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DRAFT #3

Sieves and Herrings: For Distinctive Vowel Length in Swedish[1]

0 Abstract

In this article, I reexamine the question of vowel and consonant length in Swedish, a hotly debated topic since at least Elert (1955). Vowel and consonant length depend on, and mutually predict, each other, making it difficult to tell which is phonemic. I will examine the traditional arguments used in the literature, but also introduce internal and external evidence never previously been discussed in the literature on Swedish phonology. The evidence favours Vowel Theory, where vowel length is distinctive. I will also show that all major assumptions of Consonant Theory are false. This will be done using evidence such as minimal pairs for vowel length, previously claimed to be logically impossible in Swedish. I will conclude that it is difficult to defend analyses with underlying consonant length, and that an analysis with vowel length is to be preferred.

1 Introduction

This article is about vowel and consonant length in Standard Central Swedish (SCSw.), the variety of Swedish spoken in Stockholm and surrounding areas. Phonologists have debated this question for many decades without reaching a consensus. The reason for this is that vowel and consonant length are not independent. Instead, the distribution of one determines the distribution of the other, and vice versa. The possible and impossible combinations of length are shown in (1) for CVC syllables.

(1) The problem

	Long vowel	Short vowel
Long consonant	*['siːlː], ungrammatical	['sɪlː] 'herring'
Short consonant	['siːl] 'sieve, strainer'	*['sɪl], ungrammatical

(1) shows that every CVC syllables has either a long consonant (as in ['sɪlː] 'herring') or a long vowel (as in ['siːl] 'sieve'). Syllables where both vowel and consonant are short are ungrammatical (as in *['sɪl]), as are syllables where they are both long (as in *['siːlː]). Consequently, if one knows the consonant length of the syllable, one also knows its vowel length: long consonant → short vowel, and short consonant → long vowel. However, it is also true that if one knows the vowel length, one knows the consonant length: long vowel → short consonant, and short vowel → long consonant. Phonologists must choose what kind of length they want to represent in speakers' mental lexicons.[2] It could be that vowel length is underlyingly represented, with consonant length derived by predictable rules. I will call this Vowel Theory throughout the article. Alternatively, consonant length could be underlying, with derived vowel length. This will be referred to as Consonant Theory. Phonologists have debated this problem for decades, and the following solutions have been the most common:

1 I would like to thank the following people for the invaluable help they have given me while working on this article: Bert Vaux, Ollie Sayeed, Lis Kerr, Tom Meadows, Tomas Riad, Anders Holmberg, and the audience at ULAB 2016. A special thanks to those of you who have taken the time to read and comment on previous drafts, especially Tomas Riad. This article would be far worse without your help. Responsibility for any remaining errors is of course entirely my own.

2 In section 6, we will see an argument against representing both kinds of length underlyingly.

(2) The solutions

Solution	Underlying representation of ['siːl] 'sieve'	Underlying representation of ['sɪlː] 'herring'	Some linguists in favour of this solution
Vowel length	/'siːl/	/'sil/	Engstrand (1999), Linell (1978), Witting (1977)
Consonant length	/'sil/	/'silː/	Riad (2014; henceforth R)
Consonant gemination	/'sil/	/'sill/	Elert (1955), Eliasson (1978), Eliasson (1985; henceforth E), Eliasson and LaPelle (1973)

In recent years, it seems that Consonant Theory (rows 2 and 3 in (2) above) has become more popular. For example, various forms of Consonant Theory are used in Eliasson (2010), Löfstedt (2010) and Riad (2014). In this article, however, I will argue for Vowel Theory (row 1 in (2) above). On this view, SCSw. has 17 vowel phonemes, and a phonological process which lengthens consonants after short stressed vowels. We will look at the evidence from the literature, and conclude that Vowel Theory is preferable, even in cases where the opposite initially seems to be true. But an important part of this article also introduces new evidence for Vowel Theory. This new evidence will be relevant to evaluating the predictions made by Consonant Theory. For example, it is often claimed that there are no minimal pairs for vowel length in SCSw., and even that such a contrast is impossible "by logical necessity" (Eliasson 2010: 28). Nevertheless, the empirical facts beg to differ, and I will show that SCSw. has perfect minimal pairs for vowel length. This makes it difficult to believe in Consonant Theory, which incorrectly predicts that they do not exist. I also outline my own Vowel Theory analysis of SCSw., which straightforwardly predicts the new evidence. I give internal and external evidence for the processes Vowel Theory needs. Unlike Consonant Theory, my analysis predicts the fact that some native speakers of Swedish claim that consonant length is impossible to perceive, even when told about it. However, although I argue for Vowel Theory, I also try to modify Consonant Theory to account for the new evidence throughout the article. It is my hope that this will help Consonant Theorists find possible solutions to the problems I present.

The rest of this article is structured as follows. In section 2, we examine the basic facts about vowels and consonants in SCSw., as well as the phonological processes which are common to both theories. In section 3, we turn to Consonant Theory and the processes it requires. We also use internal and external evidence to argue for those processes, and provide a number of arguments in favour of Consonant Theory. Section 4 is the equivalent of section 3 for Vowel Theory, and includes rules, motivations and arguments. Having examined both theories, we will begin the process of comparing them. Section 5 presents counterarguments to the discussion in section 3, and reduces the motivation for believing in Consonant Theory. In section 6 the new evidence is presented, including minimal pairs for vowel length. The section aims to compare the theories' main predictions, and finds that Vowel Theory is preferable. Section 7 concludes the article.

2 Basic Facts

This section introduces the basic facts about the phones found in surface forms of SCSw. and the different ways of analysing them. It will not be necessary to know every allophone of every phoneme, and we will not mention allophony which will not be significant later on. With this said, let's look at the Swedish vowels. In the table below, I provide the 17 main vowel allophones of SCSw., along with their underlying forms according to Vowel Theory. What I and all other phonologists working on Swedish call ”long vowels” are partially or fully diphthongised in the surface form, as the transcriptions show (see also Eklund and Traunmüller 1997 and the references in R: 41). The exact quality of the offglides of these diphthongs is irrelevant for us here. Therefore, I have transcribed them approximately as realised in my idiolect.

(3) The vowels

UR (Vowel Theory)	SR	Translation
/ˈsiːl/	[siːjl]	sieve
/ˈsɪl/	[sɪlː]	herring
/ˈsyːl/	[syːjl]	awl, needle
/ˈsʏl/	[sʏlː]	sleeper (part of railway)
/ˈbeːt/	[beːətʰ]	bit, preterite of bite
/ˈbe̞t/	[be̞tʰː]	bite, noun
/ˈløːs/	[løːəs]	loose
/ˈlø̞s/	[lø̞sː]	lice
/ˈɧɛːl/	[ɧɛːəl]	reason, noun
/ˈɧe̞l/	[ɧe̞lː][3]	bark, imperative
/ˈmɑːt/	[mɑːətʰ]	food
/ˈmat/	[matʰː]	matte
/ˈmoːl/	[moːəl]	goal
/ˈmɔl/	[mɔlː]	minor (music)
/ˈruːt/	[ruːβtʰ]	root
/ˈrʊ-t/	[rʊtʰː]	rowed (active past participle)[4]
/ˈfʉːl/	[fʉːβl]	ugly
/ˈfɵl/	[fɵlː]	full

