On the Exception to the /ʊ/ to /ʌ/ Change in Early Modern English*

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Chung, Inkie. 2012. **On the Exception to the /ʊ/ to /ʌ/ Change in Early Modern English.** *The Linguistic Association of Korea Journal. 20*(3). 39-58. This paper deals with an exception of the diachronic change in the history of the English language, i.e., the change of the short high back (lax) rounded vowel /ʊ/ in Middle English to the mid back/central lax unrounded vowel /ʌ/in Modern English. This exception is best analyzed as the inalterability effect of partial geminate structure (in the sense of Hayes, 1986) due to spreading of the [labial] node of the preceding labial consonant to the following vowel. It provides support for Halle, Vaux and Wolfe's (2000) revised articulator model, contra Clements' (1991) unified feature model. It also presents arguments supporting Halle, Vaux and Wolfe's (2000) claim that only terminal features spread in the geometrical representation of distinctive features. The analysis employs Calabrese's (2005) correlation statement and the notion of economy (Chomsky, 2000; Calabrese, 2005).

Key Words: Middle English, Modern English, historical vowel change, exception, feature geometry, terminal spreading, partial geminate, correlation statement, economy

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1. Introduction

1.1 The Data

One of the vowel changes in the transition from Middle English to Modern English is the change of the short high back round vowel /ʊ/ to the mid back unround /ʌ/ (Chomsky & Halle, 1968, pp. 268ff; Barber, 1976). The following Middle English (ME) and the corresponding Modern English (ModE) words show this diachronic change.

(1) Change of the Middle English /ʊ/ to the Modern English /ʌ/

ME /ʊ/	ModE /ʌ/	ME /ʊ/	ModE /ʌ/
tunge	tongue	nute	nut
dusti	dusty	luve	love
cumen	come	drunken	drunk(en)
bigunnen	begun	ȝung	young
sunne	sun	hunte	hunt
shunen	shun	up(pe)	up
thudden	thud		

However, this change did not occur when a labial consonant preceded the vowel (Lehmann, 1962, p. 151; Chomsky & Halle, 1968, p. 269). Thus, we have the following correspondences:

(2) No change of /ʊ/ after a labial consonant (including [w])

ME /ʊ/	ModE /ʊ/	ME /ʊ/	ModE /ʊ/
pullen	pull	ful	full
puten	put	wude	wood
busch	bush	wulf	wolf
bull	bull	wum(m)an	woman

The change and the exceptions can be expressed in the *SPE* system as follows:

(3) *SPE*-style formalism for the change of ME /ʊ/ to ModE /ʌ/

$$\begin{bmatrix} +\text{syll} \\ +\text{high} \\ +\text{back} \\ -\text{long} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{high} \\ -\text{round} \end{bmatrix} / \text{ except } \begin{bmatrix} \text{C} \\ +\text{lab} \end{bmatrix} \_\_\_$$

Although this formalism describes the fact, it does not explain why the change has an exception. Particularly, it does not say what role the [+labial] feature plays in preventing the vowel /ʊ/ from changing to /ʌ/. (For various descriptive analyses for this change and the exception, see chapter 6 of Chomsky & Halle, 1968.)[1)]

The purpose of this paper is to show how this exception can be explained, articulating the blocking nature of the context of the exception with the inalterability effect due to the doubly-linked partial-geminate structure (Hayes, 1986) and the principle of economy and Calabrese's (2005) correlation statement. The proposed analysis supports Halle, Vaux and Wolfe's (2000) revised articulator model over Clements' (1991) unified feature model, and the former authors' claim that only terminal nodes spread in the feature geometry.

