| | -p̄iq ‘at the summit’ |
| | -iyooqʔ ‘in the mouth’ |

These affixes are typologically unusual in a few ways, one of which is relevant to the present study, i.e., lexical affixes may accompany a few different types of base modification. Some lexical suffixes accompany base modifications, such as vowel lengthening and vowel shortening; others appear with reduplication within a lexical base; others can accompany both vowel length adjustment (VLA) and reduplication; and others are not associated with any of these processes.

An illustration of accompanying base modifications is supplied by the following examples. Note that in (2a), *-paatʔ* ‘along with’ co-occurs with vowel lengthening in the first syllable of the lexical base *ʔu* (the term lexical base is used for a linguistic constituent to which derivational or aspectual markers are attached). In (2b), the affix *-iih* ‘hunting’ occurs with CV reduplication of the lexical base *túcup* ‘sea urchin’. In (2c), the

affix *-čit* 'to blame' co-occurs with CV reduplication and vowel lengthening, both in the reduplicant and the base. Finally, note that in (2d), no base changes occur. While examples (2a-c) do not span the full range of base modification types, they do serve as introductory illustrations of some such processes in the language. The data below are drawn from fieldwork, unless otherwise specified.

(2) Types of lexical suffix depending on accompanying base modifications

a. *Vowel lengthening*

ʔuupaaʔwaʔiš	Ken	naačiqsciʔuk	Kay
ʔu-paaʔ [L]-waʔiš	Ken	naačiqs-ciʔuk	Kay
REF- along.with-3SQUO	Ken	Tofino-going.to	Kay
'Along with Ken, Kay is going to Tofino'			

b. *Reduplication*

ʔuʔučiʔiš	naniiq
RED-ʔuʔučiʔiš [R]-ʔiš	naniiq
sea urchin-hunting -3S. IND	grandparents
'Grandparents went to get sea urchins'	

c. *Reduplication and vowel lengthening*

ʔaaʔaayačitʔiš
RED ʔaya -čit[RL+L]-ʔiš
RED many -to.blame-3S.IND
'He is blaming lots.'

d. *No base modification*

hiix ^w athikukʔiš	Kay
hiix ^w athi -kuk -ʔiš	Kay
angry-look.like-3S. IND	Kay
'Kay looks angry'	

In the literature on Nuuchahnulth, reduplication and VLA are understood as processes that are triggered by certain suffixes (Sapir and Swadesh, 1939; Davidson, 2002; Kim 2003b; Stonham, 2004, among others). That the suffix in fact triggers the

alternations can be demonstrated by comparing the examples in (3)⁸: the base, *ʔu-*⁹ in Nuu-chah-nulth is reduplicated when the suffix *-yuk* ‘cry’ is added in (3b), whereas the same base does not undergo reduplication when a segmentally identical suffix *-yuk* ‘at the head’ is affixed in (3a), although the vowels in both bases undergo lengthening. In fact, a significant feature of some suffixes in Nuu-chah-nulth is that they can trigger reduplication and vowel lengthening concurrently, as shown in [ʔuʔuuyukʔiš] ‘she is crying’ in (3b). Note that the base *ʔu-* does not undergo any processes in (3c).

- (3) a. ʔuuyukʔiš
 ʔu-yuk [L]-ʔiš
 REF-at.the.head-3S.IND
 ‘There is something on one’s head’
- b. ʔuʔuuyukʔiš Ken
 RED ʔu-yuk [R+L] -ʔiš Ken
 RED REF-cry-3ps.IND Ken
 ‘Ken is crying.’
- c. ʔuʔukʔišʔiš Kay
 ʔu-ʔuk-ʔišʔiš Kay
 REF-born.of-MOM-3ps. IND Kay
 ‘She is an offspring of Kay.’

Previous research is consistent in positing that vowel lengthening/shortening and reduplication are morphologically determined, depending on which suffix is added (Davidson, 2002; Stonham, 2004; Kim, 2003a, b), following Sapir and Swadesh (1939), who first insightfully observed the patterns. In these studies, although reduplication and VLA are closely related, the two processes have been treated as distinct processes. Also,

⁸ At this point in the dissertation, I refer to the phenomena as suffix-triggering base modifications. The term ‘trigger’ will change to ‘accompany’ in a later part of this chapter.

⁹ *ʔu-* is an expletive base that does not contain any meaning but is used to provide a site of attachment for lexical suffixes.

the morphological motivation for the observed processes has received scant attention in the literature.

The current study proposes that together, a non-inflectional suffix and base modification simultaneously denote a particular single expression, and thus constitute multiple exponence (ME). To provide evidence for this claim, reduplication and vowel length change are examined using the criteria proposed in Chapter 2 for subsidiary exponence: *Non-phonological conditioning*, *Consistent occurrence*, and *No exceptions on base selection*. Each process, i.e., VLA and reduplication, is examined separately; then, an analysis is provided that embraces these seemingly distinct processes as instances of one phenomenon: multiple exponence.

I also propose that non-inflectional affixes are classified according to the shape of base modifications (see §2.4.1 for details). Nuu-chah-nulth shows 14 types of base modification. Since each type of base modification is equivalent to a class of *affixes*, 14 non-inflectional classes are proposed that co-occur with approximately 500 non-inflectional affixes. While each suffix carries its own meaning (i.e., there are around 500 meanings), it seems impossible for 14 classes (base modifications) to express the meaning of each suffix. This gap in the mapping of meanings between affixes (500) and classes (14) implies that suffixes, rather than base modifications, contain the semantic information expressed through ME.

This disparity provides strong evidence for the claim in this dissertation that non-inflectional Word Formation Rules (WFRs) within the Word-and-Paradigm (WP) model require two different types of rule: a suffixation rule and a set of base modification rules. A crucial difference between the two types of WFR is that the suffixation rule contains

semantic information, whereas base modification WFRs do not. Also, it is implied that suffixes are the main exponent of ME because they make the main contribution to the meanings conveyed through ME.

The remainder of this chapter is organized as follows: §3.2 provides preliminary information on Nuu-chah-nulth as a basis for further discussion. §3.3 examines VLA and reduplication and provides evidence of subsidiary exponence, based on the proposed criteria. §3.4 proposes a classification of derivational affixes, in accordance with patterns of VLA and reduplication. This section also describes multiple occurrences of triggering affixes. §3.5 provides an analysis of ME in Nuu-chah-nulth within the WP framework, in line with Matthews (1972, 1991) and Anderson (1986, 1992). §3.6 discusses previous studies and critically reviews alternative approaches. §3.7 summarizes the main points of the chapter.

3.2 Preliminaries

This section provides background information that is required as a basis for understanding processes and the analysis presented in this chapter, including basic linguistic information about the Nuu-chah-nulth language, such as the segmental inventory, syllable structure, foot structures, word formation processes, and lexical affixes. Also, the sources of the data used in the present study are described.

3.2.1 The Nuu-chah-nulth language, previous studies, and data sources

Nuu-chah-nulth is a Southern Wakashan language spoken along the west coast of Vancouver Island, from Barkley Sound in the south to Quatsino Sound in the north of

British Columbia, Canada. Fourteen First Nations constitute the Nuu-chah-nulth Tribal Council. Although it is unclear how many dialects exist within those Nations (Nakayama 2001), 12-15 dialects are usually identified (Powell 1991, Stonham 2004). The Nuu-chah-nulth dialects may be roughly classified into Northern, Central, and Southern varieties (Stonham 2004). Northern Nuu-chah-nulth includes Chicklisaht, Kyuquot, Ehattesaht, Nuchatlaht, Mowachaht, and Muchalaht. Central Nuu-chah-nulth consists of Hesquiaht, Ahousaht, and Tla-o-qui-aht; and Southern Nuu-chah-nulth comprises Ucluelet, Toquaht, Tseshaht, Huu-ay-aht, Uchucklesit, and Hupachasath.

In the 2002 Canadian census, the number of Nuu-chah-nulth speakers was estimated at 500. However, more recent studies estimate the number to be between 150 and 200 (Kim, 2003b; Wojdak, 2005; Klokeid et al., 2010). Differences in the estimates may stem from the use of different criteria for measuring fluency. However, the decline in the estimated number of speakers may also indicate a rapid decrease in the number of fluent speakers of Nuu-chah-nulth in the years between the studies. Also, Nuu-chah-nulth is considered as a nearly extinct language in the *Report on the status of B.C. languages*, which identifies only 115 speakers (First People's Heritage, Language and Culture Council, 2010). In fact, most fluent speakers of Nuu-chah-nulth are elderly (Cook and Howe, 2004, Wojdak, 2005). While the number of fluent speakers has been decreasing, there have been efforts to revitalize the language. The Nuu-chah-nulth Language Council, which leads these language revitalization efforts, has researched the needs of communities in terms of language learning and maintenance. A two-year Nuu-chah-nulth Language Diploma program was started in 2012 in Nuu-chah-nulth communities led by

Quuquutsa Language Society in partnership with University of Victoria and North Island College.

In line with the communities' efforts, recent linguistic studies have deepened our understanding of the language and have helped to document the language through the production of a series of books and dissertations: Rose (1981) studied the grammar of the Kyuquot variety and provided considerable understanding of the morphology and syntax of the language. Nakayama (1997, 2001) examined the morphosyntactic structure of the Ahousaht dialect from a discourse-functional perspective. Davidson (2002) provided a comparative study of Nuu-chah-nulth and Makah. In the section of the dissertation that focuses on Nuu-chah-nulth, his analysis contributes to a significant understanding of word and sentence formation in the Tseshaht dialect, drawing on the texts of Sapir and Swadesh (1939, 1955). Kim's (2003b) dissertation focused on the phonology and morphology of the Ahousaht dialect, contributing to an understanding of phonological and morphological processes, including vowel lengthening/shortening and reduplication. Stonham (1999) studied the phonetics and phonology of the Tseshaht dialect, and his later work (2004) provided morphosyntactic studies on the same variety of the language. Wojdak (2005) examined predicates formed by affixation in Nuu-chah-nulth. She also provided a long list of sentences collected from her field work on the Ahousaht dialect. Also, Woo's dissertation (2007) examined prepositional predicates in Nuu-chah-nulth; and recently Waldie (2012) studied evidentiality in Nuu-chah-nulth. For all the above-cited works, the studies of Sapir and Swadesh (1939, 1955), including their field notes, provided a fundamental starting point for linguistic studies of Nuu-chah-nulth. Although most of Sapir and Swadesh's research was based on the Tseshaht dialect, their texts as

well as their linguistic descriptions have served as invaluable sources for later generations, even for researchers who have focused on other dialects. Swadesh (1933, 1939) published the Nuu-chah-nulth (Nootka) grammar using these notes. Also, a grammar book (Kammler & Vajkonny, 1996, 2009) and various dictionaries (Powell, 1991; Barkley Sound Dialect Working Group 2004; Stonham, 2005, among others) have been published. In addition to the sources noted above, many conference proceedings and journal articles on the language have proven to be helpful sources (Carlson, et al, 2001, Howe and Pulleyblank, 2001; Stonham and Yiu 2002; Werle, 2001, 2007; Wojdak 2003, 2004, Stonham, 2007; Kim and Pulleyblank 2009, among others).

With respect to lexical suffixes, Boas (1890) was the first to observe their process-triggering behaviour. In the work of Sapir and Swadesh (1939), this process is well described, using notations such as [R] and [L], which are also employed in the current study. Wojdak (2003, 2005) studied lexical suffixes in the Ahousaht dialect in relation to the syntactic formation of predicates. Davidson (2002) described lexical suffixes that trigger reduplication and VLA using texts in Sapir and Swadesh (1939, 1955). As for reduplication and VLA, the pattern of reduplication found in Tseshaht has been studied by Davidson (2002) and Stonham (2004, 2007). In particular, Stonham (2007) focused on double reduplication and suggested Stratal Optimality Theory as an efficient method to account for the presence/absence of double reduplication. Kim (2003a, b, 2008) studied patterns of reduplication and VLA in the Ahousaht dialect based on her field work material, adopting templatic morphology to account for these patterns within Optimality Theory. In her approach, suffixes are specified for types of reduplication according to the foot structure that the reduplication/VLA builds. Although the current

study does not classify types of reduplication/vowel length change according to foot shape, Kim's work contributes greatly to an understanding of reduplication patterns and VLA for Nuu-chah-nulth in general and for the Ahousaht dialect in particular. Rose (1981) compiled reduplication patterns in Kyuquot, dealing especially with the multiple occurrence of triggering suffixes. Her description of VLAs in the Kyuquot dialect, along with the multiple application of triggering suffixes, provides valuable insights for the present study.

The data used in this study are drawn from various sources. The published sources study the Ahousaht dialect (Central Nuu-chah-nulth), the Tseshaht dialect (Southern Nuu-chah-nulth), and the Kyuquot dialect (Northern Nuu-chah-nulth). The Ahousaht dialect includes my field work with Mary Jane Dick, which was carried out in 2007, 2008 and 2012. The data obtained from Mary Jane were independently confirmed with her mother, Sara Webster. Much of the Ahousaht data comes from Kim (2003b), who did her field work in early 2000. Some data are cited from Nakayama (2001), whose data were collected in late 1990, and from Wojdak (2004), who completed her field work from 2000 to 2004. References to the Tseshaht dialect draw on the work of Sapir and Swadesh (1939, 1955), who collected the language data at two different time periods: in 1910 and from 1913 to 1914. Also, the Tseshaht data are drawn from the works of Davidson (2002) and Stonham (1999, 2004), who based their studies on Sapir and Swadesh's *Nootka Texts*¹⁰. The Kyuquot data are drawn from Rose (1981).

¹⁰ Nootka is an old term that referred to the Nuu-chah-nulth language and the First Nations. James Cook, who first contacted the people, mistakenly understood Nootka as the tribe's name. In 1976, the First Nations named their tribes and the language Nuu-chah-nulth (meaning 'along the mountains').

3.2.2 Segmental inventory and syllable structure

Like most other indigenous languages of the Northwest Coast, Nuu-chah-nulth is rich in consonants. Most stops, affricates, and sonorants have glottalized counterparts. Table 2 shows the consonant inventory in Nuu-chah-nulth. The alphabet in the inventory is in the Nuu-chah-nulth orthography¹¹.

Table 2 *Nuu-chah-nulth Phonemic Consonant Inventory*

		Labial	Alveolar	Alveo-lateral	Alveo-palatal	Velar	Labio-velar	Uvular	Labio-uvular	Pharyngeal	Laryngeal
Stops	Plain	p	t			ḳ	ḳ ^w	q	q ^w		
	Glottalized	p̚	t̚			ḳ̚	ḳ̚ ^w			ʕ	ʔ
Affricates	Plain		c	ʎ	č̣						
	Glottalized		c̚	ʎ̚	č̣̚						
Fricatives			š	ʦ	ṣ̌			x̣	x̣ ^w	ħ	h
Sonorants	Plain	m	n		ỵ		ẉ				
	Glottalized	m̚	n̚		ỵ̚		ẉ̚				

In contrast, the vowel inventory is relatively simple. Three vowel qualities are phonemically distinctive: /i, u, a/; /u/ can be replaced by /o/ depending on the dialect. Also, the vowel length contrast is phonemically distinctive. Table 3 presents the Nuu-chah-nulth vowel inventory.

¹¹ IPA equivalents of the Nuu-chah-nulth orthography

Nuuchahnulth	IPA	Nuuchahnulth	IPA
c	ts	ʎ	tʦ
c̚	ts'	ʎ̚	tʦ'
š	ʃ	ỵ	j'
č̣	tʃ	y	j
č̣̚	tʃ'	ħ	ħ
x̣	χ		

Table 3 *Nuu-chah-nulth Phonemic Vowel Inventory*

	Front		Central		Back	
	Long	Short	Long	Short	Long	Short
Close	ii	i			uu	u
Mid						
Open			aa	a		

As noted above, vowel length is distinctive in Nuuchah-nulth; each vowel has short and long pairs, which are considered to be underlying phonemes. The minimal pairs in (4) demonstrate the vowel length distinctions clearly.

- (4)
- | | | | |
|------|-------------|-------|-----------------------|
| yač | ‘dogfish’ | yaač | ‘warped, bent out’ |
| wa | ‘to coil’ | waa | ‘to say’ |
| mas | ‘healed up’ | maas | ‘baking on open fire’ |
| -’as | ‘on ground’ | -’aas | ‘at the wrist’ |
| -uk | DUR TRN. | -uuk | ‘all over’ |
- (Stonham 1999: 33)

In addition to the phonemic vowels, Nuuchah-nulth has a ‘variable length vowel’ (marked with \cdot), in which the length of the vowel differs according to where it occurs in a word. A ‘variable length vowel’ is realized as long in the first two syllables of words, but as short when it occurs in the third or later syllables of words. For example, as shown in (5) below, /a/ in $-na'k^w$ in (5) is manifested as long when it occurs in the first two syllables of a word, as in (5a), but as short when it occurs in the third or later syllables of a word, as shown in (5b) and (5c).

- (5)
- | | | | | | |
|----|----------------------|----|-------------------------|----|------------------------|
| a. | ʔunaak ¹² | b. | čapacnak | c. | ʔaʔanak |
| | ʔu-na'k ^w | | čapac-na'k ^w | | ʔaʔa-na'k ^w |
| | REF-have.. | | canoe-have... | | child-have |
| | ‘possess it’ | | ‘have a canoe’ | | ‘have a child’ |
- (Stonham & Yiu 2002: 329)

¹² k^w in $na'k^w$ in (5) is delabialised. A labial consonant is delabialised when it occurs word finally, as in (5) or when it is followed by a lexical suffix. By contrast, delabialisation does not occur before a grammatical suffix.

The examples in (6) demonstrate that a variable length vowel is also affected by the “first two syllable” rule when it occurs in a lexical base. The variable length vowel in *ya'k^w* is realized as long in (6a), but the same base vowel is short when the vowel occurs in the third syllable because of the occurrence of double reduplication. Note that the lexical suffix *suuh* ‘at eye’ does not affect the vowel length contrast.

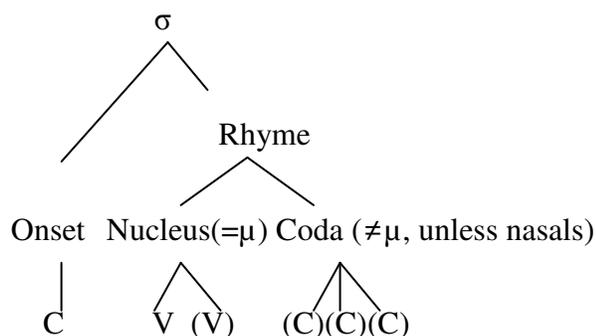
- | | | | | |
|-----|----|--|----|--|
| (6) | a. | yaak.ši.ʔaʔ.at
ya'k ^w -šiʔ-aʔ-'at
sore-MOM-TEM-PST
'became sore' | b. | ya.ya.yak.suuh
RED-RED-ya'k ^w -suuh
DIST-RED-sore-at.eye
'sore-eyed' |
|-----|----|--|----|--|
- (Stonham & Yiu 2002: 330)

The examples above show that regardless of whether a variable length vowel occurs in a lexical base or a suffix, the vowel lengthens only within the first disyllable. Note that the suffix *-suuh* ‘at eye’ accompanies only reduplication but not vowel shortening; vowel shortening should not be applied to *yak* in (6b). Also, as can be seen in (6b), the reduplicant vowel is not affected by the length of the variable length vowel, so reduplicant vowels are short.

This disyllable window, as we will see in vowel lengthening/shortening processes, plays an important role in the phonology and morphology of Nuu-chah-nulth, in that quite a few processes are accommodated in this domain. Importantly, stress assignment is made within this domain. Primary stress comes on the first syllable, but stress falls on the second syllable if the first syllable is light and the second syllable is heavy (Stonham 1999; Waldie 2003; Werle 2002; Wilson 1986). Because of the phonological salience and the stress patterns in the initial disyllable in Nuuchahnulth, researchers have claimed that the first two syllables form a domain, namely the foot (Kim 2004, Stonham 1999, 2004, Werle 2002, Wilson 1986). Following Kim (2004) and Lee (2008), this study assumes

that the disyllabic domain is a foot that can contain either a trochee, (L l)_F, (H l)_F, (H h)_F, or an iamb (l H)_F. (See §3.3.2.1 for a detailed discussion of foot structure in Nuu-chah-nulth.)

As for syllable structure, a syllable in Nuu-chah-nulth must have one and only one onset consonant and a nucleus vowel. A vowel can be long or short. Unlike the onset, which does not allow clusters, the coda position allows sequences of up to three consonants (Howe and Pulleyblank 2001; Sapir and Swadesh 1939; Stonham 1999, 2004). While there is no constraint on what can occur in onsets, not all consonants can occur in coda position. None of the glottalized consonants or /h/ may occur in coda position. Also, labial consonants are delabialized in coda position. All vowels are moraic, but with the exception of nasals, coda consonants do not have moraic status. Following Wilson (1986) and Stonham (1999, 2004), this study assumes that following syllable structure for Nuu-chah-nulth:



3.2.3 Word formation

As a polysynthetic language, Nuu-chah-nulth forms words by adding affixes to a lexical base. Except for several infixes, all are suffixes and the number of suffixes amounts to approximately 590, according to the list of suffixes in Sapir and Swadesh (1939). Lexical

bases occur in the leftmost position, except in cases of reduplication, where a reduplicant may precede a lexical base. The reduplicant can be the initial consonant and vowel sequence of a base, as shown in (7a), or a mono-syllabic base, as in (7b). In all cases, the reduplicants are attached to the leftmost edge of the lexical base.

- (7) a. ta-taanaqayukʔiš
 RED-taana-qa-yuk [R]-ʔiš
 RED-money-for-to.cry-3S.IND
 ‘s/he is pouting for money’
- b. miitx-miitxaʔiš
 RED-mitx-(y)a-ʔiš
 RED-to.spin-REP.ITE-3S.IND
 ‘s/he spins continuously.’

In terms of the classification of inflectional versus derivational suffixes, no agreement has yet been reached (Davidson 2002, Nakayama 2001, Rose 1981, Sapir and Swadesh 1939, Stonham 2004). One reason for this inconclusiveness is the status of aspectual markers. Aspect in Nuu-chah-nulth is a case where the distinction between derivation and inflection is not clear-cut. This is mainly because aspectual markers, which usually occur between derivation and inflection cross-linguistically, may occur before derivation (particularly lexical suffixes) in Nuu-chah-nulth. As illustrated in (8), the momentaneous aspect, *-siʔ* and the iterative repetitive aspect, *-(y)a* occur before derivational suffixes.

- (8) a. *ħisʃiʔmapt*
ħis-ʃiʔ-mapt
 bleed-MOM-plant
 ‘Black Raspberry (bleed-plant)’ (Stonham, 2004: 146-147)

- b. ʔučnaakšičmašiiqstuʔaʔaḥ
 ʔučna·k^w-šič-mašiiqstuʔ-ʔaʔ-(m)aʔḥ
 marry-to spin-want-TEM-1S.IND
 ‘s/he spins continuously.’
- c. ʃiḥaaqiičič
 ʃiḥak-(y)a-ʔaqa-iičič
 cry-REP.ITE-several..ing-INC
 ‘they all began crying’

Following Stonham (2004), in which aspectual affixes are considered as a separate element from derivational or inflectional suffixes, this study assumes the maximal word in Nuuchahnulth as in (9). More than one lexical affix can occur in a single word; in some dialects, double-reduplication may occur.

- (9) Maximal Word in Nuuchahnulth¹³
 Reduplication- Lexical base – Lexical affixes (Derivational affixes) –Aspectual affixes - Inflectional Suffixes –Clitics

Inflectional affixes include person, voice, tense, etc. Importantly, non-inflectional morphology in this study refers to both lexical affixes and aspectual affixes. The evidence for this classification comes not from non-derivational morphology, but rather, from a trait that lexical affixes and aspectual affixes share. Both classes of affixes trigger reduplication and vowel lengthening, while inflectional affixes do not. In this study, sometimes derivational morphology is used as a cover term that also includes aspectual affixes.

It is not clear precisely what the term ‘word’ means with respect to Nuuchahnulth. In Nuuchahnulth, lexical bases are built into larger units with the addition of

¹³ See Davidson (2002: §4.2), Sapir and Swadesh (1939: 235-236), and Nakayama (2001: § 2.4) for alternative approaches to the classification of suffixes in Nuuchahnulth.

First, lexical affixes cover as wide a semantic scope as lexical items do, encompassing actions/events, states, entities, and locations. Nakayama (2001:18)

provided examples of lexical affixes with these meanings as follows:

- (11) Semantic scope of lexical affixes
- a. Actions/Events

-ḥwāt	'using...'
-'i'c	'eating...'
-ḥaaḥ	'seeking...'
-ʔatu	'sinking into the water'

 - b. States

-yuʔaaʔ	'being aware of...'
-maḥsa	'desiring to...'
-ḥtin	'being made of...'
-ḥta	'being apart'

 - c. Entities

-ʔaq	'animal hide...'
-mapt	'plant'
-qimʔ	'round object'
-ʔaqsup	'female from ...'

 - d. Locations

-'is	'on the beach'
-ʔas	'on the ground'
-ʔa'	'on the rock'
-'itʔ	'in the house'

Nakayama also points out that affixes pertaining to actions/events, states, and locations are equally numerous, while affixes that denote entities are not as common as the others, but occur in significant numbers nonetheless.

Although lexical affixes often carry meanings very similar to those of lexical bases in the language (e.g., 'buy' lexical base: *makuk* vs. lexical affix: *ʔaap*), it is possible to make a semantic distinction between affixes and lexical items denoting entities. In his

study of the Ahousaht dialect, Nakayama states that lexical affixes tend to express abstract, general classes of things/beings, whereas lexical bases express more specific, particular things/beings. For example, 'a house' is expressed by the lexical base *maḥtʰii*, whereas *naquwiṭ* 'a pub' (literally, a place to be present for drinking) is formed by affixing *-uṭ* 'place for' (*naquwiṭ* < *naq* 'drink' + *-uṭ* 'place for' + *-iṭ* 'being in the house'). Terms for specific animals such as *muwač* 'deer' and *kuukuḥwisa* 'hair seal' are expressed by lexical bases. On the other hand, affixation produces general words such as *haptuup* 'fur-bearing animal' (*haptuup* < *hap-* 'fur' + *-tuup* 'thing, species') and *quʔactup* 'mankind, human beings' (*quʔactup* < *quʔac-* 'human' + *-tuup* 'thing, species').

Despite their semantic similarity, the morphosyntactic status of lexical bases and suffixes is strictly distinguished (Swadesh 1948, Davidson 2002, Wojdak 2003, 2005, among others). For example, the suffix *-ʔaap* and the lexical base *makuk* have the meaning of 'buy'. However, *-ʔaap* must co-occur with a lexical base, as can be seen in (12a); the unit cannot occur in the leftmost slot, where lexical bases appear. Examples in (12) and (13) are drawn from Wojdak (2003: 276-277).

- (12) a. *maḥtʰiiʔamitʔiš* *čakup*
 maḥtʰii-ʔaap-mit-ʔiš *čakup*
 house-buy-PST-3S.IND man
 'A man bought a house'
- b. **ʔaap-mit-ʔiš* *čakup* *maḥtʰii*
 buy-PST-3S.IND man house
 'A man bought a house'

By contrast, *makuk* must occur in the lexical base slot and have an object as a transitive verb, as illustrated in (13a), and unlike *-ʔaap*, cannot affix to *maḥtʰii* 'house'.

- (13) a. makuk^witʔiš čakup maḥʔii
 makuk-mit-ʔiš čakup maḥʔii
 buy-PST-3S.IND man house
 'A man bought a house'
- b. *maḥʔii-makuk-mit -ʔiš čakupii
 house-buy-PST-3S.IND man
 'A man bought a house'

The second trait of lexical affixes is their capacity to be affixed to a wide range of lexical categories. It is known that lexical affixes can be hosted by many word classes, including nouns, adjectives, quantifiers, relative pronouns, wh-words, and verbs (Rose 1981, Davis and Sawai 2001, Nakayama 2001, Davidson 2002, Wojdak 2003). The following examples illustrate the range of bases to which lexical affixes can be attached. (14) contains a noun base. In (15), although the noun *šuuwis* 'shoes' is modified by the lexical base *ʔiih^w* 'large', interestingly it is the modifier, rather than a modified noun, that becomes the base of a lexical affix. Similarly, the quantifier *ʔaya*, which modifies an adjective - *ʔut* 'good' serves as a base in (16).

- (14) šuuwiiʔapʔiš
šuuwis-ʔaap-ʔiš
 shoes-buying-3S.IND
 'He bought shoes.' (Nakayama 2001: 24)
- (15) ʔiiwʔapʔiš yacyut šuuwis
ʔiih^w-ʔaap-ʔiš yacyut šuuwis
large-buying-3S.IND worn shoes
 'He bought big used shoes.' (ibid: 24)
- (16) ʔayaʔiš ʔut
ʔaya-ʔiš ʔut
many-3S.IND good
 'There are many good ones.' (ibid: 51)

The affix - *ʔit* in (17), which has a locative meaning, is attached to a verbal base to form a predicate. In addition to the major lexical classes, even relative pronouns and wh-words can host lexical affixes, as seen in (18) and (19), respectively. Thus, researchers agree that in Nuu-chah-nulth, the leftmost item serves as the host of lexical affixes (Wojdak 2005, Nakayama 2001, Davidson 2002, among others). Examples (17-19) come from Wojdak (2003: 279).

- (17) suʔitʔaʔquu
 su-ʔit-ʔaʔ-quu
hold-being.in.the.house-TEL-3.COND
 'She used to keep her in the house.'
- (18) hačumsiqsaksiš ɥaa čakupʔi yaʔinɥiʔitq Mary
 ɥačumsiqs-ak-siš ɥaa čakup-ʔi **yaq**-ʔinɥi-ʔitq Mary
 brother-POSS-1S.IND DEIC man -DEF **REL**-wait.for-3.REL Mary
 'The man who Mary is waiting for is my brother.'
- (19) ʔaɥiʔamith Louis
ʔaɥi-ʔaap-mit-ɥ Louis
what-buy-PST-3.INT Louis
 'What did Louis buy?'

Lastly, a striking characteristic of lexical affixes, also highly relevant to the present study, is that some suffixes may accompany base modifications such as VLA, reduplication, or a combination thereof. The base modification is also accompanied by some aspectual suffixes. This trait will be discussed in detail in the following sections.

3.3 Multiple exponence of non-inflectional morphology in Nuu-chah-nulth

VLA and reduplication are dominant processes in Nuu-chah-nulth that are known to be triggered by lexical suffixes/aspectual suffixes, as reported in previous literature (Sapir

and Swadesh 1939, Davidson 2001, and Kim 2003, among others). These two seemingly unrelated processes receive a unified analysis as part of ME. In what follows, features of each process are examined in order to illustrate whether they meet the criteria for ME. Then, a unified analysis is proposed, which states that the two processes along with an accompanying suffix are indeed ME.

3.3.1 Traits of the processes

3.3.1.1 Traits of Vowel Length Adjustment

As discussed in Section 2.1, vowel length in Nuu-chah-nulth is contrastive. Vowel lengthening in Nuu-chah-nulth is one of the dominant processes and VLA shows two properties: (i) the vowel-length changes are accompanied by certain suffixes and (ii) the vowel lengthening/shortening is restricted to vowels in the first or second syllables of a word. In what follows, these two traits are discussed.

First, vowel lengthening/shortening in Nuu-chah-nulth almost always occurs with lexical affixes¹⁴, although not all lexical affixes are associated with VLA. Note that the vowel in the lexical base *ʔu*, to which the lexical affixes *-ʔumčʉ* 'serving' and *-ʔc* 'eating' are attached in (20a) and (20b) respectively, is short.

- (20) a. **ʔu**ʔumčʉʔiš Kay nananiqsak
 ʔu-ʔumčʉ-ʔiš Kay nananiqsak
 It –serving -3S.IND Kay grandparents
 ‘Kay is serving (a meal) to grandparents.’

¹⁴ There is only one case in which a vowel is lengthened independently of lexical affixes; this case is concerned with gradative aspect, which will be discussed shortly.

- b. **ʔuʔiicsiʃ** **suuḥaa**
 ʔu-iʻc-siʃ suuḥaa
 It-eating-1st salmons
 ‘I am eating salmon.’

However, as shown in (21), the vowel in *ʔu* is lengthened when accompanied by the affixes *-yuk* ‘at the head’, *-paaʔ* ‘along with’, and *-wik* ‘on the head’. Thus, these examples demonstrate that vowel lengthening in the base is not related to any intrinsic property of the lexical bases. Rather, lexical affixes determine whether base modification occurs.

- (21) a. **ʔuuʔukʔiʃ** Kay **ʔiiḥciip**
 ʔu-yuk [L]-ʔiʃ Kay **ʔiiḥciip**
 REF -at.the.head -3S.IND Kay flowers
 ‘Kay is wearing flowers on her head.’
- b. **ʔuuʔukʔis** Kay **maaḳicum**
 ʔu-yuk [L]-ʔiʃ Kay **maaḳicum**
 REF-at.the.head-3S.IND Kay cedar headband
 ‘Kay is wearing a cedar headband.’
- c. **ʔuupaaʔḥʔiʃ** Ken **ʔuʔuʔiiḥ** **naniiqsakʔi**
 ʔu-paaʔ [L]-ḥ-ʔiʃ Ken **ʔuʔuʔiiḥ** **naniiqs-ak-ʔi**
 REF-along.with-?-3S.IND Ken sea.urchin-hunting grandparents-PST-DEF
 ‘Ken, along with his grandparents, went to sea urchin gathering.’
- d. **ʔuuwikčipʔiʃ** **ʔuk^wiiqsak** **ciyapuxs**
 ʔu-wik [L]-čip-ʔiʃ **ʔuk^wiiqsu-ak** **ciya-puxs**
 REF-on.the.head-for-3S.IND younger.sibling-POSS hat-to.wear
 ‘S/he is wearing his/her younger sibling’s hat.’

Also, (22) shows that lexical affixes can lengthen the first vowel of any lexical base, in this case, *ʔaya* ‘many’ and *ta* ‘sick’. Compare (21d) and (22a): the sentences in (21d) and (22a) contain the same lexical affix, *-wik* ‘on the head’ but they have different bases. In all cases, the vowels of the bases are lengthened. These examples allow us to conclude

that base modification depends on lexical affixes attached to the base, rather than on properties of the lexical bases themselves.

- (22) a. **ʔaayawikʔiš** Kay sačkʰaḥs
 ʔaya-wik [L]-ʔiʃ Kay sačk-ʰaḥs
 many-on.the.head-3S.IND Kay sharp (comb)–vessel (instrument)
 ‘Kay is wearing many combs.’
- b. **taaʔiikukʔiš** Kay naʔaqak
 ta-ʔiʔ-iik [L]-uk-ʔiʃ Kay naʔaqak
 sick–inside–given.to–POSS-3S.IND Kay baby
 ‘Kay’s baby is very sickly.’

The only case in which vowel lengthening occurs independently is the ‘graduative’ aspect. In her study of the Kyuquot dialect, Rose (1981) observes that a long vowel (morpheme [L] in her term) in a verbal base indicates the graduative aspect. The graduative aspect ‘points to or magnifies the gradualness, progression, and continuity (i.e. the imperfectivity) of the phases of an event’ (Rose 1981: 275). This aspect may co-occur with other aspects, such as momentaneous (-šičʰ) and inceptive (-ʔičičʰ; -šičʰ). The data below are drawn from Rose (1981: 275-276).

- (23) a. **yaaciičaʔʰintiis**
 yac-[L]-ʔiči(ʰ)-ʰaʰ-int-(y)i:s
 step–GRAD–INC–TEM–PST–INDF–1S.IND
 ‘I was thinking of/taking my time to start going out’
- b. **ʰʔiisukšʰ**
 ʰʔis-[L]-uk-šiči(ʰ)
 white–GRAD–DUR–MOM/INC
 ‘The object was slowly turning white.’
- c. **ḥuuqšaaʔʰ**
 ḥuq-[L]-šiči(ʰ)-ʰaʰ
 Spill–GRAD–MOM–TEM
 ‘it slowly/gradually spilled out’

- b. waaw^haa^hsaqaʔiʃ
 RED w^hasaq-(y)a[RL+L]-ʔiʃ
 RED to.cough-REP.ITE-3S.IND
 ‘She is continuously coughing.’ (Kim 2003b: 144)

Above, various patterns of vowel-length change are illustrated in terms of where the changes occur; however, I have not found any evidence that vowel lengthening/shortening occurs beyond the initial disyllable. For instance, in (27b), both the first two vowels undergo vowel lengthening, but the vowel in the third syllable, which is also part of the lexical base, *w^hasaq* is not lengthened. Thus, we may conclude that the domain of vowel length changes is the initial disyllable.

To recapitulate, we have seen that vowel length is adjusted in the presence of certain types of lexical affix and that the process always occurs within the domain of the initial disyllable.

3.3.1.2 Traits of reduplication

This section examines reduplication, a prevalent morphological process in Nuu-chah-nulth. The behaviour of reduplication in Nuu-chah-nulth shows very similar properties to that of VLA in the sense that reduplication, in most cases, occurs with certain affixes. Reduplication may co-occur with an affix that conveys either lexical meanings or aspectual status (i.e., iteratives and inceptive). An unusual phenomenon in reduplication occurs with respect to the presence of coda copying: The coda(s) of a mono-syllabic base is copied only with aspectual suffixes. From this observation, I propose that the presence of a coda signifies aspecthood in Nuu-chah-nulth.