Note that it will be useful for us to talk about these 17 vowels as 9 long-short pairs in many places, and to talk about /iː/ as the long vowel counterpart of /ɪ/, for example. If Vowel Theory is correct, as I will argue, these 17 vowel qualities correspond to 17 vowel phonemes, leaving SCSw. with the following 18 consonant phonemes: /p, t, k, b, d, g, f, v, s, ɕ, ɧ[5], h, m, n, ŋ, l, r, j/. Consonant Theory instead proposes nine vowel phonemes (one for each of the nine pairs above), indicated in Riad (2014) with the quality of the long vowel: /i, y, e, ø, ɛ, ɑ, o, u, ʉ/ (R: 17). When writing underlying forms in Consonant Theory, I will use the same symbols. Since Riad believes in consonant length, he is left with 34 consonant phonemes (R: 45). 34 is not a

3 This vowel is the same as that of [be̞tʰː] 'bite' in SCSw. It is included it here to show that SCSw. is one of the varieties of Swedish merging the short vowel counterparts of /eː/ and /ɛː/. We will return to this in section 5.

4 /ʊ/ is a rather rare vowel, which is why, even as a native speaker, I have been unable to find a monomorphemic minimal pair for it and /uː/.

5 /ɧ/ is used here for the phoneme realised as [ɧ] in onsets and [ʂ] in codas (see R: chapter 3). Some varieties of SCSw. (including my own) lack the [ʂ]-[ɕ] contrast, leading to a slightly different set of phonemes and allophones.

typo for 36. The two consonants /ɧ, h/ never occur in codas, so their long counterparts *[ɧː] and *[hː] do not exist in SCSw. (R: 45).[6] The word for 'sieve' would be /ˈsil/ according to Riad, and 'herring' would be /ˈsilː/.[7] Eliasson (1985) instead favours Consonant Theory with gemination, leading to the same nine vowel phonemes as in Riad's theory, and the same 18 consonant phonemes as in Vowel Theory. For Eliasson, 'sieve' is /ˈsil/, while 'herring' is /ˈsill/.

Before we move on to detailed phonological analyses, we will note a few phonological processes which both Vowel and Consonant Theory require. We do this here in order to avoid repeating the processes and the data motivating them in the separate sections on Consonant Theory (section 3) and Vowel Theory (section 4). All processes will be given a name in **bold**, a prose description, and a formalisation in Rule-Based Phonology. The first process common to both Vowel and Consonant Theory is **C short**, a process of unstressed consonant shortening. The motivation comes from words like the one given below (taken from R: 179). Note that the superscript 2 indicates both primary stress and the so-called second or grave pitch accent (see e.g. R: 181-191 for a phonological analysis, and references therein). I've included pitch accent in phonemic transcriptions not as a statement about underlying forms, but because any rules for the assignment of pitch accent will not be relevant in this article. The same applies to my use of stress marks.

(4) Motivating **C short**

UR (Vowel Theory)	SR	Translation
/^{2}krʏst-ad-t/	[^{2}k^{h}rʏsːtat^h]	strained/contrived, neut. pass. past part.

An assimilation rule which need not concern us initially gives an intermediate form ending in tt: ^{2}ˈkrʏstad-t → ^{2}ˈkrʏstatt. This is then shortened by **C short** because the syllable which the tt cluster is in is unstressed. So in prose, **C short** is: ”Shorten a consonant in an unstressed syllable.” Formally, it is: $C_i \rightarrow Ø$ / $C_i\_$ when unstressed.

Next, we will look at another consonant shortening rule, which I will call **shortening after consonants**, or **SAC** for short. In prose, it is: “Shorten a consonant after another consonant.” Formally, it is: $C_i \rightarrow Ø$ / C_C_i Below is an example of a derivation where **SAC** applies, using the underlying form of Vowel Theory:

(5) Motivating **SAC**

UR (Vowel Theory)	SR	Translation
/ˈvẹnd-d/	[ˈvẹnːd][8]	turned, common gender passive past participle

The steps of the derivation are: vẹnd-d → vẹnd (**SAC**) → [ˈvẹnːd] (other theory-dependent rules; see sections 3 and 4). **SAC** is missing from the descriptions of Swedish found in Eliasson and LaPelle (1973), and it is unclear why. Since 'turned' does not surface with a long *[dː], some rule like **SAC** appears to be necessary.

A final point I wish to make concerns the quantity rules which we will begin to look at

6 With the exception of a handful of borrowed names, like [ˈaɧːmẹd] 'Ahmed', where [ɧː] does appear.

7 Riad actually uses a suberscript Greek letter μ (for mora) instead of the IPA length diacritic, so 'herring' is /ˈsil$^\mu$/ in his notation (R: 45). He points out (p.c.) that he interprets the consonant system as having eighteen units, with a general quantity contrast, rather than 34 separate phonemes. This will not be relevant to us.

8 The first consonant in CC clusters is sometimes written as half-long. For example, Eliasson (1982) uses the feature [half-long]. Some even write it as fully short (Löfstedt 2010: 12 and Witting 1977: 31). Witting and Löfstedt both cite Kloster-Jensen (1962), but that study only considers Norwegian in the relevant ways. I follow Riad (R: 167, footnote 8), and assume that these consonants are long in the surface form, even if they may be shorter in the bodily output. For the distinction between surface form and bodily output, see e.g. Hale and Reiss (2008: 83).

in the next chapter. In both theories, quantity rules will make reference to stressed syllables. Perhaps confusingly, a stressed syllable does *not* refer to the most prominent syllable within a phonological word. Rather, these statements are meant to hold for a lower level of the prosodic hierarchy, which Riad, following Itô and Mester (2012), calls the minimal prosodic word (see R, ch. 5). This means that lengthening under primary stress can take place more than once per phonological word. This is the case with compounds, for example. Different prosodic word structure can give rise to surface minimal pairs for both vowel and consonant length (the vowel example is from R: 137).

(6) Prosodically conditioned minimal pairs
a) Consonants

Prosodic structure	UR (Vowel Theory)	SR	Translation
One prosodic word:	/^{2}sløːs-ɪg/	[^{2}sløːsɪg]	wasteful
Two prosodic words:	/^{2}sløː-ˌsɪg/	[^{2}sløːˌsɪgː]	lazy + cigarettes (perhaps 'cigarettes smoked when lazy')

b) Vowels

Prosodic structure	UR (Vowel Theory)	SR	Translation
One prosodic word:	/^{2}tɪlt-a/	[^{2}t^{h}ɪlːta]	to tilt
Two prosodic words:	/^{2}tɪl-ˌtɑː/	[^{2}t^{h}ɪlˌt^{h}ɑː]	to increase (intrans.)

These are not true minimal pairs, since the difference in length is caused by a prosodic contrast. So for a), one does not need an underlying contrast between /g/ and /gg/ in order to explain the surface contrast [g] vs [gː]. However, it is worth remembering that this difference is prosodic, and not morphological. One can find monomorphemic words which still have two long segments, and thus two prosodic words, e.g. [^{2}ɪŋːe̞ˌfɛːra] 'ginger' and [^{2}ɑːˌɭanːda][9] 'Arlanda, place name.'[10] Notice that quantity is not the only trace of prosodic word structure; compare the aspiration in [^{2}t^{h}ɪlːta] 'to tilt' and [^{2}t^{h}ɪlˌt^{h}ɑː] 'to increase.' Differences in prosodic word structure will not play a large role in this article, but it is important to know how the word 'stressed' is interpreted, and that the minimal pairs illustrated above are different from the true minimal pairs in section 6.