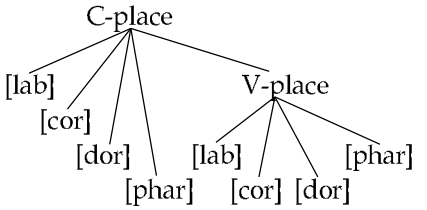
1.2 Theoretical Background

The exception in (2) can be viewed in two different ways. In one view, all the instances of /ʊ/ first change to /ʌ/, and subsequently the resulting /ʌ/ returns to /ʊ/ when they are preceded by a labial. The other view is to involve some restriction in the derounding process itself. That is, the change of /ʊ/ to /ʌ/ is blocked by virtue of the preceding labial consonant. This paper presents an analysis supporting the latter view. Section 4.1 points out problems with the

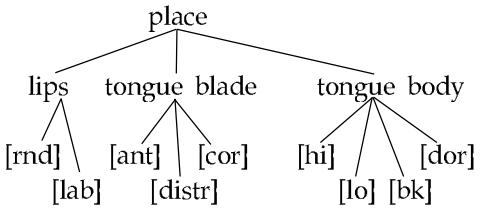
1) The change occurred around the seventeenth century, and has been restricted to middle and southern areas of Britain. Thus, the northern areas still retain the short high back round vowel (Barber, 1976). This paper does not address the nature of this change, whether it is an idiosyncratic or natural phonological 'rule' or it is better to be considered to arise from a markedness effect or a constraint interaction. Nor does it discuss the cause of the historical derounding change, either. The cause and the proper analysis of the change itself go beyond the scope of the present study. I focus on the exception to this change. Also, the situation in the northern areas of Britain is not discussed as this study is about the exception to the change: The northern areas have not shown any change at all.

former view. This paper specifically compares two versions of feature geometry, focusing on the representation of the place node within the whole feature organization: a unified feature model for consonants and vowels by Clements (1991) and Clements and Hume (1995); and a revised articulator model by Halle, Vaux and Wolfe (2000).

(4) Unified feature model (Clements, 1991 et seq.)



(5) Revised articulator model (Halle, Vaux & Wolfe, 2000)



I argue that Halle, Vaux and Wolfe's model explains the exception better than Clements' model does.

I introduce Calabrese's (2005) mechanism of "correlation statements." These statements relate certain phonological and phonetic/ derived properties to others within segments (Cf. Archangeli & Pulleyblank, 1994). It is a formal way of expressing affinity between certain phonologically primitive features and other phonetic or predictable features of a phonological segment. Calabrese (2005) puts:

> [...] in addition to the contrastive primary articulators, there can also be other non-contrastive secondary articulations in the production of these sounds. ... these non-contrastive aspects need to be represented phonologically. The correlation statements ... do that. (Calabrese, 2005, p. 60)

One such correlation statement proposed by Calabrese (2005, p. 62) is presented below:[2)]

(6) Labial and round correlation for vocoids
[labial] → [+round] / [___, –cons]

The Correlation Statement (6) describes that a labial vocoid gets the [+round] feature. Readers are referred to Calabrese (2005) for more discussion of the above correlation statement and some statements dealing with vowel lowering due to an adjacent guttural consonant in Tiberian Hebrew (discussed in McCarthy, 1994) and affrication or spirantization of a palatalized velar stop due to a high front vowel in Italian and many other languages.

In this paper, I will propose the converse of the above statement (i.e., (15)) to deal with the exception of the change of the Middle English /ʊ/ to the Modern English /ʌ/. The relevant predictable property which is normally provided by this correlation statement can come from another source. This derived non-distinctive property can interact with another phonological process. This interaction of the derived property and another property or process explains the exception of the historical vowel change in English.

The paper is organized as follows. Section 2 examines interactions between labial consonants and round vowels in a few languages. Section 3 presents an analysis of the exception to the change from /ʊ/ to /ʌ/ and shows that the revised articulator model (5) is superior to the unified feature model (4) and the classical articulator model (Halle, 1995; McCarthy, 1988; Sagey 1986). Section 4 provides possible alternative analyses. These alternatives turn out to be inadequate, and thus support the present analysis in section 3. Section 5 is a summary.