Before examining reduplication that occurs with repetitive/inceptive aspect markers and lexical affixes, I will introduce reduplication connoting plurality¹⁶, which is the only use of reduplication occurring on its own in Nuu-chah-nulth. To indicate plurality by reduplication, initial CV(V) segments are copied. The plurality signifies more than one instance of the entity denoted by a noun, as in (28).

- (28) a. maamah̄t̄i
 RED-ma^{h̄}t̄i
 PL-house
 ‘houses’
- b. taataayi
 RED-taayi
 PL-old.brother
 ‘old brothers, seniors’ (Stonham 2004:130)

Also, plurality includes distributive reduplication, which denotes “plurality for entities which are clearly distributed within some domain of nature, e.g., a forest, beach, or sea, or some other domain such as kinship” (Rose 1981: 239). For example, in the sentence shown in (29a), reduplication implies that it was not a single person who brought a spear, but rather, that each person brought a spear.

- (29) a. ʔuuʔuucsuλweʔin miʔs̄ȳi
 RED ʔu-iics-awiλ-weʔin miʔs̄ȳi
 DIST REF-take.along-MOM -3.QUO spear
 ‘each took along his spear’
- b. ʔuʔupqimʔayiiʔat
 RED ʔup-qimʔ-ayi-ʔat
 DIST one-CLS-give-PASS
 ‘he gave a dollar to each’ (Stonham 2004:130)

¹⁶ Plurality also can be expressed with suffixes such as *-m̄inh̄* and *-ʔaat̄* in the Kyuquot dialect (See Rose 1981: 241-255 for details); and with *-m̄inh̄*, *-ʔaat̄*, and *-h̄* in the Tseshah dialect (See Sapir 1921: 75-76 and Stonham 2004: 95-98). Also the infixes, *-t-* and *-y’-* are used to denote plurality (Rose 1981: 330-332).

Except for the reduplication that denotes plurality, all other instances of reduplication occur with either aspectual affixes or lexical affixes. Below, let us examine reduplication associated with lexical affixes followed by that associated with aspectual affixes.

3.3.1.2.1 Reduplication accompanied with lexical affixes

Like VLA, reduplication is always accompanied by certain lexical/aspectual suffixes (with the exception of the graduative aspect mentioned above). Also, reduplication is closely connected to VLA in the sense that both may co-occur in a form. Indeed, many lexical affixes (about 80 in the Nootka Texts of Sapir and Swadesh, 1939) are associated with both reduplication and VLA. Possible combinations of reduplication and VLA are illustrated in (30) below. Because patterns of co-occurrence of reduplication and VLA will be examined in depth in later sections, here I provide simple examples to illustrate some basic patterns.

- (30) a. *Reduplication*
- | | |
|--|--------------|
| <u>t</u> u <u>t</u> u <u>ç</u> i <u>h</u> ?i <u>š</u> | naniiq |
| RED t <u>u</u> ç <u>u</u> p–i <u>h</u> [R]–?i <u>š</u> | naniiq |
| RED sea.urchin–hunting-3S.IND | grandparents |
| ‘Grandparents went to get sea urchins’ | |
- b. *Reduplication with vowel lengthening in reduplicant*
- | | |
|---|---------------------------------|
| <u>ʔ</u> aa <u>ʔ</u> amaas?ap <u>at</u> ?i <u>š</u> | Ken ?u <u>h</u> ?at Kay çistuup |
| RED ʔam–aas [RL]–’ap–’at–?i <u>š</u> | Ken ?u <u>h</u> ?at Kay çistuup |
| RED string-at.the.wrist-CAUS-PASS-3S.IND | Ken by Kay rope |
| ‘Ken has a string on his wrist by Kay’ | |

- c. *Reduplication with vowel lengthening in the base*
 ʔuʔuuuyukʔiš Ken ʔumʔiiqsakitʔi
 RED ʔu-yuk [R+L]-ʔiš Ken ʔumʔiiqsu-ak-it-ʔi
 RED REF-cry-3S.IND Ken mother-POSS-PST -DET
 ‘Ken is crying about his late mother.’
- d. *Reduplication with vowel lengthening in both reduplicant and base*
 ʔaaʔaayačitʔiš Ken
 RED ʔaya-čitʔ [RL+L]-ʔiš Ken
 RED many-to.blame-3S.IND Ken
 ‘Ken is blaming lots of people.’

Generally speaking, reduplication may occur by itself, as in (30a) above; with vowel lengthening in the reduplicant, as in (30b); with vowel lengthening in the base, as in (30c); and with vowel lengthening in the reduplicant and the base, as in (30d). More detailed patterns will be examined in § 3.4.1. However, it is worth noting at this point that all the instances of reduplication above are accompanied by certain affixes that specify a given pattern of reduplication. For example, *-iih* ‘hunting’ accompanies a simple reduplication, which is denoted by [R]; *-čitʔ* ‘to blame’ occurs with a more complex pattern involving vowel lengthening in both the reduplicant and the base, denoted by [RL+L].

3.3.1.2.2 Reduplication co-occurring with aspectual affixes

Reduplication also occurs with three types of aspectual affix, the sporadic iterative, *-šč*¹⁷, the repetitive iterative, *-(y)aʔ*, and the inceptive, *-siʔ*. A unique characteristic of reduplication occurring with aspect markers is that coda copying is required in most cases. I propose that this copied coda implies the aspectual status. Accordingly, the

¹⁷ Both *-š* and *č* denote the sporadic iterative: *-š* occurs after a consonant or a low vowel /a/; *č* occurs after other vowels (/i/ and /u/).

- b. miitxmiitxaʔiʃ
 RED mitx–(y)a [RL+L]-ʔiʃ
 RED to.spin-REP.ITE-3S.IND
 ‘S/he spins continuously’
- c. ʔaaʔaasaqaʔis
 RED ʔasaq–(y)a [RL+L]-ʔiʃ
 RED to.cough-REP.ITE-3S.IND
 ‘She is continuously coughing’

The inceptive aspect marker, *-siʔ* occurs with reduplication of the first syllable in the Ahousaht dialect. Notice that *-siʔ* marks either momentous or inceptive aspect. Interestingly, it accompanies reduplication only when it denotes inceptive. Examples that contain inceptive in (33) are drawn from Kim (2003b: 145); the examples with counterpart momentous are from my field work with the language consultant, Mary Jane Dick, the same speaker with whom Kim worked for her study. The speaker confirms that both words, i.e., with/without reduplication are grammatical, although words with momentous aspect marker (without reduplication) are constructed for the purpose of comparison, and are thus a bit unnatural.

- (33) a. tuuxtuuxʃiʔ
 RED tuʔ–ʃiʔ [R]
 RED to.jump-INC
 ‘starting to jump’
- Cf) tuʔʃiʔʔiʃ ‘S/he jumps’
- b. ʔuusʔuusʃiʔ
 RED ʔus–ʃiʔ [R]
 RED to.dig-INC
 ‘starting to dig’
- Cf) ʔusʃiʔʔiʃ ‘S/he digs’
- c. ʔaaʔaasaqʃiʔ
 RED ʔasap–ʃiʔ [R]
 RED to.cough-INC
 ‘starting to cough’
- Cf) ʔasapʃiʔʔiʃ ‘S/he coughs’

To my knowledge, however, the inceptive *-šičʰ* appears to accompany reduplication only in the Ahousaht dialect. In her study of the Kyuquot dialect, Rose (1981) points out that an inceptive aspect is indicated by *-iicʰi(ʰ)* or *-šičʰ*, in which case the inceptive *-šičʰ* does not occur with reduplication, as illustrated in (34). Examples are drawn from Rose (1981: 276).

- (34) a. yaacukšʰ
 yac-[L]-uk-šičʰ [R]
 step-GRAD-DUR -INC
 ‘(He’ s) just starting to walk better’
- b. waaʰwaaʰsʰ
 RED [L]-uk-šičʰ [R]
 RED go.home-GRAD-DUR-INC
 ‘(He’ s) starting to go home repeatedly’

An interesting fact in both types of iterative reduplications concerns coda consonants. In reduplication in Nuu-chah-nulth, coda consonants are rarely copied. When associated with lexical affixes, reduplication is usually restricted to the first consonant and vowel¹⁸. So, the coda copying is a unique phenomenon; coda copying occurs only with aspectual affixes, from which I suggest that the coda consonant is an indication of aspecthood. Note that a fixed segment *ʰ* is inserted when there is no coda in the monosyllabic base, as in (35). Given that coda copying is not required at all when occurring with lexical affixes, there is no evidence to suggest that this fixed segment occurs for phonological reasons¹⁹. Data in (35) are drawn from Kim (2003b : 166-167)

¹⁸ To my knowledge, there is only one lexical affix that is associated with copying of a coda consonant: *-huk* ‘on the hand’, reported in Kim’s (2003) study of Ahousaht.

¹⁹ Alternations between *c* and *ʰ* are phonologically conditioned: *c* replaces *ʰ* before the affricates *ʰ* or *ʰ* as shown below.

<i>ʰacʰašʰiš</i>	Kim (2003b: 167)
RED <i>ʰa-š-ʰiš</i>	
RED to.split.wood-SPO.ITE-3S.IND	‘S/he is splitting wood continually’

- (35) a. tʰiʰtʰiʰtʰiʰʒiʃ
 RED tʰi-ʃ/č [R]-ʒiʃ
 RED to.throw-SPO.ITE-3S.IND
 ‘She keeps throwing something’
- b. kʷuʌkʷuʌčʒiʃ
 RED kʷu- ʃ/č [R]-ʒiʃ
 RED to.filet-SPO.ITE-3S.IND
 ‘She keeps mending a mat.’
- c. čʷuʌčʷuʌyaʒiʃ
 RED čʷu-(y)a [RL+L]-ʒiʃ
 RED -to.wash-REP.ITE-3S.IND
 ‘S/he does laundry continuously’
- d. kʷaaʌkʷaayaʒiʃ
 RED kʷaa-(y)a [RL+L]-ʒiʃ
 RED -to.back up-REP.ITE-3S.IND
 ‘S/he keeps backing up’

In summary, in the Ahousaht dialect, two types of iterative *-š* and *-(y)a* and the inceptive *-siʌ* occur with reduplication, and the reduplication includes a copied coda. Most reduplication patterns in Nuuchah-nulth have no copied coda. I propose, therefore, that this copied coda plays a role in signalling aspecthood, i.e., repetitive in all dialects and inceptive in the Ahousaht dialect.

This section has examined the traits of VLA and reduplication. The following section explores their characteristics as multiple exponents.

3.3.2 Vowel length modification and reduplication as a subsidiary exponent of ME

The current study proposes four criteria to diagnose ME, based on Matthews’ (1972) study of Latin ME (see §2.2). In (36), the criteria are repeated for convenience.

(36) Criteria for ME

A pattern is defined as an instance of multiple exponence if and only if the following two conditions are met:

- (i) *Non-phonological condition*: no exponents are phonologically conditioned;
- (ii) *Consistent co-occurrence*: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) *Phonological consistency*: phonological representations of the co-occurring exponents are consistent.
- (iv) *No exceptions on base selection*: an exponent may appear on any lexical bases of a morphological category.

This section examines whether reduplication and VLA meet these criteria as ME and concludes that the processes are not phonologically conditioned and consistently occur with certain suffixes and on the lexical bases of certain categories.

3.3.2.1 Non-phonologically conditioned process

In this subsection, the possible phonological motivation for VLA and reduplication is examined. I examine two pieces of evidence suggesting that VLA is not phonologically conditioned: (1) the segmental environment for VLA varies; and (2) VLA is not motivated by the need to create well-formed foot structure in the initial two syllables. As for reduplication, it is generally assumed that reduplication is a morphological process. In the dual theory of reduplication, however, Inkelas (2008) claims that some cases of reduplication are phonological. Such cases are motivated by the need to provide "phonological content to an epenthetic or templatic segment" (p. 27). A possibly relevant phonological motivation for reduplication in Nuu-chah-nulth would be to provide an onset or nucleus for a syllable, thereby creating a well-formed syllable. This possibility is

rejected, since in Nuu-chah-nulth, reduplication always involves copying a CV, a well-formed syllable. In what follows, we first examine the segmental environment of the affixes and lexical bases that are relevant to both reduplication and VLA. Then, metrical structure is examined as a possible phonological motivation for VLA.

First, one plausible phonological motivation for reduplication and VLA would be that the segmental environment of affixes or lexical bases may condition the processes. Specifically, if affixes starting with certain sounds always trigger VLA or reduplication and/or if only particular sounds undergo the processes, these phonological conditionings might be the reason for base modification. However, examination of a suffix list of Sapir and Swadesh (1939) reveals that the initial sounds in suffixes that occur with/without base modifications are randomly distributed. Both VLA and reduplication are accompanied with suffixes starting with vowels /a, i/, stops /p, p̣, s, t, q, ʔ/, affricates /c, č, č̣/, fricatives /s, h/, or sonorant /m, ṃ, n, ṇ, y, ỵ, w, ẉ/, which do not constitute natural classes. Among them, *m* and *ỵ* occur only with vowel lengthening and *w* with reduplication, which seems to be coincidental. The following examples clearly demonstrate that the initial affix sounds do not affect the processes. A group of suffixes that are segmentally identical, as in (37), occurs with distinct base modifications or do not accompany any modifications. The suffixes are taken from Sapir and Swadesh (1939). The examples in (37) not only show the non-influence of the segmental environment of affixes, but also provide further evidence that base modifications are not conditioned by the phonological shape of affixes. Since different types of base modification are accompanied by identical affixes, these modifications are clearly not associated with the shape of affixes.

- (37) a. -iṭ ‘sleeping with’ w/Reduplication
 -(č,k^w) iṭ ‘doing to, with reference to’ w/Lengthening
 ’-iṭ ‘in the house, on the floor’ No base modification
- b. -paṭ- ‘on the each side;’ w/Reduplication
 -paṭ- ‘in the same group with’ w/Lengthening
 -paṭ ‘season of’ No base modification

Furthermore, base modifications are not conditioned by the lexical bases on which the modifications occur. As can be seen in (38), different base modifications occur in the same base. In (38), the lexical base, *ʔaya* ‘many’ accompanies no modification (38a), vowel lengthening (38b), reduplication (38c), or vowel lengthening and reduplication (38d). These examples provide evidence that VLA and reduplication are not dependent on the shape of the base.

- (38) a. ʔayaʔiʔʔiṣ m̄aami
 ʔaya-ʔiʔ-ʔiṣ m̄aami
 Many-to.lose-3S.IND older siblings
 ‘Your older sibling lost lots (in the sense of money).’
- b. ʔaayawikʔiṣ Kay sačkaḥs
 ʔaya-wik [L]-ʔiṣ Kay sačk-’aḥs
 many-on.the.head-3S.IND Kay sharp (comb)-vessel (instrument)
 ‘Kay is wearing many combs.’
- c. ʔaʔayiṭʔiṣ Kay
 RED ʔaya-iṭ [R]-ʔiṣ Kay
 RED many-sleeping.with-3S.IND Kay
 ‘Kay is sleeping with lots (of people in the same room)’
- d. ʔaaʔaayačitʔiṣ Ken yaʔatuk^wii hiqaaʔat maḥtii
 RED ʔaya-čit [RL+L]-ʔiṣ Ken yaq-at-uk-ii hiq-aa-at maḥtii
 RED many-to.blame 3S.IND Ken who-PST-POSS -REL wreck-con-PASS house
 ‘Ken is blaming lots of people who wreck his house.’

Second, another important phonological motivation for VLA might be to create a well-formed foot. We will examine this possibility and reject it. Cross-linguistically, most cases of VLA are phonologically motivated to produce well-formed foot structures, such as iambs or trochees (Kager, 1994; Hayes, 1987, 1995; McCarthy and Prince, 1990, among others). VLA in Nuu-chah-nulth, however, is not associated with the generation of well-formed foot structure.

In her study of Ahousaht, Kim (2003) describes VLA as ‘metrical requirements specified for suffixes attached to the root/stem morpheme’ (p. 105). She maintains that the metrical requirements, however, are not phonologically motivated, but idiosyncratically enforced by the suffix to satisfy certain templates. Kim points out that contrary to what commonly happens in other languages, in Nuu-chah-nulth, VLA does not create unmarked structures. In line with Kim, Lee (2008) argues that VLA in Nuu-chah-nulth is not a strategy to obtain a well-formed foot, i.e. iambic lengthening or trochaic shortening. Below, I will briefly discuss foot types in Nuu-chah-nulth and will show that VLA does not occur to create well-formed foot structure.

Researchers have not yet reached agreement on the foot typologies and foot shapes in Nuu-chah-nulth. Werle (2002) considers that the foot in Nuu-chah-nulth is a trochee formed in the first disyllable, i.e., (L l)_F and (H)_F²⁰. Kim (2004) and Lee (2008) state that the foot shapes attested in Nuu-chah-nulth include both trochee, i.e., (L l)_F, (H l)_F, (H h)_F and iamb (l H)_F²¹. Lee (2008) maintains that the first two syllables are a salient domain

²⁰ Abbreviations: H = stressed heavy syllable; L = stressed light syllable; h = unstressed heavy syllable; l = unstressed light syllable

²¹ See Kim (2004) and Lee (2008) for more detailed discussion of the metrical structure of Nuu-chah-nulth; Hayes (1980), Halle and Vergnaud (1987), Prince (1991), Kager (1996), van der Hulst and Klamer (1996) for discussion of uneven trochees; Hayes (1987, 1995) and McCarthy and Prince (1986, 1990), for discussion of the syllabic trochee and moraic trochees; Kager (1994)

based on stress assignment, variable length vowel, and vowel lengthening/shortening.

The domain, therefore, constitutes a phonological unit, which is equivalent to a foot. For the purpose of this study, following Kim (2004) and Lee (2008), I assume that the metrical structure of Nuu-chah-nulth comprises both trochees and iambs. The trochees include an uneven trochee such as (H l)_F, and a rather uncommon foot shape, the heavy foot (H h)_F (see Lee (2008) for a justification of these foot types).

Thus, template shapes for the first two syllables in Nuu-chah-nulth vary widely in that most of the possible combinations of L and H sequences are attested: {(L l)_F, (l H)_F, (H l)_F, (H h)_F}²². Examples that demonstrate foot shapes of the initial two syllables are provided below.

(39) Foot shapes of the initial disyllable

- | | | | |
|----|------------------------------|----------------------------------|---------------------------|
| a. | (L l) _F | | |
| | wá.wa.ʔiik | ‘being ashamed’ | (Sapir and Swadesh, 1955) |
| | ʔát.ʔa.čik | ‘(they) like going fishing.’ | (ibid) |
| b. | (H l) _F | | |
| | wíi.ʔak.simč | ‘doing ritual to be unbeatable’ | (ibid) |
| | ʔúu.ʔuʔ.we.ʔiik | ‘fond of saying good thing’ | (ibid) |
| c. | (H h) _F | | |
| | híi.sii.k ^w a.ńuʔ | ‘(he) goes all along the place.’ | (ibid) |
| | túuš.kaa.si.ʔiik | ‘A codfish was on the ground.’ | |
| | | | (Sapir and Swadesh 1939) |
| d. | (l H) _F | | |
| | hi.síik. | ‘go to the place’ | (ibid) |
| | ʔíqúuʔis | ‘large stone on the point’ | (ibid) |

for analysis of the Moraic Trochee and Moraic Iamb; and finally, Hammond (1990) and Crowhurst (1991) for discussion of uneven trochees containing two heavy syllables.

²² A syllable is heavy in Nuu-chah-nulth when it has a long vowel or a short vowel followed by a nasal consonant. See footnote 13 for evidence that a nasal consonant is moraic.

Table 4, which is based on a preliminary investigation of 996 words from the first seven texts (p. 14 - p.40) in Sapir and Swadesh (1939), illustrates the distribution of initial disyllabic shapes in Nuu-chah-nulth. As discussed in §3.2.4, the term 'word' in this study may include a word, a phrase, or a clause, because of unclear boundaries among them in Nuu-chah-nulth. Accordingly, no strict distinction was made among words, phrases, and clauses, and a unit was considered as one word when it was separated from another unit by a space. The shapes examined include those that result from VLA and/or reduplication, if applicable.

Table 4 *Distribution of Disyllable Shapes*

Disyllable shapes	Numbers	Percentages
Ll	371	37.2
Hl	264	26.5
Hh	98	9.8
IH	263	26.4
Total	996	99.9

(Lee 2008: 15)

The distribution of initial disyllabic shapes in Table 4 shows that Ll is the most prevalent, and Hh the least prevalent shape. Hl and IH shapes are almost evenly distributed in Nuu-chah-nulth. Therefore, we can conclude that (L l)_F is the unmarked foot shape in Nuu-chah-nulth and that (H h)_F is the most marked one. If VLA is a strategy to meet criteria for well-formed feet, we would expect to see the unmarked foot, (L l)_F more often than others after the application of the process. In other words, VLA would be less likely to produce the heavy trochaic foot, (H h)_F, which is the most marked foot. However, the following examples produce the foot type (H h)_F. If VLA is phonologically conditioned, then this (H h)_F structure is unexpected because of its markedness.

(40)	Lexical bases	Words	
a.	(l H) _F	(H h) _F	(Sapir and Swadesh 1939)
	qasíi ‘eye’	qáaqaasč’aʔiik	‘having sore eyes’
	tuskúuḥ ‘codfish’	túuskaasiʔiik	‘A codfish is on the ground.’
b.	(L l) _F	(H h) _F	(Sapir and Swadesh 1939)
	hísa ‘at that place’	híisiikciiʔas	‘to go along the side of a house’
	túḥçiti ‘head’	túu'túuḥçapiik	‘to have a headache’
c.	(L l) _F	(H l) _F	(Sapir and Swadesh 1955)
	ʔáya ‘many’	ʔáayacaqa	‘S/he is busy with many things’
	máʔas ‘house’	maa'simč	‘a place for doing ritual’

Notice that in (40a), (l H)_F, a well-formed iamb, undergoes lengthening to form a less well-formed foot, (H h)_F. In (40b) and (40c), one or two vowels in (L l)_F feet, an unmarked foot shape in Nuu-chah-nulth, are lengthened to build more marked feet, (H l)_F or (H h)_F. Clearly, therefore, in Nuu-chah-nulth, VLA does not occur in order to create well-formed feet.

To conclude, in Nuu-chah-nulth, VLA and reduplication are not phonologically conditioned with respect to segmental environment or metrical structure. Neither the shape of affixes nor the shape of bases is associated with the presence/absence of VLA and reduplication. Also, VLA does not occur to create well-formed feet. There are no other possible phonological reasons for the process. Thus, it is conclusive that VLA and reduplication meet the first, crucial criterion: *Non-phonological condition*.

3.3.2.2 Consistent occurrence of with a suffix and base modifications

Recall that another obligatory criterion for determining whether two or more exponents are ME is whether the components always co-occur. In Nuu-chah-nulth in particular, if VLA/reduplication is a subsidiary exponent of multiple exponence, it must occur whenever a particular lexical affix or aspectual affix attaches to a base.

In fact, in Nuu-chah-nulth, it is rare to find that VLA and/or reduplication are accompanied by a given suffix in one circumstance but not in another. For instance, *-h̥waaʔ* 'to use' co-occurs with vowel lengthening in the first syllable and vowel shortening in the second syllable, i.e., [L+S]. All the examples in (41) show this pattern. Consider the second syllable: in (41a) and (41b), in which the second syllable belongs to a lexical base, and (41c) and (41d), in which the second syllable belongs to a suffix. In all these examples, the second syllables are consistently shortened, and the first syllables are consistently lengthened. The examples in (41) are drawn from Kim (2003b: 107).

- (41) a. **kuuṁah̥waaʔ**
 kuṁaa-h̥waaʔ [L+S]
 scarcely.any-to.use
 'using hardly any'
- b. **t̥uunaax̥h̥waaʔ**
 t̥unaax-h̥waaʔ [L+S]
 tulle-to.use
 'using a tulle'
- c. **ciis̥x̥h̥waaʔ**
 ciis̥x-h̥waaʔ [L+S]
 dirty-to.use
 'using something dirty'

- d. ʔuuhʷaʔ
 ʔu-ḥwaaʔ [L+S]
 REF-to.use
 ‘to use’

The conclusions drawn from the examples above will receive additional support from the examples that appear in §3.4.1 below. To avoid repetition, I will not discuss this issue further in this section.

As for reduplication, in Nuu-chah-nulth, the copied segments, i.e., the reduplicants, vary, but maximally comprise the first syllable of a base: CV, CVV, CVVC(C)(C), or CVC(C)(C). The type of reduplicant depends, however, on the affix that accompanies it. For example, Kim observed that the affix *-(č)ink* ‘to converse with/together/side by side’ is associated with the copying of the first consonant and vowel of a base and that both the reduplicant and the base vowels are shortened unless they are already underlyingly short. This affix unfailingly accompanies this pattern of reduplication (and vowel shortening). The examples in (42), drawn from Kim (2003: 148), show instances of CV reduplication as well as VLA co-occurring with *-(č)ink*.

- (42) a. huhuʔačinksapʔiš
 RED huʔa-čink [RS+S]-sap-ʔiš
 RED to.put.together-side.by.side-MOM.CAUS-3S.IND
 ‘S/he puts engine back together’
- b. ciqinqinkʔiš
 RED ciq-(č)ink [RS+S]-ʔiš
 RED to.speak-side.by.side-3S.IND
 ‘S/he is praying’
- c. čačacink
 RED -čaa -čink [RS+S]
 RED -swiftly.moving.water -side.by.side
 ‘going against the tide of swift current’

- b. huuhupimaʃqʔiik
 RED hupi-maʃaqʔ-'iik [RL]
 RED help-want.tor-given.to
 'He's always wanting to help people.' (Rose, 1981:301)

As shown above, whether a suffix accompanies vowel lengthening/shortening or reduplication, the suffix always occurs with the process. Therefore, the second criterion, *Consistent co-occurrence*, is satisfied.

3.3.2.3 Phonological consistency

The third criterion for ME concerns the phonological representations of the co-occurring exponents. If the co-occurring exponents, specifically a suffix and VLA or reduplication, are phonologically invariant, the criterion is met.

In the previous section, I showed that VLA/reduplication and the accompanying suffixes consistently co-occur. In the examples in (41) and (42) above, the pattern of vowel length change that occurs with each suffix *-hwaat* 'to use' and *-cink* 'side by side' shows phonological consistency. The suffix *-hwaat* 'to use' always accompanies the pattern of [L+S]: lengthening of the first base vowel and shortening of the second base vowel. Also, *-cink* 'side by side' accompanies a combination of reduplication and vowel shortening [RS+S]: copying the CV of the base, and shortening of the reduplicant vowel and the base vowel. Also, reduplication as subsidiary exponence generates consistent shapes in the resulting CV skeleton. The consistency of the copied segments supports the argument that reduplication, not to mention VLA, satisfies the third criterion for ME: exponents are phonologically invariant.

- b. tataanaqayukʔiš
 RED **taanai**-qa-yuk^w [R]-ʔiš
 RED money-for-to.cry-3S.IND
 ‘She is pouting for money’
- (iii) *With an adjectival base*
- a. ʔaaʔaanuʔ
ʔaaʔ-aaṅu(ʔ) [L]
 thick-along.length
 ‘thick along its length’
 (Davidson, 2002: 46)
- b. tataʔiʔʔaʔuk
 RED-**taʔiʔ**-ʔaʔuk [R]
 RED-sick-to.look.after
 ‘to look after s.o. sick’
 (Kim, 2003b: 142)
- (iv). *With a negative base*
- a. wiikiṅakuuḥsis
wik-iṅakuuḥ [L]-siš
 NEG-to.observe-1S.IND s
 ‘I am watching nothing’ (Kim, 2003b: 108)
- b. wiwikiyukʔis
 RED **wik**-yuk^w [R]-ʔiš
 RED NEG-to.cry -3S.IND
 ‘She is not crying’

The point here is that if a suffix accompanies VLA/reduplication and may occur with a nominal base, then the VLA/reduplication occurs with all nominal bases. For example, the suffix, *-(q)iiʔ* ‘to make’ may attach to a noun and accompanies vowel lengthening in the first syllable and vowel shortening in the second syllable of the base, if applicable. In all the examples in (46), VLA consistently occurs in the base; and I have not found any examples where the suffix is not accompanied by VLA in the base.

- (46) a. ʔiink^wiiʔ
 ʔink^w-(q)iiʔ [L+S]
 fire-to.make
 ‘making fire’
- b. čʔaapaciiʔ
 čʔapac-(q)iiʔ [L+S]
 canoe-to.make
 ‘making a canoe’
- c. saapniqiiʔ
 sapnii-(q)iiʔ [L+S]
 bread-to.make
 ‘making fire’

- d. maaḥtiqiiṭ
 maḥtii-(q)iiṭ[L+S]
 house-to.make
 ‘building a house’

To illustrate cases of reduplication, take the repetitive iterative *-(y)a* as an example. The examples in (47) are copied from (32) above.

- (47) a. cuuccucaʔiš
 RED cuc-(y)a [RL+L]-ʔiš
 RED scratch-REP.ITE -3S.IND
 ‘S/h is continuously scratching.’
- b. miitxmiitxaʔiš
 RED mitx-(y)a [RL+L]-ʔiš
 RED to.spin-REP.ITE-3S.IND
 ‘S/he spins continuously’
- c. ṵaaṵaasaqaʔis
 RED ṵasaq-(y)a [RL+L]-ʔiš
 RED to.cough-REP.ITE-3S.IND
 ‘She is continuously coughing’

Again, the aspect marker can occur with any verbal base if there is no semantic restriction; and no examples that restrict the addition of the marker to the verbal base are found. In short, the criterion *No exceptions on base selection* is satisfied.

In conclusion, VLA and reduplication meet all the criteria for subsidiary exponence of an aspectual/lexical affix. That is, VLA and reduplication are not phonologically conditioned; whenever a main exponent (suffix) is present, VLA and/or reduplication always occur with the suffix; the shape of base modification is consistent; and VLA and reduplication occur on the lexical bases of certain categories consistently. Thus, base modification and suffixation together constitute ME in non-inflectional

morphology. In the following section, based on the patterns of VLA and reduplication, non-inflectional classes will be discussed.

3.4 Classification of derivational and aspectual affixes

This section concerns the classification of non-inflectional affixes in Nuu-chah-nulth. As discussed earlier, the classification of non-inflectional is similar to that of inflectional in some respects, and different in others. One similarity lies in the way that classes are identified. Both types of affix are classified in accordance with *phonological shapes*. In inflectional morphology, affixes are identified by the phonological shapes of inflection; in non-inflectional morphology, affixes are organized by the phonological shapes of base modification. For instance, in English, inflectional classes can be identified by the phonological manifestations of past tense, i.e., regular verbs, vowel alternation, no change, vowel alternation and affix *d*, and so on. Non-inflectional classes are identified by patterns of base modification, i.e., in Nuu-chah-nulth, reduplication, VLA, reduplication and VLA, and so on.

A significant difference lies in what gets classified. That is, an inflectional class is a group of *lexemes* that may occur with the same inflectional marker. Thus, Class I may include verbs such as *bake*, *walk*, and *cook*; Class II *break*, *speak*, and *steal*; Class III *beat*, *bet*, and *cut*, and so on. On the other hand, a non-inflectional class is a group of *affixes* that may occur with the same (non-phonologically conditioned) base modification (see §2.3.1 for a detailed discussion). In what follows, I propose 14 non-inflectional classes according to patterns of base modification (§ 3.4.1). This section also discusses forms which contain more than one affix that belongs to different classes (§ 3.4.2). This

type of form is important in that it provides empirical evidence that supports the WP accounts over other analyses such as a Templatic approach or a Stratal Optimality Theoretic approach, which will be discussed in §3.6.

3.4.1 Classes of derivational affixes

As discussed earlier, it is suggested that non-inflectional classes are identified by base modifications. Nuu-chah-nulth has various patterns of base modification that comprise combinations of reduplication, vowel lengthening, vowel shortening, and fixed segment *c*. Each pattern is identified as a single class. Accordingly, 14 classes are suggested. See Table 5 below for a summary of the classes.

In the table, each class is described in the second column, e.g., whether affixes are lexical or aspectual; what alternation(s) the affix occurs with. In the third column, the notation adopts the traditional way of presenting alternations in Nuu-chah-nulth literature, e.g., [R] =reduplication; [R+L] = reduplication and vowel lengthening in the first base vowel etc. Unlike the traditional symbols, the notation includes [L_A] or [A_{SP}] in it, e.g., [R... L_A] [R... A_{SP}]. [L_A] and [A_{SP}] denote a lexical affix and an aspectual affix, respectively. These symbols are used to distinguish Class 5 from Class 11 as well as Class 8 from Class 10. The patterns of base modification are the same in these pairs of classes, but they differ by types of affix. The fourth column in the table shows the segmental patterns within each class. Since the alternations always occur on the initial disyllable, segments in the first two syllables are specified, if any. Parentheses, as in (C)

and (V) indicates that the segment is optional. { } represents cases in which one of the segments in the parentheses must occur. In what follows, each class is examined.

Table 5 *Description of Classes*

Classes of affix	Descriptions	Notations	1st σ - 2nd σ	Number of suffixes
CL 1	Lexical affixes (LA) w/no stem modification	No notation	No specification (NS)	Approx 300
CL 2	LA w/vowel lengthening (VL) in the 1st σ	[L... LA]	CVV(C) ²³ - NS	120
CL 3	LA w/VL in the 1st σ and vowel shortening (VS) in the 2nd σ	[L+S... LA]	CVV(C) - CV(C)	4
CL 4	LA w/VS both in the 1st and 2nd σ	[S+S ... LA]	CV(C) - CV(C)	1
CL 5	LA w/reduplication (RED)	[R... LA]	CV(V) - NS	37
CL 6	LA w/RED and VL in the 1st σ	[RL... LA]	CVV - NS	15
CL 7	LA w/RED and VL in the 2nd σ	[R+L... LA]	CV(V) - CVV(C)	18
CL 8	LA w/RED and VL in both 1st σ and 2nd σ	[RL+L... LA]	CVV - CVV(C)	9
CL 9	LA w/RED and VL in the 1st σ and VS in the 2nd σ	[RL+S... LA]	CVV - CV(C)	2
CL 10	Repetitive iterative w /RED and VL in both 1st σ and 2nd σ	[RL+L... ASP]	CVV{C2, λ , (C2)} - CVV(C2)	1
CL 11	Sporadic iterative w/RED	[R... ASP]	CV(V){C2, λ , (C2)} - CV(V)(C2)	2
CL 12	-(c)su(ʔ) 'at the eyes'	[Rc+L ... LA]	CV(V)c - CVV(C)	1
CL 13	-(c)suptʔaaʔ 'competing in ...'	[RLc ... LA]	CVVc - CV(V)(C)	1
CL 14	-(q)ḥsa 'at the brink'	[RLc+L ... LA]	CVVc - CVV(C)	1

Class 1 includes all the suffixes that are not accompanied by stem modification.

This class is the most common, i.e., the unmarked pattern; thus, no symbol is necessary to denote it. Approximately 300 affixes belong to this class.

²³Codas can include up to three consonants. Thus, here, (C) does not imply that a coda consists of a single consonant. There could be two or three consonants in a cluster.

Class 2 ([L...LA]) involves vowel lengthening in the first syllable; the second syllable is not specified. This is the largest class of ME (Class 2-14), including approximately 120 affixes from Sapir and Swadesh's (1939) suffix list. The first vowel in the stem is lengthened (*hayu* > *haayu*; *?aya* > *?aaya*), as in (48). If the first vowel is underlyingly long, the length of the vowel is maintained (*?iih^w* > *?iih*; *ħuučũqʰis?ath* > *ħuučũqʰis?ath*), as illustrated in (49).

- (48) a. **ħaayumiik**
 ħayu–miik^w [L]
 ten–getter.of
 ‘getter of ten’ (Davidson 2001: 48)
- b. **?aayapanač**
 ?aya–panač [L]
 many–moving.around
 ‘many people moving around’ (Kim 2003b: 108)
- (49) a. **?iihħwink**
 ?iih^w–ħwink^w [L]
 big–use
 ‘use a big one’ (Kim 2003b: 108)
- b. **ħuučũqʰis?athsimč**
 ħuučũqʰis?ath–simč [L]
 Uchucklesit–do.ritual.for
 ‘perform a ritual for (catching) Uchucklesits’ (Kim 2003b: 108)

Class 3 ([L+S... LA]) affixes are associated with modified vowel length in the first and second syllables. Four suffixes belong to this class. The first vowel is lengthened and the second vowel is shortened unless the vowels are underlyingly specified for length. Note that in (50c), the second vowel belongs to the VLA-accompanying affix itself and still goes through the shortening process.

- (50) a. **hiinisuuʔuk**²⁴
 ʰina-iis-uuʔuk [L+S]
 empty.root–carry-going
 ‘carry along’ (Davidson 2001: 49)
- b. **kuuṁaḥwaaʔ**
 kuṁaa-ḥwaaʔ [L+S]
 scarcely/hardly any–to use
 ‘using hardly any’ (Kim 2003b: 107)
- c. **ciisḥwaaʔ**
 ciṣḥ-ḥwaaʔ [L+S]
 dirty-to.use
 ‘using something dirty’ (Kim 2003b: 107)

If a vowel is already specified for length, the process applies vacuously. In (51a), the vowel *a* in the second syllable of *-hina* is underlyingly short and is realized as short in the surface. The vowel in the first syllable of *taanaa* in (b), on the other hand, is underlyingly long and the length is maintained in the derived form. Data in (51-56) are from Davidson (2002: 51-52) except for (51b).