We have now seen the basic facts about quantity in Swedish. There are 17 main vowel qualities, and 18 main consonant qualities. We have also noted two phonological processes which are common to both theories. In section 3, we will begin to explore the formal sides of Consonant Theory. What phonological processes does it propose, and how well-motivated are they?

3 Consonant Theory

In this section, we will see that Consonant Theory needs two rules to account for the relevant data on quantity, excluding ones introduced in the previous section. The remaining ones are **C_2 length** and **V length**. The latter rule covers three environments in which vowels lengthen, but

9 Because the retroflex [ɭ] comes from underlying /rl/, I am unable to syllabify the surface form of words like these (including, among others, my last name). There is no reason that I have placed the secondary stress mark before the [ɭ] and not after it. For more reading on retroflexes in SCSw., see Riad (R: ch. 4) and references therein.

10 Some analyse this as having two morphemes, since the sequence /landa/ occurs in other place names. However, it seems obvious to me that as placenames are not semantically compositional, they must necessarily be stored wholes.

I include it here as a single rule. When one sees functionally similar processes it is essentially an empirical question whether or not they are linked *formally*. Some criteria for thinking that they are related are given in Kiparsky (1982: 112). These criteria include processes showing parallel developments in diachronic change, identical sets of lexical exceptions etc. Unfortunately, I do not know of any data allowing us to test these predictions. I will talk about **V length** as if it were a single rule, acknowledging that there is no evidence for this. However, let's begin with **C_2 length**.

3.1 C_2 Length

C_2 length lengthens consonants in certain clusters. In prose, it can be stated as: "In a stressed syllable, lengthen the first of two or more tautomorphemic consonants." The motivation for this rule is that consonant length is predictable in this environment. There are words like [ˈmjø̞lːkʰ] 'milk' (underlyingly /ˈmjølk/ in Consonant Theory), but single morphemes of the type *[ˈmjøːlkʰ] "are ungrammatical" (Löfstedt 2010: 49).[11] If something is predictable, the argument goes, it is better to derive it by rule than to store it for each individual lexical item. **C_2 length** applies to words like those in (7) a), but does not apply in the words in (7) b) since those have a morpheme boundary within the cluster.

(7) Motivating **C_2 length**

UR (Consonant Theory)	SR	Translation
a) Application		
/ˈfest/	[ˈfe̞sːtʰ]	party, noun
/ˈmjølk/	[ˈmjø̞lːkʰ]	milk
b) Non-application before a morpheme boundary		
/ˈkɑl-t/	[ˈkʰɑːltʰ]	bare, neuter; cf. [ˈkʰɑːl] 'bare, common'
/ˈsul-s/	[ˈsuːls]	sun, possessive; cf. [ˈsuːl] 'sun'

3.2 V Length

The final rule to be discussed is the most complicated one, **V length**. As I have already mentioned, vowel lengthening occurs in a number of different contexts. In the literature, there have been several proposals for how to formalise **V length**, including Teleman (1969) and Eliasson and LaPelle (1973). Both of these analyses, however, make incorrect predictions. The problem lies in separating words like /ˈvit-t/ 'white, neuter' (which surface with a short vowel) from words like /^{2}mut-ˌtɑ/ 'to receive' (which surface with a long vowel). It is true that these linguists do not explicitly discuss what happens when there is more than one prosodic word, as in /^{2}mut-ˌtɑ/ 'to receive'. However, their analysis of single prosodic words fails to extend to these cases. Both of these types of words have the sequence /t-t/, so the rules proposed incorrectly produce a short vowel for both of them. Both analyses are also arguably conceptually undesirable. Teleman's (1969) analysis requires Duke of York derivations (Eliasson and LaPelle 1973: 144, footnote 15. These derivations have the general form A → B → A; a segment undergoes a change, only to be changed back into its underlying form later on (Pullum 1976). For example, Teleman has 'white, neuter' with a short vowel underlyingly, and this vowel lengthens only to be shortened again.

Because of these issues with earlier analyses, I propose a new one here. Its one flaw –

11 In actual fact, many words of this form exist. They are typically treated as exceptions in Consonant Theory, and will be discussed further in section 6.

being convoluted – is compensated for by the fact that it is empirically adequate. It goes without saying that any analysis which cannot explain all Swedish words is not the analysis that native speakers use. If a complicated analysis is the only one which provides empirical coverage, then it is preferable to others, even if it is not economical (though see Boeckx, Hornstein and Nunes 2010: 2 for a different opinion). With this said, we are ready to take a look at **V length**. In prose, it is: ”Vowels lengthen under primary stress a) in open syllables b) before an optional consonant C_i, and an optional sequence of a morpheme boundary and a different consonant C_j, c) before an optional consonant at the end of a prosodically minimal word ω^{min}, d) before sequences of /r/ and a coronal consonant.” Formally, these four vowel lengthenings can be written as follows:

(8) **V length**, the rules
a) V → Vː / ˈ_.
b) V → Vː / ˈ_(C_i)(-C_j)
c) V → Vː / ˈ_(C)]$_{\omega\text{-min}}$
d) V → Vː / ˈ_r[+coronal, +consonant]

These four rules give lengthening in i) open syllables (9) a), ii) before a single word-final consonant (9) b), but not before geminate consonants (9) c) nor before tautomorphemic consonant clusters (9) d), iii) before an optional consonant, a morpheme boundary and a different consonant (9) e), but not before identical consonants split by a morpheme boundary (9) f), iv) before an optional consonant at the end of a phonological word, even if the following consonant is identical (9) g), and v) before /r/ followed by a coronal consonant (9) h).

(9) **V length** in action

UR (Consonant Theory)	SR	Translation
a) Open syllables		
/ˈse/	[ˈseː]	to see
/ˈpeter/	[ˈpʰeːtḙr]	Peter
b) Before single word-final consonants		
/ˈsil/	[ˈsiːl]	sieve
c) Not before geminate consonants		
/ˈsill/	[ˈsɪlː]	herring
d) Not before consonant clusters within a morpheme		
/ˈmjølk/	[ˈmjø̞lːkʰ]	milk
e) Before an optional consonant, a morpheme boundary and a different consonant		
/ˈse-s/	[ˈseːs]	see, passive
/ˈgʉl-t/	[ˈgʉːltʰ]	yellow, neuter
f) Not before a consonant, a morpheme boundary and the same consonant		
/ˈvit-t/	[ˈvɪtʰː]	white, neuter
g) At the end of a minimal prosodic word		
/^{2}sil]$_{\omega\text{-min}}$-førˌstør-else/	[^{2}siːlfø̞ʂˌʈøːrḙlsḙ]	sieve destruction

/^{2}sil]$_{\omega\text{-min}}$-ˌlɑgr-iŋ/ [^{2}siːl̩(l)ɑːgrɪŋ][12] sieve storage

h) Before /r/ and a coronal consonant
/ˈvɛrd/ [ˈvɛːɖ] world

Having seen what **V length** does and does not do, let's look at the motivation for such a rule. Something like **V length** is clearly needed in a Consonant Theoretic description of Swedish. Since long vowels are claimed not to be underlying, they must come from a vowel lengthening rule. However, there is also motivation from alternations, second-language transfer and loanwords supporting the existence of this rule. We will begin with the alternations, as they have been very important in Consonant Theoretic argumentation. They are, for example, the sole topic of Eliasson (1985), and an important part of Riad (2014). The argument is as follows: **V length** ensures that vowels lengthen in (some) stressed syllables. If stress were somehow moved around in a word, vowel length should follow. This is exactly what is observed in what I call the 'critical' alternations (E: 116).