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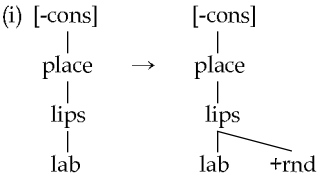
2) This formalism can be represented graphically as follows in Halle, Vaux and Wolfe's (2000) revised articulator model:

(i)


2. Affinity between Labial Consonants and Round Vowels

Before discussing the change from the Middle English /ʊ/ to the Modern English /ʌ/ and the exception, this section briefly presents relationships and interactions between labial consonants and round vowels. The study in this section would provide more insights into the understanding of the exception of the vowel change in English, because the exception is due to the preceding labial consonant. While doing this, three models of feature geometry are discussed. Among the three, Halle, Vaux and Wolfe's (2000) revised articulator model is shown to be superior to the classical articulator model (Sagey, 1986; Halle, 1995) and the unified feature model (Clements 1991; Clements & Hume 1995). Examples are from Korean and Romance languages.

2.1 Interaction between Labials and Rounds

It is well known that certain consonants interact with certain vocoids (i.e., vowels and glides). For example, labial consonants frequently make the adjacent vowels round. The high central unround vowel /ɯ/ in Middle Korean became /ʊ/ in Modern Korean after a labial consonant. (See Campbell, 1974, p. 52 for similar cases.)

(7) High back vowel rounding from Middle Korean to Modern Korean (diachronic)

MK	ModK	
pɯl	pul	'fire'
$p^hɯ$-	p^hu-	'to dig'
mɯl	mul	'water'

On the other hand, a labial consonant becomes a round vocoid in the history of many languages, or they alternate in synchronic changes (Campbell, 1974, p. 53). Again in Korean, a stem-final plain labial stop of a predicate becomes /w/ before a vowel-initial suffix.

(8) Synchronic alternation between a labial consonant and a round vocoid in Modern Korean

underlying	*concomitant*	*infinitive*	
top-	topko	towa	'to help'
kip-	kipko	kiwə	'to patch'
čʰup-	čʰupko	čʰuwə	'to be cold'

Conversely, round vocoids (typically, the high back round ones such as /u, w/) commonly strengthen to labial consonants. One representative case is found in Latin and its descendent languages. The glide /w/ in Latin changed to the labiodental /v/ or bilabial /b/ in modern Romance languages. (See Campbell, 1974, and Clements, 1991 for the reverse weakening cases.)

(9) Diachronic change of Latin /w/ to labial consonants /v, b/ in Romance languages (from Clements, 1991, p. 18)

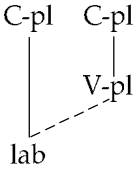
Latin /w/	Italian /v/	French /v/	Spanish /b/ (initially)	
vinum	vino	vin	vino	'wine'
vox	voce	voix	voz	'voice'
venit	viene	vient	viene	'comes'

The *SPE* distinctive feature system fails to capture such interactions and natural groupings of labial consonants and round vocoids (See Campbell, 1974; Clements, 1991, among others.).

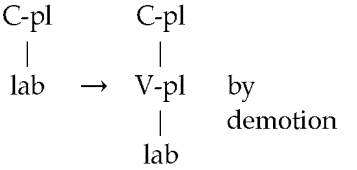
Clements' (1991) study is an attempt to relate this relationship between labial consonants and round vocoids within the framework of feature geometry. In his unified feature system (4), feature definitions of vowels are analogous to those of consonants. Thus the feature "labial characterizes vowels produced with labial protrusion (rounded vowels)", just as "a labial consonant is one whose primary constriction is formed by the lips" (Clements, 1991, pp. 37-38). His unified feature model formalizes the above phenomena with the single feature [labial]. (The changes of /p/ > /w/ and /w/ > /p/ should be accompanied by changes in values for [consonantal], [continuant], [sonorant] and so on.)