- (51) a. **hiinawiiqš**
 hina-awiiqš [L+S]
 empty.root–call.for
 ‘send for’
- b. **taanaqḥwaaʔ**
 taanaa-q-ḥwaaʔ [L+S]
 money–EXIS-to.use
 ‘using money’ (Kim, 2003b: 107)

Class 4 ([S+S... LA]) specifies that in the initial disyllables, vowels in both syllables are shortened unless they are already short. The [S+S] pattern is attested in only one affix, *-(q)aq* ‘very’ in both the Tsessaht and Ahousaht dialects. In this pattern,

²⁴ Two vowels (*a* and *i*) are reduced to *i* when they occur adjacently. This vowel reduction is a regular rule in Nuu-chah-nulth phonology.

illustrated in (52) below, vowels in both the first and second syllables are shortened unless they are already short.

- (52) a. ʔiɦaqaq
 ʔiiɦ-aq(aq) [S+S]
 big-very
 ‘very big’
- b. ʔayačiɦaqaq
 ʔaya-iičiɦ-aq(aq) [S+S]
 many-INC-very
 ‘become very many’

Underlyingly short vowels do not undergo a change in length when accompanied by the suffix. Note that both the first and second vowels are underlyingly short in (53a) and (53b). Whether the second vowel belongs to the root, as in (53a) with *ɦaɦuk* or to the VLA-accompanied affix itself, as in (53b), the result does not change.

- (53) a. ɦaɦuk^waq
 ɦaɦuk-aq(aq) [S+S]
 eat-very
 ‘eat a lot’
- b. ɦuɦaqaq
 ɦuɦ-aq(aq) [S+S]
 good-very
 ‘very good’

Class 5 ([R... LA] includes affixes that copy the initial base consonant and vowel. So, the reduplicant vowel can be either long or short depending on the length of the underlying base vowel. The second syllable is not affected. 37 suffixes belonging to this class are found in Sapir and Swadesh’s (1939) suffix list.

- (54) a. **ci**cifaatuk
 RED ciq-'aatuk [R]
 RED speak-attend.to
 'listen to sb speaking'
- b. **ʔa**?anas
 RED ?ana-as [R]
 RED only-on.cheeks
 'only that on the cheeks'
- c. **ku**kuḥwisaʔiih
 RED kuḥwisa-q-'iih [R]
 RED-hair.seal-BFR-hunt
 'hunt hair-seal'

As can be seen in (55), a reduplicant vowel is short, even when the base vowel is long. Following Swadesh (1948) and Davidson (2002), who have observed that long vowels regularly become short in reduplicants, I assume that [R] represents CV reduplication, rather than CVV²⁵.

- | | | | |
|---------|---|----|---|
| (55) a. | ʔa ?aacataḥ
RED ?aac-ataḥ [R]
RED go.fishing-ready.to
'ready to go fishing' | b. | yaa ac'ap
RED yaa-c'ap [R]
RED sore-sore.with
'feel sore' |
|---------|---|----|---|

It should be noted, however, that Davidson reports a couple of cases where a long vowel in the base is copied, as illustrated in (56). In such cases, Davidson suggests that the base vowels are persistently long and the origin might stem from historical change. For the current study, I simply consider such cases as idiosyncratic, while classifying the suffix as Class 5.

²⁵ Alternately, [RS] may be suggested instead of [R]; however, unless a suffix allows to belong to two classes, this is not plausible, since -*ataḥ* 'ready to' may occur with long reduplicant vowel in (56).

- (56) a. **č̣iič̣iiṭataḥ**
 RED č̣iiṭ-ataḥ [R]
 RED escape- ready.to
 ‘ready to escape’
- b. **hūuhūuṛičuḥataḥ**
 RED hūuṛič-uḥ-ataḥ [R]
 RED sleep.PL-PERF-ready.to
 ‘ready to fall asleep’

Class 6 ([RL ... LA]) duplicates the base onset consonant and vowel and lengthens the reduplicant vowel. 15 suffixes in Sapir and Swadesh’s (1939) suffix list belong to this class. Note that the reduplicant vowel is long regardless of whether the base has a short vowel in an open syllable (57a), a long vowel in an open syllable (57b), or a vowel in a closed syllable in (57c). (57) comes from Kim (2003b: 143).

- (57) a. **naanaṭataḥṛiik**
 RED naṭataḥ-ṛiik [RL]
 RED to.listen-s.o.who.always.does.s.t
 ‘someone who always listens a lot’
- b. **ṛuuṛuuwaṛiik**
 RED ṛuuwa-ṛiik [RL]
 RED to.complain-s.o.who.always.does.s.t
 ‘someone who always complains a lot’
- c. **yaaṣaqḥstáṭṭṛiik**
 RED ṣaqḥ- stáṭṭ-ṛiik [RL]
 RED dislike-each.other-s.o.who.always.does.s.t
 ‘someone who always dislike another’

Class 7 ([R+L ... LA]) involves reduplication of the base and lengthening of the initial base vowel. Codas are not copied. 18 suffixes belong to this class. Although the reduplicant vowel associated with this category is not specified, the vowel tends to be short regardless of whether its original length is short, as in (58), or long, as in (59). Also,

the base vowel is lengthened when it is short (58) and keeps its length when the initial base vowel is underlyingly long, as in (59). Data from (58) to (61) are drawn from Davidson (2002: 51-53).

- | | | | | |
|------|----|---|----|---|
| (58) | a. | <u>ʔuʔuuk</u> ^{wi} ya†
RED ʔu-čiya† [R+L]
RED REF-pursue
'pursue it' | b. | <u>ʔaʔaayim</u> ču
RED ʔaya-mču [R+L]
RED many-regale
'regale many' |
| (59) | a. | <u>ʔuʔuu</u> štaq
RED ʔuuš-taq [R+L]
RED something-work.on
'do work' | b. | <u>hahaa</u> ʔinyu
RED haaʔin-yu [R+L]
RED invite-PL
'several inviting' |

Class 8 ([RL+L ... LA]) engages three processes: reduplication, lengthening of the reduplicant vowel, and lengthening of the base vowel. Therefore, both vowels in the initial disyllable must be long. Codas in the base are not copied. Nine suffixes belong to this class.

- | | | | | |
|------|----|---|----|---|
| (60) | a. | <u>tuutuup</u> kħin
RED tupk-ħin [RL+L]
RED black-at.end
'black-tipped' | b. | <u>hiihii</u> šcithin
RED hiš-cit-ħin [RL+L]
RED all-at.X.end-at.end
'at both ends' |
| | c. | <u>niinii</u> ħmaqa
RED niiħ-maqa [RL+L]
RED 1PL-for.sake.of
'for our sake' | | |

Class 9 ([RL+S ... LA]) is similar to Class 8 except for the first base vowel, which undergoes shortening rather than lengthening. The reduplicant vowel is required to be long, while the base vowel should be short. Note that the reduplicant vowels in (61) and (62) (*q^wii*, *wii*, *ʔuu*, and *ʔaa*) are all long. In this pattern, the coda is not duplicated.

Examples in (62) are drawn from Kim (2003b: 147). The two suffixes shown below belong to this class.

- (61) a. **q^{wii}q^{wi}it^ʔak**
 RED q^{wi}-it^ʔak [RL+S]
 RED whatever-fear
 ‘whatever one fears’
- b. **wi^{wii}wikit^ʔak**
 RED wik-it^ʔak [RL+S]
 RED not-fear
 ‘not fear it, fear nothing’
- (62) a. **ʔuuʔuščasči**
 RED ʔuuš-(k)časči [RL+S]
 RED some-to.play (on.someone’s.side)
 ‘S/he is on someone’s side in a team.’
- b. **ʔaaʔayasči**
 RED ʔaya-(kča)sči [RL+S]
 RED many-to.play (on.someone’s.side)
 ‘Many on someone’s side’

Class 10 and Class 11 involves aspectual suffixes such as the repetitive iterative - (y)a, the sporadic iterative –š, and the inceptive *siʔ* (Ahousaht dialect)²⁶. These aspectual affixes are classified as distinct classes, because while they have many common properties in terms of coda behaviour in the reduplicant, they also differ with respect to vowel lengthening in the initial disyllable. Recall that (y)a and *siʔ* are associated with long vowels in the disyllable. Class 10 ([RL+L ... AA]) refers to the repetitive iterative aspectual (y)a and the inceptive *siʔ*; Class 11 ([R ... AA]) refers to the sporadic iterative aspectual š. The initial part of their notations looks the same as Class 8 and Class 5, which involve lexical affixes instead of aspectual suffixes. However, their subsidiary exponents differ in terms of the coda in the reduplicant. Coda copying is not permitted in [RL+L] of Class 8 and [R] of Class 5, i.e., the syllable structure of the initial disyllable is

²⁶ Other aspectual suffixes attested in Sapir and Swadesh’s (1939) suffix list are not included in this study, because their status with respect to coda copying has not been verified. I leave this issue for future study.

CVV - CVV(C) and CV(V)-NS. On the other hand, [RL+L] of Class 10 and [R] of Class 11 require that the base coda be duplicated.

Recall that iteratives are required to have a coda in the reduplicant if the base is monosyllabic. If the base has no coda, a fixed segment λ is inserted instead. If the base is a multi-syllabic open syllable, however, then a coda in the reduplicant is not required.

Thus, the patterns of the initial disyllable of Class 10 and Class 11 are CVV{C₂, λ , (C₂)}-CVV(C) and CV(V){C₂, λ , (C₂)}-CV(V)(C), respectively. In Class 10, C₁VVC₂-C₁VVC₂ applies when the base is monosyllabic, as in (63a) and (63b); C₁VV λ -C₁VV applies when the base is monosyllabic and has no coda (63c); and C₁VV-C₁VV occurs when the base is multisyllabic, as in (63d). Data in (63) are from Kim (2003b: 166-167).

- (63) a. **cuuccu**caʔiʃ
 RED cuc-(y)a-ʔiʃ
 RED to.scratch-REP.ITE-3S.IND
 ‘S/he is continuously scratching.’
- b. **miitxmiitx**aʔiʃ
 RED mitx-(y)a-ʔiʃ
 RED to.spin-REP.ITE-3S.IND
 ‘S/he spins continuously.’
- c. **ʔuu λ ʔuu**yaʔiʃ
 RED λ -ʔu-(y)a-ʔiʃ
 RED to.wash-REP.ITE-3S.IND
 ‘S/he does laundry continuously’
- d. **waa λ waasaq**aʔiʃ
 RED w λ asaq-(y)a-ʔiʃ
 RED to.cough-REP.ITE-3S.IND
 ‘S/he is continuously coughing.’

Similarly, CV(V){C₂, λ , (C₂)}-CV(V)(C) of Class 11, C₁V(V)C₂-C₁V(V)C₂ applies when the base is closed monosyllabic, as in (64a) and (64b), in which vowels can

'at the eyes' behaves differently in the two different dialects. In the Ahousaht dialect, the suffix accompanies vowel lengthening in both the reduplicant and the base, whereas in the Tseshaht dialect the suffix comes with vowel lengthening in the base only. This discrepancy can be addressed by employing a syllable description using parentheses, CV(V)c - CVV(C), which allows optional long vowels. The remaining two suffixes, -(c)suptáaɬ 'competing in ...' and -(q)h̥sa 'at the brink' show vowel lengthening in the reduplicant with c in the coda. While the second syllable for -(c)suptáaɬ is not specified, -(q)h̥sa feature a long vowel in the second syllable. These two affixes, however, are not recognized by my language consultant, who is an Ahousaht speaker.

I have classified non-inflectional affixes in Nuuchahnulth into 14 classes according to the patterns of base modification. All the forms illustrated so far include only one affix that accompanies alternation. However, logically, there would be instances in which affixes of different classes co-occur in the same word or in which affixes of the same class occur more than once. The following subsection discusses such cases.

3.4.2 Multiple occurrences of affixes belonging to distinct classes

Given that more than one non-inflectional affix can occur on any given word, there could be cases in which the same class of affix as well as different classes could co-occur.

Previous research (Rose 1981, Davidson 2002, Stonham 2007) confirms that in such cases base modification may occur just once, even though more than one affix belonging to the same class co-occurs. For example, if two Class 2 affixes[L ...LA] co-occur in a word, the vowel in the first syllable is lengthened only once. In (74a) below, both *-simč*

- (67) a. Class 5 and 8 = Class 8
maa^maa^tyim^tap
 RED ma^t-yim^t [R]-apa [RL+L]
 RED cold-at.shoulder-really
 'He is really cold in the shoulders.'
- b. Class 6 and 8 = Class 8
maa^maa^t?asap
 RED ma^t-'as [RL]-apa [RL+L]
 RED cold-at.wrist-really
 'He has really cold wrists.'
- c. Class 7 and 8 = Class 8
ʔuu^ʔuuk^waⁿt^tap
 RED ʔuk-aaⁿu^t [R+L]-apa [RL+L]
 RED broad-at.leg-really
 'His legs are really big'

On the other hand, as illustrated in (68a), only the leftmost affix, Class 7, is expressed in the surface form. In (68b) and (68c), the leftmost affixes alone, Class 6 and Class 12 respectively, are derived in the surface form.

- (68) a. Class 7 and Class 13 = Class 7
kukuucxaⁿt^sta^t
 RED kucx-aaⁿu^t [R+L]-(c)s^ta^t [RLc]
 RED tickle-along.leg-reciprocally
 'They were tickling each other's legs.'
- b. Class 6 and Class 13 = Class 6
miimit^wis^sta^t
 RED mitx^w-'as [RL]-(c)s^ta^t [RLc]
 RED turn-at.wrist-reciprocally
 'They were twisting each other's wrists'
- c. Class 12 and Class 13 = Class 12
hichiisu^ts^ta^t
 RED his-(c)su^t [Rc+L]-(c)s^ta^t [RLc]
 RED hit-at.eyereciprocally
 'They were hitting each other in the eye.'

Furthermore, when Class 12 [Rc+L] occurs with Class 8 [RL+L], a combined form [RLc+L] surfaces, rather than the rightmost or the leftmost, as in (69).

- (69) Class 12 and 8 = cumulative [RLc+L]
puucpuuma†su†ap
 RED puma†-(c)su† [Rc+L]-apa [RL+L]
 RED itchy-at.eye-very
 'He has really itch eyes.' (Stonham, 2007: 120)

In her study of Kyuquot, based on the data shown above, Rose (1981) suggests a hierarchy of patterns, in which the leftmost in the hierarchy has priority for realization: [RL+L] > {[R+L], [Rc+L], [RL]} > [RLc]. Although the hierarchy covers the forms in (67) and (68), it cannot explain the combined form in (69). Moreover, the following examples, drawn from fieldwork in the Ahousaht dialect, show an unpredictable surface form, in which lengthening-accompanying and reduplication-accompanying affixes occur together in a word. Compare the examples in (71) with those in (70).

- (70) Class 2 and Class 5 = Class 2
- a. ʔuuksnaʔaa†kʷukʔiš taana
 ʔu-ksnaʔaa† [L]-kʷuk [R]-ʔiš taana
 REF-play.with-look.like-3S.IND money
 'S/he is playing with a money-like object.'
- b. ʔuuḥçiiikʷukʔiš qaawic
 ʔu-ḥçii [L]-kʷuk [R]-ʔiš qaawic
 REF-to.cook-look.like-3S.IND money
 'S/he seems to cook potato.'
- c. ʔuuwikʷukʔiš ciyapuxsukʔi Ken
 ʔu-wik [L]-kʷuk [R]-ʔiš ciyapuxs-uk-ʔi Ken
 REF-on.the.head-look.like-3S.IND hat-POSS-DEF Ken
 'S/he is playing with a money-like object.'

- (71) Class 2 and Class 8 = Class 8
 ʔuuʔuuḥwáʔap
 ʔu-ḥwáʔ [L]-apa [RL+L]
 REF-to.use-too
 ‘(He) used it too much.’ (Rose, 1981:340)
- (72) Class 6 and Class 3 = Class 6
 ʔuuʔutyíkšiiʔ
 ʔu-itʔík [RL]-šii(ʔ)-ʔiiʔ [L+S]
 REF-to.fear-MOM-sporadic iterative
 ‘S/he started to fear it every now and then.’ (Rose, 1981:340)

In (70), the surface form is realized with vowel lengthening (Class 2), rather than reduplication (Class 5). On the other hand, in (71), a reduplicated form (Class 8), rather than a vowel-lengthened form (Class 2) surfaces. (72) also shows that a reduplication-associated affix (Class 6) survives over a VLA-related affix (Class 3).

In conclusion, the surface form is not entirely predictable in the case of multiple occurrences of affixes that belong to distinct classes. Such irregular forms can be formally accounted for within the WP framework (§3.5.2.2). In a later section (§ 3.6), it will be discussed that other alternative templatic approaches (Kim, 2003b; Stonham 2007) fail to account for this phenomenon.

3.5 Analysis of ME within the Word and Paradigm Framework

This section provides a formal analysis of ME using a WP approach, in line with the work of Anderson (1992). I demonstrate that the ME of lexical/iterative affixes comprises a suffix as a main exponent and reduplication and/or VLA as a subsidiary exponent. The subsidiary exponent of ME in Nuu-chah-nulth can have, at most, four components. For example, *-(q)ḥsa* ‘at the brink’, which has a pattern of [RLc+L ... LA], comprises five parts:

suffixation, CV reduplication, vowel lengthening in the reduplicant, the fixed segment *c* in the reduplicant coda, and vowel lengthening in the second syllable. In order to account for this one-to-many association between meaning and form, this study adopts a WP model that assumes independent analysis of the morphological and phonological representations of a form. The WP model assumes that morphology is based on stems (Anderson, 1992) and comprises WFRs that describe relations between forms. The application of a set of WFRs to a single form accounts for ME. In this section, the formulation of WFRs and the ordering of the rules are discussed. Then, in order to have a set of WFRs apply to the same base, WFRs are organized into blocks. Rules in the different blocks are compatible, so it is possible to apply the rules to a single base. Using a set of WFRs in the proper order, the derivation of ME is illustrated.

3.5.1 Word formation rules

As discussed in detail in Chapter 2, two types of rule are required to account for ME in non-inflectional morphology. This measure is necessary because main exponents and subsidiary exponents differ in terms of the presence/absence of semantic and syntactic information (see § 2.6.1 for details).

First, consider WFRs that derive suffixation. As there are a large number of suffixation rules, here I only present a schema for suffixation rules, as in (73). See §2.6.1 for details. The operation of suffixation rules will be illustrated in §3.5.2.2. As demonstrated in the schema, the rule provides a mapping of phonological, syntactic, and semantic relations between two lexical items.

(73) Schema for Suffixation Rule

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

(a) **Structural Description:***Phonological Description: X**Syntactic Description:**Lexical category of the base**(e.g., NOUNS, VERBS)**Semantic Description:**Meaning of the base*(b) **Structural Change:***Phonological Change: XZ**Syntactic Change:**Lexical category of the derived form**(e.g., PREDICATE)**Semantic Change:**Meaning of the derived form**Morphological Description:**Classes of affixes*

The SD of the suffixation rule contains syntactic information on the lexical base (e.g., lexical category), a semantic interpretation of the input base, as well as the phonological form of the base. The SC describes changes in the phonological shape, syntactic information, and a semantic interpretation. Importantly, morphological information such as the class of affixes, is present in the SC. A morphological description is necessarily specified in the SC because affixes are grouped into classes, and the class is assigned to the base by suffixation. Specifically, [X], a variant of the phonological shape of the base in SD, undergoes a phonological change to [XZ] in the SC. [Z] refers to any suffix added to the base X. The semantic description specifies that the 'meaning of X' changes to 'the meaning of XZ'. Then, the class of the suffix Z is assigned to the base in the SC. The syntactic description in the SC in Nuu-chah-nulth always results in a predicate, marked as PRED outside the bracket because when derivational suffixes are added to a base, the stem becomes a predicate (Wojdak, 2005), regardless of the category of the base.

In terms of rule ordering, the suffixation rule must operate prior to base modification because lexical bases do not have class information and class assignment is made by suffixation. If base modification rules apply first, class assignment cannot occur in the base until suffixation. In that case, it would not be possible to associate a specific modification to a base with a suffix. Rule ordering will be discussed in the following section.

A second type of rule is required for base modifications. This type of rule does not contain semantic and syntactic information in either the SD or the SC, as can be seen in (74). This is justified by the fact that the number of non-inflectional classes is insufficient (14 classes) to denote the meanings of up to 500 suffixes. Instead, morphological information, such as the class of affixes, must be provided in the SD.

(74) Base modification Rule

$$\begin{array}{ccc} \left[\begin{array}{l} \text{CLASS(ES)} \\ \text{(Aspect)} \end{array} \right] & & \\ \text{XZ} & \rightarrow & \text{X'Z} \end{array}$$

(a) **Structural Description:** (b) **Structural Change :**
Morphological Description: *Phonological change:*
Class of affix Z; Aspect *The base X is modified to X'*
Phonological Description:
The base is X

Instead, it is crucial to include information on the phonological condition or environment in the SD and its corresponding change in the SC. Notice that the morphological description may contain language-particular morphological information, e.g., [+repetitive] in Nuu-chah-nulth. Aspect here is considered as morphological rather than semantic information, in line with the fact that other morphological categories such as Tense or Gender are considered as morphological information (Anderson, 1992;

Matthews, 1992). The lexical base, X is a variant of a phonological representation; the base X undergoes a phonological change to X' in the SC. X' denotes that the base X is modified.

As discussed in §2.6.1, the domain specification, []_B, that the phonological modification of the base X applies only within the domain of the lexical base, does not apply to Nuu-chah-nulth. This is because base modification in Nuu-chah-nulth does not make reference to the lexical base but occurs in the domain of the initial disyllable (Kim, 2004; Lee, 2008). The initial disyllable may include part of the suffix as well as the lexical base, and specifying the domain, []_B results in an incorrect derivation. Thus, the phonological domain is not considered in formulating WFRs. See §3.6.3 for an alternative approach employing Prosodic Circumscription (McCarthy and Prince, 1990; McCarthy and Lombardi, 1993; McCarthy, 2000).

Following the schema provided in (74), I propose a total of nine WFRs for base modifications. First, let us begin with vowel length-associated rules that are restricted to the first and the second syllables: base-vowel lengthening, first base-vowel shortening, and second base-vowel shortening.

(75) Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 2, CL 3, CL 7} \\ \text{CL 8, CL 10, CL 12} \end{array} \right)$$

$$\text{XZ} = \text{C}_1\text{V}_1(\text{V}_1)\text{YZ} \rightarrow \text{C}_1\text{V}_1\text{V}_1\text{YZ}$$

Base-vowel lengthening involves a number of classes of affix (i.e., morphological conditions). The phonological condition or environment for vowels (i.e., XZ = C₁V₁(V₁YZ) indicates that a vowel may be long or short; the phonological change, then, specifies

that the surface vowel must be long (i.e., $C_1V_1V_1YZ$). If V occurs in parentheses (V_1), the vowel may or may not be long. C_1 refers to an onset consonant; Y refers to any segments occurring after the nucleus; Z refers to the suffix added in the previous application of the suffixation rule. Rule 2 can be read as ‘A base belonging to Class 2, 3, 7, 8, 10, or 12 is realized by lengthening the vowel in the first syllable’.

In addition to the base vowel lengthening rule, a rule to derive shortening of the first base vowel (Class 4 and Class 9) and a rule for shortening the second base vowel (Class 3 and Class 4) must be formulated. Rule 3 is construed as saying that the first base vowel must be short when a Class 4 or Class 9 affix is added. Rule 2, which accounts for lengthening of the first base vowel, is incompatible with Rule 3 because vowel lengthening and shortening are processes that never co-exist. When they co-occur in the same word, however, Rule 3 applies (see 3.5.2.1 for details).

(76) Rule 3 [First base-vowel shortening]

$$\left[\text{CL } 4, \text{CL } 9 \right]$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1YZ$$

Rule 4 derives a short vowel in the second syllable of the base.

(77) Rule 4 [Second base-vowel shortening]

$$\left[\text{CL } 3, \text{CL } 4 \right]$$

$$XZ = C_1V_1(V_1).C_2V_2(V_2)YZ \rightarrow C_1V_1(V_1).C_2V_2YZ$$

These three vowel length-associated rules must occur before reduplication rules.

Otherwise, the phonological environment, i.e., the location of syllable, would be changed

because of copied segments. The ordering will be discussed in detail in the following section.

As for reduplicated forms, a few rules need to be formulated to derive various patterns. By and large, reduplication patterns are divided into three types: reduplication without coda copying, reduplication with coda copying, and reduplication with a fixed segment. Thus, rules are necessary to reflect the presence/absence of coda copying as well as the presence/absence of a fixed segment. Recall that coda copying represents the aspectual status (Class 10 and 11), whereas coda copying is irrelevant for the rest of the classes. Beyond aspectual reduplication, Nuu-chah-nulth has only one reduplication pattern. Therefore, I propose only one rule for non-aspectual reduplication. Rule 5 derives CV reduplication. Co-indexed segments in the rightmost position indicate copied segments.

(78) Rule 5 [CV(V) Reduplication]

$$\left(\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right) \text{XZ} = \text{C1V1(V1)} \text{YZ} \rightarrow \text{C1V1(V1).C1V1(V1)YZ}$$

Separating out the reduplication rule from the other rules accounts elegantly for the lack of double reduplication, which will be discussed in §3.5.2.2. As can be seen above, the SD of the rule specifies the classes of base that can be reduplicated. Thus, even though a word may be specified for more than one class, the reduplication rule will still only apply once. Also, there are no other blocks of rules in which reduplication occurs. (See (97) in §3.5.2.2 for this type of derivation.)

Now a WFR is required to derive coda copying. Note that the copied coda implies repetitive/inceptive status and that repetitives are complex with respect to coda copying

depending on the number of syllables in the stem and the presence/absence of a coda²⁸.

Rule 6 derives the repetitive and the inceptive, in which the root is a closed monosyllable.

In that case, the whole syllable is copied.

(79) Rule 6 [Aspect syllable reduplication]

$$\left(\begin{array}{l} +\text{repetitive} \\ +\text{inceptive} \\ \text{CL 10, CL 11} \end{array} \right)$$

$$\text{XZ} = \text{C}_1\text{V}_1\text{C}_2(\text{C}_3)(\text{C}_4).\text{Z} \rightarrow \text{C}_1\text{V}_1\text{C}_2(\text{C}_3)(\text{C}_4).\text{C}_1\text{V}_1\text{C}_2(\text{C}_3)(\text{C}_4).\text{Z}$$

This rule alone, however, cannot completely account for the patterns observed for repetitives. Recall that in the repetitive formation, when a monosyllabic base has no coda, a fixed segment \mathfrak{k} is inserted in the coda position of the reduplicant to fill the coda slot.

Rule 7 accounts for such a case. Note that no Y (segments following the CV) is present in Rule 7, signifying that the base is monosyllabic.

(80) Rule 7 [Aspect reduplication w/ a fixed segment \mathfrak{k}]

$$\left(\begin{array}{l} +\text{repetitive} \\ +\text{inceptive} \\ \text{CL 10, CL 11} \end{array} \right)$$

$$\text{XZ} = \text{C}_1\text{V}_1(\text{V}_1).\text{Z} \rightarrow \text{C}_1\text{V}_1(\text{V}_1)\mathfrak{k}.\text{C}_1\text{V}_1(\text{V}_1)\text{Z}$$

In addition, Rule 8 applies when a lexical base is multisyllabic and no coda is present, in which case, coda copying does not occur²⁹.

²⁸ It is not clear that reduplication of inceptive in the Ahousaht dialect inserts a fixed segment \mathfrak{k} ; I leave this issue for future study.

²⁹ Logically, there is an instance of a multiple syllabic base with a coda. I do not consider this form, because it has not been attested either in the literature or in my fieldwork.

(81) Rule 8 [Aspect reduplication w/multi-syllables]

$$\left(\begin{array}{l} +\text{repetitive} \\ +\text{inceptive} \\ \text{CL 10, CL 11} \end{array} \right)$$

$$XZ = C_1V_1.C_2V_2 Z \rightarrow C_1V_1.C_1V_1C_2V_2 Z$$

As seen above, three rules are required to account for Class 10 and Class 11, in that the phonological changes differ according to the phonological environment.

In addition, there are two rules that must occur after the reduplication rules. Rule 9 derives vowel lengthening in the reduplicant. A reduplicant vowel is lengthened in affixes belonging to Class 6, 8, 9, 10, 13, and 14. Two identical C_1V_1 s in $/C_1V_1(V_1).C_1V_1(V_1)YZ/$ denote that the initial C_1V_1 is copied.

(82) Rule 9 [Reduplicant vowel lengthening]

$$\left(\begin{array}{l} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{array} \right)$$

$$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1V_1.C_1V_1(V_1)YZ$$

Finally, Rule 10 derives forms with a fixed segment c , observed in Class 12, Class 13, and Class 14 affixes. When repetitive or inceptive aspect is affixed to a base whose root is a monosyllable, the fixed segment c is inserted after the copied CV. The fixed segment can be inserted regardless of the length of the vowel.

(83) Rule 10 [Fixed segment c -insertion]

$$\left(\begin{array}{l} \text{CL 12, CL 13,} \\ \text{CL 14} \end{array} \right)$$

$$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1(V_1)c.C_1V_1(V_1)YZ$$

Rule 9 and Rule 10 may apply on the same base when the affixes are Class 13 and Class 14. When these two rules apply to the same base, Rule 9 must precede Rule 10 because Rule 10 would bleed the phonological environment of Rule 9 by adding the segment *c*.

In summary, the suffixation rule schema is introduced and nine rules for subsidiary exponents are formulated. By applying more than one WFR to the same base, the full range of ME phenomena can be accounted for. The following section discusses rule ordering and rule organization into blocks, which are necessary to allow for multiple operations of WFRs.

3.5.2 Blocks, rule ordering, and derivation

As discussed in Chapter 2, this study assumes that derivational WFRs are organized into blocks, following Anderson's (1992) and Stump's (2001) analyses of inflection. WFRs in the same block are mutually exclusive; they are not applied together. On the other hand, WFRs in distinct blocks are compatible, such that more than one rule can operate on a given form. Thus, rule ordering is required in some cases between compatible rules.

3.5.2.1 Rule Blocks

Let us consider WFRs that are required to derive each class. As can be seen in Table 6, the suffixation rule, Rule 1 (R1), operates for each class, since the suffix is the main exponent. Any rules operating on a class must not belong to the same block to ensure that the rules may apply to the same word. Rules organized in the same block are incompatible; they cannot apply to the same word. Taking Class 8, for instance, four

WFRs need to operate: R1 [Suffixation], R2 [Base-vowel lengthening], R5 [CV reduplication], and R9 [Reduplicant vowel lengthening]. Each of these rules should belong to a distinct block, so that each modification realizes an exponent. Table 6 illustrates which rules need to operate for each class. Table 7 presents the names of the rules.

Table 6 *Word Formation Rules in Operation for Each Class*

Classes of affix	Notations	WFRs in operation
CL 1	No notation	R1
CL 2	[L... LA]	R1, R2
CL 3	[L+S... LA]	R1, R2, R4
CL 4	[S+S ... LA]	R1, R3, R4
CL 5	[R... LA]	R1, R5
CL 6	[RL... LA]	R1, R5, R9
CL 7	[R+L... LA]	R1, R2, R5
CL 8	[RL+L... LA]	R1, R2, R5, R9
CL 9	[RL+S... LA]	R1, R3, R5, R9
CL 10	[RL+L... ASP]	R1, R2, {R6, R7, or R8}, R9
CL 11	[R... ASP]	R1, {R6, R7, or R8}
CL 12	[Rc+L ... LA]	R1, R2, R5, R10
CL 13	[RLc ... LA]	R1, R5, R9, R10
CL 14	[RLc+L... LA]	R1,R2, R5,R9, R10

Table 7 *Name of Rules*

Rules	Names
Rule 1	Suffixation
Rule 2	Base-vowel lengthening
Rule 3	First base-vowel shortening
Rule 4	Second base-vowel shortening
Rule 5	CV(V) Reduplication
Rule 6	Aspect syllable reduplication
Rule 7	Aspect reduplication w/ a fixed segment λ
Rule 8	Aspect reduplication w/multisyllables
Rule 9	Reduplicant vowel lengthening
Rule 10	Fixed segment c-insertion

Following the logic that compatible rules should belong to different blocks, WFRs are organized into blocks, as illustrated in Table 8.

Table 8 *Rule Blocks*

Blocks	Rules
Block I	R1
Block II	R2, R3
Block III	R5, R6, R7, R8
Block IV	R4, R9
Block V	R10

First, because the suffixation rule always occurs with any of the alternations, Rule 1 must be organized into a distinct block (Block I). Second, base vowel lengthening (R2) and Base V1 shortening (R3) are organized into Block II. These two rules are not compatible, since they apply to the same syllable of the base. These rules occur with other alternations such as reduplication (R5, R6, R7, R8), lengthening of a reduplicant vowel (R9), second base vowel shortening (R4), or fixed segment *c*-insertion; therefore, Rule 2 and Rule 3 must not belong to the same block as these rules. Third, reduplication-associated rules (R5, R6, R7, R8) are grouped into Block III, since they are not compatible with one another. Fourth, reduplicant vowel lengthening (R9) co-occurs with all alternations other than second base vowel shortening (R4); thus, R9 and R4 are in Block IV. Second base vowel shortening (R4) occurs only with first base vowel shortening (R2). R4 can belong to either Block IV with R9 or Block III with the reduplication rules. Note that Rule 4 is organized into Block IV, so that rules in the same block are coherent with respect to the types of alternation, i.e. VLA or reduplication. Finally, fixed segment *c*-insertion (R10) is classified into Block V, since it co-occurs with base vowel lengthening (Block II), reduplication-associated rules (Block III), or reduplicant vowel lengthening (Block IV).

As for compatibilities between rules, rules belonging to the same block are mutually exclusive. For instance, R4 and R9 in Block IV never apply to a base at the same time. Also, the reduplication-associated rules in Block III are not applied together, because their conditions differ with respect to morphology (R5 and {R6, R7, or R8}) or phonology (R6, R7, and R8). On the other hand, R2 and R3 in Block II are interesting, in that they may co-occur, but only one of them surfaces. The examples in (84) and (85) illustrate the multiple occurrences of suffixes that involve vowel lengthening and shortening. The suffix *-pa* 'dislike' accompanies lengthening, while on the other hand, the suffix *-aq(aq)* 'very' accompanies vowel shortening in the first and second base syllables. The forms in (84) and (85) show that first base vowel shortening (R5) surfaces over base vowel lengthening (R3).

- (84) a. ʔuupačipsiš t'anaaqs yaqçinʔitq
 ʔu-pa [L]-čip-siš t'anaaqs yaq-çinʔitq
 REF dislike ? 1S.IND child who-married
 'I don't like the person who my child marries to.'
- b. ʔupaqaqčipsiš t'anaaqs yaqçinʔitq
 ʔu-pa [L]-aq(aq) [S+S]-čip-siš t'anaaqs yaq-çinʔitq
 REF dislike-very ?-1S.IND child who-married
 'I really don't like the person who my child marries to.'
- (85) a. wiitqpašiš šuwisukʔitk
 wik-tq-pa [L]-siš šuwis-uk-ʔitk
 NEG ?-dislike-1S.IND shoes-POSS-you
 'I don't like your shoes'
- b. witqpaqaqsiš šuwisukʔitk
 wik-tq-pa [L]-qaq [S+S]-siš šuwis-uk-ʔitk
 NEG ?-dislike-very-1S.IND shoes-POSS-you
 'I really don't like your shoes'

Logically, there are two ways to interpret this phenomenon. First, we can assume that both the lengthening and shortening WFRs are applied sequentially: the base λu undergoes vowel lengthening when affixed by $-\acute{p}a$, and then gets shortened when $-aq(aq)$ is added. Alternatively, one could assume that between the two rules, the shortening rule (R3) is simply applied over the lengthening rule (R2), regardless of order. The former assumption is rejected, because we have seen that in multiple occurrences of distinct class affixes, application of the affix does not occur sequentially. Rather, the choice of applied affix was random (see Section 3.4.2). Thus, it is assumed that shortening (R3) operates over lengthening (R2).

3.5.2.2 Rule ordering and derivations

This subsection explores the ordering among rules and demonstrates derivation using properly ordered WFRs. The complete ordering of the rules is first discussed, and then evidence of the order between two groups of rules is provided by showing correct and incorrect derivations.

In terms of rule ordering, the suffixation rule (Block I), the operation that generates a main exponent, always occurs first and assigns a class to the base. Second, vowel lengthening/shortening rules that are restricted to the first base syllable (Block II) must occur before reduplication-associated rules (Block III). If reduplication occurs first, then the copied vowel, which becomes the first vowel, is affected by vowel lengthening/shortening rules. This point is illustrated using the word in (87), in which reduplication and shortening of the first base vowel occur together. Also, rules associated with reduplication (Block III) must precede the reduplicant vowel lengthening rule (R9)

(Block IV), if the two phenomena co-occur. This order is necessary because the condition for vowel lengthening is met only after the lexical base is reduplicated. Finally, the reduplicant vowel lengthening rule must precede the fixed segment-*c* insertion rule (Block V). The reverse order will bleed the environment for reduplicant vowel lengthening due to the presence of the segment, *c*.