(10) The 'critical' alternations

UR (Consonant Theory)	SR	Translation
/kriˈt-ik/	[kʰrɪˈtʰiːkʰ]	criticism
/ˈkrit-isk/	[ˈkʰriːtɪsk]	critical

In 'critical', the stressed root has a long vowel. But in 'criticism', the suffix /-ik/ attracts the stress, so that the base becomes unstressed. The stress shift is why the root vowel in 'criticism' is short, and why the suffix vowel is long. Since these alternations will come up again, I ask the reader to remember that joint stress-length movement is what “the 'critical' alternations” refers to. These alternations have been claimed to be difficult or even fatal for Vowel Theory, for the following reasons. In Vowel Theory, one could include a vowel lengthening rule to explain alternations like these. However, that somewhat defeats the point of the theory, ”given that one manages to bring all the other cases of long vowels under the rule” (R: 171). Another alternative would be to set up the vowel of /krit/ as underlyingly long, with shortening in unstressed syllables. Yet there is no reason to think that it is long in the base form [kʰrɪˈtʰiːkʰ] 'criticism', so it is unclear why learners would propose such an analysis. The alternations are also ”fully productive” (E: 120), which cannot be explained other than by a vowel lengthening rule. Furthermore, they have been claimed to be so frequent that an account which does not feature vowel lengthening is implausible (E: 119-120 and Eliasson 2010: 14).[13] Eliasson also makes the argument that Vowel Theory ”tends to obscure the relation between vowel length and stress” (Eliasson 1978: 118), because it treats the long and short vowel pairs – which show a close interaction in the 'critical' alternations – as completely separate phonological units (see also Eliasson 1985: 119 and Eliasson and LaPelle 1973: 135).

Another argument for **V length** is that it applies in loanwords. Löfstedt (1992: 95) mentions [pʰaˈniːkʰ] 'panic' from French [paˈnik], rather than *[pʰaˈnɪkʰː]. This example is not ideal, because it may be that the French tense vowel quality [i] causes people to prefer the tense vowel [iː] over a form with the lax vowel [ɪ]. In other words, people may prioritise faithful borrowing of quality to faithful borrowing of quantity. However, other French loanwords show that this is not the case. One gets [pʰaˈrɑːd] 'parade' from French [paˈʁad],

12 For the quantity of the [l] or [lː] here, see Elert (1964: 37-38) and Hellberg (1974: 86)

13 I have never before seen the argument that children avoid postulating phonological rules which would have to apply very frequently, and Eliasson provides no evidence for why this should be the case. The proposal seems to be immediately falsified by languages with vowel harmony.

even though *[pʰa'radː] would match the French vowel quality better. A final argument for **V length** is Eliasson's (1982) report on unpublished work by Karlsson (1977). Karlsson found that when given a Finnish CVCV word, like ['tuli] 'fire', his students tended to lengthen the vowel – ['tʰuːlɪ] – as predicted by **V length** (Eliasson 1982: 189-190).

Before concluding this section, we will look at some additional arguments for Consonant Theory and against Vowel Theory. The first has to do with morphophonology. Some long consonants arise from sequences of two identical consonants. So /'vit/ 'white', when suffixed with neuter /t/, surfaces with a long [tʰː]. Therefore, we ought to assume that all long consonants are in fact clusters of identical consonants underlyingly. This simplifies our morphophonological descriptions, since long consonants both within and across stems have the same underlying source. This argument is found in many places in the literature, including Elert (1964: 40), Elert (1970: 55), Eliasson (1978: 113), Eliasson (E: 118), Eliasson (2010: 11) and Eliasson and LaPelle (1973: 137).

Typological arguments also seem to favour Consonant Theory. It has been pointed out that Vowel Theory requires 17 vowel phonemes for Standard Central Swedish, a number so high as to be ”dubious from the perspective of a universal phonological theory” (Eliasson and LaPelle 1973: 133, my translation; see also Elert 1964: 42-43 and Eliasson 1985: 105-107). Eliasson has also argued for Consonant Theory on the basis of phonotactics (Eliasson 1978: 113, E: 118 and Eliasson and LaPelle 1973: 138). Consider the table in (11):

(11) Vowel Theory phonotactics

First C / Second C	s	k
s	-	/'fɪsk/ 'fish, noun'
k	/'fɪks/ 'fix, noun'	-

This table shows some attested and unattested clusters in Swedish according to Vowel Theory. Notice that /s/ and /k/ can occupy both the first and the second position in a word-final cluster. Morphemes like /'fɪss/ or /'fɪkk/ do not violate this pattern; /s/ is allowed in the first position, and in the second position, and /fɪss/ is consistent with that information. Yet in Vowel Theory, morphemes of this type, with geminate consonants, are not found. In Consonant Theory, on the other hand, they do exist, because consonant length is represented underlyingly. Consonant Theory, then, fills an otherwise unexplained phonotactic gap in Swedish.

Long consonants, Eliasson points out, are also syllabified in the same way as consonant clusters (Eliasson 1978: 113-114, E: 118 and Eliasson 2010: 11), giving further justification to a theory where both clusters and geminates are represented as clusters underlyingly. Moreover, Vowel Theory stores predictable information – vowel length – in the lexicon, which is undesirable (Eliasson 1978: 118 and Eliasson 2010: 14). In other work, Eliasson claims that the absence of minimal pairs for vowel length ”ought, of course, to be totally devastating” to Vowel Theory (E: 108). Note also that vowel length is oddly distributed if Vowel Theory is correct. For example, why are all vowels in stressed open syllables long? Why are all vowels before tautomorphemic consonant clusters short? Why are all unstressed vowels short? These facts follow from the contexts in which **V length** does and does not apply, but have to be stipulated in Vowel Theory (E: 114-115).

We will end this section with the most persuasive argument for Consonant Theory which I am aware of. It is not applicable to the versions of Consonant Theory proposed by

Eliasson and LaPelle (1973) and Riad (2014), which is why it is difficult to find it in the literature. Indeed, while the facts I'm about to present have been discussed, I am not aware of any linguist ever having used them to argue for Consonant Theory. The argument rests on a contrast between a morpheme /t/ and a morpheme /tt/. This cannot be expressed in Vowel Theory, where /tt/ is impossible within a morpheme. The morpheme /t/ is the definite suffix for neuter nouns. The surface form varies between [ẹt^h] and [t^h], both within and across speakers (Riad 2003), but I believe that all speakers agree on the possible/impossible forms presented here. Consider the following table for the neuter noun 'knee':

(12) Definite knees

	UR (Consonant Theory)	SR	Translation
Non-definite form:	/ˈknɛ/	[ˈk^{h}nɛː]	knee
Definite form with correct suffix /t/:	/ˈknɛ-t/	[ˈk^{h}nɛːt^h]	the knee
Definite form with incorrect suffix /tt/:	*/ˈknɛ-tt/	*[ˈk^{h}nẹt^{h}ː]	intended: the knee

This shows that the definite neuter suffix consists of a single /t/. Next we will consider the neuter suffix for adjectives, which is /tt/ (for more suffixes which pattern this way, see R: 174). To prove its quantity, we will look at the common and neuter gender forms of 'new'. I am not aware of any variation for this suffix whatsoever.