(10) Labial C and round V interaction in the unified feature model

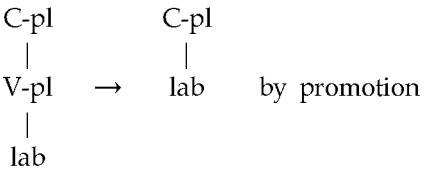
a. Vowel rounding in (7)



b. /p/ > /w/ in (8)



c. /w/ > /v,b/ in (9)



There are problems with the unified feature theory. One immediate question is whether the feature label "labial" has the same phonological or phonetic substance under C-place and under V-place, even if the "labial" under C-place and the "labial" under V-place both involve the lips. Labial under C-place indicates the major place of articulation, while labial under V-place means lip rounding, a property of secondary articulation.

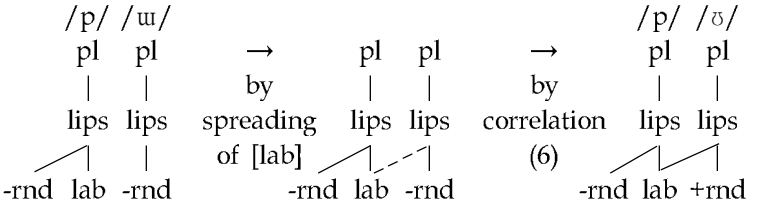
Another problem is that Clements' analysis of weakening and strengthening relies crucially on the mechanism of demotion and promotion. Thus, in the case of weakening, the labial node under C-place (for the place specification of a labial consonant) is "demoted" to the lower V-place node (for the place specification of a round vowel). The strengthening process is involved in the promotion operation, which is reverse to the demotion operation. The problem is: if the labial under C-place is really the same as the labial under V-place, its status should not need to be promoted or demoted. In addition to these conceptual problems, there are empirical problems with the unified feature theory (For some empirical problems, see Halle, Vaux & Wolfe, 2000, pp. 399ff.).

2.2 Revised Articulator Model and Terminal Spreading

Adopting Halle, Vaux and Wolfe's (2000) feature model and the correlation statement (6), vowel rounding by the adjacent labial consonant in the history of

Korean in (7) can be analyzed as follows. First, the designated articulator node [labial] of the labial consonant spreads to the vowel. The correlation statement (6) turns on the feature [+round] for the vowel with [labial], which is [–consonantal].

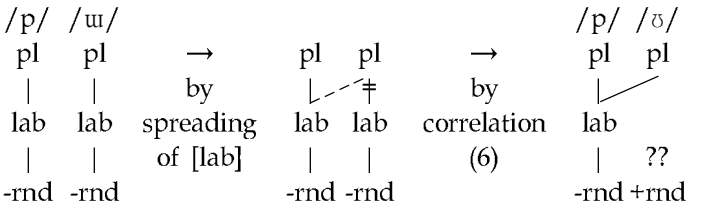
(11) Vowel rounding in (7): Terminal spreading in the revised articulator model



It should be pointed out that the proper feature geometry model is Halle, Vaux and Wolfe's (2000) revised articulator model, where the designated articulators are expressed as terminal features rather than as intermediate nodes. In this model, the secondary articulation feature [round] is not a dependent node of the primary articulator [labial]: both are daughters of a common functional node, [lips]. Hence the [labial] node of the preceding consonant can spread to the following vowel's [lips] node.

However, if a classical articulator model is assumed (e.g., Sagey, 1986; McCarthy, 1988; Halle, 1995), it is not clear how the correlation statement (6) would apply to the derived round vowel, whether or not the input unround vowel has the [–round] specification.