(86) Rule ordering

- a. Suffixation (R1) >> Base first vowel lengthening/shortening (R2, R3) >> Reduplication rules (R5, R6, R7, R8) >> Base second vowel shortening (R4), Reduplicant vowel lengthening (R9) >> Fixed segment *c*-insertion (R10)
- b. Block I >> Block II >> Block III >> Block IV >> Block V

An illustration of the rule ordering is partially supplied in (88), drawing on the example in (87), *ʔuuʔuščasči* ‘on someone's side in a team’.

- (87) *ʔuuʔuščasči*
 RED *ʔuuš-(k)časči* [RL+S]
 RED some-to.play (on.someone's.side)
 ‘on someone’s side in a team.’

In (88a), in the affixation stage, Class 9 is assigned to the base in the SC and the affixal predicate is formed, with the meaning 'on someone's side in a team'. Then, right after first base-vowel shortening (88b), the reduplication rule applies (88c), which provides the condition for Rule 9 (i.e., the presence of the reduplicant vowel) (88d).

(88) Rule 1 >> Rule 3 >> Rule 5 >> Rule 9

- a. Schema of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{ʔuuʃ}]_{\text{NOUN}} \\ \text{SOME} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS 9} \\ [\text{ʔuuʃcasçi}]_{\text{PRED}} \\ \text{'ON SOMEONE'S SIDE'} \end{array} \right)$$

b. Rule 3 [First base-vowel shortening]

[CL 4, CL 9]

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1YZ$$

Operation of Rule 3

[CL 9]

$$\text{ʔuuʃcasçi} / \rightarrow \text{ʔuʃcasçi}$$

c. Rule 5 [CV reduplication]

[CL 5, CL 6, CL 7,]
[CL 8, CL 9]

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1(V_1).C_1V_1(V_1)YZ$$

Operation of Rule 5

[CL 9]

$$\text{ʔuʃcasçi} \rightarrow \text{ʔuʔuʃcasçi}$$

d. Rule 9 [Reduplicant vowel lengthening]

[CL 6, CL 8, CL 9,]
[CL 10, CL 13, CL 14]

$$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 9

[CL 9]

$$\text{ʔuʔuʃcasçi} \rightarrow \text{ʔuuʔuʃcasçi}$$

Rule 3 and Rule 5 are crucially ordered; the reverse order results in an incorrect form, as illustrated in (89). If Rule 3 applies after Rule 5, as illustrated in (89b), then Rule 3 is applied to the form, *ʔuʔuuʃ*. In that case, according to the phonological description in

the rule, the first vowel becomes a copied vowel in *ʔuʔuusʃ*, rather than a base vowel. This process results in the base vowel not getting shortened. As shown in (89c), this ordering of the rules then produces **ʔuuʔuuščasči*.

(89) Ungrammatical form produced by incorrect ordering of R5 >> R3 >> R9

a. Rule 5 [CV Reduplication]

$$\left[\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right]$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 5 [CV Reduplication]

$$[\text{CL 9}]$$

$$\text{ʔuuščasči} \rightarrow \text{ʔuʔuuščasči} /$$

b. Rule 3 [First base-vowel shortening]

$$[\text{CL 4, CL 9}]$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1YZ$$

Operation of Rule 3 [First base-vowel shortening]

$$[\text{CL 9}]$$

$$\text{ʔuʔuuščasči} \rightarrow \text{ʔuʔuuščasči}$$

c. Rule 9 [Reduplicant vowel lengthening]

$$\left[\begin{array}{l} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{array} \right]$$

$$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 9

$$[\text{CL 9}]$$

$$\text{ʔuʔuuščasči} \rightarrow *ʔuuʔuuščasči$$

The ordering of Rule 5 and Rule 9 is also crucial; reversing the application of the two rules will yield an unattested form. For instance, when R9 applies prior to R5, as in (90b), R9 is not applicable, because there is no reduplicant vowel. R5 derives **ʔuʔuščasči*, an ungrammatical form (90c) that has a shortened reduplicant base vowel.

(90) Ungrammatical form produced by incorrect ordering of R3 >> R9 >> R5

a. Rule 3 [First base-vowel shortening]

$$\left[\begin{array}{l} \text{CL 4, CL 9} \end{array} \right] \\ XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1YZ$$

Operation of Rule 3 [Base V1 shortening]

$$\left[\text{CL 9} \right] \\ \text{ʔuuščasči} \rightarrow \text{ʔuščasči}$$

b. Rule 9 [Reduplicant-vowel lengthening]

$$\left[\begin{array}{l} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{array} \right] \\ XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 9

N/A (because no reduplicant is present)

$$\left[\text{CL 9} \right] \\ \text{ʔuščasči} \rightarrow \text{ʔuščasči}$$

c. Rule 5 [CV Reduplication]

$$\left[\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right] \\ XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 5 [CV Reduplication]

$$\left[\text{CL 9} \right] \\ \text{ʔuščasči} \rightarrow *ʔuʔuščasči$$

Consider, now, the order in (92) below between the base vowel lengthening rule (R2) and the reduplication rule (R5), using the Class 7 form in (91) as an example. By operating R2 (yielding *ʔaaya*) before R5, the correct form (*ʔaʔaayamɔ̃u*) is derived, as can be seen in (92c).

(91) *ʔaʔaayamɔ̃u*
 RED *ʔaya-mɔ̃u* [R+L]
 RED many-regale
 'regale many'

(92) Rule 1 >> Rule 2 >> Rule 5

a. Schema of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [ʔaya]\text{NUMERAL} \\ \text{MANY} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS 7} \\ [ʔayamɔ̃u]\text{PRED} \\ \text{'REGALE MANY'} \end{array} \right)$$

b. Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 2, CL 3,} \\ \text{CL 7, CL 8, CL 10,} \\ \text{CL 12} \end{array} \right)$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1V_1YZ$$

Operation of Rule 2

$$\left(\text{CL 7} \right) \\ \text{ʔayamɔ̃u} \rightarrow \text{ʔaayamɔ̃u}$$

c. Rule 5 [CV Reduplication]

$$\left(\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right)$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 5

$$\left[\text{CL 7} \right]$$

$$\text{ʔaayam}^{\text{c}}\text{u} \rightarrow \text{ʔaʔaayam}^{\text{c}}\text{u}$$

A reversed order of the application of Rule 2 and Rule 5 yields an incorrect result.

In (93), R5 applies first, resulting in the reduplicated form *ʔaʔaya*. Operation of R2 followed by R5 produces the incorrect form **ʔaaʔaya*, rather than *ʔaʔaaya*, since the description of R2 predicts that the first base vowel is a reduplicant vowel. Although, in this case, the first vowel is not the base vowel, there is no way for the WFR to access that morphological information.

(93) Ungrammatical form produced by incorrect ordering of (R1) >> R5>>R2

a. Rule 5 [CV Reduplication]

$$\left(\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right)$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1.C_1V_1(V_1)YZ$$

Operation of Rule 5

$$\left[\text{CL 7} \right]$$

$$\text{ʔayam}^{\text{c}}\text{u} \rightarrow \text{ʔaʔayam}^{\text{c}}\text{u}$$

b. Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 8, CL 2, CL 3,} \\ \text{CL 7, CL 8, CL 10,} \\ \text{CL 12} \end{array} \right)$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1V_1YZ$$

Operation of Rule 2

[CL 7]

ʔaʔayamɔ̄ → *ʔaaʔayamɔ̄

In summary, the suffixation rule applies at the initial stage of the derivation, providing class, syntactic, and semantic information. Rules associated with base vowels need to apply before reduplication-associated rules. Reduplicant vowel lengthening must occur after reduplication rules.

Finally, as an example of a derivation that involves aspectual suffixes, let us consider Class 10. Take the derivation of *ɔ̄uuʔɔ̄uuya* in (94) .

- (94) *ɔ̄uuʔɔ̄uuya*
 RED-ʔ-ɔ̄u-(y)a
 RED to.wash-REP.ITER
 ‘to do laundry continuously’

The suffixation rule (R1) applies first and forms a predicate that contains the iterative repetitive. Base-vowel lengthening (R2) derives the long vowel in the base. The CV of the base is copied by operating R7. The rule operates, because the stem does not have a coda consonant, so that the fixed segment *ʔ* fills the coda slot. Note that R7 does not have Y, signifying that the base is monosyllabic. Then, reduplicant vowel lengthening (R9) derives the long vowel in the reduplicant. All the rules need to be ordered for the aforementioned reasons.

- (95) a. Schema of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1 [Suffixation Rule]

$$\left(\begin{array}{l} [\acute{c}u]_{\text{VERB}} \\ \text{TO WASH} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS 10} \\ [\acute{c}uya]_{\text{PRED}} \\ \text{DO LAUNDRY CONTINUOUSLY} \end{array} \right)$$

b. Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 8, CL 2, CL 3,} \\ \text{CL 7, CL 8, CL 10,} \\ \text{CL 12} \end{array} \right)$$

$$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1V_1YZ$$

Operation of Rule 2 [Base VL]

$$\left[\text{CL 10} \right]$$

$$\acute{c}uya \rightarrow \acute{c}uuya$$

c. Rule 7 [Aspect reduplication w/ a fixed segment λ]

$$\left(\begin{array}{l} +\text{repetitive} \\ +\text{inceptive} \\ \text{CL 10, CL 11} \end{array} \right)$$

$$XZ = C_1V_1(V_1).Z \rightarrow C_1V_1\lambda. C_1V_1(V_1)Z$$

Operation of Rule 7

$$\left[\begin{array}{l} +\text{repetitive} \\ \text{CL 10} \end{array} \right]$$

$$\acute{c}uuya \rightarrow \acute{c}\lambda\acute{c}uuya$$

d. Rule 9 [Reduplicant-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{array} \right)$$

$$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ/ \rightarrow C_1V_1V_1. C_1V_1(V_1)YZ$$

Operation of Rule 9

$$\left[\text{CL 10} \right]$$

$$\acute{c}\lambda\acute{c}uuya \rightarrow \acute{c}uu\lambda\acute{c}uuya$$

I have demonstrated the application of the WP model in a formal analysis of ME in non-inflectional morphology. A set of distinct WFRs apply to the same base in order to derive the correct surface form. I have examined crucial rule ordering and the organization of rules into blocks. In what follows, I discuss the multiple occurrence of alternation-accompanied suffixes.

Importantly, the WP approach has merit in dealing with the absence of the double occurrence of reduplication and/or lengthening. Recall that the base modification occurs only once when more than one suffix accompanies base modification. This advantage stems from the fact that the morphological description of a base modification rule may specify multiple classes to which the rule may apply. In addition, a set of WFRs may apply to the same base, but each rule applies only once. Thus, for instance, although two or more cases of suffixation that accompany CV reduplication occur with the same base, the CV reduplication rule applies only once. Also, there are no other blocks of rules that reduplication occurs in.

Consider the word in (96), which contains two suffixes: one (*-yim†* [R]) belongs to Class 5 and the other (*-apa* [RL+L]) to Class 8.

- (96) maamaa†yim†apa
 RED ma†-yim† [R]-apa [RL+L]
 RED cold-at.shoulder-really
 'to be really cold in the shoulders.'

The surface form in (96) shows that reduplication occurs only once, rather than twice (i.e., there is no double reduplication) and that both vowels are lengthened, in accordance with the pattern for Class 8 [RL+L]. (97) illustrates the derivation of (96). Notice that Rule 5 (CV Reduplication) is applied just once, since the rule is applied to both Class 5 [R] and Class 8 [RL+L]. Thus, double reduplication cannot occur, as expected. This result

demonstrates the crucial advantage of the WP model in the current study. Templatic approaches (Kim 2003, Davidson 2002, Stonham 2004) cannot deal successfully with the multiple occurrence of process-accompanying suffixes, an issue which will be discussed in Section 3.6. Following the rule ordering proposed earlier, the derivation is illustrated in (97).

(97) a. Schema of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{m}^{\text{a}}\text{t}^{\text{a}}]_{\text{A}} \\ \text{COLD} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS 5, CLASS 8} \\ [\text{m}^{\text{a}}\text{t}^{\text{a}}\text{yim}^{\text{t}}\text{apa}]_{\text{PRED}} \\ \text{REALLY COLD IN THE SHOULDER} \end{array} \right)$$

b. Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 2, CL 3,} \\ \text{CL 7, CL 8, CL 10,} \\ \text{CL 12} \end{array} \right)$$

$$\text{XZ} = \text{C}_1\text{V}_1(\text{V}_1)\text{YZ} \rightarrow \text{C}_1\text{V}_1\text{V}_1\text{YZ}$$

Operation of Rule 2

$$[\text{CL 8}]$$

$$\text{m}^{\text{a}}\text{t}^{\text{a}}\text{yim}^{\text{t}}\text{apa} \rightarrow \text{m}^{\text{a}}\text{a}^{\text{a}}\text{t}^{\text{a}}\text{yim}^{\text{t}}\text{apa}$$

c. Rule 5 [CV Reduplication]

$$\left(\begin{array}{l} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{array} \right)$$

$$\text{XZ} = \text{C}_1\text{V}_1(\text{V}_1)\text{YZ} \rightarrow \text{C}_1\text{V}_1.\text{C}_1\text{V}_1(\text{V}_1)\text{YZ}$$

Operation of Rule 5 [CV Reduplication]

[CL 5, CL 8]

máaťyimťapa → mámaťyimťapa

d. Rule 9 [Reduplicant-vowel lengthening]

[CL 6, CL 8, CL 9,
CL 10, CL 13, CL 14]

$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow C_1V_1V_1.C_1V_1(V_1)YZ$

Operation of Rule 9

[CL 8]

mámaťyimťapa → máamaťyimťapa

In particular, the WP model accounts successfully for irregular forms. Recall that surface alternations originating from more than one triggering suffix are irregular and thus sometimes unpredictable. Consider an irregular form, in which vowel lengthening but not reduplication occurs, which is what happens when Class 2 [L] and Class 5 [R] affixes co-occur, as seen in §3.4.2. The example (98) is repeated for convenience.

(98) ʔuuksnaʔaaťkúkʔiš taana
 ʔu-ksnaʔaať [L]-kúk [R]-ʔiš taana
 REF-play.with-look.like-3S.IND money
 ‘S/he is playing with a money-like object.’

It may be expected that the base is reduplicated (or reduplicated and lengthened), because reduplication is more salient than vowel lengthening. Rather unexpectedly, the vowel is lengthened but the lexical base is not copied at all.

As demonstrated in (99), by operating suffixation (R1) and lengthening (R2) rules, the correct form is derived. The failure of the CV reduplication rule (R5) to operate can be understood as a gap in the paradigm, which is inherently unpredictable.

(99) a. Schema of Rule 1 [Suffixation]

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left([\text{ʔu}]_{\text{REF}} \right) \rightarrow \left(\begin{array}{l} \text{CLASS 2, CLASS 5} \\ [\text{ʔuksna}\lambda\text{aa}\text{t}^{\text{k}}\text{kuk}]_{\text{PRED}} \\ \text{TO PLAY WITH SOMETHING} \end{array} \right)$$

RESEMBLING

b. Rule 2 [Base-vowel lengthening]

$$\left(\begin{array}{l} \text{CL 2, CL 3,} \\ \text{CL 7, CL 8, CL 10,} \\ \text{CL 12} \end{array} \right)$$

$$X = C_1V_1(V_1)YZ \rightarrow C_1V_1V_1YZ$$

Operation of Rule 2

$$\left(\text{CL 2} \right)$$

$$\text{ʔuksna}\lambda\text{aa}\text{t}^{\text{k}}\text{kuk} \rightarrow \text{ʔuuksna}\lambda\text{aa}\text{t}^{\text{k}}\text{kuk}$$

A WP analysis successfully accounts for forms with multiple occurrences of affixes from different classes, including cases with unexpected realizations of the secondary exponent. The following section discusses alternative approaches.

3.6 Alternative approaches

Previous literature on VLA and reduplication-accompanying suffixes (Sapir and Swadesh, 1939; Davidson, 2002; Kim, 2003a, b; Stonham, 2004, 2007) provides a consistent account of the patterns that result from these processes. Most studies successfully account

for the relationship between process-triggering suffixes and the processes themselves. However, importantly, templatic analyses (Davidson, 2002; Kim, 2003b; Stonham, 2004) have difficulties in accounting for the single realization of base modification (especially the irregular form illustrated in (98)), when a word contains more than one alternation-accompanying affix. I have provided an account of such cases within the WP framework, demonstrating the advantages of that model over others. In what follows, the studies of Kim (2003b) and Stonham (2007) are examined.

3.6.1 Stonham (2007)

In his study, Stonham (2007) accounts for cases of multiple appearance of reduplication-triggering suffixes. Observing several such patterns drawn from Rose (1981), he suggests that there always occurs "a single copy that selects the features required by all of the suffixes that appear" (p.121). In other words, if there is more than one suffix, and these suffixes require different reduplication shapes, a reduplication type that embraces features of both patterns is selected. For instance, when a suffix accompanying [R] and a suffix accompanying [RL] occur on the same base, a more comprehensive form [RL] surfaces. This observation, however, is sometimes incorrect because the realized shape is not always the form that encompasses all features, as discussed earlier.

Observing insightfully that double reduplication occurs only when both inflectional and derivational suffixes that trigger reduplication apply to the same base, Stonham adopts Stratal Optimality Theory (Bermúdez-Otero, 1999, 2003; Kiparsky, 2000) as a formal analysis. Stratal OT differs from standard OT in that it allows two domain-

specific strata. In Stratal OT, an output of the first stratum (the stem level) serves as an input to the second stratum (the word level). Stonham suggests that the occurrence/absence of double reduplication is made possible by the implementation of two distinct levels of rule application, the stem and the word. In both levels, a markedness constraint, *RedRed that prohibits double reduplication is ranked higher than faithfulness constraints, ensuring reduplication occurs only once. He proposes that reduplication denoting plurality occurs at the word level, following the general assumption that plurality is part of inflectional morphology. The type of reduplication that occurs with derivational suffixes (i.e., lexical and aspectual suffixes) occurs at the level of the stem.

As can be seen in (100), double reduplication (*yá'yá'q̄hiʔi*) occurs when two triggering suffixes are associated with distinct levels.

- (100) *yá'yá'q̄hiʔi*
 RED-RED *yá'q̄-ħi* [R+L] =ʔi
 PL - RED-long-at.the.limbs =DEF
 'the long-limbed ones'

At both the stem and the word level, the *RedRed constraint is higher than a faithfulness constraint. Thus, at each level, double reduplication is prohibited. At the stem level, both candidates satisfy FaithIO, a general faithfulness constraint that ensures the presence of copied segment (RED). The candidate, *yá'yá'q̄hi* is selected as optimal by satisfying *RedRed. The winner at the stem level, then, becomes the input to the word level (101b). Since the input at the word level is already a reduplicated form, *yá'yá'q̄hi*, the candidate *yá'yá'yá'q̄hi* becomes the winner by satisfying the high-ranked constraint *RedRed at the word level. The candidate *b* is ruled out by violating FaithIO since no segments are copied.

(101) a. Stem level (Stonham, 2007: 128)

RED- <i>yaq</i> – <i>hi</i>	*RedRed	FaithIO
☞ a. <i>ya^hya^hq^hi</i>		
b. <i>ya^hya^hya^hq^hi</i>	*!	

b. Word level

RED- <i>ya^hya^hq^hi</i>	*RedRed	FaithIO
☞ a. <i>ya^hya^hya^hq^hi</i>		
b. <i>ya^hya^hq^hi</i>		*!

While Stonham's analysis successfully accounts for the presence/absence of double reduplication, which is the goal of his analysis, this analysis is not capable of accounting for the pattern of base modification that surfaces. For instance, in (102) below, the form, *maamaatyimtap* has two suffixes, each of which accompanies distinct shapes of stem modification: *-yimt* 'at shoulder' comes with CV reduplication ([R]), while *-apa* 'really' accompanies reduplication and vowel lengthening of both the reduplicant and base vowels ([RL+L]). The resulting surface shape is the form, [RL+L] that *-apa* requires.

(102) *maamaatyimtap*
 RED *ma^ht*–*yim^ht* [R]–*apa* [RL+L]
 RED cold–at.should–really
 'he is really cold in the shoulders' (ibid: 121)

Within Stonham's account, since both suffixes are part of derivational morphology, only a stem-level account is necessary. In Tableau 1, the double-reduplicated form is ruled out by violating *RedRed.

Tableau 1 (ibid: 127)

RED-RED-- <i>m̥aaʔ</i> – <i>yimʔ</i> – <i>ap</i>	*RedRed	FaithIO
 <i>m̥aaʔm̥aaʔyimʔap</i>		*
<i>m̥aaʔm̥aaʔm̥aaʔyimʔap</i>	*!	

Notice that there is a problem with the underlying form, RED-RED--*m̥aaʔ*–*yimʔ*–*ap*, in Tableau 1 above: the underlying representation of the base, *m̥aaʔ* ‘cold’ should be, in fact, *m̥aʔ* with a short vowel, rather than *m̥aaʔ* with a long vowel. Recall that vowel length is phonemically contrastive in Nuu-chah-nulth. Thus, it is important to account for correct vowel length as well as reduplication shape in an analysis of base modification in Nuu-chah-nulth.

In Tableau 2, I provide an analysis using the correct underlying form, *m̥aʔ*. Within Stonham’s framework, candidate (a) is incorrectly ruled out, because it violates the constraint, DEPIO, since a long vowel in the output is short in the input. Candidate (b), which has a short vowel in both the reduplicant and the base, is selected as the winner. Candidate (c) is ruled out, as the output has a mora which the input does not contain. Candidate (d) crucially does not satisfy FAITHBR, since a short base vowel is copied as a long vowel. Candidate (e) is ruled out, as it violates the highly ranked *RedRed.

Tableau 2

RED-RED-- <i>m̥aʔ</i> – <i>yimʔ</i> – <i>apa</i>	*RedRed	MAXIO	DEPIO	FAITHBR
⊖ a. <i>m̥aaʔm̥aaʔyimʔap</i>		*	*(μ)!	
 b. <i>m̥aʔm̥aʔyimʔap</i>		*		
c. <i>m̥aaʔm̥aaʔyimʔap</i>		*	*(μ)!	*
d. <i>m̥aaʔm̥aʔyimʔap</i>		*		*!
e. <i>m̥aaʔm̥aaʔm̥aaʔyimʔap</i>	*!		*(μ)	

As illustrated, the set of constraints suggested in Stonham (2007) does not select the optimal candidate as the winner when the underlying representation, *máʔ* is present. In short, while Stonham's Stratal OT approach successfully accounts for the occurrence/inactivity of double reduplication, his model is insufficient to account for various patterns of base modification attested in the language. The following discussion focuses on Kim's (2003b) templatic approach, in which patterns of modification that occur with suffixes are accounted for within OT.

3.6.2 Kim (2003b)

In her study of the Ahousaht dialect, Kim (2003b) proposes that VLA and the shapes of the reduplicant and the base occur to meet a metrical requirement specified in the template that accompanies the suffix. She classifies the shapes of VLA relative to three foot structures and reduplication/VLA in relation to six foot structures. In her Optimality Theoretic analysis, the templates of the foot structures are specified in the input; the interaction between one markedness constraint and several faithfulness constraints regulating foot structure determines the optimal output.

In this analysis, VLA receives two distinct accounts, depending on whether VLA occurs with reduplication or not. When VLA occurs by itself, unaccompanied by reduplication, it is accounted for by employing a set of general faithfulness constraints (e.g., MAXIO(μ) and DEPIO(μ)). In accounting for VLA that co-occurs with reduplication (e.g., [RL] or [R+L]) or for reduplication that occurs without VLA (i.e., [R]), her faithfulness constraints are domain-specified, i.e., constraints are applied only to the classes indicated. For instance, MAXIO(μ) [I-IV, VII] (A mora in the input in class I-IV, VII

must have a correspondent in the output) applies to foot types I, II, III, IV, and VII. In both analyses, the constraint MAXFootForm (A foot in the input must have a correspondent in the output) plays an important role in selecting a specified template as the winner. Below, I will first illustrate how Kim's analysis accounts for VLA and reduplication and then discuss how her analysis may present challenges when affixes with different foot templates co-occur.

As an illustration of Kim's analysis, let us consider the form in (103), which contains a foot shape with a light first syllable and a second heavy syllable with no coda copying (Class VII-2).

- (103) Class VII-2
 wiwiiksapiʔiš
 RED wik-sapi [R+L]-ʔiš
 RED NEG-to.depend.on-3S.IND
 'S/he is depending on nothing' (Kim, 2003b: 163)

In Tableau 3, MAXFootForm is highly ranked and must be satisfied at the expense of violating other faithfulness constraints. DEPIO_{VII} should be violable because a short vowel in the input becomes a long vowel; thus, it is ranked lower than MAXFootForm. Also, as the reduplicant does not contain a copied coda consonant, NOCODA is ranked lower than MAXFootForm. MAX/DEPBR_{VII-2} (Every element of the base of Class VII-2 has a correspondent in the output, and vice versa) should also be violable in that segments in the reduplicant are not identical to those in the base.

Tableau 3 (ibid: 164)

/Rσ-wik-sapi (σ σ) _φ /	MAXIO	MAX Foot Form	DEP IO(μ) _{VII}	NO CODA	MAX BR _{VII-2}	DEP BR _{VII-2}	INTE -GRITY
a. {σ[wi]wiik} _φ			*	*	*(k)*(μ)		**
b. {σ[wii]wiik} _φ		*!	*	*	*(k)		**
c. {σ[wi]wik} _φ		*!		*	*(k)		**
d. {σ[wik]wik} _φ		*!		**			***
e. {σ[wii]wi} _φ	*!(k)	*				*(μ)	**
f. {σ[wii]wii} _φ	*!(k)	*	*				**
g. {σ[wik]wiik} _φ			*	**!	*(μ)		***
h. {σ[wii]wik} _φ		*!		*	*(k)	*(μ)	**

Candidates (b), (c), (d), and (h) are ruled out because they violate the high-ranked constraint MAXFootForm (*b* has two heavy vowels; *c* and *d* two short vowels; *h* a heavy first vowel). Candidates (e) and (f) fatally violate MAXIO, as the outputs do not include the coda *k*. Candidate (g) is ruled out by twice crucially violating NOCODA. Candidate (a) is the winner; it violates only the four relatively low-ranked constraints DEPIO_{VII} (the output has a long vowel, while the input has a short vowel.), NOCODA, MAXBR_{VII-2}, and INTEGRITY (i.e., no segment in the input has multiple correspondents in the output).

Now, consider an analysis of vowel lengthening. Kim observes that the suffix -*inaakuuh* in (104) triggers lengthening of the vowel in the first syllable.

- (104) qaah^hina^hkuuh
 qa^h-ina^hkuuh [L]
 to.die-to.observe
 ‘dreaming of dead people’ (Kim, 2003b: 115)

The vowel lengthening in (104) seems to exhibit the same process observed above in (103), in which vowel lengthening occurs with reduplication. In (104), however, the formal analysis of VLA is performed with a set of constraints distinct from those employed in (103). As demonstrated in Tableau 4, here Kim employs the general

faithfulness constraints MAX_{μ} and DEP_{μ} , rather than the domain-specified constraints used in Tableau 3. The optimal candidate *a* is selected by satisfying the highly ranked constraint $MAX_{FootForm}$.

Tableau 4 (ibid: 116)

/qaḥ-ḥnákúuḥ (σ σ) _φ /	\bigwedge $\mu \mu$	$MAX_{FootForm}$	MAX_{μ}	DEP_{μ}
a. (qaḥi) _φ ḥnákúuḥ				*
b. (qaḥi) _φ ḥnákúuḥ	*!			
c. (qaḥii) _φ ḥnákúuḥ	*!			*

While the analysis accounts for shapes of VLA and reduplication accompanied by a single suffix, issues arise when multiple suffixes of different templates are added to the same base. If, as illustrated in (105), one of the suffixes is accompanied only by VLA and the other is accompanied by VLA and reduplication, then another set of constraints may be needed to account for the form.

- (105) Class 2 and Class 8 = Class 8
 ḥuuḥwáṭap
 ḥu-ḥwáṭ [L]-apa [RL+L]
 REF-to.use-too
 ‘(He) used it too much.’ (Rose, 1981: 340)

Also, a device that rules out a form that meets the high-ranked constraint $MAX_{FootForm}$ (e.g., *ḥuuḥwáṭap*), is necessary.

A similar problem arises when more than one reduplication-accompanying suffix is attached to the same base. As mentioned earlier, despite the existence of two foot templates, double reduplication does not occur. It should be possible to account for the absence of double reduplication by postulating the constraint, $INTEGRITY$, since a

candidate with a doubly copied form would violate INTEGRITY to a greater degree than a candidate with a single copied form. However, issues arise when co-occurring reduplication-accompanying suffixes have distinct foot templates. Recall that Kim's constraints are domain-specific. She proposes distinct rankings for classes to account for the various patterns of base modification in Nuu-chah-nulth (11 patterns in her classification). Her ranking of constraints is shown in (106) below.

(106) Ranking of constraints (Kim 2003b: 155)

MAX/DEPIO(SEG), MAXIO(μ) [I-IV, VII], DEPIO(μ) [I-III, V-VI]
 ⇓
 MAXFootForm
 ⇓
 MAXIO(μ)_[IV, VI], DEPIO(μ)_[IV, VII]
 ⇓
 MAX/DEPBR_[I-1, IV, VII-1]
 ⇓
 NOCODA
 ⇓
 MAX/DEPBR_[I-2, II, III, V, VI, VII-2]
 ⇓
 INTEGRITY

Some of the constraints above are ranked differently according to domain. For example, the constraint MAXIO(μ) is ranked after MAXFootForm in Class V and VI; while for the rest of the classes, it is ranked before the constraint MAXFootForm. Note also that DEPIO(μ) and MAX/DEPBR are ranked differently depending on the class of affixes. Therefore, for instance, when a Class IV suffix (i.e., a suffix accompanying CV reduplication and vowel lengthening in both the reduplicant vowel and the base vowel: [RL+L]) and a Class V suffix (i.e., a suffix accompanying CV reduplication: [R]) co-occur on the same base, then the orders specified for each set of constraints conflict.

This problem is inherent to an approach that, in line with co-phonology theory (Orgun 1996, 1998; Inkelas 1998, 2008; Antilla 2002; Inkelas & Zoll 2005, 2007; Downing 2008, among others), adopts distinct constraint rankings for each class in contrast to approaches that adopt a single, fixed constraint ranking (McCarthy and Prince, 1995; Myers and Carleton, 1996; Urbanczyk, 1996; Itô and Mester, 2003, among others).

A WP approach does not encounter this problem, in that (as mentioned in §3.5.2.2) a single rule accounts for VLA within the same syllable and a separate rule accounts for reduplication. For the first base VLA, for instance, the SD for the rule specifies that it only applies to the classes of base in which the first base vowel is lengthened. Thus, although the word *ʔuuʔuuḥwáʔap* in (105) is specified for Class 2 and Class 8, the VLA rule applies only once. The same logic can account for the absence of double reduplication. The reduplication rule applies to a word only once, regardless of the presence of more than one triggering suffix.

Above, I have shown how Kim's analysis accounts for the templates accompanied by suffixes. I have also addressed the challenges that arise for Kim's analysis when ME includes more than one modification-accompanying affix. Then, I have shown how the WP approach overcomes these issues: a rule applies only once, but is specified for more than one class.

3.6.3 Prosodic Circumscription

I have shown in §3.3.1 that VLA and reduplication occur within the initial disyllabic domain. Since the base modifications are sensitive to this, it is worth examining an

alternative approach employing the theory of Prosodic Circumscription (McCarthy and Prince, 1990; McCarthy and Lombardi, 1993; McCarthy, 2000). In what follows, I will discuss Prosodic Circumscription and provide an analysis within the framework.

The theory of Prosodic circumscription (McCarthy and Prince, 1990) addresses the proposal that morphological operations can apply to a prosodically circumscribed domain. The phonological domain may be less than a morphological constituent. For instance, in Ulwa (Southern Suma), possession in nouns is expressed by affixing *-ka* right after the first iambic foot of the noun ([**al**]_φ *-ka* 'man', [**sana**]_φ *-ka* 'deer', [**suu**]_φ *-ka-lu* 'dog', [**siwa**]_φ *-ka-nak* 'root')³⁰ (p. 228). Prosodic circumscription theory divides the single base (*suulu*, *siwanak*) into affected (*suu*, *siwa*) and unaffected (*lu*, *nak*) parts. Then, only the prosodically circumscribed domain (the affected part) is considered as a constituent which affixation applies.

The morphological operation system of prosodic circumscription comprises the parsing function, ϕ (C, E), the parsed-out constituent, $B:\phi$, and the remainder, B/ϕ . In the parsing function, C denotes a prosodic constituent (σ , foot, etc.) and E an edge of the base (left or right). A base (B) comprises the parsed-out portion ($B:\phi$) and the remainder (B/ϕ), as in (107). The asterisk, *, denotes the concatenation of two parts.

$$(107) \quad B = B:\phi * B/\phi$$

A morphological operation O may apply to either a parsed-out constituent, as in (108a), or to the remainder, as in (108b). The operation on the remainder (108b) applies to a case of extrametricality, which will not be discussed here. The operation on the

³⁰ In the examples, the root is bolded and the suffix is italicized.

parsed-out constituent (108a) is referred to as positive prosodic circumscription, such as the Ulwa possessive construction.

- (108) a. $O: \phi(B) = O(B: \phi) * B/\phi$
 b. $O/\phi(B) = B:\phi * O(B/\phi)$

To illustrate the operation of prosodic circumscription, let us consider the Ulwa possessive word, **siwa-ka-nak** 'root' cited above, where the operation (-KA) is limited to the leftmost foot. Thus, the parsing function is ϕ (F, L). The application is demonstrated in (109).

- (109) -KA: ϕ (siwanak) = -KA(siwanak: ϕ) * siwanak/ ϕ
 = -KA(siwa) * nak
 = siwaka * nak
 = siwakanak

A similar operation can be applied to reduplication and VLA in Nuu-chah-nulth. Recall that the processes occur only within the domain of the initial two syllables, which is assumed to be a foot (see §3.3.2.1; also, readers may refer to Kim (2004) and Lee (2008) for a justification of this claim).

First, let us consider VLA using the word in (110).

- (110) **kuuṁahwaaṭ**
 kuṁaa-ḥwaaṭ [L+S]
 scarcely/hardly any-to use
 'using hardly any' (Kim 2003: 107)

With the naming of the operation [L+S], the parameter of the function ϕ is (F, left). The base is the whole word. The concatenation of the circumscribed portion and the remainder is marked by the asterisk, *.

- (111) $[L+S]/\phi$ (kuṁaaḥwaaṭ) = [L+S](kuṁaaḥwaaṭ: ϕ)* kuṁaaḥwaaṭ / ϕ
 = [L+S] (kuṁaaḥ) * waaṭ
 = kuuṁah * waaṭ
 = kuuṁahwaaṭ

As for reduplication, the domain³¹ is limited to the consonant and vowel of the lexical base. Although this description does not apply to reduplication occurring with aspectual affixes, I will illustrate a simple case, leaving a full account for further study. Consider the word in (112) for the operation of prosodic circumscription.

- (112) **cicifaaʔuk**
 RED ciq-'aaʔuk [R]
 RED speak-attend.to
 'listen to sb speaking'

Let us call the operation [R]. The parameter of the function ϕ is set as $(\sigma_\mu, \text{left})$. The application is illustrated below.

- (113) $[R]/\phi (ciʔaaʔuk) = [R] (ciʔaaʔuk:\phi) * (ciʔaaʔuk/\phi)$
 $= [R] (ci) * ʔaaʔuk$
 $= cici * ʔaaʔuk$
 $= ciciʔaaʔuk$

In forms that contain both reduplication and vowel length adjustment, as in (114), reduplication and VLA should each be considered as an individual operation. Because reduplication feeds the condition for reduplicant vowel lengthening, reduplication must apply before VLA. The output of reduplication (tutupkħin) in (115a) becomes the input to the operation [L + L] in (115b)

- (114) **tuutuupkħin**
 RED tupk-ħin [RL+L]
 RED black-at.end
 'black-tipped'

³¹ In fact, a prosodic domain is not necessary for reduplication in that reduplication is sensitive to the edge of lexical base. However, for a unified analysis for the cases that reduplication occurs with VLA, the operation is suggested here.

(115) a. [R]: the parameter of the function ϕ : (σ_μ , left)

$$\begin{aligned} [R]/\phi(\text{tupk}\dot{\text{h}}\text{in}) &= [R](\text{tupk}\dot{\text{h}}\text{in}:\phi) * \text{tupk}\dot{\text{h}}\text{in}/\phi \\ &= [R](\text{tu}) * \text{pk}\dot{\text{h}}\text{in} \\ &= \text{tutu} * \text{pk}\dot{\text{h}}\text{in} \\ &= \text{tutupk}\dot{\text{h}}\text{in} \end{aligned}$$

b. [L+L]: the parameter of the function ϕ : (F, left)

$$\begin{aligned} [L+L]/\phi(\text{tutupk}\dot{\text{h}}\text{in}) &= [L+L](\text{tutupk}\dot{\text{h}}\text{in}:\phi) * \text{tutupk}\dot{\text{h}}\text{in}/\phi \\ &= [L+L](\text{tutupk}) * \dot{\text{h}}\text{in} \\ &= \text{tuutuupk} * \dot{\text{h}}\text{in} \\ &= \text{tuutuupk}\dot{\text{h}}\text{in} \end{aligned}$$

I have demonstrated a simple application of the prosodic circumscription theory to reduplication and VLA in Nuu-chah-nulth, leaving a fuller account for future research.