(13) 'new' evidence

	UR (Consonant Theory)	SR	Translation
Common gender form:	/ˈny/	[ˈnyː]	new
Neuter form with correct suffix /tt/:	/ˈny-tt/	[ˈnʏt^{h}ː]	new, neuter
Neuter form with incorrect suffix /t/:	*/ˈny-t/	*[ˈnyːt^h]	intended: new, neuter

This shows that the neuter adjective suffix is /tt/, not /t/. We have now seen one suffix of the form /t/ and another of the form /tt/. In Vowel Theory, there is no way to express this contrast, because there are no geminate consonants within a morpheme. The quantity contrast in the suffix can only be expressed in Consonant Theory, making this a very strong argument for adopting that view of Swedish quantity.

We have now seen the quantity rules which I propose for Consonant Theory, both of which are found in the existing literature already. While the motivation for **C_2 length** is purely language-internal, I have also introduced some external evidence in favour of Consonant Theory. In addition, we have seen a large number of arguments in favour of underlying consonant length in Swedish, rather than the underlying vowel length which I believe in. It is now time to turn to Vowel Theory, in order to find out whether there is any hope left for it.

4 Vowel Theory

This section examines the theory I believe in: Vowel Theory. I will introduce the three rules which are necessary empirically, as well as motivation for them. All rules will be supported by external evidence. We will also see many counterarguments against the ideas from the previous section. At the end of the section, we will have a clear picture of both theories, and will be ready to begin comparing them in more detail.

4.1 C Length

The first rule we will look at is **C length**, which is the Vowel Theory equivalent of Consonant Theory's **V length**. **V length** was intended to explain where all long vowels came from, and **C length** is intended to explain where all long consonants come from. Since I believe that vowel length is underlying, a prose description of **C length** becomes incredibly simple: "Lengthen a consonant after a short stressed vowel". This looks like quite the improvement, simplicity-wise, over the four-environment rule **V length**. However, there is a complication. What if the short stressed vowel is already followed by two consonants? This situation arises across morpheme boundaries, and the two consonants are not lengthened further to overlong:

(14) Nothing is longer than long

UR (Vowel Theory)	SR	Translation
/ˈlȩt/	[ˈlȩtʰː]	easy
/ˈlȩt-t/	[ˈlȩtʰː], *[ˈlȩtʰːː]	easy, neuter

There are two possible analyses here. One could say that in /'lȩt-t/, there is first an intermediate form lȩtːt because of **C length**, and postulate a subsequent rule of degemination. This would be a Duke of York derivation, where a short consonant becomes long only to shorten again. A Duke of York derivation is found in some analyses of Swedish (see section 3.2 and Eliasson and LaPelle 1973: 144). However, I will opt for an alternative analysis. We will restrict **C length** so that it does not apply in these contexts. In prose, **C length** then becomes ”Insert a consonant C_i after a short stressed vowel and anything but C_i.” How might this be formalised in RBP? It seems to me that the feature algebra of Reiss (2003) is a good solution. In this formalism, one can easily express the idea that two segments have to be different, irrespective of what features they do or do not share. While this is my preferred analysis, I will use a simpler notation in this article. C_i and C_j are [+cons] segments which have different specifications for some feature. My notation allows segments like C_i and X_j, where X_j differs from C_i in some feature, which may itself be [cons]. X_j effectively means ”any *segment* but C_i” just as C_j means ”any *consonant* but C_i”. The entire rule is now: $\emptyset \rightarrow C_i$ / 'V_C_i(X_j)

The motivation for **C length** ought to be obvious; it is simply where all long consonants in Swedish come from. Below are a few examples of cases where **C length** applies:

(15) **C length**

UR (Vowel Theory)	SR	Translation
/ˈsɪl/	[ˈsɪlː]	herring
/ˈfȩst/	[ˈfȩsːtʰ]	party, noun
/a'tak/	[a'tʰakʰː]	attack, noun

According to the transcriptions in Riad (2015: 228), which match my intuitions, **C length** is also productive under so-called corrective focus. This is found in utterances of the type: "No I said [X], not [Y]", where [X] and [Y] are given extra stress to emphasise how they differ from each other. For example, take the words [pʰrʊ'sȩnːtʰ] 'percent' and [pʰrȩ'sȩnːtʰ] 'present'. Under corrective focus, these words are pronounced as follows: "No, I said ['pʰrʊsːˌȩnːtʰ], not ['pʰrȩsːˌȩnːtʰ]".'The /s/ lengthens automatically when the extra stress is added. Applying vowel lengthening here, as **V length** would appear to predict, is ungrammatical:

*[ˈpʰruːˌsẹnːtʰ], *[ˈpʰreːˌsẹnːtʰ].

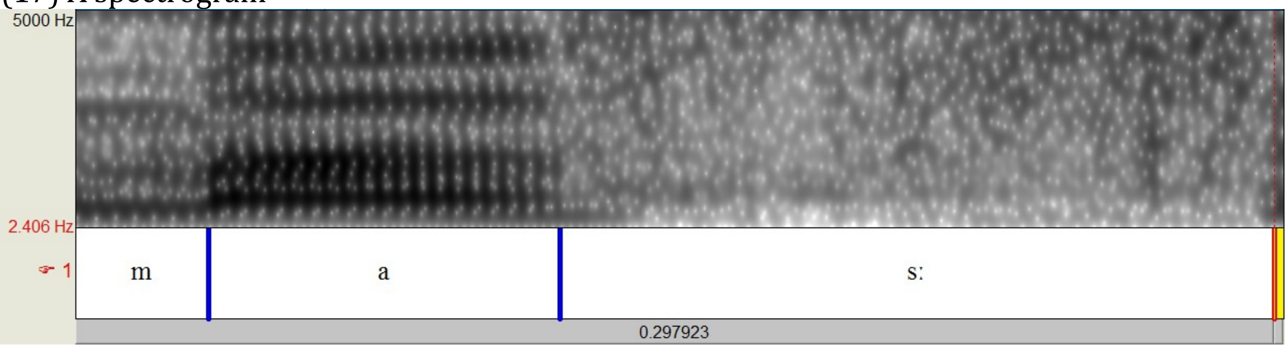
C length can also be used to explain alternations in morphologically related forms. Two two examples of this will be presented, beginning with new evidence which looks difficult to account for using Consonant Theory. This new evidence, then, will favour both **C length** and Vowel Theory in general. The data here come from Johanna Frändén, a football commentator during the European Championships in 2016. Before the championships, a player by the name of Karim Benzema was suspended from the French team. His last name, [bɛnzɛˈma] in French, was nativised by Frändén as [bẹnsẹˈma]. This name thereby joins the group of small words in Swedish ending in a short stressed vowel, something we will return to in section 6. What is of interest to us, however, is Frändén's use of the possessive form of the name. The possessive clitic in Swedish is a singleton /s/ in both Vowel and Consonant Theory. Crucially, it cannot be a geminate in Consonant Theory, as shown below:

(16) Po**s**e**s**ive **s**

UR (Consonant Theory)	SR	Translation
/te/	[ˈtʰeː]	tea
Correct possessive with singleton /s/: /te-s/	[ˈtʰeːs]	tea, possessive
Incorrect possessive with geminate /ss/: /te-ss/	*[ˈtʰẹsː]	Intended: tea, possessive

In Consonant Theory, the possessive /benseˈma-s/ should give *[bẹnsẹˈmɑːs].[14] And yet, Frändén's possessive of [bẹnsẹˈma] was [bẹnsẹˈmasː] with a geminate [sː]. A spectrogram of the word makes it clear beyond any doubt that it contains a short vowel followed by a long consonant:

(17) A spectrogram



In Vowel Theory, the variation between [s] and [sː] in this suffix can be straightforwardly accounted for. When the stem ends in a long vowel, as in /ˈteː/ 'tea', the underlying short /s/ surfaces as [s]. When the stem ends in a short vowel, as in /bẹnsẹˈma/, **C length** lengthens /s/ to [sː]. In Consonant Theory, one would have to argue that there are two allomorphs /s/ and /ss/. But it is unclear how a child would acquire the /ss/ allomorph, given that none of the very few words ending in a short stressed vowel in Swedish are nouns (see section 6). None of them take the possessive suffix, so the crucial data leading the Consonant Theory child to set up an allomorph /ss/ is in all likelihood absent from the input. Therefore, Frändén's pronunciations are good evidence for the Vowel Theory explanation, where the [sː]

14 Alternatively, and more probably, *[bẹnsẹˈmaːs], with the long central vowel found in some loanwords in Swedish.

arises automatically by the phonological rule **C length**.

I would also like to mention some comments from a survey of 200 speakers of SCSw. The single question asked was: "How do the pronunciations of ['siːl] and ['sɪlː] differ?". 176 respondents identified the difference as being in the vowel. One might think that this is good evidence for Vowel Theory, but these answers could have been influenced by many other factors. Phonetically, vowel length differences are bigger than consonant length ones (Linell 1978: 127-128), and the Swedish education system uses the terms long and short vowel, for example. Therefore, we will ignore the survey, and focus instead on some of the quite revealing comments people gave.

(18) Some comments
a) During survey
"There's a difference in the vowel. ['siːl] starts with ['siː], but ['sɪlː] starts with ['sɪ]"
b) After survey, in response to my remark: "Some linguists think the difference is in the *l*."
"Oh, I'd never thought of that, that the pronunciation of the *l* might be different."
"What?! But it's obviously in the [iː]!"
c) After being told that there really is a difference in the [l]
"What?! But you can't *hear* that!"

In a), we observe that this speaker was able to isolate out the vowel length, removing the consonant entirely. From a Consonant Theory perspective, why would one remove the phonemic difference between two words when illustrating how they differ? This question is especially relevant in light of the fact that forms like ['sɪ] are typically thought to be ungrammatical (but see section 6).

However, the b) and c) answers are even more interesting. In Consonant Theory, there is a difference in the *l*s of these words at every level of representation: underlying, every intermediate form, the surface form, the bodily output, the spelling etc. In ['siːl] vs ['sɪlː], the contrast between single and geminate *l* is always present. So if people are considering whether that contrast exists, then no matter what level of representation they examine, they ought to find a difference.

The actual answers are quite different from these predictions. People claim that it has never occurred to them that the consonants might be different, and fail to understand why linguists would propose that. In c), we see a respondent claiming that this contrast is impossible to hear, even when told that its existence is a matter of fact. If consonant length is represented everywhere from underlying form to surface form to spelling, why do native speakers claim not to be able to hear it? I leave it as an exercise to the reader to find another case where literate native speakers are unable to hear a phonemic distinction of their language, represented both in the spelling and in the phonetics.[15, 16]

Instead, the comments in (18) seem to reflect native speakers' general surprise when told about allophones in their language. English speakers are surprised to find out that English has aspirated and unaspirated stops, or clear and dark *l*s, for example. That exact same surprise is seen with Swedish consonant length. It must be admitted that there are speakers which can hear a difference in consonant length (Anders Holmberg, p.c.). However, this

15 This argument is just as true of Consonant Theory as it is of theories where both kinds of length are represented underlyingly. These comments are the reason that I am not consider such redundant solutions.

16 Riad (p.c.) suggests [ˈdɵʂː] 'shower' and [ˈkʰɵʂː] 'course', if the underlying forms are /ˈdɵʂ/ and /ˈkɵrs/. However, the reason speakers cannot detect the phonemic ʂ-rs contrast is that it is neutralised (R: 61); there is no phonetic contrast there to detect. In the [l]-[lː] case, the contrast is never neutralised in stressed syllables, which is why it is so surprising (in Consonant Theory) that some are unable to perceive it.

is not a problem for Vowel Theory, as those speakers might be considering the surface form, or the spelling. So unlike Consonant Theory, Vowel Theory can explain both those who can hear consonant quantity as well as those who cannot.

C length also makes correct predictions about the language game *rövarspråket*. After every consonant, the vowel /ɔ/ and a copy of the consonant is inserted. In my variety of *rövarspråket*, stress may fall on any of the /ɔ/ vowels. As stress is shifted from one /ɔ/ vowel to another, **C length** automatically lengthens the consonant after the stressed vowel:

(19) *Rövarspråket*/[rɔrø̞vɔva^{2}ˈrɔrːsɔspɔprɔrɔkɔke̞ˌt^{h}ɔt^{h}ː]

a) 'glass' in Swedish

UR	SR	Translation
/ˈglɑːs/	[ˈglɑːs]	glass

b) 'glass' in rövarspråket

Stress	SR
Initial	[^{2}gɔgːlɔlaˌsɔsː]
Medial	[gɔg^{2}lɔlːaˌsɔsː]
Final	[gɔglɔlaˈsɔsː]

The external evidence from *rövarspråket* matches **C length's** predictions, with lengthening after every short stressed vowel. Here it is important to point out that Consonant Theory can also explain the forms in (19). A Consonant Theorist could say that the game is played by inserting the vowel /o/ and a geminate copy of every consonant. The underlying form of 'glass' would be /gogglollasoss/. Whichever /o/ vowel is stressed, it will have a long consonant after it, and any unstressed geminates will shorten by **C short**.[17] In other words, the *rövarspråket* forms are one of Vowel Theory's correct predictions, but not one of Consonant Theory's incorrect ones.