(12) Vowel rounding in (7): Classical articulator model

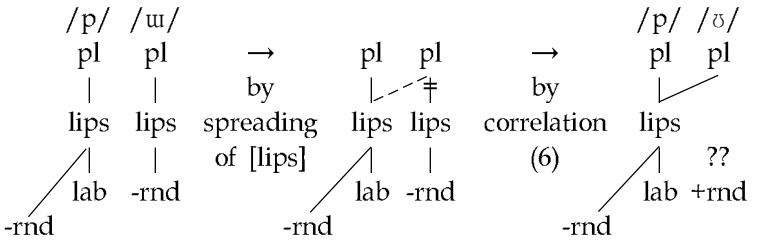


The [+round] feature cannot find the proper docking site for the vowel in the

final step. The labial node is linked to both segments in the second step of the derivation. Hence linking of [+round] to this node would result in a round labial consonant. If [+round] is forced to be associated solely with the vowel interpolating an intermediate [labial] node, the vowel will bear two [labial] nodes.

The same problem arises when spreading the intermediate node [lips] is adopted instead of spreading the terminal feature [labial] even in Halle, Vaux and Wolfe's model.

(13) Vowel rounding in (7): Non-terminal spreading in the revised articulator model

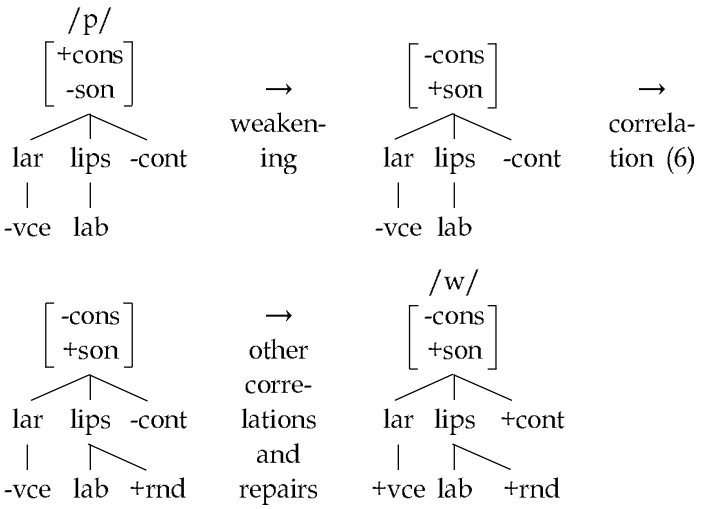


Again, if the intermediate node [lips] spreads, this doubly-linked node cannot but be uniform in having or not having [+round] node under it. Consequently, the surface sequence of an unround consonant plus a round vowel cannot be obtained. This is evidence for terminal feature spreading, which is argued in Halle (1995) and Halle, Vaux and Wolfe (2000), as the initial analysis (11) exhibits.

The change of /p/ to /w/ in (8) can be analyzed as the correlation statement (6) following the weakening process[3] as in the following (with irrelevant intermediate nodes omitted):

3) I interpret "weakening" (and "strengthening") as changing of root node feature values. Other changes, e.g., values for [continuant], [voiced] etc., are regarded as repairs of the resulting intermediate ill-formed structure. The correlation statement (6), then, can also be understood as one of these subsequent operations.

(14) Weakening of /p/ to /w/ in Korean (8): Terminal spreading in Halle, Vaux and Wolfe's (2000) model



The phenomena discussed in this section show that articulator nodes are terminal nodes and that only terminal nodes spread in feature geometry. Based on the discussions in this section, the following section provides an analysis of the vowel change in Early Modern English and the exception.