The above application may be subject to the following criticism. First, the prosodic circumscription approach cannot account for multiple suffixation accompanying different modifications. In a templatic approach, it is obligatory to meet the Template Satisfaction Condition (templatic constraints must be satisfied). To meet this condition, the operations such as [RL] or [R], if they occur together, must apply to the same base. The consequence will be an occurrence of double-reduplication or a triple-long vowel, which is unattested. Second, reduplication in Nuu-chah-nulth always occurs on the leftmost edge of a lexical base. Thus, prosodic circumscription is not strictly necessary for the analysis. Third, the prosodic circumscription operation does not account for the observation that the suffix triggers alternations. Thus, the analysis does not reflect the relationship between the two exponents as ME.

In summary, I have provided an analysis within the prosodic circumscription theory, respecting the phonological domain that VLA makes reference to. While VLA patterns are accounted for, this approach exhibits the same problem shown by other templatic approaches.

3.7 Summary

This chapter has examined base modifications (VLA and reduplication) and lexical/aspectual suffixes that accompany base modifications. This study characterizes these seemingly distinct processes in terms of subsidiary exponence within ME, thus providing a unified account. The base modifications have been examined as subsidiary exponents of ME, based on ME criteria for inflectional morphology from Matthews's (1972) study of Latin: a subsidiary exponent (i) is not phonologically conditioned; (ii) always occurs with a main exponent; (iii) occurs in a consistent phonological form; and (iv) occurs with any base of certain lexical categories. I have demonstrated that VLA and reduplication in Nuu-chah-nulth meet all these criteria.

Affixes are organized into 14 non-inflectional classes in accordance with patterns of base modification. These non-inflectional affix classes serve as the basis for WFRs within the WP model. A total of ten WFRs are formulated to account for the 14 classes. A suffixation rule is responsible for providing semantic and syntactic information in the SD and SC; other rules formulated for secondary exponents are similar to inflectional WFRs in that they contain morphological and phonological information. By allowing multiple applications of WFRs, ME phenomena receive a formal analysis within the WP framework. The model provides an efficient account of the complex morphology of Nuu-chah-nulth.

In particular, this model provides a solution for the lack of double reduplication in the presence of multiple occurrences of accompanying suffixes. By having a single reduplication rule (excluding aspectual reduplication) and by specifying in the SD the

classes to which the rule may apply, the reduplication rule applies only once, regardless of the presence of more than one specified class in a word.

CHAPTER 4 Non-inflection Multiple Exponence in Central Yup'ik

4.1 Introduction

This chapter examines multiple exponence (ME) in the non-inflectional morphology of Central Yup'ik. Central Yup'ik, a Yupik Eskimo language, has derivational suffixes, named *postbases* in traditional grammars of this language. The postbases resemble lexical affixes in Nuuchahnulth (see Chapter three) in two ways. First, they convey lexical meanings. Some examples of these suffixes are illustrated in (1).

- (1) Suffixes (Postbases) that contains lexical meanings (Jacobson 1984a)
- | | |
|-----------------------|---|
| -cete ³² - | 'to let, allow, permit, cause, or compel one to do' |
| -ci- | 'to buy' |
| -niq | 'since' |
| -leryag- | 'abruptly, in a huff' |
| -cilleq | 'worthless' |

Second, postbases may accompany base modifications. Recall that lexical suffixes in Nuuchahnulth accompany base modifications such as reduplication and/or VLA. Postbases in Central Yup'ik may accompany segmental adjustments, such as vowel or/and consonant deletion. In (2), some types of base modification that occur with postbases are provided as illustrations.

³² Data in the current study are transcribed in orthography, respecting the conventional writing system used for studies of this language. IPA equivalents for Central Yup'ik orthography are provided in Section 4.2.2.

- (2) Types of derivational suffixes depending on accompanying base modifications
- a. *Base final consonant deletion*
 angyakcak
 angya**q**-kcak
 boat -something.that.looks.like
 ‘something that looks like a boat’

 - b. *Base final consonant and vowel deletion*
 agluryirtuq
 aglurya**q**-ir-(g/t)uq³³
 rainbow-something.is.occuring-3S.IND.INT
 ‘There is a rainbow.’

 - c. *Verb final te [ti] deletion*
 ikirngaitaa
 i**kte**-ngait-aa
 to.open-to.not.do.in.the.future-3S.IND.TRN
 ‘He won't open it.’

In (2a) above, note that the base-final back velar stop *q* is deleted when the suffix *-kcak* is attached. In (2b), the suffix *-ir* triggers the deletion of the base final consonant and vowel. Note that in (2c), *te* is deleted when the suffix *-ngait* is added to the lexical base *ikirte*. (Examples are drawn from Jacobson (1984a). See Section 4.2.1 for details about the source of the data.)

Central Yup'ik exhibits a large number of morphophonological processes. Although all alternations are morphologically motivated, in that the processes are triggered by suffixes, the alternations can be distinguished by whether or not they occur for phonological reasons. However, previous studies have not made this distinction clear. For instance, Reed et al. (1977) and Jacobson (1984a, 1996) attribute these processes to properties of suffixes, making no mention of the phonological environment. In contrast,

³³ *-tug* is realized after a consonant; *gug* after two vowels; *-ug* after a vowel

Miyaoka (to appear) considers most processes to be phonological, although he describes exceptional cases and specific suffixes that trigger an alternation, where applicable.

This study draws a line between phonologically and non-phonologically conditioned alternations. Take intervocalic velar deletion and base-final consonant deletion for example. In intervocalic velar deletion, a base-final voiced velar, *r* [ɣ] is deleted when it occurs between two vowels at the boundary of a base and a suffix, as illustrated in (3).

- (3) mertaucitaa
 mertar-(u)cite³⁴-aa
 to.pack.water-in.place.of-3S.IND.TRN
 'He is packing water in place of her.'

This morpho-phonological alternation is phonologically conditioned in that the alternation occurs only when the phonological criterion for the environment is met. On the other hand, in base-final consonant deletion (2a), a base-final consonant is deleted when specific suffixes are affixed. The initial sounds of the suffixes are random. In addition, not all suffixes starting with these sounds trigger the deletion. Thus, phonology plays no role in base-final consonant deletion. In this study, it is proposed that this non-phonologically conditioned alternation is part of ME. In other words, two components, a suffix and an instance of deletion, together comprise ME of a single expression. Recall that ME or extended exponence refers to a phenomenon in which two or more exponents in a word jointly convey a morphosyntactic or semantic feature value (Anderson, 2001; Caballero, 2008; Harris, 2009; Matthews, 1972, 1991; Xu, 2007, among others). Thus, deletion and suffixation together signify a single expression. As evidence for this

³⁴ *u* surface with bases ending in a consonant or *e*

proposal, different types of deletion are examined, using a set of criteria identified in Matthews's (1972) study of Latin. These criteria, repeated from Chapter 2 for convenience, are as follows:

(4) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

- (i) ***Non-phonological condition***: no exponents are phonologically conditioned;
- (ii) ***Consistent co-occurrence***: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) ***Phonological consistency***: phonological representations of the co-occurring exponents are consistent.
- (iv) ***No exceptions on base selection***: an exponent may appear on any lexical bases of a morphological category.

I propose that to constitute ME, an alternation must meet the two criteria, *Non-phonological condition* and *Consistent co-occurrence*. Interestingly, among attested base modification patterns in Central Yup'ik, some processes (i.e., base-final consonant deletion and base-final consonant and vowel deletion) meet all the criteria for ME, while others (i.e., three types of *te*-verb deletion) meet only some of the criteria, suggesting that ME parameters occur along a continuum.

The remainder of this chapter is organized as follows: §4.2 provides preliminary information on Central Yup'ik that is required as a basis for understanding the discussion in this chapter. §4.3 examines base modification processes and provides supporting evidence that they constitute ME. §4.4 provides a formal account using the Word-and-Paradigm model. Finally, §4.5 summarizes the chapter.

4.2 Preliminaries

This section provides background regarding Central Yup'ik, including information on phonemic inventories, syllable structure, and word formation processes. This information is necessary to help determine whether phonological conditioning influences derived forms.

4.2.1 The Central Yup'ik language, previous studies on the language, and sources of the data

Central Yup'ik is a Yupik Eskimo language spoken in southwestern Alaska in the Yukon-Kuskokwim Delta and Bristol Bay area (Jacobson 1984a). Along with Siberian Yupik and Alutiiq, Central Yup'ik forms the Yupik Eskimo language family. According to Jacobson (1984a), Central Yup'ik comprises 10 dialects, which are distinguished based on shared properties. Krauss (2007) notes that more than 10,000 of a total of population of about 21,000 people speak the language, mainly around the lower Kuskokwim River, on Nelson Island, and along the coast between the Kuskokwim River and Nelson Island (Yupiugukut). According to the Alaska Native Language Centre at the University of Alaska, Fairbanks, in 17 of 68 Yup'ik villages, children speak and are taught Central Yup'ik as their first language (<http://www.uaf.edu/anlc/languages/cy/>).

Quite a few studies have focused on the interactions between postbases and bases. Jacobson (1984a) compiled a list of postbases in the *Yup'ik Eskimo Dictionary* and describes what kind of modification(s) each postbase triggers in the base. Previous studies, including Jacobson (1979, 1984a, 1996) and Reed et al. (1977), mainly describe

the sound changes that accompany postbases. Miyaoka (forthcoming) adds great detail about the phonology, morphology, and syntactic aspects of the language.

The present study builds on the descriptions in these previous studies. In particular, all the data cited are drawn from Jacobson's (1984) *Yup'ik Eskimo Dictionary*, unless otherwise noted. The forms are from the list of postbases and have been rearranged herein for the purpose of the current study. Page numbers are not provided, since the cited data can be easily located in the original source, where it is ordered alphabetically. For instance, *angyakcak* in (5), repeated from (2a) above, can be found among examples of the postbase, *-kcak* 'something that looks like' (*not* in the list of bases).

- (5) *angyakcak*
 angyaq-kcak
 boat-something.that.looks.like
 'something that looks like a boat'

4.2.2 Segmental Inventory and Syllable Structure

The Central Yup'ik consonant inventory comprise five stops and 20 continuants (or, as maintained by some researchers, 22 continuants)³⁵. Stops are all voiceless and have no voiced counterparts; all voiceless fricatives have a voiced counterpart, although Miyaoka (forthcoming) states that only some speakers distinguish between voiceless and voiced nasals.

Table 9 presents the consonant inventory in Central Yup'ik. The table is drawn from

³⁵ Miyaoka (to appear) adds two approximant sounds, [w] and [y], whereas Jacobson (1984) does not include [w], but categorizes [y] as a voiced fricative, along with s [z].

Jacobson (1984a) and Miyaoka (forthcoming) and has been rearranged by the author. All the data in this dissertation are written in the orthography typically used in studies of Central Yup'ik, respecting the convention of the sources of the data. Phonetic equivalents in Jacobson (1984) for the Central Yup'ik orthography are provided in parentheses.

Table 9 *Central Yup'ik Phonemic Consonant Inventory*

	Labial	Apical		Front Velar	Back Velar	Labialized front velar	Labialized Back velar
		Dental	Alveoplatal				
<i>Stops</i>	p	t	c (tʃ)	k	q		
<i>Voiced fricatives</i>	v	l	s (z)	g (ɣ)	r (ʁ)	uḡ (ɣ ^w)	ur (ɣ ^w)
<i>Voiceless fricatives</i>	vv (f)	ll (ɸ)	ss (s)	gg (x)	rr (x̥)	w (x ^w)	urr (x̥ ^w)
<i>Approximant</i>	w		y				
<i>Voiced nasals</i>	m	n		ng (ŋ)			
<i>Voiceless nasals</i>	m̥ (m̥)	n̥ (n̥)		ng̥ (ŋ̥)			

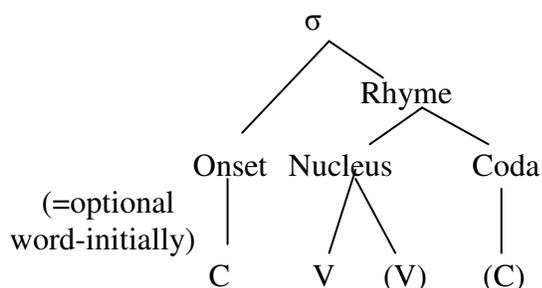
The vowel system of Central Yup'ik is relatively simple. There are three phonemically distinctive tense vowels (referred to as “prime vowels” by Jacobson): /i, u, a/; a lax or non-prime vowel represented in the orthography as *e* is phonetically realized between [ə] and [i]. A base-final vowel *e* often undergoes deletion. Table 10 shows the Central Yup'ik vowel inventory.

Table 10 *Central Yup'ik Phonemic Vowel Inventory*

	Front	Central	Back
High	i	e (i)	u
Low		a	

Central Yup'ik syllables consist maximally of an onset consonant, a short or long vowel, and a coda consonant. Codas are optional; syllables with no onset (i.e., syllables with only a vowel) are possible only word-initially. A sequence of two consecutive vowels of different quality is considered a diphthong. Consonant clusters are not allowed in either onset or coda position. When a consonant cluster occurs in the middle of a word, the cluster is re-syllabified, and the second consonant becomes the onset of the following syllable. When three or more consonants occur in a word, a vowel *e* is inserted to break up the clusters (Reed et.al, 1977: 29). To break up a sequence of three consonants, *e* is inserted between the first and second consonant; but when *t* is the second consonant, *e* is added after *t*. For instance, *kenkluku* becomes *kenekluku* 'loving him' (*e* is inserted between the first and second consonants), but *qimugtnguug* becomes *qimugtenguuq* 'it is a dog' (*e* is inserted between the second and third consonants). I provide the following representation of the syllable structure of Central Yup'ik, based on descriptions from previous studies.

(6) Syllable Structure



Thus, possible syllable shapes in this language are CV, CVV, CVC, and CVVC. At the beginning of a word, syllables with the shapes V, VV, VC, and VVC are possible as well.

ending *-(g/t)uq* denotes indicative mood intransitive third person singular; and *-llu* is an enclitic meaning ‘also’.

Most lexical bases in Central Yup'ik are inflectable and only a small number of lexical bases can stand alone (Reed et. al, 1977). Lexical bases in Central Yup'ik are either verbal or nominal. No other word classes can act as lexical bases. Some verbs end in *te*, and are hence called *te*-verbs. *te*-verbs undergo several different types of deletion, depending on which suffix is added, a topic that will be discussed in detail in later sections.

4.2.4 Postbases

Central Yup'ik has derivational affixes called postbases that contain idiosyncratic lexical meaning, as do the lexical affixes of Nuu-chah-nulth. Central Yup'ik includes a large number of postbases: Jacobson has compiled approximately 500 postbases in the *Yup'ik Eskimo Dictionary*, a total that is similar to the number of lexical suffixes in Nuu-chah-nulth. Interestingly, the postbases share two common properties with lexical affixes in Nuu-chah-nulth, in that they have wide semantic scope and co-occur with base modification. In what follows, I discuss the hosts of postbases and then explore in more detail the two above-noted traits of Central Yup'ik postbases that are similar to Nuu-chah-nulth lexical suffixes.

Either a nominal or verbal lexical base can host a postbase. According to Reed et al. (1977), four different types of predicate can be produced by combining a lexical base and a postbase. A postbase may be added to a nominal base to yield either a nominal or

verbal predicate. Also, a postbase can attach to a verbal base, yielding either a nominal or a verbal predicate. An illustration of these four possibilities is supplied below. First, as shown in (8a) and (8b), a noun base such as *angyar-* 'boat' or *qayar-* 'kayak' may host a noun-modifying type of postbase, such as *-cuar(ar)* 'small' or *-pik* 'real, genuine'. These combinations result in noun predicates, as seen below.

- | | | | | |
|-----|----|--|----|--|
| (8) | a. | angyapik
angyar-pik
boat-real
'a real boat' | b. | qayacuar
quyar-cuar(ar)
kayak-small
'a small kayak' |
|-----|----|--|----|--|

Second, a nominal base may host a verbal type of postbase to result in a verbal predicate. In (9a), the postbase *ngqerr-* 'to have or possess' is affixed to the base *qayar* 'kayak', making it a verbal phrase. Furthermore, the postbase *-ngqerr* can be affixed to another postbase *-rpak* 'big', as in (9b). Note that the postbase *-ke* in (9c) behaves like a transitive verb and should occur with transitive endings. The sentence in (9c) literally means 's/he has it as his/her kayak.

- | | | |
|-----|----|---|
| (9) | a. | qayangqertuq
qayar-ngqerr-(g/t)ug
kayak-to.have-3S.IND
'S/he has a kayak.' |
| | b. | qayarpangqertug
qayar-rpak-ngqerr-(g/t)ug
kayak-big-to.have-3S.IND
'He has a big kayak.' |
| | c. | qayaqaa
qayar-ke-aa
kayak-subject.has.object.as.its-3S.IND.TRN
'It is his kayak.' |

Third, a verbal base may be affixed by a nominal postbase, a process which yields a noun. In (10) and (11), *-vik* 'place to do' or 'site of one's doing' and *-ta* 'one who does something' (mostly in the sense of "as a profession") are added to a verbal base *cali-* 'to work'. The resulting affixed words are nominal phrases.

- | | | | | |
|------|----|---|----|--|
| (10) | a. | calivik
cali-vik
to.work-place.to
'place to work, workshop' | b. | nervik
ner-vik
to.eat-place.to
'restaurant' |
| (11) | a. | calista
cali-(s)ta ³⁷
to.work-one.who.does.s.t
'the worker' | b. | pista
pi-(s)ta
to.do-one.who.does.s.t
'doer, servant' |

Lastly, a verbal base may host a verbal postbase. Postbases such as *-yug* 'to want to' and *-ur(ar)* 'to keep on' are added to the verbal base, *cali* 'to work' and *ayag* 'to leave', producing verbs such as *caliyug* 'want to work' and *caliur* 'keep on working', respectively.

- | | | |
|------|----|--|
| (12) | a. | caliyugtuq
cali-yug-(g/t)ug
to.work-to.want.to-3S.IND.INT
'He wants to work.' |
| | b. | ayagyugtuq
ayag-yug-(g/t)ug
to.leave-to.want.to-3S.IND.INT
'He wants to leave.' |
| (13) | a. | caliurtuq
cali-ur(ar)-(g/t)ug
work-to.keep.on-3S.IND.INT
'He keeps working.' |

³⁷ *s* is realized when the base ends in a vowel.

- b. aturturaraa
 atur–ur(ar)–aa
 to.use–to.keep.on-3S.IND.TRN
 ‘He keeps using it.’

One common property that Central Yup'ik postbases share with Nuu-chah-nulth lexical affixes is broad semantic scope. I have examined the list of postbases in the *Yup'ik Eskimo Dictionary* (Jacobson 1984) to focus on the semantic range of postbases. Based on this preliminary investigation, I conclude that postbases express action/events (14a), states (14b), degrees (14c), and entities (14d), among other possibilities.

(14) Semantic scope of lexical affixes

a. Actions/Events

- | | |
|---------|--------------------------------|
| -cur | 'to hunt' |
| -tur | 'to eat' |
| -karci | 'to buy something for someone' |
| -(ng)ir | 'to remove N from' |

b. States

- | | |
|-----------|---|
| -tangqerr | '(for there) to be something/someone' |
| -l(er)aq | 'shabby, old' |
| -cungaq | 'cute and little' |
| -lkiite- | 'to not be apparent that or whether one has done something' |

c. Degrees

- | | |
|-------------|---|
| -kanir(ar)- | 'more and more, with greater intensity' |
| -laag- | 'quickly, to V in a hurry' |
| -qsig- | 'to be far in the direction' |
| -pallag | 'intensely, excessively' |

d. Entities

- | | |
|--------------|--------------------------------|
| -cuun | 'device for doing something' |
| -in | '(plural) pair, group, series' |
| -iq, -ir(aq) | 'animal that dwells in N' |
| -pacug- | 'poor dear one' |

Note that the illustration of semantic scope above is not exhaustive. Also, there are more action/event postbases than for other categories, and entities are expressed mostly by lexical bases rather than by postbases.

Another significant trait shared by Central Yup'ik postbases and Nuu-chah-nulth lexical suffixes is their co-occurrence with base modifications, a trait that is of interest for the present study. A large number of base modifications occur with postbases, including different types of deletion and assimilation. Some of the base modifications are instances of ME, and will be discussed in the following section.

4.3 Multiple exponence in non-inflectional morphology in Central Yup'ik

Central Yup'ik exhibits about a dozen different types of base-final segment deletion that are triggered by a postbase. Some deletions are phonologically conditioned, while others are not. This section examines deletions that occur for no phonological reason. These types of deletion are base-final consonant deletion, base-final consonant-vowel deletion, and three types of deletion associated with *te*-verbs. Each type of process is first described and then discussed in terms of whether it meets the criteria for ME.

4.3.1 Base-final consonant deletion and base-final vowel and consonant deletion

In this subsection, I discuss two types of deletion: base-final consonant (C) deletion and base-final vowel and consonant (VC) deletion. These two types meet all the criteria for ME. Other types of deletion associated with *te*-verbs meet some of the criteria and will be discussed in a later section.

4.3.1.1 Base-final C-deletion

A final consonant of a base is deleted when certain postbases are added to the base, as shown below. The base-final velars *q* in (15a) and *r* in (15b) are deleted when followed by the postbases *-ir* ‘to deprive’ and *-llag* ‘suddenly and surprisingly’, respectively. Also, the base-final nasal *n* in (15c) is deleted when the postbase *-in* ‘pair’ is added.

- (15) a. amiiraa
 ami**q**-ir-aa
 skin-to.deprive-3S.IND.TRN
 ‘He skinned it.’
- b. ellngallagtuq
 ellngar -llag-(g/t)uq
 to.spring.a.leak-suddenly.and.surprisingly-3S.IND.INT
 ‘It suddenly sprang a leak’
- c. cetamain
 cetaman-in
 four-pair
 ‘four pairs’

Base-final C-deletion is very common in Central Yup'ik; a large number of derivational suffixes (about 250) listed in the *Yup'ik Eskimo Dictionary* accompany C-deletion.

4.3.1.2 Vowel and consonant sequence deletion (VC deletion)

Postbases such as *-ir* ‘is occurring’ and *-i* ‘to spend’ trigger the dropping of both the final consonant and preceding vowel in the base, as illustrated in (16). In Central Yup'ik, tense vowels (i.e., *a*, *i*, or *u*) may be followed by a consonant.

- (16) a. agluryirtuq
 aglury**aq**-ir-(g/t)uq
 rainbow-occurring-3S.IND.INT
 'There is a rainbow.'
- b. up'nerkivik³⁸
 up'ner**kaq**-i-vik
 spring-to.spend-place
 'spring camp'
- c. qanirtuq
 qan**uk**-ir-(g/t)uq
 snowflake-occurring -3S.IND.INT
 'It is snowing'

In contrast to base-final C-deletion, the number of suffixes that trigger VC-deletion is limited to four: *-ir* 'occurring', *-i* 'to spend', *-irin* 'days' (this suffix forms the names of weekdays), and *-aa* 'repeatedly'.

4.3.2 Deletion as a subsidiary exponent of ME

This subsection examines whether C-deletion and VC-deletion satisfy the criteria for ME proposed in Chapter 2. For each alternation, *Non-phonological condition*, *Consistent co-occurrence*, *Phonological consistency*, and *No exceptions on base selection* are examined.

4.3.2.1 Non-phonological condition

A possible phonological motivation for segment deletion is to obtain a legitimate syllable structure. In what follows, I will examine if deletion in Central Yup'ik serves this

³⁸ ' denotes gemination.

purpose and demonstrate that it does not. Also, I examine the environments preceding the deleted sounds and suffix-initial sounds to identify whether or not the environment is phonologically conditioned and conclude, once again, that the deletion is not phonologically motivated.

Let us first examine consonant deletion. Logically, there are two possibilities for CV combinations when a base meets an affix that triggers consonant deletion: (1) a consonant-final base meets a consonant-initial affix (i.e., C-C); and (2) a consonant-final base meets a vowel-initial affix (i.e., C-V). Recall that Central Yup'ik syllables do not allow consonant clusters in either the onset or the coda. Also, syllables containing only a vowel are possible word-initially (see §4.2.2 for details).

First, when a consonant-initial affix such as *-luaqar* 'to V well' is added to a consonant-final base, as in (17), the final consonant *r* of *quvar* is deleted, yielding the outcome *qu.va.lua.qar* rather than **qu.var.lua.qar*. However, when the consonant *r* is retained in the second syllable, i.e., *var*, the resulting syllable structure (CVC) is still legitimate.

- (17) quvaluaqartuq
 quvar-luaqar-(g/t)uq
 to.sleep-well-3S.IND.INT
 'He is sleeping well'

Furthermore, no phonotactic restrictions would prohibit the consonant cluster *rl* from surfacing, if the final consonant were not dropped. The form in (18) is an interesting example that illustrates the legitimacy of the *rl* cluster. When the same affix *-luaqar* occurs with *nerē* 'to eat', the vowel *e* is deleted, generating an *rl* cluster. (Recall that as

observed by Miyaoka (forthcoming), base-final *e* is usually deleted when followed by a voiced segment.)

- (18) nerluaqar
 nere-luaqar
 to.eat-well
 ‘to eat well.’

Second, when a vowel-initial affix is added to a consonant-final base, the consonant is deleted and a syllable with a diphthong is created. In (19), the affixed words are not **mal.ru.kin* and **pi.nga.yu.nin*, but instead *mal.ruin* and *pi.nga.yuin*, as a result of the deletion of *k* and *n*, respectively. Central Yup’ik phonotactics do not prohibit the occurrence of CV.CVC sequences; rather, this sequence of syllables is one of the most commonly observed in this language as well as cross-linguistically. As seen with the case of consonant-initial affixes, there appears to be no phonological motivation for base-final consonant deletion.

- | | | | | |
|------|----|--|----|--|
| (19) | a. | malruin
malruk-in
two-pairs
‘two pairs, two groups’ | b. | pingayuin
pingayun-in
three-pairs
‘three pairs, three groups’ |
|------|----|--|----|--|

While required syllabic structures do not mandate consonant deletion, it is worth considering whether the initial sounds of the triggering suffixes trigger phonologically motivated base-final consonant deletion. However, the initial sounds are random. The suffix-initial sounds include vowels (*a, u, i*), stops (*t, k, p*), as well as fricatives (*r, rr, g, gg, s, ss*), both voiced and voiceless. Also, not all suffixes that start with these sounds trigger deletion.

Moreover, segmentally identical suffixes behave differently, as found in (20) and (21). The postbase *-neq* ‘the activity’ (20a) and *-cuk* ‘unpleasing’ (21a) trigger base-final

consonant deletion, whereas *-neq* 'thing that results from' (20b) and *-cur* 'to hunt' (21b) do not. In the latter two examples, base-final consonants remain, undergoing regular, phonologically motivated sound changes³⁹, where applicable.

- | | | | | |
|------|----|---|----|---|
| (20) | a. | ayaneq
ayag- neq
to.leave-the.activity
'leaving, departure' | b. | ayagneq
ayag- neq
to.leave-thing.that.results.from
'beginning' |
| (21) | a. | putukucuk
putuku q-cuk
big.toe-unpleasing
'sore toe' | b. | yaqulegcurtuq
yaqule k-cur -(g/t)uq
bird-to.hunt-3S.IND.INT
'S/he is hunting birds' |

As for affixes accompanied by VC-deletion, only four of this type are listed in the *Yup'ik Eskimo Dictionary*: *-ir* 'occurring', *-i* 'to spend', *-irin* 'days' (this suffix forms the names of weekdays), and *-aa* 'repeatedly'. An illustration of VC-deletion is supplied in (22).

- | | | |
|------|----|--|
| (22) | a. | (c)ellallirtuq
(c)ellall uk-ir -tuq
rain-something (natural phenomenon) is occurring -3S.IND.INT
'It is raining.' |
| | b. | agluryirtuq
aglury aq-ir -tuq
rainbow -something (natural phenomenon) is occurring -3S.IND.INT
'There is a rainbow.' |

By deleting *uk* in (22a) and *aq* in (22b), the resulting words are syllabified as *ce.lla.llir.tuq* and *ag.lur.yir.tuq*, rather than **ce.lla.llu.kir.tuq* and **ag.lur.ya.qir.tuq*,

³⁹ A velar stop becomes a voiced velar fricative between vowels: A front velar stop /k/ becomes a voiced front velar fricative [ɣ] ('g' in orthography).

respectively. In fact, there is no phonological motivation either for avoiding the syllable structures of *llu.kir* and *ya.qir* or for choosing *llir* and *yir* instead.

Also, not all suffixes beginning with the vowel *-i* or *-a* trigger VC-deletion. As seen in (19) above, the suffix, *-in* 'pairs' triggers base-final C-deletion rather than VC-deletion. In addition, the VC sequence that undergoes deletion is not limited to certain sounds but occurs, rather, with various VC combinations (e.g., ak, uk, aq, eq (day), er, un, an, in).

In summary, by examining legitimate syllable structures and the phonological environment, we have demonstrated that neither C- nor VC-deletion are phonologically conditioned in Central Yup'ik. Deletion does not contribute to creating an optimal syllable structure. Examples of homophonous suffixes that trigger entirely different processes lend further support to the conclusion that deletion does not occur for phonological reasons.

4.3.2.2 Consistent co-occurrence

This subsection examines the criterion, *Consistent co-occurrence*, which stipulates that two or more exponents that signify the same expression co-occur. This is an obligatory criterion for a diagnosis of ME. Specifically, I examine whether C-deletion and VC-deletion always co-occur with postbases.

Indeed, certain types of deletion consistently occur with particular classes of affixes. For instance, as shown in (23) below, when the affix *-yagaq* 'little (one)' attaches to a base, the base-final consonants (*k*, *q*, and *r* in the examples below) are

deleted, as in *yaqulek* 'bird' (23a), *kassaq* 'white person' (23b), and *angninrir* 'to be no longer happy' (23c). If the base ends in a vowel, as in (23d), nothing happens.

- (23) a. yaquleyagaq b. kass'ayagaq
yaqulek-yagaq kass'aq-yagaq
bird-little white.person-little
'baby bird' 'child who is half white and half native'
- c. angninriyagrtuq
angninrir-yagar⁴⁰-(g/t)uq
to.be.no.longer.happy-liitle-3S.IND.TRN
'The little one is no longer happy'
- d. tuntuyagaq
tuntu-yagaq
caribou-little
'caribou calf'

Thus, VC-deletion and an accompanying affix appear to co-occur invariably. For instance, the suffix, *-aa* 'repeatedly' occurs only preceded by an *er* sequence. When the affix *-aa* 'repeatedly' occurs, it is always accompanied by VC-deletion. Notice that the patterns associated with C-deletion in (23) above and VC-deletion in (24) below are also invariant, a finding that satisfies the third criterion, *Phonological consistency*, which will be discussed in the following subsection.

- (24) a. qunaaguq
quner-aa-(g/t)uq
to.speak-repeatedly-3S.IND.TRN
'He is talking'
- b. caknaaguq
cakner-aa-(g/t)uq
to.struggle.to.function-repeatedly-3S.IND.TRN
'He is straining'

⁴⁰ *-yagar* is a variation of *-yagaq*

- c. naspaaguq
 nasper-aa-(g/t)uq
 considering.alternatives-repeatedly-3S.IND.TRN
 'He tasted it, tried it'

Also, note that when the suffix *-i* is added to *nakacuk* 'bladder' (25a) and *uksuq* 'winter' (25b), the base-final VC sequences *uk* and *uq* are deleted.

- (25) a. nakaciunga
 nakac**uk**-i-unga
 bladder-to.be.full.in.one's.N-?
 'I have to urinate'
- b. uksiuq
 uks**uq**-i-(g/t)uq
 winter-to.spend-3S.INT
 'He is spending the winter'

In conclusion, it seems that postbases and C- or VC- deletion co-occur in a consistent manner, satisfying the second criterion, *Consistent co-occurrence*.

4.3.2.3 Phonological consistency

The third criterion concerns the phonetic variability of alternations, which are considered to be allomorphs in a morphemic approach. Phonological consistency is satisfied when the phonological representations of co-occurring exponents are invariant.

Specifically, to meet the criterion, when a postbase occurs with C- or VC-deletion, it must always accompany the same type of deletion. In the previous subsection 4.3.2.2, I showed that certain postbases consistently co-occur with C- or VC-deletion. In (23), the postbase *-yagaq* 'little' invariably accompanies C-deletion; in (24) and (25), *-aa* 'repeatedly' and *-i* 'to spend' regularly accompany VC-deletion.

In fact, two exceptions are observed, as illustrated in (26). When the suffix *-i* 'to spend' is added, bases such as *kiak* 'summer' (26a) and *unuk* 'night' (26b) do not undergo VC-deletion. Rather, in these instances, the stop *k* becomes the voiced fricative *g* between vowels, a regular phonological process in Central Yup'ik. It is not clear whether these exceptions are attributable to the suffix or to the bases. This issue should be clarified by further study.

- (26) a. *kiagiuq*
 kiak-i-(g/t)uq
 summer-to.spend-3S.IND.INT
 'He is spending the summer'
- b. *unugiuq*
 unuk-i-(g/t)uq
 night-to.spend-3S. IND.INT
 'He is spending the whole night doing something or being somewhere'

Despite these two exceptional examples, the patterns of C-/VC-deletion accompanied by a particular postbases seems to be consistent. I consider the evidence to be solid enough to conclude that deletion is an exponent that is associated with a co-occurring affix.

4.3.2.4 No restriction on base selection

The fourth criterion of ME, which is optional, is associated with base selection: an exponent may appear on any lexical base of a morphological category. Specifically, the deletion occurs on any base to which a deletion-triggering suffix is attached. In other words, the same type of deletion occurs regardless of the particular lexical base within the categories that the affix selects.

In Central Yup'ik, affixes that accompany a particular deletion may come with either a noun or verb base. Given that the lexical categories of a base in Central Yup'ik are only nouns and verbs, deletion is not restricted to any particular type of lexical category. Also, it seems that deletion is not restricted to particular lexical bases⁴¹. For example, consonant deletion accompanying the affix *-ngqerr* 'to have' selects nouns in the base, as in (27); the affix *-ngcar* 'to try to cause', which belongs to the same class of affix, selects verbs in the base, as shown in (28).

- (27) a. angyangqertuq
 angya**q**-ngqerr-tuq
 boat-to.have-3S.IND.INT
 'He has a boat'
- b. cavigganqertuq
 cavigga**q**-ngqerr-tuq
 knife-to.have-3S.IND.INT
 'He has a knife'
- (28) a. qavangcaraa
 qavar-**ngcar**-aa
 to.sleep-to.try.to.cause.to.V-3S.IND.TRN
 'He is trying to induce her to sleep.'
- b. elicungcartuq
 elicu**g**-ngcar-tuq
 to.tend.to.learn-to.try.to.cause.to.V-3S.INT
 'He is studying.'

Recall that VLA in Nuu-chah-nulth occurs consistently regardless of the intervention of other suffixes between the base and the accompanying suffix. This “long–

⁴¹ Also, the forms that retain a base-final consonant should be considered as ungrammatical. I was not able, however, to confirm this point, because I have not conducted field work specifically on this issue. Therefore, I argue, with some reservations, that forms without proper deletion might be ungrammatical, by analogy with VLA/reduplication phenomena illustrated for Nuu-chah-nulth.

distance” criterion is not relevant to Yup’ik, since such modifications apply to the preceding final segments of a lexical base or extended base.

In conclusion, C-deletion and VC-deletion in Central Yup’ik seem to meet all the requirements for subsidiary exponence within ME: They are not phonologically conditioned and consistently and invariantly co-occur with certain suffixes regardless of the base to which the suffixes attach.

4.3.3 *te*-verb Deletion

These three *te*-deletions, of the five *te*-deletions attested in the traditional approach, are interesting in that they partially meet the criteria for ME. Two of the five types of *te*-deletion are phonologically conditioned; these will not be discussed here. As discussed in Chapter 2, within ME, a morphophonological alternation must meet the criteria, *Non-phonological condition* and *Consistent co-occurrence*. In distinguishing morphophonological alternations from ME, the first criterion, *Non-phonological condition*, is especially important. The other two criteria, *Phonological consistency* and *No restriction on base selection* are violable in some cases of ME, as will be examined shortly with respect to *te*-deletions. Base selection with *te*-deletion is inherently restricted to verbal bases ending in *te*, rather than to verbal bases in general. In addition to this limitation, the three *te*-deletions behave differently. Given that *te*-verb deletion is relevant to three classes, one might wonder why the sequence *te* has this special property. Cross-linguistically, it is uncommon for the sequence *te* to be deleted. One might, therefore, suspect a historical explanation for the phenomenon. In previous literature, however, *te*-

verb deletion has only been studied descriptively; no motivation for the process has been examined. Given the lack of attention to this phenomenon in the literature, I will leave the issue for further study. In what follows, the behaviours of these three *te*-deletions are described and their properties will be discussed in relation to their candidacy for ME.

4.3.3.1 *te*-verb deletion I

The segments *te* are deleted when particular suffixes are added, regardless of which sounds occur at the beginning of the suffixes. Reed et al. (1977) state that this type of suffix starts with *c* or *p*. However, in the *Yup'ik Eskimo Dictionary*, some suffixes beginning with *k*, *ll*, *ng*, or *q* as in *-kenge*, *-llru*, *-ngqa*, *-qaqe* are found to exhibit this type of behaviour, as shown in (29).