The same kinds of stress shift as we have just seen also exist in morphologically related Swedish words. In (15) above, we saw that the noun 'attack' is [aˈt^{h}ak^{h}ː]. The verb 'attack' is formed with the stress-attracting verbal suffix /eːr/, followed by the ending /a/ (which functions as the infinitive ending, the imperative ending, and the theme vowel). This gives [ata ˈk^{h}eːra] 'to attack/attack!'. Notice that the verb has a short [k^{h}] while the noun has a long [k^{h}ː]. My explanation is **C length**. In the noun, that underlying /k/ follows a short stressed vowel, so it's lengthened by **C length**. But in the verb, the suffix bears the stress, and the /k/ is no longer in a position where **C length** can apply. The following forms summarise the situation:

(20) 'Attack!'

/aˈtak/	[aˈt^{h}ak^{h}ː]	attack, noun
/ataˈk-eːr-a/	[ataˈk^{h}eːra]	attack, verb

The attentive reader might have noticed that this kind of alternation looks very similar to the 'critical' alternations in section 3.2. The 'critical' alternations showed vowel length moving with stress, and was used as an argument for Consonant Theory. (20) shows that consonant length can also move with stress. This could be used as an argument for Vowel Theory in an analogous way. The end result would be that some alternations favour Vowel Theory, and others Consonant Theory. No side really wins the battle of quantity and stress movement.

17 This explanation would presumably be ruled out by Eliasson, who argues against phonological solutions where rules would have to apply very frequently, as **C short** would in this word. However, as mentioned in footnote 13, that condition on rules would probably need to be abandoned anyway.

Even so, Consonant Theorists have placed a lot of importance on the 'critical' alternations. This is puzzling, since we have just seen that no theory has the upper hand. It is even more puzzling when one considers that both Eliasson (1985) and Riad (2014) cite both kinds of alternations. Eliasson has even noticed that the 'attack' alternations are problematic, and says that this “may at first seem like a drawback” (E: 112). Even so, Eliasson's article criticises Vowel Theory for an analysis which is identical to his own, only that it targets vowels instead of consonants.[18] There is not a word in Eliasson (1985) about how the identical problems for his own theory might be solved.

Before moving on to our next rule, it would be worth our while to spend some more time on the 'critical' alternations. I will argue that they do not tell us anything about Swedish phonology. My argument is this: The 'critical' alternations are also found in German and English, and these languages lack both long consonants and vowel-lengthening rules like **V length**. From this we can conclude that the existence of 'critical' alternations in Swedish are insufficient as an argument for long consonants and **V length**. Some German and English data are given here:

(21) Meanwhile in Europe

SR	Translation
a) Standard German (see also Wiese 2000: 287-296)	
[ˈkʰanada]	Canada
[kʰaˈnaːdɪʃ]	Canadian
b) Standard Southern British English	
[ˈkʰænədə]	Canada
[kʰəˈneɪdiən]	Canadian

Both German and English lack long consonants within morphemes, and both languages have minimal pairs for vowel length/quality, without any differences in the following consonant. For German, we have [ˈʃtiːl] 'handle' and [ˈʃtɪl] 'quiet' (see Wiese 2000: 11 for many more minimal pairs), and for English [ˈfiːɫ] 'feel' versus [ˈfɪɫ] 'fill.' Both languages also lack rules lengthening vowels in open syllables. German has [ˈʃtɪlə] 'quiet (pl.)' and English [ˈfɪlɪŋ] 'filling.' And yet, both German and English show exactly the same kinds of quantity alternations as in Swedish. German in particular is strikingly similar to Swedish in the kinds of alternations it presents, as exemplified throughout in Eliasson (2010). It is clearly possible, then, for a language to have phonemic vowel length and show exactly the kinds of alternations we see in Swedish.

However, Eliasson (2010) is committed to the 'critical' alternations in Swedish, and says that ”it may at least be contemplated” that the German long and short vowels are allophones of the same phoneme, with the (phonetically never present) consonant length being contrastive (Eliasson 2010: 44). The same would hold for English, one presumes. Yet Eliasson's arguments for this are insufficient as evidence. The ambisyllabicity reported for German and English does not require geminates, since we know that ”ambisyllabic responses [in syllabification tasks – SA] /…/ are more frequent for the [b] of a word like *rabbit*, which is represented by an orthographic geminate, than the [b] of a word like *habit*, which is represented by an orthographic singleton” (Eddington, Treiman, & Elzinga 2013: 50; see also references therein). Eliasson does not exclude orthographic interference as an explanation. He also does not exclude a templatic analysis of syllabification, where speakers attempt to fit as

18 As we will see in section 4.2, however, my analysis of the 'critical' alternations is morphological rather than phonological.

much material as possible into a syllable. For ['ʃtɪlə] 'quiet (pl.)', this would make the first syllable ['ʃtɪl] and the second ['lə], giving the impression of ambisyllabicity.

Eliasson's second argument is that if German had geminates, a phonotactic gap would be filled. In German (and English), consonants like /s/ can occupy both the first and second C position in VCC words (Eliasson 2010: 43). By postulating morphemes where it occupies both simultaneously, e.g. /Vss/, we are filling a gap which was previously unexplained. However, the same phonotactic gap is found in languages like French as well, as seen in ['bylb] 'bulb' and ['bibl] 'Bible.' This, we take it, is not enough evidence to say that French has geminate consonants. In other words, having this phonotactic gap is not sufficient evidence for learners to conclude that there are geminate consonants.

Finally, Eliasson cites German pronunciations in “deliberately slowed-down speech” (Eliasson 2010: 43) as evidence. This is clearly paralinguistic evidence, unless Eliasson thinks that the longer segments we find in slowed-down speech are due to a phonological rule specific to this register (e.g. iː → iː::: / slow speech). Previously, he has rejected paralinguistic evidence when it favoured Vowel Theory (Eliasson 2010: 10, footnote 4). Being methodologically consistent requires us to reject paralinguistic evidence everywhere, no matter what theory it favours.[19]

We have now considered some of the motivation for **C length**, and found both internal and external evidence in favour of the rule. Some of the new evidence presented here seems to be very difficult to explain in Consonant Theory. We have also concluded that the 'critical' alternations are not good enough evidence for Consonant Theory, as was argued in the previous section. Moreover, even if they had constituted good evidence, we have now seen the 'attack' alternations, which in that case would provide equally good evidence for Vowel Theory. I suggest that future research assign a much more marginal role to these alternations in arguments about which theory is better. We are now ready to consider Vowel Theory's next rule.

4.2 V Short

The next rule is **V short**, which is probably the simplest rule we will have to consider. In prose, it is: “Unstressed long vowels shorten.” Formally, that would be Vː → V in unstressed syllables. The reader may remember from section 3 that Eliasson (1985) proposed that such a rule might be one way of explaining the 'critical' alternations in Vowel Theory, as shown below:

(22) The 'critical' alternations, revisited

Possible UR (Vowel Theory)	SR	Translation
/kriː't-iːk/	[k^hrɪ't^hiːk^h]	criticism
/'kriːt-ɪsk/	['k^hriːtɪsk]	critical

The key is to suppose that the stem is /kriːt/ with a long /iː/, and not the short /ɪ/ seen in the noun form. **V short** guarantees that the first underlying long vowel in 'criticism' surfaces as

19 It is also unclear to me what results of this experiment could have falsified Eliasson's view. His argument is that the consonants in [V:CV] and [VCV] words are different, because only the consonant in [VCV] words lengthened in slow speech. But consider the opposite result, where both consonants behave the same. Since some segment has to lengthen when speech is slowed down, both vowels would lengthen. And then Eliasson could have said that the vowels are behaving the same, and so must represent the same phoneme. No result falsifies his idea. My own interpretation of the facts is that phonemically long vowels in German lengthen further, and that phonemically short vowels remain short, leading necessarily to a lengthening of the consonant.

short, while the derived form shows the underlying long quantity of this vowel. However, I will argue that a non-phonological account of the 'critical' alternations is to be preferred for a number of reasons. Specifically, I propose a morphological lengthening before the /-ɪsk/ suffix, as well as in any other contexts that trigger this lengthening.