3. The Exception of /ʊ/ Derounding

Let us now turn to the exception of the Early Modern English change of /ʊ/ to /ʌ/. I propose the following labial-round correlation of vocoids, which is the converse of (6):[4]

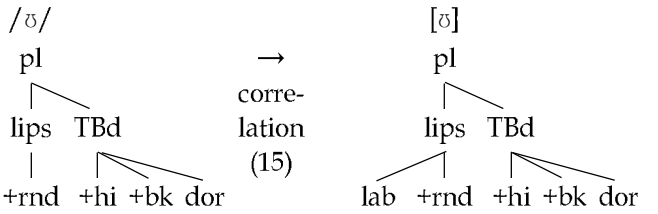
(15) Labial and round correlation of vocoids II
[+round] → [labial] / [___, –cons]

4) The two correlation statements (6) and (15) can be reduced to one biconditional statement:
(i) Bidirectional labial-and-round correlation of vocoids
[labial] ↔ [+round] / [___, -cons]

This correlation statement says that round vowels and glides acquire the [labial] node as a derived property. That is, a non-consonantal segment with lip rounding necessarily involves lips.[5)]

The underlying representation of /ʊ/, along with the glide /w/, does not have the specification for [labial] under the [lips] node; the vowel has only [+round]. On the surface, the vowel acquires [labial] by virtue of the correlation statement (15), as shown below.

(16) Application of the correlation statement (15) to /ʊ/



In ordinary cases, this correlation statement and the outcome of its application seem trivial in (16), since there is no phonologically or phonetically significant difference between the underlying /ʊ/ and the derived [ʊ]. However, the application of this correlation statement may interact with a phonological process, as discussed below.

The change from the Middle English /ʊ/ to the Modern English /ʌ/ can be encoded as follows in Halle, Vaux and Wolfe's revised articulator model (with irrelevant nodes omitted):

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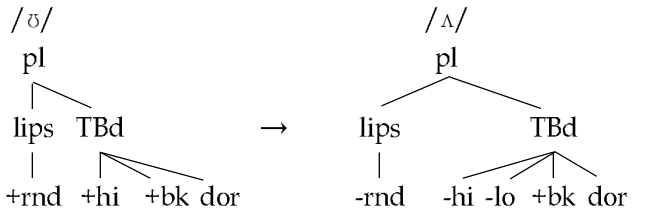
5) The relationship between [labial] and [+round] is supported by the acoustic properties as well. As is wellknown, the loci of the second and the third formants (F2 and F3) are relatively low for both labial and round segments, compared to those of both non-labial and unround segments.

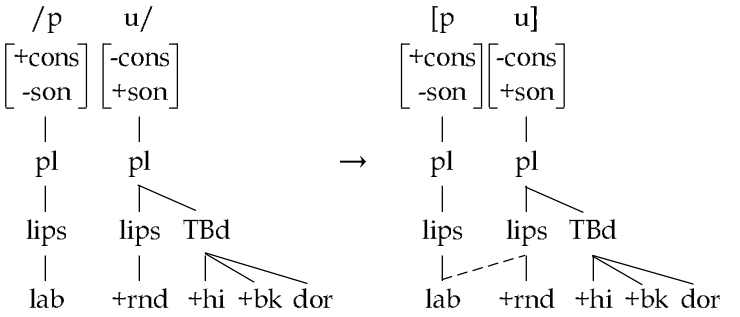
In a broader sense, correlation statements can be understood as a kind of redundancy rules (Cf. Stanley, 1967; Kiparsky, 1982; Archangeli, 1985). This may be the reason why the correlation statement (15) does not appear so compelling. See section 4.3 as well for the necessity of this correlation statement in an alternative analysis with a classical articulator model.

(17) Diachronic change of the ME /ʊ/ to the ModE /ʌ/



As in (2), this change did not take place when the vowel followed a labial consonant: The preceding labial consonant is responsible for blocking the change. Thus, the [labial] node of the preceding labial consonant spreads to the following vowel, instead of inserting the [labial] feature within the segment (due to the correlation statement (15)).

(18) Labial spreading: Doubly-linked structure in the [pu] sequence



This spreading operation yields a doubly-linked structure between the labial consonant and the following round vowel. This spreading is essentially the same as *w*-rounding after a labial consonant in the diachronic change (7) in Korean. The difference is that the effect of the same spreading operation is vacuous in the present case. Further, there is a strong solidarity, articulatory and acoustical, between the two groups of sounds as seen in the discussions of the labial-and-round correlation and *w*-strengthening. Finally, the [labial] articulator is necessary for /ʊ/ on the surface anyway. Addition of [labial] to the underlying /ʊ/ segment can be done in two different ways. One is the application of the correlation statement (15) as in (16). The other is done by

spreading [labial] of an adjacent labial consonant as in (18), which is the case for the present situation.