- (29)
- | | |
|--|---|
| <p>a. kipukengaa
kipute-kenge-aa
to.buy-to.do.something-3S.IND.TRN
'the thing he is buying'</p> | <p>b. mikellruuq
mikete-llru-(g/t)uq
to.be.small-to.be.more -3S.IND.INT
'It is smaller'</p> |
| <p>c. kitungqauq
kitugte-ngqa-(g/t)uq
to.fix-to.be.in.a.state.of-3S.IND.INT
'It is fixed'</p> | |
| <p>d. mumigqaqiuq
mumigte-qaqe-i-(g/t)uq
to.turn.over-one.after.another-?-3S.IND.INT
'He is turning things over one after another'</p> | |

Te-deletion I shows the consistent occurrence of a base modification with an accompanying suffix. As shown below, whether the sound preceding *te* is a fricative

(30a) or a vowel (30b) and whether the base is stative (marked with -°) (30c), *t* and *e* are always deleted.

- (30) a. kinerciraa
 kinerte-cir-aa
 to.be.dry- to.let.(it).V-3S.IND.TRN
 'He is letting it dry.'
- b. kumlaciraa
 kumlate-cir-aa
 to.be.cold-to.let.(it).V-3S.IND.TRN
 'He is letting it cool off or freeze.'
- c. assiipaa
 assiite°-paa
 to be bad-oh.how.
 'Oh. how bad!'

Although accompanying postbases may begin with *c*, *p*, *k*, *l*, *ng*, or *q*, not all suffixes beginning with these sounds behave the same way. For instance, the suffix, *-caar* 'to endeavor' does not trigger *t*-deletion; instead, *t* changes to *l*. On the other hand, *-cuun* 'device for' does not trigger any modification. Therefore, the deletion is not phonologically conditioned in that the initial sounds of suffixes do not constitute a natural class.

4.3.3.2 *te*-verb deletion II

Some suffixes occurring with *te*-verbs do not trigger the deletion of both sounds. In some instances, only the vowel *e* is deleted; the consonant *t* becomes *s* regardless of whether the preceding sound is a fricative or a vowel. The suffixes may start with the sounds *c*, *k*,

t, or *ng*, which do not constitute a natural class. In (31a), *t* becomes *s* when the suffix *-ki* is affixed. In (31b), when the suffix *-ki* is added to the base *cenirte* 'to visit', the vowel *e* is deleted and *t* becomes *s*, which creates the illegitimate cluster, *rsk*. The *e*-insertion is a phonological process that occurs between the first two consonants to break up clusters.

- (31) a. qanruskiu
 qanrute-ki- u
 to.tell.-in.the.future -?
 'Tell him (later).'
- b. ceni~~r~~eskilaput
 cenir~~t~~e-ki-laput
 to.visit-in.the.future-1pl.OPT.TRN
 'Let's visit them (later).'

Interestingly, when the base is stative, *t* becomes *l*, as illustrated in (32).

- (32) ayanrilkila
 ayanrite[°]-ki-lta
 to.not.go-in.the.future-?
 'Let's not go (later).'

It is often the case that statives in *te*-verbs are marked by the consonant *l*. I assume that the sound *l* plays a role in denoting the stative in two types of *te*-verbs, this type and the type discussed in *te*-verb deletion III. Statives denote a static rather than active/dynamic condition. Lockwood (2002) notes that languages have different ways of expressing the stative condition. He points out that in Yup'ik, "[t]here are no general verbs of being. Rather, the typical noun has a corresponding identification and locative-existential intransitive verb ... In addition, there are many individual stative verbs" (p.131). The stative in Central Yup'ik seems to be lexically encoded, and the sound *l* seems to be an exponent that expresses the stative.

4.3.3.3 *te*-verb deletion III

The third type of suffix behaves differently, depending on whether it is preceded by a fricative or a vowel. When *te* is preceded by a fricative, both *t* and *e* are deleted and the preceding fricative becomes voiceless. When a suffix is affixed to a *te*-verb followed by a vowel, the vowel *e* is deleted and *t* changes to *s*. In stative verbs, *t* changes to *l*, as seen in *te*-verb deletion II. Note in (33a) that both *t* and *e* are deleted and that the fricative *r* before *te* becomes voiceless, when *-ngaitē* 'to not V in the future' is added. When the same suffix is attached to a base with *te* preceded by a vowel *u*, as in (33b), *t* becomes *s*. When the suffix occurs in a stative base such as *nanite* 'to be short', as in (33c), *t* becomes *l*. When the suffix is added to a base ending in a sequence other than *te*, such as *ayag* 'to leave', no processes are applied, as shown in (33d).

- (33) a. *ikirrŋaitaa*
 ikirte-*ngaitē*⁴²-*aa*
 to.open-to.not.V.in.the.future-3S.IND.TRN
 'He won't open it.'
- b. *kipusŋaitaa*
 kipute-*ngaitē*^o-*aa*
 to.buy-to.not.V.in.the.future-3S.IND.TRN
 'He won't buy it.'
- c. *nanilŋaituq*
 nanite^o-*ngaitē*^o-(*t/g*)*uq*
 to.be.short-to.not.V.in.the.future-3S.IND.TRN
 'It won't be short.'
- d. *ayagŋaituq*
 ayag-*ngaitē*^o-(*t/g*)*uq*
 to.leave-to.not.V.in.the.future-3S.IND.TRN
 'He won't leave.'

⁴² ^o denotes stative.

Although the initial sounds for this type of suffix are restricted to four sounds (i.e., *ng*, *m*, *t*, or *v*), this does not mean that all suffixes starting with these sounds are grouped into a single class. For instance, *-mi* 'also' shows the property of the type of suffix under discussion (*inarte* 'lay down' + *-mi* → *inarrmi* 'laying down too'); but many other suffixes starting with *m* do not behave like *-mi* (e.g., *-ma* 'to be in a state of', *-mik* 'thing held in one's N'). This type of suffix includes one suffix starting with *m*, eight suffixes beginning with *ng*, seven suffixes beginning with *t*, and three suffixes starting with *v*. The suffixes in this group are phonetically random and phonologically unpredictable, characteristics which will be discussed in 4.3.5.1.

4.3.4 Domain of base modification

This section discusses the domain in which the five types of *te*-deletion occur. In earlier sections, it was observed that all deletions occur in a lexical base, a linguistic unit to which derivational or aspectual makers are attached. The lexical base is equivalent to a root in morpheme-based models. This observation can be extended to other morpho-phonological processes that occur in certain phonological environments: they also occur within the domain of the lexical base. These processes include 'velar place substitution', whereby a base-final velar is assimilated to a suffix-initial velar and is deleted; 'base-final consonant gemination', whereby a consonant in a VCe-sequence in the base is geminated when a suffix is added; 'inter-vocalic velar deletion', whereby a base-final voiced velar continuant is deleted when a vowel-initial suffix is added; and so on.

In addition to morpho-phonological alternations, stress assignment provides strong evidence that the lexical base has a special status as a domain. Jacobson (1984b)

made the insightful observation that primary stress must fall on a lexical base (stem in his terms). In Central Yup'ik, primary stress falls on a heavy syllable (CVV) or an initial closed syllable (CVC); starting from the initial stressed syllable, stress is assigned rhythmically on every second syllable (rhythmic stress⁴³) (Jacobson, 1984ab, 1985; Hayes, 1985; Woodbury, 1985, 1987). The lexical base retains the primary stress either by including a heavy syllable (*qíiqaqa* 'it is my gray hair; *qiir-* 'gray hair') or an initial closed syllable (*átqaqa* 'it is my name'; *ater-* 'name'). In the absence of an initial heavy or closed syllable, the primary stress in the word falls rhythmically on the second syllable, if the second syllable is part of a lexical base (*quyáqaqa* 'it is my kayak', *qayar-* 'kayak'). However, if a lexical base is monosyllabic followed by a vowel initial suffix, the coda of the lexical base is geminated, as illustrated in (34). The effect of the gemination is to close the initial syllable so that stress falls on the lexical base.

(34)	lexical base	word	
a.	yug- 'person'	yúp'ik ⁴⁴	'real person'
		yúl'irtuq	'It has many people'

⁴³ In rhythmic stress assignment, if stress is due to fall on an open syllable following a closed syllable, the stress is retracted to that closed syllable (CVV.CVC.CV); a syllable preceding a heavy syllable receives stress; and a word-final syllable does not get stress.

e.g., *túntuvágtúryúumírluni* 'yearning to eat moose'

In rhythmic stress assignment, CVV is always stressed, CVC often attracts stress, and CV is stressed only when the alternating binary count allows it (Hayes, 1985; Woodbury, 1985, 1987)

⁴⁴ *-pik* 'real' is a postbase that accompanies a base-final deletion. Thus, the base-final consonant, *g* is deleted and *p* becomes geminated, serving as coda of the first syllable. The same account applies to a form with *-lir* 'to have lots of N'.

Table 12 *The continuum of ME Criteria in te-verb Deletion*

	<i>Te-verb deletion I</i>		<i>Te-verb deletion II</i>		<i>Te-verb deletion III</i>	
Non-phonological Condition	Not phonologically conditioned	√	Not phonologically conditioned	√	Not phonologically Conditioned	√
Consistent Co-occurrence	Consistent	√	Consistent	√	Consistent	√
Phonological Consistency	Consistent	√	Somewhat consistent	?	Not consistent	X
No restriction of Base selection	Restricted to verbs ending in <i>te</i>	X	Restricted to verbs ending in <i>te</i>	X	Restricted to verbs ending in <i>te</i>	X

4.3.5.1 Non-phonologically conditioned alternations

This subsection discusses the phonological environment of *te-verb deletion* (i.e., the sounds that precede *te* and the initial sounds of suffixes), with a view to determining whether the alternations meet the ME criterion, *Non-phonological condition*. The sounds that precede the suffixes that accompany *te-verb deletion* do not comprise a natural class. For instance, with *te-verb deletion I*, suffixes starting with *c, k, l, ng, p, or q* are affixed. With *te-verb deletion II*, suffixes beginning with *c, k, t, or ng* are affixed. Finally, with *te-verb deletion III*, suffixes may begin with *ng, m, t, or v* (see Table 13 for a summary).

Table 13 *Initial Sounds of te-verb Deletion Suffixes*

	<i>Te-verb deletion I</i>	<i>Te-verb deletion II</i>	<i>Te-verb deletion III</i>
Initial sounds of suffixes	c, k, l, ng, p, q	c, k, t, ng	ng, m, t, v

The initial sounds in each type of deletion are randomly distributed in terms of manner and place of articulation and do not comprise natural classes. Furthermore, the sounds *c, k, and ng* are shared by some of the suffixes in *te-verb deletion I* and *te-verb deletion II*,

while the sounds *t* and *ng* are common in *te*-verb deletion II and *te*-verb deletion III. The sound *ng* occurs in suffixes in all three types of *te*-verb deletion. In addition, as discussed before, not all the suffixes beginning with those sounds show the same behavior in terms of base modification. Such evidence strongly supports the contention that the alternations are not phonologically conditioned and therefore cannot be accounted for by a phonological rule.

4.3.5.2 Consistent co-occurrence

The second criterion, *Consistent co-occurrence* is satisfied when two or more exponents always co-occur, and is an obligatory criterion for ME. As seen in §4.3.3, a postbase that co-occurs with any type of *te*-deletion consistently accompanies the alternation, although some alternations may vary in some ways.

For instance, in the case of *te*-verb deletion I, the deletion of the sounds *te* is consistent. As shown in (35) and (36), *-kenge* 'to do something' and *-paa* 'oh, how V' both demonstrate deletion of the sounds *te*.

(35) a. kipukenguq
kipute-kenge-(g/t)ug
to.buy-to.do.something.-3S.IND.INT
'He is buying something.'

b. akngirkenguq
akngirte-kenge-(g/t)ug
to.hurt-to.do.something-3S.IND.INT
'He hurt someone.'

(36) a. assiipaa
assiite-paa
to.be.bad-oh, how V
'oh, how bad it is!'

- b. kiircepaa
 kiircete -paa
 to.be.hot -oh, how V
 'oh, how hot it is!'

In case of *te*-verb deletion II and III, a postbase and an alternation always co-occur, but the alternation varies depending on whether or not the verb is stative (II and III) or/and on the preceding sounds (III). When the postbase *-ta* 'to be that' is affixed to a *te*-ending stative base, *e* deletes and *t* becomes *l*, as shown in (37).

- (37) a. iqkiltauq
 iqkite^o-ta-(g/t)uq
 to.be.narrow-to.be.that-3S.IND.INT
 'It is that narrow.'
- b. uqamailtauq
 uqamaite^o-ta-(g/t)uq
 to.be.heavy-to.be.that-3S.IND.INT
 'It is that heavy.'

The postbase *-ngig* 'to be able to do easily', which triggers *te*-verb deletion III, is accompanied by the deletion of *e* as well as the change of *t* to *s* when the sound preceding *te* is a vowel, as in (38a). When the same postbase occurs with a *te*-verb base in which the sound preceding *te* is the fricative *g* [ɣ], *e* is deleted and the fricative becomes voiceless (*gg* [x]), as in (38b).

- (38) a. elisngigtuq
 elite-ngig-(g/t)uq
 to.learn-to.be.able.to.do.easily-3S.IND.INT
 'He is adept at learning.'
- b. iggngigtuq
 igte-ngig-(g/t)uq
 to.fall-to.be.able.to.do.easily-3S.IND.INT
 'He can easily fall'

As illustrated, a certain postbase always co-occurs with a certain alternation, although the alternation may show phonological variation. Thus, the criterion of *Consistent co-occurrence* is satisfied. In the following subsection, the observed variation will be discussed.

4.3.5.3 Consistency of phonological manifestation as a subsidiary exponent

We have seen that the deletions in §4.3.2.3 exhibit consistent results when the alternation-accompanying suffixes are affixed. However, the patterns of alternation found in *te*-verbs vary among the three types, according to the sounds preceding *te* and/or the semantic property of verbs, i.e., whether or not they are stative. A summary is provided in Table 14.

Table 14 *Alternations Accompanied with te-verb Deletions Suffixes*

<i>Te</i> -verb deletion I	<i>Te</i> -verb deletion II	<i>Te</i> -verb deletion III
<i>t</i> and <i>e</i> delete.	<i>e</i> deletes; <i>t</i> becomes <i>s</i> ; <i>t</i> becomes <i>l</i> in stative verbs.	i) when preceded by a fricative: <i>t</i> and <i>e</i> drop; the fricative becomes voiceless. ii) when preceded by a vowel: <i>e</i> drops; <i>t</i> becomes <i>s</i> ; <i>t</i> changes to <i>l</i> in stative verbs

In *te*-verb I, the sounds *te* are deleted consistently when triggering suffixes are added, as examined in §4.3.3. This alternation is not affected by any preceding sounds. As for *te*-verb deletion II, the vowel *e* is deleted and *t* changes to *s*. However, when *te*-verbs are stative, the consonant *t* becomes *l*, rather than *s*. Therefore, as a subsidiary exponent, the alternation is not as consistent as that of *te*-verb deletion I, in which *te* is always deleted regardless of the preceding sounds or semantic context. Lastly, *te*-verb deletion III shows complex patterns; the base modification is affected not only by whether the verb is

stative, but also by preceding sounds. Both segments are deleted when preceded by a fricative, and the fricative becomes voiceless. When *te* is preceded by a vowel, then the lax vowel *e* drops and *t* becomes *s*, as in the case of *te*-verb deletion II. In addition, in stative verbs, *t* becomes *l*.

The above patterns suggest that parameters to determine ME differ by alternations and exist along a continuum. *Te*-verb deletion I shows the most consistent pattern among the three, satisfying the third criterion for ME. The pattern of alternation observed in *te*-verb deletion II is less consistent than in *te*-verb deletion I. The most complex patterns are found in *te*-verb deletion III, in which phonology plays a role in determining the alternation. The condition of a preceding sound, i.e., whether it is a fricative or vowel (as well as the devoicing of the fricative in the output) requires a phonological account.

4.4 Analysis of the Classes of ME within the Word and Paradigm Framework

This section provides a formal analysis of the aforementioned instances of ME, i.e., a postbase as a main exponent and base modification as a subsidiary exponent. As discussed in Chapter 2, Anderson (1992) and Beard (1995), among many others, point out that subtractive morphology challenges any theory that defines the morpheme as a sign. Since a deleted segment in Central Yup'ik cannot be represented as a sign, morpheme-based theories fail to account for its morphological status. Anderson (1992) also points out that the classical view of morphemes hypothesizes that components of form and meaning must correspond. In other words, a phonological unit is linked to one and only one semantic unit, and vice versa. In Central Yup'ik, ME does not support this

hypothesis, in that affixation and deletion combine to form a single expression. Furthermore, Central Yup'ik ME is problematic for the theoretical predictions of Kurisu (2001)'s model. Kurisu mentions that no language has been observed that combines affixation and morphological subtraction and his model is therefore not able to account for such a case.

In this section, I propose six derivational classes in accordance with patterns of non-phonologically conditioned alternations. Word Formation Rules (WFRs) are formulated by comparing a base and the properties of the derived word. Derivational ME in Central Yup'ik is then accounted for within the Word-and-Paradigm approach (Matthew, 1991; Anderson, 1992).

4.4.1 Classes of ME in Central Yup'ik

Based on the patterns of base modification, six classes of derivational affix are identified in Central Yup'ik. Table 15 summarizes the six classes of affix. For patterns and examples for each class, see § 4.3.

Class 1 does not involve ME. The postbases belonging to this class do not accompany any deletion. Class 2 and Class 3 both meet all ME criteria; their names are randomly assigned, and do not reflect a differing degree of prototypicality in terms of ME. Classes 4, 5, and Class 6 (*te*-verb deletions) are ordered according to the number of ME criteria they meet (i.e., Class 4 meets more criteria than Class 6, as discussed in the previous section).

Table 15 *Classes of Multiple Exponent Affixes*

Classes of affixes	Descriptions	Traditional Notations
Class 1	affixes accompanied with no base modification	
Class 2	affixes accompanied with base final VC-deletion	--
Class 3	affixes accompanied with base final C-deletion	-
Class 4	affixes accompanied with <i>te</i> -deletion I	@5
Class 5	affixes accompanied with <i>te</i> -deletion II	@4
Class 6	affixes accompanied with <i>te</i> deletion III	@2

The third column shows notation that is used in traditional literature on Central Yup'ik (Jacobson, 1984a, 1996; Reed et. al, 1977) for the benefit of readers who are familiar with those conventions.

4.4.2 Word Formation Rules

The current study develops a formal account of derivational ME within the Word-and-Paradigm framework, building on Matthews (1991) and Anderson (1992). Following Anderson (1992), paradigms build on bases (stems in his terminology), rather than on words, through Word Formation Rules (WFRs). This study assumes that WFRs are organized into *blocks* following Anderson's (1992) and Stump's (2001) inflectional models. Rules belonging to different blocks can co-occur and may need to be ordered; rules in the same block do not apply to the same base.

As discussed in §2.6.1, two types of WFR are required for an analysis of derivational ME, one for suffixation, and the other for base modification. These two types of WFR are necessary because the two components of ME (i.e., affixation and base modification) differ significantly in their properties in terms of the presence/absence of semantic and syntactic information. For instance, base modifications, i.e., deletion in

Central Yup'ik, do not include syntactic and semantic information, which are conveyed by suffixation. This is evident considering the number of suffixes (approximately 470) versus the number of base modifications (six). While suffixes provide 470 meanings, six base modifications are not sufficient to map one-to-one onto the 470 meanings conveyed by suffixes. In what follows, I discuss WFRs that are required for an analysis of derivational classes in ME. Readers are referred to §2.6 for further discussion of the WP model.

In (39), I repeat from Chapter 2 the proposed schema for suffixation rules for main exponents.

(39) Schema for Suffixation Rule

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

(a) **Structural Description:**

Phonological Description: X

Syntactic Description:

Lexical category of the base

Semantic Description:

Meaning of the base

(b) **Structural Change:**

Phonological Change: XZ

Syntactic Change:

Lexical category of the derived form

Semantic Change:

Meaning of the derived form

Morphological Description:

Classes of affixes

On the left side of the suffixation rule, the Structural Description (SD) (39a) includes the phonological environment of the base, a syntactic description such as lexical category, and a semantic description. The Structural Change (SC) (39b) presents changes to the phonological shape. The base X, a variant of a given phonological shape, undergoes a phonological change to XZ in the SC. Z here refers to a suffix presented in the SC. Any changed syntactic or semantic information is presented in the SC.

Importantly, class assignment is made in the SC, rather than the SD because class assignment is made when an affix is added to the base. Recall that a derivational class comprises a group of affixes and that class information is assigned by an affix, in contrast to inflectional morphology, in which class information is assigned by a lexical base (see §2.4.1).

Now, let us examine WFRs for secondary exponence, i.e., base modification. The schema in (40) presents the specifications for base modification rules.

(40) Base modification Rule

$$\left[\begin{array}{l} \text{CLASS(ES)} \\ \text{(Aspect)} \end{array} \right]$$

$$[X]_B Z \quad \rightarrow \quad [X']_B Z$$

(a) **Structural Description:** (b) **Structural Change :**
Morphological Description: *Phonological change:*
Class of affix Z; Aspect *The base X is modified to X'*
Phonological Description:
The base is X

In the SD in (40a), the morphological description includes the class of *affixes* (i.e., [Class I, Class II]) to which the rule applies. As noted above, the class information was assigned by suffixation. Accordingly, it is crucial that the suffixation rule applies before the base modification rule, so that the class information for the suffix is assigned to the base in the base modification rule. The morphological description may include aspectual information, i.e., [+Stative]. A variant of the phonological representation of the lexical base, X in the SD becomes X' in the SC, showing that the base is modified.

Importantly, the phonological modification of the base X takes place exclusively within the domain of the lexical base, which is denoted by []_B. The lexical base in Central Yup'ik constitutes a domain for various morpho-phonological processes,

including five types of deletion in the current study. In addition, the lexical base is the domain for stress assignment (see §4.3.4 for the domain of base modification).

It is crucial to specify the lexical base (i.e., []B) as the domain for base modification because deletion of one or more segments always occurs on the boundary between the base and the suffix. By defining the domain for the process as the lexical base, the rule can refer to the edge of the base for the purpose of deletion.

Following the schema in (40), WFRs that account for six classes are formulated below. First, for Class 2 suffixes that accompany the deletion of a base-final sequence of vowel and consonant, two rules are formulated. An alternative rule that accounts for the truncation of both segments is rejected, because base-final consonant deletion occurs in both Class 2 and Class 3. As will be discussed, having two rules for Class 2 is consistent with having two rules to account for *te*-deletion (rather than *te*-truncation), since base-final *e* deletion occurs in Classes 4, 5, and 6.

(41) Rule 2 [Base pre-final vowel deletion]
 [CL 2]
 $[X]_{BZ} = [YVC]_{BZ} \rightarrow [YC]_{BZ}$

In the phonological description of Rule 2, a phonological variant *X* here refers to *YVC*. *Y* signifies any preceding segments. *YVC* denotes that the base ends in a vowel followed by a consonant and that any segments (*Y*) can precede the *VC* sequence. *Z* refers to a suffix added in the application of the previous suffixation rule. The phonological change specified in Rule 2 indicates that a vowel before a consonant is deleted. This rule applies to Class 2 suffixes.

Rule 3 denotes the deletion of a base-final consonant. The consonant *C* in the SD in Rule 3 is deleted in the SC. This rule must apply after Rule 2. The reverse rule order

does not derive the correct form, a fact that will be discussed in the following section in detail. Rule 3 applies to Class 2 and Class 3 suffixes. Thus, this WFR accounts for Class 3 suffixes that are accompanied by deletion of the base-final consonant.

- (42) Rule 3 [Base-final consonant deletion]
 { CL 2, CL 3 }

$$[X]_{BZ} = [YC]_{BZ} \rightarrow [Y]_{BZ}$$

As for Class 4 affixes which accompany *te*-deletion, two rules are required to derive separately the deletion of *t* and *e*. Since *t* and *e* are not always deleted together, two distinct rules are required. Rule 4 can be read as "the sound *t* in the *te*-verb is deleted."

- (43) Rule 4 [*t*-deletion]
 { CL 4 }

$$[X]_{BZ} = [Yte]_{BZ} \rightarrow [Ye]_{BZ}$$

Rule 5 accounts for the deletion of base-final *e* in *te*-verb-associated classes.

Thus, this rule applies to Classes 4, 5, and 6. Rule 4 and Rule 5 must apply in this order.

- (44) Rule 5 [Base-final *e* deletion]
 { CL 4, CL 5 }
 { CL 6 }

$$[X]_{BZ} = [Ye]_{BZ} \rightarrow [Y]_{BZ}$$

With respect to Class 5 affixes, three WFRs are required, since the sound *t* behaves differently depending on the aspectual status of the verb, i.e., [+/- Stative]. For non-stative verbs, Rule 6 is formulated, in which *t* becomes *s*. Rule 5 must apply after Rule 6 to ensure that base final *e* in *te*-verbs is deleted.

(45) Rule 6 [*t*-frication]

$$\left(\begin{array}{c} \text{CL 5} \\ -\text{Stative} \end{array} \right)$$

$$[X]_{\text{BZ}} = [Yte]_{\text{BZ}} \rightarrow [Yse]_{\text{BZ}}$$

Rule 7 applies to stative *te*-verbs. In these cases, the sound *t* becomes *l*. Rule 5 applies to the base after the application of Rule 7.

(46) Rule 7 [*t*-lateralization]

$$\left(\begin{array}{c} \text{CL 5} \\ + \text{Stative} \end{array} \right)$$

$$[X]_{\text{BZ}} = [Yte]_{\text{BZ}} \rightarrow [Yle]_{\text{BZ}}$$

Finally, Class 6 affixes need five WFRs in order to reflect the various phonological environments and the aspectual status of the verb. First, when *te* is preceded by a fricative, the fricative becomes voiceless. Rule 8 formulates this phenomenon. C_F in the SD refers to a fricative and $C_{F\bar{\circ}}$ in the SC denotes a voiceless fricative. Then, the sound *t* is deleted when followed by a voiceless fricative, which is accounted for by Rule 9. Rule 5 applies for base-final *e*-deletion. Rules, 8, 9, and 5 must apply in that order.

(47) Rule 8 [Fricative devoicing]

$$[\text{CL 6}]$$

$$[X]_{\text{BZ}} = [YC_{F\bar{\circ}}te]_{\text{BZ}} \rightarrow [YC_{F\bar{\circ}}e]_{\text{BZ}}$$

(48) Rule 9 [Pre-fricative *t*-deletion]

$$[\text{CL 6}]$$

$$[X]_{\text{BZ}} = [YC_{F\bar{\circ}}te]_{\text{BZ}} \rightarrow [YC_{F\bar{\circ}}e]_{\text{BZ}}$$

When a Class 6 affix occurs after a vowel, the sound *t* becomes *s* in non-stative verbs, but *t* becomes *l* in stative verbs. Rule 10 and rule 11 derive *t*-frication and *t*-lateralization, respectively. Rule 5 applies after either Rule 10 or Rule 11.

(49) Rule 10 [Postvocalic t-frication]

$$\left[\begin{array}{l} \text{CL 6} \\ - \text{Stative} \end{array} \right]$$

$$[X]_{\text{BZ}} = [YVte]_{\text{BZ}} \rightarrow [YVse]_{\text{BZ}}$$

(50) Rule 11 [Postvocalic t-lateralization]

$$\left[\begin{array}{l} \text{CL 6} \\ + \text{Stative} \end{array} \right]$$

$$[X]_{\text{BZ}} = [YVte]_{\text{BZ}} \rightarrow [YVle]_{\text{BZ}}$$

In summary, a schema of suffixation rules and a total of ten WFRs for secondary exponence are provided in order to account for six classes of derivational morphology in Central Yup'ik. Since multiple rules apply to the same base, a device is required to allow or disallow a given set of rules to be applied to the same base. The following sections discuss such a device, rule *blocks*. Rule ordering is examined, using the derivation of several Central Yup'ik words as examples.

4.4.3 Rule blocks

As discussed in §2.6.2, this study assumes that derivational WFRs are organized into *blocks*, following Anderson (1992) and Stump (2001), who use this device to account for inflection. See Table 18 below for the organization of the above-discussed WFRs into blocks. WFRs in the same block are mutually exclusive. In contrast, WFRs in distinct

blocks are compatible. Thus, rules that apply together must be organized into distinct blocks. Rules that never occur together are grouped into the same block. Note that except for Class 1, all the derivational classes presented are instances of ME. Thus, more than one rule applies to account for instances of ME. Table 16 summarizes the rules that apply to each class and Table 17 presents the names of the rules.

Table 16 *Rule Application to Each Class*

Class of affixes	Rules applied
Class 1	Rule 1
Class 2	Rule 1, Rule 2, & Rule 3
Class 3	Rule 1, & Rule 3
Class 4	Rule 1, Rule 4, & Rule 5
Class 5	Rule 1, Rule 5, Rule 6, & Rule 7
Class 6	Rule 1, Rule 5, Rule 8, Rule 9, Rule 10, & Rule 11

Table 17 *Names of Rules*

Rules	Names
Rule 1	Suffixation
Rule 2	Base pre-final vowel deletion
Rule 3	Base-final consonant deletion
Rule 4	<i>t</i> -deletion
Rule 5	Base-final <i>e</i> deletion
Rule 6	<i>t</i> -frication
Rule 7	<i>t</i> -lateralization
Rule 8	Fricative devoicing
Rule 9	Pre-fricative <i>t</i> -deletion
Rule 10	Postvocalic <i>t</i> -frication
Rule 11	Postvocalic <i>t</i> -lateralization

The suffixation rule (Rule 1) must be in a distinct block since it applies to all classes. Rule 2 and Rule 3 must be in distinct blocks, since they occur together for Class 2. Rule 4 and Rule 5 must also be grouped into different blocks, as both apply to Class 4. Note that Rule 5 must apply to Class 5 and Class 6 as well. Rule 6 and Rule 7 do not need

to be organized into different blocks, because they are incompatible (+/- stative). Since Rule 8 and Rule 9 apply together, they must be in distinct blocks. However, Rule 10 and Rule 11 never apply together due to a complementary morphological condition (+/- stative). To recapitulate, Rule 2 and 3 must in different blocks; Rule 4 versus Rules 6-11 must be grouped into distinct blocks; and Rule 8 and Rule 9 need to be organized into different blocks. Based on the reasoning above, I suggest four rule blocks. Table 18 summarizes the organization of rules into blocks.

Table 18 *Blocks of Rules*

Blocks	Rules
Block I	1
Block II	2, 4, 8
Block III	6, 7, 9, 10, 11
Block IV	3, 5

4.4.4 Rule ordering and derivation

In terms of rule ordering, Rule 1, a suffixation rule, must apply before all other base modification rules, since class assignment is made by suffixation. The class assignment must be made before the application of base modification rules, so that the class information on the base is encoded in the morphological description.

Among base modification WFRs, Rule 2 must apply before Rule 3, because the pre-final vowel becomes base-final if Rule 3 applies first, bleeding the environment for the application of Rule 3. Take the example in (51) for an illustration of derivation.

- (51) agluryirtuq
 aglury**aq**-ir-(g/t)uq
 rainbow-occurring-3S.IND,INT
 ‘There is a rainbow.’

A derivation of this word using the correct order is presented in (52). The suffixation rule applies first and assigns Class 2 to the base. Note that the syntactic category, *NOUN* in the SD, becomes *PREDICATE* in the SC. Like Nuu-chah-nulth, the syntactic description in SC in Central Yup'ik always results in a predicate because when derivational suffixes are added to a base, a predicate is yielded regardless of the category of the base (see §4.2.6 for details). Then, in (52b), the base pre-vowel *a* in the base *agluryaq* is deleted in the operation of Rule 2. The base in (52c) then is the output of Rule 2 operation, *agluryq*. The base-final consonant is deleted and the base becomes *aglury*. At the end of the derivation, the bracket [] is erased, following the Bracket Erasure Convention (Kiparsky, 1982).

(52) Rule 1 >> Rule 2 >> Rule 3 (correct order)

a. Schema of Suffixation Rules

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [[X]Z]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{agluryaq}]_{\text{NOUN}} \\ \text{'RAINBOW'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CL2} \\ [[\text{agluryaq}]_{\text{ir}}]_{\text{PRED}} \\ \text{'THERE TO BE A RAINBOW'} \end{array} \right)$$

b. Rule 2 [Base pre-final vowel deletion]

[CL 2]

$$[X]_{\text{BZ}} = [YVC]_{\text{BZ}} \rightarrow [YC]_{\text{BZ}}$$

Operation of Rule 2

[CL 2]

$$[\text{agluryaq}]_{\text{ir}} \rightarrow [\text{agluryq}]_{\text{ir}}$$

- c. Rule 3 [Base-final consonant deletion]
 [CL 2, CL 3]
 $[X]_{BZ} = [YC]_{BZ} \rightarrow [Y]_{BZ}$
 Operation of Rule 3
 [CL 2]
 $[agluryq]_{ir} \rightarrow [aglury]_{ir}$
 $\rightarrow agluryir$

The derivation in (53) illustrates an incorrect rule ordering. When Rule 2 applies after Rule 3, the base of Rule 2 becomes *aglurya*, in which the final consonant is deleted. Thus, Rule 2 does not apply to the base, *aglurya*, since no pre-final vowel exists. As Rule 3 bleeds Rule 2, Rule 2 must precede Rule 3.

(53) (Rule 1) >> Rule 3 >> Rule 2 (incorrect order)

- a. Rule 3 [Base-final consonant deletion]
 [CL 2, CL 3]
 $[X]_{BZ} = [YC]_{BZ} \rightarrow [Y]_{BZ}$
 Operation of Rule 3
 [CL 2]
 $[agluryaq]_{ir} \rightarrow [aglurya]_{ir}$
- b. Rule 2 [Base pre-final vowel deletion]
 [CL 2]
 $[X]_{BZ} = [YVC]_{BZ} \rightarrow [YC]_{BZ}$
Not Applicable (there is no pre-final vowel)
 [CL 2]
 $[aglurya]_{ir} \rightarrow [aglurya]_{ir}$
 $\rightarrow *agluryair$

As for the relative ordering of Rule 4 and Rule 5 for Class 4, Rule 4 must precede Rule 5. Rule 5 may apply together with any of Rules 6 to 11. But Rule 5 must precede these rules. For this reason, Rule 5 is organized into Block III, while Rules 6-11 belong in Block II, as in Table 17 above. The ordering of Rule 4 and Rule 5 is illustrated using a Class 4 word in (54).

- (54) kinerciraa
 kinerte -cir -aa
 to.be.dry - to.let.(it).V -3S.IND.TRN
 'He is letting it dry.'

The derivation in (55) illustrates that *t* in *kinerte* is deleted by the application of Rule 3, as in (55a); then *kinere*, the base of Rule 4, becomes *kiner* (55b). The suffixation rule applies in (55c) and derives *kinecir*, 'letting (it) dry.'

- (55) Rule 1 >> Rule 4 >> Rule 5

- a. Schema of Rule 1

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{kinerte}]_{\text{ADJ}} \\ \text{'DRY'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CL 4} \\ [[\text{kinerte}]_{\text{cir}}]_{\text{PRED}} \\ \text{'LETTING (IT) DRY'} \end{array} \right)$$

- b. Rule 4 [*t*-deletion]

[CL 4]

$$[X]_{\text{BZ}} = [Yte]_{\text{BZ}} \rightarrow [Ye]_{\text{BZ}}$$

Operation of Rule 4

[CL 4]

$$[\text{kinerte}]_{\text{cir}} \rightarrow [\text{kinere}]_{\text{cir}}$$

- c. Rule 5 [Base-final *e* deletion]

$$\left(\begin{array}{l} \text{CL 4, CL 5} \\ \text{CL 6} \end{array} \right)$$

$$[X]_{\text{BZ}} = [Ye]_{\text{BZ}} \rightarrow [Y]_{\text{BZ}}$$

Operation of Rule 5

$$[\text{CL 4}]$$

$$[\text{kinere}]_{\text{cir}} \rightarrow [\text{kiner}]_{\text{cir}}$$

$$\rightarrow \text{kinercir}$$

The derivation in (56), which shows the application of Rule 5 before Rule 4, results in an attested surface form. As illustrated in (56b), Rule 4 bleeds the condition of Rule 5 (*t* followed by *e*).

- (56) (Rule 1) >> Rule 5 >> Rule 4 (incorrect order)

- a. Rule 5 [Base-final *e* deletion]

$$\left(\begin{array}{l} \text{CL 4, CL 5} \\ \text{CL 6} \end{array} \right)$$

$$[X]_{\text{BZ}} = [Ye]_{\text{BZ}} \rightarrow [Y]_{\text{BZ}}$$

Operation of Rule 5

$$[\text{CL 4}]$$

$$[\text{kinerte}]_{\text{cir}} \rightarrow [\text{kinert}]_{\text{cir}}$$

- b. Rule 4 [*t*-deletion]

$$[\text{CL 4}]$$

$$[X]_{\text{BZ}} = [Yte]_{\text{BZ}} \rightarrow [Ye]_{\text{BZ}}$$

Operation of Rule 4

Not Applicable (since the sound *t* is not followed by the vowel *e*)

$$[\text{CL 4}]$$

$$[\text{kinert}]_{\text{cir}} \rightarrow [\text{kinert}]_{\text{cir}}$$

$$\rightarrow *[\text{kinert}]_{\text{cir}}$$

Finally, let us consider the relative ordering of Rule 5, Rule 8, and Rule 9. In (57), an example belonging to Class 6 is used for demonstration.