Then, the diachronic vowel change from /ʊ/ to /ʌ/, (17), is to apply. However, the diachronic change (17) is blocked due to Hayes' (1986) Linking Constraint (Cf. Uniform Applicability Condition by Schein & Steriade, 1986, p. 693.):

(19) Linking Constraint (Hayes, 1986)
Association lines are interpreted exhaustively.

According to the Linking Constraint when the structural description of a rule has a certain representation, the rule applies only if the representation is exhaustively present in the input. However, there is another feature [labial] along with the association line under the lips node in (18). The application of the /ʊ/-to-/ʌ/ change in (18) is blocked because, according to the Linking Constraint, the structural description of the rule is not met.

Summarizing this section, the correlation statement (15) applies so that the [+round] vowel acquires the [labial] feature. In a labial-plus-round sequence, however, the same effect is achieved by (18), spreading [labial] from the adjacent labial consonant. The historical change of the ME /ʊ/ to the ModE /ʌ/, (17), takes place. In the labial-and-round sequence case, however, this change is blocked, because the diachronic change refers to only part of the doubly-linked partial-geminate structure (Hayes, 1986). The following table illustrates the overall picture regarding the change and the exception.

(20) The /ʊ/-to-/ʌ/ change and the blocked case

Middle English	/ʊ/ not following a labial C	/ʊ/ following a labial C
Labial spreading (18)	n/a	√
/ʊ/ → /ʌ/ (17)	√	blocked by LC (19)
Modern English	/ʌ/	/ʊ/

4. Potential Alternative Accounts

This section considers other plausible analyses of the exception to the /ʊ/-to-/ʌ/ change. These potential alternative accounts are shown to be inadequate, supporting the revised articulator model and terminal spreading.

4.1 Derounding and then Rounding

Consider the first scenario: all the instances of the Middle English /ʊ/ uniformly became /ʌ/ and the resulting /ʌ/ changed back to /ʊ/ in the context of a preceding labial consonant. The reason of the latter rounding process might be considered similar to rounding of a vowel by a labial consonant in Korean as discussed in section 2.1.

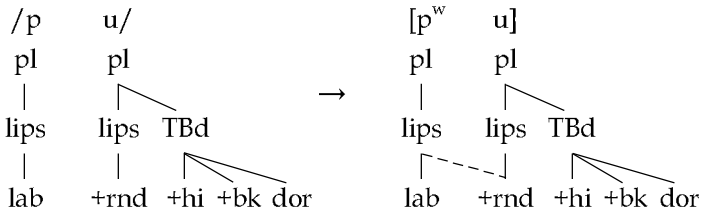
However, this analysis has several problems. It is not obvious how and why the whole process retreats back to the original segment in the environment of a preceding labial consonant. If this "derounding-and-then-rounding-back" analysis operates as spreading of [labial] node (i.e., rounding /ʌ/), the ultimate outcome should be /o/ rather than /ʊ/. There is no reasonable motivation for raising of /o/ to /ʊ/ in this context. Even if one could devise a way of raising the /o/ (from /ʌ/) to /ʊ/, the entire derivation is obviously uneconomical. Chomsky (2000) and Calabrese (2005) among others present the economy principle, an overarching principle in representation and derivation. The principle of derivational economy requires that the shortest derivation is chosen over the longer derivations when there are multiple derivations available yielding the same outcome. The "rounding back" derivation is uneconomical and is to be avoided because it is a round-about and vacuous derivation. For the conceptual and empirical reasons, this round-about analysis does not work, regardless of the appropriateness of feature organization and spreading operation.