- (57) **ikirr**ngaitaa
 ikirte -ngaite -aa
 to.open -to.not.V.in.the.future -3S.IND.TRN
 'He won't open it.'

- (58) Rule 1 >> Rule 8 >> Rule 9 >> Rule 5 (correct order)

- a. Schema for Rule 1

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{ikirte}]\text{VERB} \\ \text{TO OPEN} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CL 6} \\ [[\text{ikirte}] \text{ngaite}]\text{PRED} \\ \text{NOT TO OPEN'} \end{array} \right)$$

- b. Rule 8 [Fricative devoicing]

[CL 6]

$$[X]_{\text{BZ}} = [Y\text{C}_{\text{f}}\text{te}]_{\text{BZ}} \rightarrow [Y\text{C}_{\text{f}}\text{te}]_{\text{BZ}}$$

Operation of Rule 8

[CL 6]

$$[\text{ikirte}]\text{ngaite} \rightarrow [\text{ikirrte}]\text{ngaite}$$

- c. Rule 9 [Pre-fricative *t*-deletion]

[CL 6]

$$[X]_{\text{BZ}} = [Y\text{C}_{\text{f}}\text{te}]_{\text{BZ}} \rightarrow [Y\text{C}_{\text{f}}\text{e}]_{\text{BZ}}$$

Operation of Rule 9

[CL 6]

[ikirrte]ngaite → [ikirre]ngaite

c. Rule 5 [Base-final *e* deletion]

(CL 4, CL 5)
[CL 6]

[X]_{BZ} = [Ye]_{BZ} → [Y]_{BZ}

Operation of Rule 5

[CL 6]

[ikirre]ngaite → [ikirr]ngaite
→ ikirrngaite

The ordering of Rule 8 and Rule 9 is crucial. (59) illustrates that a reversed rule ordering results in an incorrect surface form. Rule 8 derives the deletion of the sound *t* preceded by a voiceless fricative. As seen in (59a), the rule is not applied due to the absence of the voiceless sound, which is derived by Rule 8 in (59b).

(59) (Rule 1) >> Rule 9 >> Rule 8 >> Rule 4 (incorrect order)

a. Rule 9 [Pre-fricative *t*-deletion]

[CL 6]

[X]_{BZ} = [YC_Fte]_{BZ} → [YC_Fe]_{BZ}

Operation of Rule 9

Not Applicable (the preceding fricative is voiced)

[CL 6]

[ikirte]ngaite → [ikirte]ngaite

- b. Rule 8 [Fricative devoicing]

[CL 6]

$$[X]_{BZ} = [YC_{f}te]_{BZ} \rightarrow [YC_{\text{f}}te]_{BZ}$$

Operation of Rule 8

[CL 6]

$$[ikirte]_{ngaite} \rightarrow [ikirrte]_{ngaite}$$

- c. Rule 5 [Base-final *e* deletion]

[CL 4, CL 5]
[CL 6]

$$[X]_{BZ} = [Ye]_{BZ} \rightarrow [Y]_{BZ}$$

Operation of Rule 5

[CL 6]

$$\begin{aligned} [ikirrte]_{ngaite} &\rightarrow [ikirrt]_{ngaite} \\ &\rightarrow *ikirrngaite \end{aligned}$$

(60) demonstrates that the ordering of Rule 5 and Rule 8/Rule 9 is crucial. As shown in (60a), Rule 5 derives the base *ikirt* through the deletion of the base-final vowel *e*. Then, Rule 8 in (60b) cannot be applied due to the absence of *e*.

(60) (Rule 1) >> Rule 5 >> Rule 8 >> Rule 9 (incorrect order)

- a. Rule 5 [Base-final *e* deletion]

[CL 4, CL 5]
[CL 6]

$$[X]_{BZ} = [Ye]_{BZ} \rightarrow [Y]_{BZ}$$

Operation of Rule 5

[CL 6]

$$[ikirte]_{ngaite} \rightarrow [ikirt]_{ngaite}$$

b. Rule 8 [Fricative devoicing]

[CL 6]

[X]_{BZ} = [YC_Fte]_{BZ} → [YC_Fe]_{BZ}

Operation of Rule 8

Not Applicable (*te* is not preceding)

[CL 6]

[ikirt]ngaite → [ikirt]ngaite

c. Rule 9 [Pre-fricative *t*-deletion]

[CL 6]

[X]_{BZ} = [YC_F*te*]_{BZ} → [YC_Fe]_{BZ}

Operation of Rule 9

Not Applicable (the preceding fricative is voiced; the vowel is not preceding)

[CL 6]

[ikirt]ngaite → [ikirt]ngaite

→ *ikirtngaite

In summary, the following rule orderings are crucial: between R1 and R2-R11; between R2 and R3; between R4,R6, R7, R8, R9 and R5; and between R8 and R5.

(61) Rule ordering

R1 (Block I) >> R2, R4, R8 (Block II) >> R6, R7, R9, R10, R11 (Block III) >> R3, R5 (Block IV)

In (61), crucial rule orderings are illustrated. Rules in the same block do not interact; thus ordering among them is not required.

4.5 Summary

This chapter examined various types of deletion accompanied by derivational suffixes in Central Yup'ik. Five types of deletion were examined and analyzed as ME, based on the given criteria. All deletions meet the crucial criteria, *Non-phonological condition* and *Consistent co-occurrence*; but the other two criteria, *Phonological consistency* and *No restriction on base selection* are met to different degrees. While base-final C-deletion and base-final VC-deletion meet all the criteria, three types of *te*-verb deletion meet *Phonological consistency* to varying degrees and *No restriction on base selection* is not satisfied in all types of *te*-verb deletion. ME in Central Yup'ik provides empirical evidence that parameters to determine ME are structured along a continuum.

CHAPTER 5 Korean Base Vowel Shortening in Derivational Morphology

5.1 Introduction

This chapter explores vowel shortening in verb and adjective bases in Korean, traditionally known as verb stem vowel shortening. Vowel shortening (VS) in verb/adjective bases refers to a phenomenon in which a vowel in the base is shortened when a suffix is added. Although researchers concur that the process is triggered by suffixes, no agreement has been reached on which suffixes trigger VS. Some scholars state that a vowel is shortened before a vowel-initial suffix (Kim-Renaud, 1974, 1995; Kim, 1998, 2000), one example of which is shown in (1).

- (1) ta:m-⁴⁶ ‘to put in’ tam-uni ‘to put in and then’
 sa:l- ‘to live’ sal-a ‘to live and’ (Kim, 1998: 294)

Some scholars have observed that VS occurs in voice-derived forms such as passive and causative (Huh 1965; Martin, 1968, 1992; Sohn 2001), regardless of whether the suffixes start with a vowel, as in (2a), or a consonant, as in (2b).

- (2) a. cwu:l- ‘to decrease’ cul-i (CAUS) ‘reduce’
 b. a:l- ‘to know’ al-li (CAUS) ‘inform’
 ka:m- ‘to wind’ kam-ki (CAUS) ‘be wound’ (Sohn, 2001: 193)

⁴⁶ The present study uses the Yale Romanization system for data transcription. See Table 19 for IPA equivalents of the Yale Romanization system for vowels. IPA equivalents of the Yale Romanization system for consonants are as follows: pp = [p] tt = [t] ss = [s] cc = [c] kk = [k] ng = [ŋ]. In this chapter, long vowels are indicated by the symbol ‘:’. The use of this symbol is not suitable for long vowels in Nuu-chah-nulth, in which double characters are conventionally used. Thus, in this dissertation, two different ways of representing long vowels have been adopted, in an effort to respect the conventions of each language, with the price of some inconsistency.

In response to their observations of seeming inconsistencies in the patterns of suffixes that do and do not trigger VS, others have concluded that VS-triggering suffixes are lexically determined (Davis and Cho, 1994; Ko, 2002, 2010, 2013). Note that, as shown in (3), segmentally identical suffixes sometimes behave differently: in (3a), the nominalising suffix *-i* accompanies VS, whereas in (3b), the adverbial suffix *-i* does not.

- (3) a. Nominalising suffix *-i*
 ki:l- 'long' kil-i 'length'
 te:p- 'hot' tewi 'heat'
- b. Adverbial suffix *-i*
 ko:p- 'beautiful' ko:i⁴⁷ 'beautifully'
 ma:nh- 'abundant' ma:ni⁴⁸ 'abundantly' (Davis and Cho, 1994: 3)

Given the many apparent anomalies in base VS, it seems reasonable to closely examine the VS-triggering suffixes. Although some studies have noted the existence of exceptional suffixes (Davis and Cho, 1994; Ko, 2002, 2010), to date, nobody has completed a comprehensive analysis of the relationship between these suffixes and base VS.

The current study proposes that base VS should be treated differently in inflectional morphology and derivational morphology. On the one hand, in inflectional morphology, VS in verb/adjective bases occurs before vowel-initial suffixes, with no exceptions. No consonant-initial suffixes trigger VS. In this case, VS is considered as a phonological process. In derivational morphology, on the other hand, a base vowel is shortened when followed by particular suffixes, including the noun-deriving suffixes *-i*

⁴⁷ *Kop* is an irregular adjective. P-irregular adjectives usually behave like p-irregular verbs (Lee, 2000: 169). However, *ko:-i* seems to be idiosyncratic.

⁴⁸ The base-final /h/ is usually deleted. When /h/ occurs before an obstruent-initial suffix, then it is aspirated on the following obstruent: /ma:nh-ta/ → [ma:nt^ha] (Davis and Cho, 1994:7).

and *-um*, the adverb-deriving suffix *-o/u*, the passive suffixes *-i*, *-hi*, *-li*, and *-ki*, and the causative suffixes *-i*, *-hi*, *-li*, *-ki*, *-u*, and *-ku*. Note that causative/passive suffixes are derivational in Korean (Han, 2006; Ko and Ku, 2009; Lee, 2005, Sohn, 2001). The present study proposes that the co-occurrence of VS and a triggering suffix is a case of multiple exponence (ME). This approach is in line with vowel lengthening/shortening in Nuuchahnulth, as discussed in Chapter 3. The present study provides a formal analysis within the Word-and-Paradigm framework.

The remainder of this chapter is organized as follows: Section 5.2 presents background information on Korean, including the Korean vowel inventory and word formation processes. Section 5.3 describes how VS occurs differently in inflectional and derivational morphology. Section 5.4 examines VS in derivational morphology as a subsidiary exponent within ME, based on given criteria. Section 5.5 provides a formal account of base VS. Section 5.6 discusses alternative approaches and Section 5.7 summarizes the chapter.

5.2 Preliminaries

This section provides some background information on Korean as a basis for understanding later discussions in this chapter. Information is provided on the Korean vowel system, focusing on the long/short distinction; sources of the data; and word formation, especially the formation of a predicate by suffixation.

5.2.1 Korean vowel system and sources of data

The Modern Central (Standard) dialect of Korean comprises ten short vowels and their ten long counterparts (Sohn 2001, Lee and Ramsey 2000, Lee 1999). Table 19 illustrates the phonemic vowel inventory of Korean. The symbols used in the table are in IPA; the symbols in parentheses represent the equivalents in the Yale Romanization system. The Yale Romanization system is used to represent the data throughout this chapter, following the convention employed in morphological studies of the Korean language. In Central dialects, the high front round vowels /y, ø/ tend to be pronounced as the on-glide diphthongs [wi] and [we], respectively. Some researchers consider the eight simple vowels, excluding /y, ø/, to be phonemic.

Table 19 *Phonemic Vowel Inventory of Modern Central Korean*

	Front		Back	
	Unrounded	Rounded	Unrounded	Rounded
High	i (i) i:	y (wi) y:	ɪ (u) ɪ:	u (wu) u:
Mid	e (ey) e:	ø (oy) ø:	ə (e) ə:	o (o) o:
Low	ɛ (ay) ɛ:			a (a) a:

With respect to long vowels, it is not known at what point this feature became distinctive. Even though the long vowels are phonemic in present-day Korean, they are not indicated in *Hankul* orthography or in *Hwunminjengum*⁴⁹. According to *Hwunminjengum Hay-Lyey*⁵⁰, Middle Korean was a tone language with four lexical tones:

⁴⁹ *Hwunminjungeum*, which translates literally as “a correct sound to instruct people”, is a Korean writing system that was invented by King Sejong and scholars in 1446.

⁵⁰ Interpretation of *Hwunminjungeum*

pyengseng (level tone), *sangseng* (rising tone), *keseng* (departing tone), and *ipseng* (entering tone). Many studies of long vowels state that long vowels originate from the *sangseng* (rising tone) of Middle Korean. While tones were marked in Hunminjeongeum, vowel length was not. Thus, the question of whether long vowels were phonemic in Middle Korean remains inconclusive. The most widely accepted account is that the long vowels existed concomitantly with the rising tone in Middle Korean, and vowel length was retained as a trace of the former rising tone (Huh, 1965; Ko, 2002; Lee, 1977). While the vowel length contrast is disappearing in modern Korean, this contrast remains robust in the Central and Cenla dialects. As of 2000, among speakers aged approximately 50 and older, vowel length remains distinctive (Sohn 2001), but many studies have reported that the contrast is disappearing in younger generations (Park, 1994; Kim, 1998; Kim and Han, 1998; Ko, 2002; Lee, 2010).

Since the status of the vowel length contrast is not straightforward, I have chosen data for the present study with caution. The data in this study are drawn either from previous literature or from my own (native Korean) vocabulary. In cases of words chosen from my own vocabulary, I have consulted the *Kuke tay sacen* [*Comprehensive Dictionary of Korean*] (Lee 1982), one of the most representative dictionaries, to confirm my own impressions of vowel length. Unless otherwise specified, I have drawn the data from my own vocabulary, a native speaker of Busan Korean (Kyeng-sang dialect).

5.2.2 Word formation

Verbs and adjectives are always bound in Korean; they do not stand alone, but always need at least one suffix to become complete predicates. In other words, a predicate must have a verb or adjective base and at least one sentence ending. Endings are divided into pre-final and final endings (Lee and Ramsey, 2000; Sohn, 2001; Ceong, 2011). Final endings occur at the end of a sentence or a clause and are obligatory to complete a sentence or a clause, whereas pre-final endings are optional. Final endings include the addressee honorific (AH), mood (MD), and clause-type (CLT)/sentence-type (SENT) endings. Pre-final endings include subject honorific (SH) and past/perfect tense (PST) endings, as well as modal expressions (MDL).

Table 20 *Predicate Formation of Korean*

Prefix (derivational)	Lexical base	Derivational suffixes	Inflectional suffixes	
			Pre-final endings	Final-endings
Stem (extended base)			Inflections	

As shown in Table 20 above (adapted from Sohn, 2001: 354), in Korean predicate formation, a lexical base and final ending(s) are obligatory to finish a phrase or a sentence. Prefixes in Korean are always derivational; there are no inflectional prefixes in Korean. One or more derivational suffixes, if any, may be added to a lexical base. Pre-final and final endings are both inflectional suffixes. A unit that does not contain any inflections is referred to as a stem or an extended base. In fact, in the traditional grammar of Korean, a unit is not differentiated according to whether it includes inflection or derivation. That is, the term ‘stem’ is used for a combined form consisting of a lexical

someone cry’, although he did not observe that all these words contain the causative suffix *-li*. Martin (1968) notes that “[B]asic vowel length in the last syllable of a base drops before those ending shapes that begin with vowels (*e/a, o, i; un, -ul*, etc.) and usually in derived forms (such as passives and causatives)” (p.102-103). His observation is accurate in the sense that derived forms are included in the description, but neither the details of derived forms nor examples are provided. Later works by other scholars cite just part of Martin’s description. For instance, Kim-Renaud (1973: 21), citing Huh (1965) and Martin (1968), mentions that “underlying long vowels in verb stems are shortened when a vowel initial affix follows”. Her description of VS is only partly complete. She neither mentions adjective bases (although her examples include the adjective, *coh* ‘good’) nor includes ‘derived forms’. Relatively recent works consider that VS occurs before vowel-initial suffixes, though with some irregularity (Kim, 1998, 2000). Sohn (2001) states that VS occurs before a vowel-initial suffix or a causative/passive suffix. Although their theoretical analyses are distinct, Davis and Cho (1994) and Ko (2002, 2010) agree that VS is attributable to a certain group of suffixes. Ko’s studies describe more VS-associated suffixes than do any other works. However, no comprehensive description of the process has yet been provided.

As briefly reviewed above, VS has not been described systematically in previous literature. As a consequence, theoretical accounts of VS are affected by the incomplete description of the phenomenon. The following subsection provides a comprehensive description of VS by examining inflectional and derivational morphology in turn.

5.3.2.1 Base vowel shortening in inflectional morphology

VS in the base of verbs and adjectives behaves differently in inflectional and derivational morphology. Before describing VS in derivational morphology, which is of interest in the current study, an examination of VS in inflectional morphology is first provided.

When inflectional suffixes are affixed to a verbal/adjectival base, vowels in the base are shortened if the suffix begins with a vowel. The examples in (5), drawn from Kim (1998: 294), show this fact clearly. Suffixes starting with a consonant, such as the declarative sentence ending *-ta* and the connective clause ending *-ko*, do not trigger base VS. In contrast, vowels in the base are always shortened when affixed by vowel-initial inflectional suffixes, such as the connectives *-a* and *-uni*. The examples in (5) also demonstrate that it is the suffix that triggers VS, rather than a property of the base, since the same bases, *ta:m-*, *sa:l-*, and *ku:lm-* either lose vowel length or retain a long vowel in the presence or absence of a suffix, respectively.

(5)	Declarative	Sequential	Causal	Causal	Gloss	
		Connective	Connective ⁵¹	Connective		
a.	<i>ta:m-</i>	<i>ta:m-ta</i>	<i>ta:m-ko</i>	<i>tam-a</i>	<i>tam-uni</i>	‘to put in’
b.	<i>sa:l-</i>	<i>sa:l-ta</i>	<i>sa:l-ko</i>	<i>sal-a</i>	<i>sal-uni</i>	‘to live’
c.	<i>kwu:lm-</i>	<i>kwu:m-ta</i>	<i>kwu:m-ko</i>	<i>kwulm-e</i>	<i>kwulm-uni</i>	‘to starve’

The following examples in (6) demonstrate that adjectives are inflected in the same way as verbs.

⁵¹ In Kim (1998), *-a* and *-uni* are defined as Stative and Effective respectively, with no explanation of the terms. This study, however, refers to *-ko*, *-a*, and *-uni* as Connective suffixes, following Yeon and Brown (2011). Yeon and Brown categorize *-a/e*, a short form of *-a/ese* as a causal connective that forms the infinitive form of the verb; and *-uni*, a short form of *-unikka*, as a causal connective that forms the causative construction. *Ko* is a connective denoting additional and sequential connection.

(6)		Declarative	Causal Connective	Causal Connective	Gloss
a.	co:h-	co:-tha	co-a	co-uni	'be good'
b.	ma:nh-	ma:n-tha	man-a	man-uni	'be plentiful'
c.	ko:p-	ko:p-ta	ko-wa	ko-uni	'be pretty'

To my knowledge, no exceptions have been observed about the given generalization that long vowels become short before vowel-initial inflectional suffixes. From this fact, I conclude that VS in inflectional morphology is phonologically conditioned. Therefore, the VS that occurs with inflectional suffixes is not related to ME, which must satisfy the criterion of *Non-phonological condition* (see §2.2 for the criteria). Rather, VS in inflectional morphology is a phonologically conditioned alternation.

However, it should be pointed out that there is disagreement on the status of VS in multi-syllabic words (Ko, 2002; Davis and Cho, 1994). Ko (2002: 32) states that VS does not apply when bases are multisyllabic. The examples, which are in IPA in the source, are re-written below using the Yale system for consistency. The vowel-initial suffixes *-e* and *-uni* that attach to the multi-syllabic bases in (7) do not trigger VS.

(7)	Declarative	Sequential Connective	Causal Connective	Causal Connective	Gloss	
a.	te:lep-	te:lep-ta	te:lep-ko	te:lep-e	te:lep-uni	'to be dirty'
b.	yo:ngseha-	yo:ngseha-ta	yo:ngseha-ko	yo:ngseha-a	yo:ngseha-uni	'to be straight'
c.	se:samsulep-	se:samsulep-ta	se:samsulep-ko	se:samsulep-e	se:samsulep-uni	'be necessary to say anew'

In contrast, Davis and Cho (1994) claim that VS occurs on the first syllable of multi-syllabic words. The examples from Cho (1994: 5) in (8) illustrate that the first long vowel undergoes VS when vowel-initial suffixes are added, as in *kkeci-e* and *kkeci-ni*.

(8)	Declarative	Sequential Connective	Causal Connective	Causal Connective	Gloss
a.	kke:ci-	kke:ci-ta	kke:ci-ko	kkeci-e	kkeci-ni to sink
b.	nay:khi-	nay:khi-ta	nay:khi-ko	naykhi-e	naykhi-ni to incline
c.	kka:talop-	kka:talop-ta	kka:talop-ko	kkatalow-a	kkatalow-uni to be fastidious

Furthermore, the vowel length in *se:samsulep* 'be necessary to say anew' in (7) and *kke:ci*'sink' in (8) is not consistent with that recorded in the *Kuk.e tae sacen* [*A Comprehensive Korean Dictionary*] (Kim, 1982), which is considered an authoritative source in the current study.

Given that the vowel length contrast is disappearing (Park, 1994; Kim, 1998; Kim and Han, 1998; Ko, 2002; Lee 2010), it would be a challenging task to clearly determine whether VS occurs in multi-syllable words. This task remains open for further study.

5.3.2.2 Vowel shortening in derivational morphology

Within derivational morphology, VS behaves differently than in inflectional morphology. When a verb or an adjective is affixed with a derivational suffix, base VS is not influenced by whether the initial sound in the suffix is a consonant or a vowel. Rather, VS consistently accompanies certain suffixes, regardless of initial sounds in the latter.

Korean has a large number of derivational suffixes. Lee (2005) lists 231 derivational suffixes and 140 derivational prefixes; Sohn (2001) states that there are several hundred derivational affixes, including 270 prefixes. Notwithstanding the absence of an exhaustive list of derivational affixes, it seems clear that Korean derivational morphology is as extensive as that of Nuu-chah-nulth and Central Yup'ik. All prefixes in

Korean are derivational and are not associated with VS. Thus, prefixes will not be discussed further.

In common with Nuu-chah-nulth and Yup'ik, many derivational suffixes in Korean have lexical meanings, as shown in (9).

- (9) a. Native Korean
 -ney 'group, family'
 -po 'thing, person' (derogatory)
 -tap 'be like, worthy of'
 -nay 'all the way'
 -li 'direction'
- b. Sino-Korean
 -ca 'person'
 -cang 'chief'
 -hak 'study'
 -hoy 'meeting'
 -tay 'generation'

Despite the large number of derivational suffixes, only a limited number of them can be added to verbs or adjectives. These are verb/adjective-deriving suffixes, noun-deriving suffixes, and adverb-deriving suffixes. Below, I discuss suffixes belonging to these three categories in relation to VS in verb and adjective bases.

5.3.2.2.1 Verb/adjective deriving suffixes

Three types of suffix derive verbs/adjectives: causative, passive, and some intensifier suffixes. Some suffixes (*-i*, *-hi*, *-li*, and *-ki*) are used to form both causative and passive. Below, I examine each type of verb/adjective-deriving suffix.

First, as previous studies (Martin, 1992; Sohn, 2001) point out, the causative/passive suffixes *-i*, *-hi*, *-li*, and *-ki* accompany VS, as shown in (10). Notice that the causative/passive suffixes start with either the vowel *i* or a consonant, as in *-li*, *-ki*, and *-hi*.

(10)	UR	Gloss	Causative/Passive
a.	kkwu:-	‘borrow’	kkwu-i ‘loan’
	nwu:p-	‘lie down’	nwu-i ‘lay down’
b.	sa:l-	‘live’	sal-li ‘save’
	a:l-	‘know’	al-li ⁵² ‘inform’
c.	ta:m-	‘put in’	tam-ki ‘be put in’
	a:n-	‘hug’	an-ki ‘make someone hug’
d.	pa:lp-	‘step on’	pal-phi ⁵³ ‘be stepped on’
	te:p-	‘hot’	te-phi ‘heat’

Lee (1989) considers these four suffixes as phonologically conditioned alternations, but most scholars (Sohn, 2001; Yeon and Brown, 2011; Lee, 2005; Kim, 1988; Ku, 1998; Ko and Ku, 2009) agree that the alternations are hard to account for on a strictly phonological basis, since many exceptions are found. This issue will not be pursued further here, since it is beyond the scope of this study and it does not affect the current discussion.

In addition to passive/causative suffixes, the suffixes, *-wu*, *-kwu*, and *-chwu* are used exclusively for the causative construction. The vowel-initial causative marker *-wu* accompanies VS in (11a). The consonant-initial causative suffix *-kwu* also shortens a vowel in the base, as in (11b).

⁵² *-li* is used as only causative in this case, since the verb *a:l* ‘know’ cannot be passivized.

⁵³ A regular phonological process is involved: When an obstruent and [h] are adjacent, the two sounds merge and become an aspirated obstruent.

(11)	UR	Gloss	Causative	
a.	kkay:-	‘awake’	kkay-wu	‘wake up’
	pi:-	‘vacant’	pi-wu	‘vacate’
b.	i:l-		il-kwu	‘bring under cultivation’

There are a limited number of verbs to which the causative suffixes *-kwu* and *-chwu* can attach. I have not found verbs with long vowels in the base occurring with the causative suffix *-chwu*. While (12) illustrates some examples that are causativized by affixing *-chwu*, VS is not verified, since the lexical bases contain short vowels. We may consider *-chwu* to be a VS-accompanying suffix, by analogy with other causative suffixes.

(12)	mac-	‘be correct’	mac-chwu	‘to verify, fix up’
	tul-	‘to lift’	tul-chwu	‘to reveal’

One exceptional causative suffix that does not trigger VS is *-ay*. To my knowledge, only one word is causativized by adding *-ay* and the word, shown in (13), is not involved in VS.

(13)	e:ps-	‘does not exist’	e:ps-ay	‘remove’.
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Korean includes several verb-deriving suffixes. These suffixes are inconsistent in terms of accompanying VS. The data in (14) - (16) below are drawn from Sohn (2001: 225-226). Vowel length is not indicated in the original source; but has been determined by consultation with the *Kuk.e tay sacen* [*Comprehensive Korean Dictionary*].

(14)	Verb/adjective-deriving suffixes accompanied by VS			
	-kkali	‘intensifier’	noy.kkali ⁵⁴	‘harp on’
			noy:-kkali	
			repeat	-INT

⁵⁴ When a period comes before a double consonant as in *.kk*, *.tt*, or *.pp*, it denotes that the consonant (*kk*, *tt*, or *pp*) is a single tense consonant. If the word *noykkali* is presented without the period, it may be syllabified as *noy.kk.li*, in which the first *k* is a coda and the second *k* is the onset of the following syllable.

- (15) Verb/adjective-deriving suffixes not accompanied by VS
- | | | | |
|----|---------------------|--------------|-------------|
| a. | -ttul ‘intensifier’ | ppay:ttul | ‘grab’ |
| | | ppay:-ttul | |
| | | take.out-INT | |
| b. | -chi ‘intensifier’ | mi:lchi | ‘push hard’ |
| | | mi:l-chi | |
| | | push-INT | |
- (16) Verb/Adjective-deriving suffixes in which VS is not verified
- | | | | |
|----|----------------------|----------------|-----------------|
| a. | -cilu ‘intensifier’ | kwukicilu | ‘wrinkle up’ |
| | | kwuki-cilu | |
| | | wrinkle.it-INT | |
| b. | -ttuli ‘intensifier’ | kkay.ttuli | ‘smash’ |
| | | kkay-ttuli | |
| | | break-INT | |
| c. | coli ‘gently’ | ulphcoli | ‘recite gently’ |
| | | ulph-coli | |
| | | recite-gently | |

The intensifier *-kkali* in (14) accompanies VS. The verbal base *noy:-* becomes short when followed by *-kkali*. The intensifiers *-ttul* (15a) and *-chi* (15b) do not trigger VS. For the suffixes in (16), it is not possible to verify whether they trigger VS, because the base vowels are underlyingly short and bases that can occur with such suffixes are very limited. For these suffixes, base selection is very limited. Words affixed by one of these suffixes are mostly lexicalized and listed as such in dictionaries.

In summary, all passive/causative suffixes (with the exception of *-ay*) accompany VS, regardless of the initial sounds in the suffixes. Also, one of the intensifiers, *-kkali* among others, occurs with VS.

5.3.2.2.2 Adverb-deriving suffixes

In addition to verb/adjective-deriving suffixes, adverb-deriving suffixes also can be added to verbal or adjectival bases, changing the category of the base from a verb/adjective into an adverb. Three suffixes belong in this group: *-i*, *-key*, and *-o/wu*⁵⁵. Among the three, only *-o/wu* occurs with VS. The suffix *-o/wu* is unproductive and words formed by it are completely fossilized, whereas *-key* is the most productive of the other two. Consider the adverbs in (17), which are derived from verbs by affixing *-o/wu*.

- | | | | | | |
|------|----|-------|----------|---------------------|-----------------------------|
| (17) | a. | ne:m- | ‘exceed’ | nem-u ⁵⁶ | ‘too much, excessively, so’ |
| | | to:l- | ‘turns’ | tol-o | ‘(over) again’ |

Yeon and Brown (2011) state that the adverbs above are lexicalized and most native speakers are not aware that they are derived forms.

In contrast to the suffix *-o/wu*, neither *-key* nor *-i* accompany VS. Notice that the two suffixes behave the same way with respect to VS, although one begins with a vowel and the other with a consonant. Sohn (2001: 407) points out that only a limited set of adjectives and verbs can be adverbialised by adding *-i*. The adverbial forms with *-i* in (18), however, are not as lexicalized as the forms with *-o/wu*, in the sense that the etymology is recognizable, but they are nonetheless listed in dictionaries as individual entries.

- | | | | | |
|------|--------|-------------|--------|---------------------|
| (18) | ma:nh- | ‘many’ | ma:n-i | ‘many, much’ |
| | ko:p- | ‘beautiful’ | ko:-i | ‘beautifully, well’ |

⁵⁵ *o* and *wu* are alternations: *o* comes after vowel *o* and *wu* occurs elsewhere.

⁵⁶ Note that in the Yale system *wu* is represented as *u* after bilabials.

The suffix *-key*, on the other hand, is productive; adverbial forms with *-key* are not listed in dictionaries. Note that ko:p (< ko:-i) and ne:m (< nem-u) also can be affixed with *-key*. (19b) shows its productivity.

(19)	a.	ko:p-	beautiful	ko:p-key	‘well’
		ne:m-	‘exceed’	ne:m-key	‘excessively’
	b.	nwuc-	late	nwuc-key	‘late’
		ssa-	cheap	ssa-key	‘cheaply’

In summary, in observing adverb-deriving suffixes, it seems conclusive that VS is attributable to a property of individual suffixes, rather than to a group of suffixes (e.g., adverbial suffixes or voice-deriving suffixes). Also, segmental differences (i.e., initial consonant or vowel) do not affect the presence/absence of VS in derivational morphology. Whether the productivity of suffixes plays a role in triggering VS will be determined in the following section.

5.3.2.2.3 Noun deriving suffixes

Korean includes another group of suffixes that can be added to verbal/adjectival bases. These suffixes derive nouns by attaching to verbs/adjectives. There are four noun-deriving suffixes: *-i* ‘act, thing, quality’, *-um* ‘fact, thing’, *-ki* ‘act, thing, quality’, and *-po* ‘thing, person’. Among the four, *-i* and *-um* accompany VS, while *-ki* and *-po* do not. From this group of suffixes, we learn that the productivity of suffixes does not affect VS, considering that the unproductive suffixes *-i* and *-po*, which do and do not trigger VS, respectively, and the productive suffixes *-um* and *-ki* do and do not, respectively. Below, each suffix is examined.

As for the suffix, *-i*, Sohn (2001) points out that a small number of verbs become nominalised by affixing it. Nouns derived by *-i* are relatively lexicalized and mostly listed in dictionaries. The following examples in (20) are all listed in the *Kuk.e tay sacen* [*Comprehensive Korean Dictionary*]. The suffix *-i* shortens the base vowel, as in (20a), unless the base vowel is underlyingly short, as in (20b).

(20)	a.	no:l-	‘play’	nol-i	‘playing’
		ka:l-	‘till, cultivate’	kal-i	‘plowing’
		ke:l-	‘hang’	kel-i	‘hanger’
b.	kil-	‘long’	kil-i	‘length’	
	chwup-	‘cold’	chwuw-i	‘coldness’	

The suffix *-um/m*⁵⁷ ‘fact, thing’ nominalises verbs/adjectives. It also shortens the vowel in the base. Some forms derived by affixing *-um/m* are lexicalized and found in dictionaries. Nouns illustrated in (21) are listed in the *Kuk.e tae sacen* [*Comprehensive Korean Dictionary*].

(21)	a.	no:l-	‘play’	nol-um	‘gambling’
		wu:l-	‘cry’	wul-um	‘weeping, crying’
		e:l-	‘freeze’	el-um	‘ice’
b.	mit-	‘believe’	mit-um	‘belief’	

One feature shared by *-um/m* and *-ki* (a discussion of which follows in the next paragraph) is that both suffixes can be used to nominalise a phrase. When used for this purpose, both *-um* and *-ki* are productive, and uniquely among VS-triggering suffixes, they occur after tense markers and the addressee honorific *-si*. In (22a), *-um* affixes to a verbal phrase and turns it to a nominal phrase. This nominalising suffix is followed by the

⁵⁷ The alternations are phonologically conditioned. *m* occurs with vowel-final bases; *um* occurs with consonant-final bases.

progressive suffix *-ka* in (22b) and by the past tense suffix *-ess* in (22c). The suffix is even followed by both the honorific and the past tense suffix, as can be seen in (22d).

- (22) a. nai mekumul nu.kkipnita.
 nai mek-**um**-ul nu.kki-p-ni-ta
 age eat -NOM -ACC feel-AH-IN -DC
 ‘I feel that I got old.’
- b. nai mekekamul nu.kkipnita.
 nai mek-e-**ka-m**-ul nu.kki-p-ni-ta
 age eat-INF -PRO -NOM-ACC feel-AH-IN-DC
 ‘I feel that I am getting old.’
- c. nai mekessumul nu.kkipnita.
 nai mek-**ess-um**-ul nu.kki-p-ni-ta
 age eat-PST-NOM -ACC feel-AH-IN-DC
 ‘I feel that I am getting old.’
- d. nai mekusyessumul nu.kkipnita.
 nai mek-(**u**)**si-ess-um**-ul nu.kki-p-ni-ta
 age eat-SH-PST-NOM-ACC feel-AH-IN-DC
 ‘I feel that (someone older than the speaker) got old.’

Given that the tense and honorific suffixes are inflections, it is odd that a seemingly derivational suffix *-um* follows such suffixes. The suffix *-um* can be analyzed as two homophonous suffixes, one a derivational suffix, as in (21), and the other an inflectional suffix, as in (22b - d). Further investigation of this possibility is beyond the scope of this dissertation, but the important point to note here is that in both cases, VS occurs.

In contrast to *-i* and *-um*, the nominative suffixes *-ki* and *-po* do not trigger VS, as can be seen in (23).

- (23) a. u:l- ‘cry’ u:l-po ‘someone who cries often’
 ccay:- ‘tear’ ccay:po ‘a harelippped person (a half-wit)’

- b. ta:m- ‘to put in’ ta:m-ki ‘putting in’
 a:n- ‘to hug’ a:n-ki ‘hugging’

The suffix *-po* is used to refer to a person or an object in a belittling or teasing way. Only a limited number of verbs are nominalised by adding *-po*; the forms are completely lexicalized and listed in dictionaries. The nominalising suffix *-po*, as demonstrated in (23a), does not trigger VS.

The nominalising suffix *-ki* is the most productive among the four. Among words formed by adding *-ki*, none are lexicalized. Like *-um*, *-ki* adds to a stem that contains tense suffixes and/or an honorific suffix. Although both *-um* and *-ki* are productive, Yeon and Brown (2011: 71-72) point out that “*ki* designates the existence (or non-existence) of events, processes and states of affairs that are situated in time (i.e., that would have a given start and end point), *um* is usually employed when what is being talked about is an abstract ‘truth’ (or non-truth) that exists outside of space and time and is not physically ‘real’.” The dimension of abstractness/ concreteness is reflected in the examples in (24).

- (24) a. cemsim mek.kika silleyo.
 cemsim **mek-ki**-ka silh-e-yo
 lunch eat-NOM-NOM hate-INF-ENDING
 ‘(I) don’t like to eat lunch.’
- b. nai mekumul nu.kkipnita.
 nai **mek-um**-ul nu.kki-p-ni-ta
 age eat-NOM-ACC feel-AH-IN -DC
 ‘I feel that I got old.’

The examples in (24) have the same verb, *mek*, which literally means ‘to eat’. In (24b), however, *mekum* is an idiomatic expression, since people do not literally eat ages. However, *mek.ki* is used when the physical activity of eating is referred to. Despite different usage, both *-ki* and *-um* are fairly productive. It is not clear what differences

between the suffixes produced their distinct behaviours with respect to VS, but it is clear that productivity does not play a role in determining the presence/absence of VS. The suffix *-po* provides further evidence for this point: neither the productive suffix *-ki* nor the unproductive suffix *-po* occur with VS.

In summary, nominalising suffixes behave like inflectional suffixes. The vowel-initial suffixes *-i* and *-um* accompany VS and the consonant-initial suffixes *-ki* and *-po* do not. This pattern is the same as that seen for inflectional suffixes, but the initial sounds in the nominalising suffixes could presumably be coincidental. It is also possible that the productive suffixes *-um* and *-ki* are inflectional, in that they follow inflectional suffixes in the predicate.

In verbal and adverbial suffixes, we have seen that the initial sounds are not associated with the presence/absence of VS. In addition, it is suggested that productivity is not a factor in triggering VS. Also, it is verified that suffixes belonging to the same category (e.g., adverb-deriving suffixes) behave differently. It appears conclusive that base VS occurs in the presence of individual, triggering suffixes.

5.4 Vowel shortening as ME in derivational morphology

This section discusses whether VS in verbs and adjectives is a morphological exponent in derivational morphology, based on the four criteria discussed in Chapter 2. The criteria are repeated below in (25), for convenience.

(25) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

- (i) ***Non-phonological condition***: no exponents are phonologically conditioned;
- (ii) ***Consistent co-occurrence***: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) ***Phonological consistency***: phonological representations of the co-occurring exponents are consistent.
- (iv) ***No exceptions on base selection***: an exponent may appear on any lexical bases of a morphological category.

In other words, a subsidiary exponent (e.g., VS) is not phonologically conditioned; it consistently co-occurs with a main exponent (e.g., suffix); its phonological representation is invariant; it occurs in any verbal or adjectival base. In contrast to derivational morphology, VS in inflectional morphology is phonologically conditioned (see 5.3.2.1). That is, in inflectional morphology, vowels in verbs and adjectives are shortened before vowel-initial suffixes. As discussed earlier, this study considers that a phonologically conditioned alternation is not part of ME. In what follows, thus, I examine only VS accompanied by derivational suffixes to determine whether VS and triggering suffixes meet the criteria for ME.

5.4.1 Non-phonological condition

If base VS is a subsidiary exponent of an accompanying-suffix, then it must not be phonologically conditioned. To examine whether VS meets this criterion, two possibilities for phonological conditioning will be examined: whether Korean base VS (1)

creates a well-formed foot shape and/or (2) occurs in phonologically conditioned segmental environments.

As discussed in §3.3.2.1, cross-linguistically, VLA tends to be motivated by the need to create well-formed metrical structure (Kager, 1994; Hayes, 1987, 1995; McCarthy and Prince, 1990, among others), although this is not the case in Nuu-chah-nulth. Some previous studies argue that, like VLA, base VS is a phonologically conditioned process (Kim-Renaud, 1974; Kang, 1991; Kim, 1998, 2000). However, this originates from the incomplete description of the environments in which VS occurs, as discussed in an earlier subsection. Kang's (1991: 187) moraic analysis of base VS is based on very limited data: three verbs followed by vowel-initial suffixes. However, Kim (1998, 2000) provides comprehensive studies on the phonological motivation for base VS. Below, I discuss Kim's studies and show that his proposed phonological motivation faces empirical difficulties.

In his studies of base VS, Kim (1998, 2000) argues that this phenomenon occurs to create a better-formed foot structure, under the assumption that Korean has iambic feet and that codas are moraic. Consider the data in (26).

- (26) a. $[(H)_F L]_{PrWd} \rightarrow [(L L)_F]_{PrWd}$
 ta: . ma → ta. ma
- b. $[(H)_F L]_{PrWd} \rightarrow [(H)_F L]_{PrWd}$
 ta:m. ko ta:m. ko

Kim argues that the base vowel in (26a) is shortened in order to form an iambic foot, $(L L)_F$, by parsing all syllables into a foot. The vowel in (26b), on the other hand, does not undergo shortening, because the first syllable is super-heavy (CVVC), a situation that

po ‘person’. Since they create a prosodic word, a trimoraic syllable is allowed. Note that in (28), *-ki* and *-po* do not trigger VS.

- (28) a. u:l-ki ‘crying’
 [{ (μμμ) }_{Stem μ}]_{Prwd}
 wu:l ki
- b. u:l-po ‘someone who cries easily’
 [{ (μμμ) }_{Stem μ}]_{Prwd}
 wu:l po

However, examples in which a trimoraic syllable is tolerated even within the stem⁵⁹ challenge Kim’s explanation. Consider *mi:l-chi* ‘push violently’. The intensifiers *-chi* (29a) and *-ttul* (29b) are derivational suffixes that derive a verb from a verbal base, as do causative/passive suffixes⁶⁰. *-ay* in (29c) is a causative suffix that does not trigger VS.

- (29) a. Verbal intensifier *-chi*
 [{ (μμμ) }_{Stem μ}]_{Stem}
 mi:l . chi
 [{ (μ μ) }_{Stem μ}]_{Stem}
 *mil . chi
- b. Verbal intensifier *-ttul*
 [{ (μμμ) }_{Stem μμ}]_{Stem}
 ppay: . ttul
 [{ (μ μ) }_{Stem μμ}]_{Stem}
 *ppay . ttul

⁵⁹ In fact, not many derivational suffixes in Korean create stems; only derivational suffixes that derive verbs or adjectives from a verbal or adjectival base are applicable.

⁶⁰ The suffix *-chi* can be affixed only to a limited number of verbs, which include *tat* ‘close’ (*tat-chi* ‘close’), *teph* ‘cover’ (*teph-chi* ‘attack’), and *mi:l* ‘push’ (*mi:l-chi-ta* ‘push violently’).

c. Causative *-ay*

$$\{ \{ (\mu\mu\mu) \}_{\text{Stem}} \mu \}_{\text{Stem}}$$

$$e:ps . \quad ay$$

$$\{ \{ (\mu \mu) \}_{\text{Stem}} \mu \}_{\text{Stem}}$$

$$*eps . \quad ay$$

All three suffixes are derivational, create a stem, and do not trigger VS. In (29), if Kim's claim is true, we would predict VS, since the super-heavy syllable is not allowed in non-final position. Contrary to this prediction, however, *-chi*, *-ttul*, and *-ay* do not trigger VS and stem-internal trimoraic syllables are attested. This empirical evidence weakens the motivation for the stem-internal trimoraic VS in Kim's analysis.

In a similar vein, Ko (2002) argues that the motivation Kim (2000) presents for trimoraic VS cannot explain why VS occurs in CVVC.CV constructions. As mentioned earlier, Kim claims that the motivation for VS is to create a well-formed iambic foot (L. L)_F; when there is a super-heavy syllable (CVVC), in which VS would not succeed in creating (L. L)_F, no VS occurs. The same environment is created when consonant clusters are followed by a vowel through resyllabification, as in (30). Although the bases in (30) should be able to tolerate super-heavy syllables, after resyllabification (i.e., **sa:l.ma*, **kwu:l.me*), the vowels are shortened and yield *sal.ma* and *kwul.me*. Ko argues that Kim's analysis cannot explain these examples.

(30)	a.	sa:lm-a	→	sal.ma	'boil-CAS.CON'	*sa:l.ma
		kwu:lm-e	→	kwul.me	'starve- CAS.CON'	*kwu:l.me

Along with the exceptions provided above, Ko's argument against the trisyllabic VS motivation weakens Kim's analysis even for VS in inflectional morphology, since the examples with consonant clusters above occur with an inflectional suffix.

Another possible phonological motivation for base VS suggested by many previous studies (Huh, 1965; Kim-Renaud, 1973; Martin, 1968 among others) is the initial sounds of the suffixes. (31) summarizes the derivational suffixes that were examined in § 5.3.2.2.

(31)	VS-triggering suffixes		Non VS-triggering suffixes
	Causative/passive	-i -hi -li -ki	
	Causative	-wu -kwu -chwu	Causative -ay
	Intensifier	-kkali	Intensifier -ttul -chi
	Adverbial	-o/wu	Adverbial -i -key
	Nominalizer	-i -um/m	Nominalizer -ki -po

As can be seen from (31), VS-accompanying suffixes in derivational morphology start either with vowels (i.e., *i*, *wu* [u], *o*) or consonants (i.e., *k*, *kk*, *ch*, *h*, *l*). In terms of the distribution of the sounds, the vowels belong to a natural class only on a large scale: Three vowels shown in at the beginning of the derivational suffixes are [–low]. The consonants do not constitute a natural class. In addition, some suffixes that do not trigger VS start with the same vowel *i* and with the consonants, *k* and *ch*. Moreover, segmentally identical suffixes behave differently, e.g., the adverbial suffix *-i*, which does not trigger VS), versus the nominalising suffix *-i*, which does; or the nominaliser *-ki*, which does not trigger VS, versus the passive/causative *-ki*, which does.

In summary, there has been one attempt to account for VS as a phonologically conditioned process, i.e., to meet a metrical requirement. However, neither metrical structure nor segmental environment motivates VS in verb/adjective bases; no further reasons exist to suggest that VS is phonologically conditioned.

5.4.2 Consistent co-occurrence and Phonological consistency

Another obligatory criterion for ME is *Consistent co-occurrence*, which stipulates that two or more exponents must consistently co-occur. The third criterion, *Phonological consistency* states that phonological representations of the co-occurring exponents must be consistent.

In the case of Korean base VS, if the criterion *Consistent co-occurrence* is met, then the criterion *Phonological consistency* is also met, in that VS, which has no variants, always occurs in the first syllable of the base. Thus, if base VS co-occurs with particular suffixes, then the two criteria are met in these instances.

In fact, as examined in §5.3.2.2, VS is accompanied by lexically determined suffixes. Exceptions are rarely found in the literature. To my knowledge, there are a few exceptions observed in Martin (1992): *pe:l* ‘to earn money’, *kku:l* ‘to pull’, and *sse:l* ‘to chop’. The vowels in these bases are not shortened, as shown in (32).

- | | | | | | |
|------|----|-------|-----------------|----------|-----------------------------------|
| (32) | a. | pe:l | ‘to earn money’ | pe:l-e | ‘to earn money and’ |
| | | | | pe:l-i | ‘earning money’ |
| | | | | pe:l-li | ‘to get earned’ |
| | b. | kku:l | ‘to pull’ | kku:l-e | ‘to pull and’ |
| | | | | kku:l-li | ‘to get pulled, to get attracted’ |

c.	sse:l	‘to chop’	sse:l-e	‘to chop and’
			sse:l-li	‘to be chopped’

However, it seems that this irregularity is attributable to the bases rather than the suffixes. Martin (1992: 33) points out that the bases have old forms such as *peul* ‘earn money’, *kkueul* ‘pull’, and *sehul* ‘chop’, and that the irregular retaining of the long vowels in these cases might be reminiscent of the pattern, in earlier Korean, of having consecutive vowels. In fact, regardless of types of suffixes (inflectional or derivational), the vowels are realized as long. The absence of VS in the these three verbs, then, can be considered as characteristic of these particular verbs, rather than a property of suffixes.

As demonstrated in §5.3.2.2, the occurrence of VS with particular suffixes is regular and consistent enough to justify the conclusion that the base VS alternations meet the criteria for subsidiary exponence.

5.4.3 Restrictions on base selection

The fourth criterion for ME proposed in previous chapters is that, in principle, an alternation as a subsidiary exponent must occur in any bases of the categories to which a given suffix attaches. Specifically, in the case of base VS in Korean, the lexical categories of the bases are inherently restricted to verbs or adjectives. Thus, the relevant point here is that when a VS-accompanying suffix is added to a base, VS should occur in any verbal or adjectival base.

Logically, passive suffixes select only a verbal base, since adjective predicates are intransitive. Other than passive suffixes, VS-accompanying suffixes attach to both adjectives and verbs. In (33a), causative and nominalising suffixes attach to verbal bases,

triggering base VS, while in (33b), the same suffixes affix to adjectival bases, producing base VS there as well.

(33)	a.	kkay:	‘awake’	kkay-wu (CAUS)	‘wake up’
		pa:lp	‘step on’	pal-phi (CAUS)	‘have something stepped on’
		no:l	‘play’	nol-i (NOM)	‘playing’
	b.	pi:	‘vacant’	pi-wu (CAUS)	‘vacate’
		te:p	‘hot’	te-phi (CAUS)	‘heat’
		ki:l	‘long’	kil-i (NOM)	‘length’

As shown above, both adjectival and verbal bases have the same effect with respect to VS when a VS-accompanying suffix is attached. Thus, the ME criterion regarding base selection seems to be met.

However, two exceptional cases must be considered. As mentioned in the previous subsection, there are three verbs that do not undergo shortening: *pe:l* ‘to earn money’, *kku:l* ‘to pull’, and *sse:l* ‘to chop’ (see (32) above for examples). In these verbs, VS is blocked, presumably because the long vowels are historical traces of former consecutive vowels (i.e., *peul* ‘earn money’, *kkueul* ‘pull’, *sehul* ‘chop’) (Martin, 1992). The second exceptional case concerns multi-syllabic bases. As discussed in §5.3.2.1, the status of VS in multisyllabic bases is disputable. Davis and Cho (1994) claim that VS occurs on multi-syllabic bases, whereas Ko (2002, 2013) argues that VS does not occur in such bases. If Ko's claim is correct, then VS-triggering suffixes select only for mono-syllabic bases. I will leave this issue for future study.

In light of our consideration of the three exceptional verbs and the uncertain status of VS on multi-syllabic bases, it seems reasonable to conclude that the criterion *No exceptions on base selection* is marginally satisfied.

To conclude, Korean VS and the triggering suffixes constitute ME. Base VS meets the three criteria *Non-phonological condition*, *Consistent co-occurrence*, and *Phonological consistency*, and also marginally meets the criterion *No exceptions on base selection*, with some exceptions and unknown cases. As shown in the discussion of *te-* verb deletions in Central Yup'ik (see Chapter 4), the parameters for ME may be structured along a continuum.

5.5 Analysis

We have seen that base VS and a triggering suffix together comprise ME and thus, denote a single expression. In this section, I provide a formal account of these instances of ME. I will discuss alternative approaches in the following section. Base modification in Korean exhibits a simple pattern compared to base modification in Nuu-chah-nulth and Central Yup'ik. In order to capture the base modification in Korean, only two classes need to be identified: suffixes that accompany VS and suffixes that do not.

The classification of derivational suffixes in relation to VS is as follows. Class 1 consists of the suffixes that do not accompany VS, including the causative suffix *-ay*, the adverbial suffixes *-i* and *-key*, the nominalising suffixes, *-ki* and *-po*, and so on. Class 2 comprises the suffixes that accompany VS, as discussed in § 5.3.2.2, such as the passive/causative suffixes (except *-ay*), the nominalising suffixes *-i* and *-um*, the adverbial suffix *-o/wu*, and the intensifier, *-kkali*. See (31) for a full list of the suffixes.

As examined above, VS is not phonologically conditioned. Thus, a moraic analysis (Kim, 1998, 2000) involves unnecessary complexities and, more crucially, the analysis cannot account for attested forms (see § 5.4.2.). Also, Ko (2001, 2010, 2013)

proposes that base VS is the deaccentuation of a lexical accent in the base, motivated by the need to avoid accent clash. Ko's proposal challenges a recognized traditional assumption regarding vowel length contrasts, in that it replaces an accent with a vowel length contrast. Ahn's (1985) lexical phonology approach does not account for all the attested examples of base VS. The studies of Ko and Ahn will be discussed in the following section. Along with a comprehensive description on base VS, this study provides a simple analysis within the Word-and-Paradigm (WP) framework, without challenging traditional assumptions about vowel length contrasts. In what follows, I formulate Word Formation Rules (WFRs) and provide an analysis of Class 2, in which VS occurs.

5.5.1 Word formation rules

Because of the distinct roles of suffixation and base modification, two types of word formation rule (WFR) are required to account for ME (for a detailed discussion, see § 2.6.1). The crucial point is that base modification rules do not contain syntactic and semantic information, whereas suffixation rules do. The reason for this difference may lie in the discrepancy between the number of suffixes versus base alternations. Specifically, Korean has approximately 500 derivational affixes, but only one non-phonologically conditioned alternation (i.e., ME). Therefore, two derivational classes are identified. While each of the 500 derivational suffixes has its own meaning, the two classes of ME cannot map to the 500 meanings conveyed by suffixes. Thus, semantic/syntactic information is provided only by suffixation rules.

The following schema, repeated from § 2.6.1 for convenience, is proposed for the derivation of the main exponent.

(34) Schema of Suffixation Rules

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

(a) **Structural Description:**

Phonological Description: X

Syntactic Description:

Lexical category of the base

Semantic Description:

Meaning of the base

(b) **Structural Change:**

Phonological Change: XZ

Syntactic Change:

Lexical category of the derived form

Semantic Change:

Meaning of the derived form

Morphological Description:

Classes of affixes

As mentioned earlier, the SD of the suffixation rule, as in (34a) above contains syntactic information for the base, such as lexical category and semantic interpretation. The SD also provides a phonological form for the base. The SC in (34b) includes changes to the phonological shape, syntactic information, and semantic interpretation. Specifically, X, a phonological representation of the base in the SD, undergoes a phonological change to XZ in the SC. Z here denotes suffixal segments added to the base. In the semantic description, the 'meaning of X' changes to the 'meaning of XZ'. For Korean, the syntactic change described in the SC always results in a predicate, marked as PRED outside the bracket. This is because when derivational suffixes are added to a verbal/adjectival base, the stem always becomes a predicate. Importantly, the class of the affix is assigned by

suffixation in the SC because in derivational morphology, a suffix contains class information, while in inflectional morphology, the lexical base contains such information.

For base modification rules, the morphological description (i.e., class of the affixes) and the phonological description are provided in the SD, as in (35a) below.

(35) Schema of base modification Rules

$$\left[\begin{array}{c} \text{CLASS(ES)} \\ \text{(Aspect)} \end{array} \right] \\ [X]_B Z \quad \rightarrow \quad [X']_B Z$$

(a) **Structural Description:** (b) **Structural Change :**

Morphological Description: *Phonological change:*
Class of affix Z; Aspect *The base X is modified to X'*
Phonological Description:
The base is X

In the SC in (35b), a phonological change is indicated. X in (35a) refers to a phonological variant and X' in (35b) denotes that the phonological representation X is modified. Z refers to a suffix added in the suffixation rule. The domain for VS is the first syllable of a lexical base. Since VS occurs in the left edge of the base, it is not crucial to specify the domain ([]_B). Thus, the WFRs for Korean do not specify the domain.

Following the schema for the base modification rules, Rule 2 is formulated as in (36). In the SD, the phonological representation may include a long vowel, as presented in parentheses (V_l). The vowel length must be short in the SC. Y refers to any segments that follow the vowel.

(36) Rule 2 [Base-vowel shortening]

$$\left[\text{CL 2} \right] \\ XZ = C_1 V_1 (V_1) YZ \rightarrow C_1 V_1 YZ$$

These two WFRs are sufficient to account for base VS in Korean. Now let us consider how the rules are organized into *blocks* and applied in the correct order.

5.5.2 Rule blocks, rule ordering, and derivation

The current study assumes that WFRs are divided into *blocks*, following Anderson (1986, 1992) and Stump (2001), as discussed in §2.6.2. Distinct blocks allow multiple exponents that signify a single expression to be realized in the same base. In principle, rules belonging to the same block are incompatible, while rules in different blocks may be applied to the same form. For this reason, ME is accounted for by operating rules belonging to distinct blocks (see § 2.5.2 for a detailed discussion of rule blocks and rule ordering). Specifically, the suffixation rule (R1) and the base-vowel shortening rule (R2) should belong to distinct blocks, since suffixation and stem modification occur together as the main and subsidiary exponents, respectively.

In terms of rule ordering, recall that the suffixation rule takes precedence over the rule(s) for base modification, so that class is assigned by a suffix. The class information provided by the suffixation rule is then assigned to the base in the base modification rule.

To illustrate the derivation of a Class 2 word, see the causativised form in (37).

- (37) sal-li
 sa:l-li
 live -CAUS
 ‘save’

In (38a), suffixation of the causative suffix *-li* to the lexical base *sa:l* produces a predicate that has the meaning ‘to save’. The suffix also assigns Class 2 to the base. Then, the operation of R2 (base VS) results in *salli*, yielding a short base vowel.

(38) a. Schema of Suffixation Rules (Rule 1)

$$\left(\begin{array}{l} [X]\text{LexicalCategory} \\ \text{'Meaning of X'} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CLASS of suffix Z} \\ [XZ]\text{LexicalCategory} \\ \text{'Meaning of XZ'} \end{array} \right)$$

Operation of Rule 1

$$\left(\begin{array}{l} [\text{sa:l}]_v \\ \text{TO LIVE} \end{array} \right) \rightarrow \left(\begin{array}{l} \text{CL 2} \\ [\text{sa:l}i]_{\text{PRED}} \\ \text{TO SAVE} \end{array} \right)$$

b. Rule 2 [Base-vowel shortening]

$$\left(\begin{array}{l} \text{CL 2} \\ \text{XZ} = \text{C}_1\text{V}_1(\text{V}_1)\text{YZ} \end{array} \right) \rightarrow \text{C}_1\text{V}_1\text{YZ}$$

Operation of Rule 2

$$\left(\begin{array}{l} \text{CL 2} \\ \text{sa:l}i \end{array} \right) \rightarrow \text{salli}$$

In summary, the current study provides a simple but comprehensive formal account for Korean base VS in derivational morphology, including the classification of VS-associated suffixes (Class 1 and Class 2) and two WFRs organized into two different rule blocks. In what follows, alternative approaches will be discussed.

5.6 Previous studies

Kim's (1998, 2000) studies on Korean base VS have already been discussed in §5.4.1. I have shown that his proposed phonological motivation for VS (i.e., exhaustive parsing into foot structure) suffers under the weight of empirical counter-evidence. This section

discusses Ko's alternative account (2001, 2010), which considers VS as accent clash avoidance and Ahn's (1985) lexical phonology approach.

5.6.1 Ko (2002, 2013)

Somewhat radically, Ko proposes that base VS is the deaccenting of the base, rather than the shortening of the vowel. It is generally assumed that the Modern Korean long vowel originates from the Middle Korean rising tone (Huh, 1965, Lee, 1977). Ko (2002), on a synchronic basis, assumes that Korean has an underlying lexical accent, instead of a vowel length contrast, and that some suffixes have been assigned a lexical accent. Then, when an accented suffix is added to an accented base, the accent in the base is deleted to avoid accent clash. That is, when there are consecutive accents between verbal base and suffix, the left accent is deleted. This analysis is formulated in (39).

(39) Avoidance of accent clash (Ko, 2013: 91)

$$\acute{\sigma}]_V \acute{\sigma} \rightarrow \sigma]_V \acute{\sigma}$$

This deaccentuation has the effect of shortening the vowel, since an accented vowel tends to have longer duration.

The data in (40) and (41) are analyzed according to Ko's accent clash avoidance hypothesis.

- (40) a. /tám/ + /á/ → tam-á [tama] 'put in – Causal Connective'
 b. /tám/ + /ko/ → tám-ko [ta:mko] 'put in – Sequential Connective'
- (41) a. /tám/ + /kí/ → tam-kí [tamki] 'put in – Passive'
 b. /tám/ + /ki/ → tám-ki [ta:mki] 'put in – Nominalizer' (Ko, 2010: 9-10)

The causal connective *-a* and the passive suffix *-ki* are assumed to be accented suffixes, whereas the sequential connective *-ko* and the nominalising suffix *-ki* are not accented. The verbal base *tam* is accented. Note that the accents in (40a) and (41a) clash; thus, the rule in (39) is applied and the base is deaccented. As a consequence, the deaccented vowels are realized as short. In contrast, the suffixes in (40b) and (41b) do not have an inherent accent. Thus, the base vowels reserve the accent and, thereby, the vowel length as well).

Basically, Ko's idea is in line with the current study, in the sense that alternation-triggering suffixes are lexically assigned. In proposing an accentual account, her reasoning is that base VS cannot be accounted for with a moraic approach (Kim, 1998, 2000; David and Cho, 1994) or by referring to the segmental environment (Kim-Renaud, 1973). Another factor that favours an accentual approach is the behavior of multi-syllabic bases. Ko observes that multi-syllabic bases do not undergo VS, a fact that she attributes to the absence of accent clash in these environments. However, her observation conflicts with that of Davis and Cho (1994: 5), in which long vowels in multi-syllabic bases undergo VS. If Davis and Cho's observation is correct, VS occurs in the absence of accent clash, which weakens Ko's claim. As mentioned in §5.4.3, this issue is not resolvable at the present, when the vowel length contrast is disappearing.

In summary, Ko proposes that base VS occurs to avoid accent clash, which is lexically assigned. While Ko provides insightful observations on the VS phenomenon, her proposal to replace vowel length by accent challenges a well-accepted traditional assumption that the vowel length contrast exists and has a historical basis.

5.6.2 Ahn (1985)

In his dissertation on the interplay of phonology and morphology in Korean, Ahn accounts for base VS within the framework of Lexical Phonology (Kiparsky, 1982; Mohanan, 1982). Lexical phonology assumes that the lexicon consists of several ordered levels (i.e., strata). Each stratum is the domain of certain phonological and morphological rules. Ahn proposes that the Korean lexicon is organized into four ordered strata, as shown in (42). Here, I discuss only Stratum 3 and Stratum 4, which are relevant to the current study.

- (42) Stratum 1: sub-compounding
 Stratum 2: co-compounding
Stratum 3: derivation
Stratum 4: inflection, case-marking (p. 21)

Ahn suggests that derivation and inflection must be grouped into two distinct strata, in light of the post-nasal tensification process. In this process, a nasal consonant can trigger tensification of the following obstruent, but only if the latter occurs in inflectional suffixes (43a). As can be seen in (43b), the same verbal base does not trigger tensification of the initial stop in a derivational suffix.

- (43) a. kam -keys → kamkkeyt
 to wind-PST
 kam-sup → kamssup
 to wind-HOR
 kam-ta → kamtta
 to wind-DEC
- b. kam-ki → kamgi *kamkki
 to wind-CAUS

As discussed in §5.3.2.2.2, there are three adverb-deriving suffixes: *-i*, *-key*, and *-o/wu*. The suffix *-o/wu* triggers VS, while *-i* and *-key* do not. Thus, Ahn's rule does not account for cases in which the consonant-initial adverb-deriving suffix *-key* does not trigger VS and in which the vowel-initial adverb-deriving suffix *-o/wu* triggers VS. His rule, therefore, is unable to account for the full range of empirical data and needs to be modified.

Above, I have discussed Ahn's proposal that VS occurs in both inflectional derivational morphology and his analysis within Lexical Phonology. I have suggested revising Ahn's rule to account for the empirical data.

5.7 Summary

Verb/adjective base VS has received attention since first observed in Huh (1965). A full description of the process, however, has not been made, and the consequences of that lack are reflected in the analyses in previous literature. The current study has examined base VS and noted that VS behaves differently in two areas of the morphology. In inflectional morphology, on the one hand, VS shows a regular pattern: it occurs only before vowel-initial suffixes. On the other hand, in derivational morphology, a base vowel is shortened when followed by a lexically specified suffix. The lexically VS-specified suffixes include the passive/causative suffixes *-i*, *-hi*, *-li*, and *-ki*, the causative suffixes *-wu* and *-kwu*, the nominalising suffixes, *-i* and *-um*, the adverbialising suffix *-o/wu*, and the verbal intensifier *-kkali*. As can be seen in the list of VS-triggering suffixes,

initial sounds do not play a role. Also, through a discussion of Kim's (1998, 2000) works, I have shown that creating a well-formed foot structure does not motivate base VS.

In brief, VS in derivational morphology is not phonologically conditioned and always co-occurs with certain suffixes. It shows a consistent effect when followed by a main exponent (i.e., suffix). However, there are a few exceptional verbs in which VS does not occur for historical reasons. Also, the presence/absence of VS in multi-syllable bases is uncertain. Although the fourth criterion, *No exceptions on base selection* is not fully met, the evidence is sufficient to propose that VS and an accompanying-suffix constitutes ME in Modern Central Korean. Also, this finding is in line with the claim that alternations may differ in the degree to which they meet ME criteria, as was found for ME in Central Yup'ik. This study provides a clear analysis of ME in Korean within the framework of WP. The analysis is consistent with other analyses of ME that include distinct types of alternation, such as reduplication and vowel lengthening in Nuu-chah-nulth and different types of deletion in Central Yup'ik, which were examined in earlier chapters of this dissertation.

Chapter 6 Conclusion

This dissertation has examined non-phonologically conditioned base modifications that are accompanied by non-inflectional suffixes, as observed in three languages: Nuu-chah-nulth, Central Yup'ik, and Korean. To close this study, I summarize the main points discussed in earlier chapters.

First, I argued that base modifications that occur for no phonological reason should receive a separate consideration from phonologically conditioned morphophonological alternations. I proposed that a non-phonologically conditioned alternation and a triggering suffix together comprise Multiple Exponence (ME) and denote a single expression. In order to diagnose this type of base modification as ME, I considered what factors needed to be incorporated into diagnostic criteria for ME and considered whether all the criteria must be met to the same degree in all instances of ME.

In Chapter 2, I examined the phenomenon of ME in inflectional ME in Latin (Matthews, 1972) and provided four criteria to diagnose ME as follows:

(1) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

- (i) **Non-phonological condition**: no exponents are phonologically conditioned;
- (ii) **Consistent co-occurrence**: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

- (iii) **Phonological consistency**: phonological representations of the co-occurring exponents are consistent.
- (iv) **No exceptions on base selection**: an exponent may appear on any lexical bases of a morphological category.

In three case studies, base modifications and accompanied suffixes were examined as instances of ME by applying these criteria. Among the suggested four criteria, *Non-phonological condition* and *Consistent co-occurrence* are obligatory criteria. The criterion, *Non-phonological condition* distinguishes between base modification as part of ME and phonologically conditioned morphophonological alternations. The two other criteria (i.e., *Phonological consistency* and *No exceptions on base selection*) are violable, as shown in the cases of *te*-verb deletion in Central Yup'ik and vowel shortening in Korean. In this sense, parameters for ME are met to differing degrees by different alternations and/or different languages.

Identifying patterns of (non-phonologically conditioned) base modification has implications for employing the morphological model, Word-and-Paradigm (WP). I have suggested that derivational classes can be organized in accordance with patterns of base modification, which is in line with inflectional classes that are identified by the phonological shape of inflections. The proposed derivational classes differ from inflectional classes in that a derivational class consists of a group of *affixes* that share phonological exponents with base modification, whereas an inflectional class contains groups of *lexemes* that share exponents of inflectional markers. In addition, class information in inflectional morphology is inherently encoded on a base, whereas in non-inflectional morphology, affixes contain such information. Thus, affixation assigns a class to a base in non-inflectional morphology. The identified derivational classes are useful in describing morphological conditions in Word Formation Rules (WFRs) within the WP approach. The identification of derivational classes opens the way to expand WP to derivational morphology.

In this type of ME, which consists of a derivational suffix and at least one base modification, the number of suffixes (i.e., main exponents) exceeds the number of classes or patterns of base modification (i.e., subsidiary exponents). Thus, syntactic and semantic information for each suffix (approximately 500 in each language in the case studies) cannot be expressed with base modifications, which are limited in number (14 in Nuu-chah-nulth; 6 in Central Yup'ik; 2 in Korean). Therefore, I suggested two different types of WFR that account for ME in the current study: suffixation rules and base modification rules. A crucial difference between the two types of rule is that a suffixation rule contains syntactic and semantic information in the Structural Description and Structural Change, as well as morphological and phonological descriptions, whereas base modification WFRs contain only morphological and phonological information and phonological change. In addition, class information is assigned by a suffix in affixation. Therefore, class assignment is described in the Structural Change in suffixation rules. The class information assigned by suffixation is, then, assigned to a lexical base in the Structure Description of the base modification rules. Thus, suffixation rules are crucially applied before base modification rules.

In order to account for ME within the WP framework, a rule for the main exponent and rule(s) for the subsidiary exponent(s) must apply to the same base, which realizational models such as WP allow. However, special devices are required that properly allow or block the application of WFRs to the same base. WFRs that apply to the same base are organized into distinct *blocks* and rule ordering among such WFRs is enforced.

Chapter 3 examined VLA and reduplication accompanied by lexical/aspectual suffixes in Nuu-chah-nulth. VLA and reduplication were examined separately, and the seemingly distinct processes then received a unified account as subsidiary exponence within ME, based on the given criteria. VLA and reduplication meet all the criteria for ME along with an aspectual/lexical affix. That is, VLA and reduplication are *not phonologically conditioned* with respect to segmental environment and metrical structure. In terms of *Consistent co-occurrence*, whenever a main exponent (suffix) is present, VLA and/or reduplication always co-occur with the suffix. Also the shape of base modification is consistent, satisfying the criterion *Phonological consistency*. VLA and reduplication occur on the lexical bases of certain categories consistently, meeting the criterion, *No restriction on base selection*.

I proposed that Nuu-chah-nulth affixes are organized into 14 non-inflectional classes in accordance with patterns of base modification. This classification served as the basis for WFRs within the WP model. Ten WFRs were formulated to account for 14 classes of non-inflectional affixes. In this study, I showed that reduplication that only occurs with the iteratives *-š* and *-(y)a* and the inceptive *-siʔ* includes a copied coda. I proposed that the copied coda plays a role in signalling aspecthood. Within the WP approach, WFRs may apply to the same base. By allowing multiple applications of WFRs, ME phenomena receive a formal analysis within the framework of WP. The WP model successfully accounts for the multiple occurrence of triggering suffixes. That is, when more than one VLA/reduplication -triggering suffix is affixed to a base, the alternation occurs only once. Since a single WFR (e.g., a CV reduplication rule) may specify to more than one class (i.e., CL5-CL9), regardless of the number of suffixes in a form, the WP

model expects only one instance of reduplication to be realized in the surface form. I also discussed alternative studies: a Stratal OT approach (Stonham, 2007), a templatic approach (Kim, 2003b), and an approach within the prosodic circumscription theory, showing in all cases that these analyses have difficulties in accounting for the multiple occurrence of triggering suffixes.

Chapter 4 examined various types of deletion accompanied by postbases in Central Yup'ik. I showed that the deletions do not occur for any phonological reason. It was observed that cases of ME in Central Yup'ik meet the ME criteria to varying degrees. Base final C-deletion and base final VC-deletion meet all the criteria; but *te*-verb deletion I-III meet two or three of the criteria. Importantly, every type of deletion satisfies the crucial criteria, *Non-phonological condition* and *Consistent co-occurrence*. Six derivational classes were identified and ten WFRs for secondary exponents were formulated. Significantly, within the WP model, I was able to provide a formal account of ME that contains a subtractive secondary exponent. This subtractive ME, along with the multiple secondary exponents of Nuu-chah-nulth, provides evidence against Kurisu's (2001) OT analysis, which cannot account for ME that contains subtractive exponents or more than two exponents.

Chapter 5 explored Korean vowel shortening (VS) that occurs in verb or adjective bases. Previous studies observed that base VS occurs before vowel-initial suffixes, though with some exceptions. I argued that this description was incomplete and proposed that base VS in inflectional morphology and VS in derivational morphology should be treated differently. VS in inflectional morphology is a phonologically conditioned process (i.e., a base vowel is shortened before a vowel-initial suffix), whereas VS in

derivational morphology is ME. I provided a comprehensive description of base VS in derivational morphology, including three groups of suffixes that may attach to verbal or adjectival bases: verb/adjective-deriving suffixes (e.g., causative, passive, intensifier), adverb-deriving suffixes, and noun-deriving suffixes. Examination of these suffixes revealed that VS is attributable to a property of individual suffixes. Also, neither segmental differences (i.e., a consonant or vowel at the beginning of the suffix) nor the productivity of suffixes (e.g., the productive noun-deriving suffixes *-i* and *-ki* behave differently) affect the presence/absence of VS in derivational morphology.

The incomplete description of base VS has generated disagreement in the analyses of base VS in previous studies. I showed that Kim's (1998, 2000) trimoraic shortening analysis and Ahn's (1985) lexical phonology approach are not completely accurate and thus, unsatisfactory. I provided counter-examples in which trimoraic shortening is motivated but does not occur, and vice versa. I also showed that the VS rule in Ahn's analysis, which is supposed to apply to inflections (Stratum 3) and to derivations (Stratum 4), cannot account for derivational suffixes. Ko (2002, 2010) assumes that the vowel length contrast is, instead, lexically assigned accent and analyzes VS as a deaccentuation phenomenon. This approach challenges a well-established assumption that a vowel length contrast exists in Korean. Also, lexically assigned accents seem to be random, calling for further study. By providing a comprehensive description of base VS, I analyzed derivational base VS as ME in line with other case studies in the previous chapters of the dissertation and provided a simple analysis within the WP framework.

The current study examined base modifications accompanied by suffixes as ME. VLA and deletion, which were assumed to be phonological processes, received a unified

account as ME when they co-occur with a suffix. Also, criteria for ME were proposed to diagnose a phenomenon as ME. This study proposed derivational classes in accordance with patterns of non-phonologically conditioned base modification. The pattern of base modification is one way to identify derivational classes. This classification opened the way to apply the WP model to derivational morphology. To the best of my knowledge, this study is the first to employ the WP approach to derivational morphology since Anderson suggested this possibility in 1992. This study contributes to a theory of morphology not only in that seemingly distinct processes (i.e., reduplication, VLA, and deletion) receive a unified analysis as ME, but also in that the distinct processes are formally accounted for, expanding the WP approach to derivational morphology.

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