4.2 Secondary Articulation

One might attribute the exceptional behavior to the effect of secondary articulation, in this case, labialization of the preceding labial consonant due to

the following round vowel. The [+round] feature of the original /ŏ/ would spread to the labial consonant and form a doubly-linked structure between the vowel and the consonant. Then, this partial geminate structure would prevent the original vowel /ŏ/ from changing into another segment as illustrated in the following representation.

(21) Doubly-linked structure in the [p^{w}u] sequence due to the secondary articulation effect

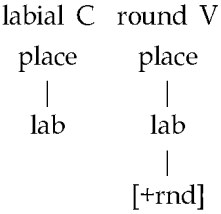


This treatment has an immediate problem. Not only labial consonants but also all other consonants are labialized before a round vowel: the /ŏ/ vowel and any preceding consonant form a partial geminate structure. Then, the change /ŏ/ > /ʌ/ should have occurred only word-initially without a consonant before the vowel. Hence, the secondary articulation effect is not relevant to the exception.

4.3 Merger

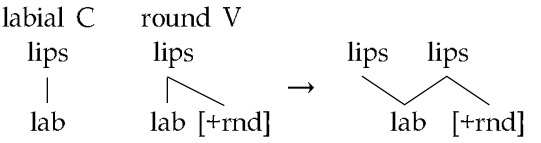
A third possibility is to capture the close solidarity between labial consonants and round vowels without appealing to such a correlation statement as (15) and the interceptive labial spreading as (18). Thus, formally, the two labial nodes of the labial consonant and of the round vowel would be merged into one node. Then the representation would have a doubly-linked structure, which then would resist the change. However, this idea cannot be implemented in a classical articulator model, because one of the labial nodes dominates nothing (in the case of labial consonants) while the other labial node (of vowels) dominates [+round], as the following illustrates.

(22) Impossible configuration for merger of labial C and round V in a classical articulator model



If the two nodes [labial] and [round] are not in a dominance relation, as in a revised articulator model (5), this merger operation could be embodied as follows.

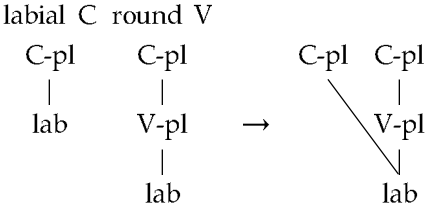
(23) Merger of labial C and round V in the revised articulator model



The problem of this merger analysis is the lack of its motivation. Also, the correlation statement (15) is necessary anyway, because the [labial] node is not present in the underlying form of the round vowel and has to be provided before the merger.

The merger analysis can be implemented in the unified feature model without the correlation statement (15). Since this model uses the same feature labels for consonants and vowels, e.g, [labial], these two nodes could merge even if they are located under different nodes.

(24) Merger of labial C and round V in the unified feature model



Again, there is no obvious motivation for merger with this model. Merger of the same node in different segments is possible if, for example, a phonological rule creates a merger of dependent nodes as Steriade's (1982) Shared Feature Convention shows. However, no phonological process merges dependent features under [labial] in (24).

5. Conclusion

I have considered the change of /ʊ/ to /ʌ/ in Modern English and its exception with a preceding labial consonant. As in the representation (18), the cohesion between a labial consonant and a round vowel supersedes the default correlation statement (15). The resulting partial geminate structure between the two segments resists the historical change of the vowel. There clearly exist interactions between phonological and derived properties.

In doing this, I have compared two particular versions of feature geometry, the unified feature theory (Clements, 1991 et seq.) and the revised articulator model (Halle, Vaux & Wolfe, 2000), along with classical articulator models. The proposed analysis shows that the revised articulator model better explains the fact concerning the vowel change and the exception. In addition, the present analysis supports the claim that only terminal features spread (Halle, 1995; Halle, Vaux & Wolfe, 2000).

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