This will help us explain a number of otherwise surprising facts. First of all, there is at least one exception to the vowel lengthening. The /-ɪsk/ form of [gramaˈtʰiːkʰ] 'grammar' is [graˈmatːɪsk] 'grammatical' for many people, rather than *[graˈmɑːtɪsk].[20] Since Riad has a productive vowel lengthening rule, he concedes that this is simply an exception (R: 170, footnote 9). The same would be true for a phonological explanation under Vowel Theory, if forms like [kʰrɪˈtʰiːkʰ] 'criticism' are automatically assigned a stem with a long vowel, /kriːt/. Secondly, there are forms where the stem has consonant lengthening, but where the /-ɪsk/ form may nevertheless show vowel lengthening:

(23) Mozambique

SR	Translation
[mʊsamˈbɪkʰː], *[mʊsamˈbiːkʰ]	Mozambique
[mʊsamˈbiːkɪsk], ?[mʊsamˈbɪkːɪsk]	Mozambican

Forms like these suggest that phonological lengthening is not involved. Instead, people seem to lengthen the vowel before the /-ɪsk/ suffix by analogy with the many [Vːɪsk] forms that already exist. In 'Mozambican', there is lengthening even though the stem must by necessity have a short underlying vowel. Consonant Theorists have also argued that the **V short** explanation is implausible for various reasons (see Eliasson 1985, passim, and R: 169-178). If one is not prepared to entertain that option, one must use morphological explanations to account for the similar kinds of lengthening we see in German and English (see section 4.1 above). If morphological explanations are allowed for those languages, they should be no less questionable when applied to Swedish.

So far I have presented arguments that some data do not require **V short** to be successfully explained. What, then, is the motivation for the rule? The answer is that some of these vowel length alternations really do appear to be phonological. They are productive in newly formed words, even outside of morphologically defined contexts like ”before /-ɪsk/”. A particularly satisfying example is given by Riad (R: 170):

(24) Melodies

UR (Vowel Theory)	SR	Translation
/me̞lʊˈdiː/	[me̞lʊˈdiː]	melody
/mɪlˈjøː/	[mɪlˈjøː]	environment
/mɪljøː-ˈdiː/	[mɪljø̞ˈdiː]	environmental melody

This word for 'environmental melody' is clearly a blend of the words 'environment' and 'melody'. The long vowel in 'environment' has to be underlying, as there is no affix to trigger morphologically conditioned lengthening, and vowels do not lengthen in open stressed syllables.[21] And the short vowel in 'environmental melody' cannot be created by a morphological rule, since the learner of Swedish is never exposed to words in the

20 While the form with consonant lengthening is prescriptively correct, there are certainly many people who use [graˈmɑːtɪsk], at least until told off by prescriptive authorities.

21 This is a controversional claim, since most theories of Swedish do postulate stressed open syllable lengthening. However, we have already seen the name [be̞nse̞ˈma] 'Benzema', which does not show lengthening. We will argue that Swedish lacks lengthening in more detail in section 6.

environment of ”preceding a truncated part of the word for 'melody'”. This justifies a phonological rule of vowel shortening. It is an open question which suffixes are like /-ɪsk (morphological vowel lengthening), and which are like 'environmental melody' (phonological vowel shortening). This will not be pursued further here, and is left for future research.

Another piece of external evidence for **V short** was actually presented in section 4.1. In the discussion of the language game *rövarspråket*, we said that stress may fall on any of the inserted /ɔ/ vowels. This means that any non-inserted vowels, i.e. the ones that were part of the original Swedish word, are unstressed. Therefore, we would predict that these vowels shorten by **V short**, and that is exactly what the data show. The word for 'glass' in *rövarspråket* is repeated here to illustrate this. As the stress placement is irrelevant, I have arbitrarily used initial stress:

(25) *Rövarspråket*, part 2
a) 'glass' in Swedish

UR	SR	Translation
/ˈglɑːs/	[ˈglɑːs]	glass

b) 'glass' in rövarspråket

UR	SR
/²gɔglɔlɑːˌsɔs/	[²gɔgːlɔlaˌsɔsː], *[²gɔgːlɔlɑːˌsɔsː]

Löfstedt, who believes in Consonant Theory, mentions what he considers to be more evidence for vowel shortening. Shortened long vowels, to the exclusion of lexically short vowels, may appear with the quality of the long vowel (Löfstedt 1992: 116). Statements to this effect, or data showing it, are also cited in Eliasson (E: 109), Elert (1964: 18), Elert (1970: 66) and Riad (R: 201-203). Relevant forms here are ones such as 'grindery/place for grinding', which are roughly [slipe̞ˈriː], but never *[slɪpe̞ˈriː]. However, I interpret the vowels in question as still being fully long. Phonetically, they often seem to appear as half-long, giving rise to transcriptions with the IPA half-long diacritic in the literature (e.g. R: 202). At least in rapid speech, they may be fully short, while at slower speech rates, they may be fully long. I take it that the surface forms contain fully long vowels, which may be phonetically shortened due to performance factors, such as rapid speech. This gives the variable phonetic length which we observe and can measure. While Löfstedt's proposal is interesting, then, it does not provide evidence for **V short**, since **V short** does not apply.

It is worth fleshing this out in a bit more detail. The data are as follows: we have [ˌsliːpe̞ˈriː] 'grindery', never *[slɪpe̞ˈriː], but both [maˌɧiːne̞ˈriː] and [maɧɪne̞ˈriː] 'machinery.' The root 'machine' is lexically unstressed, /maɧiːn/, not /maˈɧiːn/ (R: 203[22]). Stress is optionally added to it before the suffix is added. If stress is added, we get [maˌɧiːne̞ˈriː], with the stress protecting the vowel from **V short**. If stress is not added, we get [maɧɪne̞ˈriː], with the stem vowel undergoing **V short** because it's in an unstressed syllable. The root 'grind', on the other hand, is lexically stressed (R: 218), and is protected from **V short** because it does not lose its stress.

Riad (2015: 86-87) finds it problematic that a word with two stresses is not given second pitch accent. This is obligatory in compounds,[23] and seems to be the default when two stresses come together. However, we know independently that there are other exceptions to this, in words like [ˈkʰreːaˌtʰiːv] 'creative' (see Riad 2015: 226-229). This word has two

22 Riad would of course not include the vowel length in the underlying form, as I do here.
23 However, compounds with 'berry' do not show get second pitch accent. We have e.g. [ˈbloːˌbɛːr] 'blueberry', rather than *[²bloːˌbɛːr].

prosodic words, required to explain the two long vowels as well as the two aspirated stops, *[ˈkʰreːaˌtiːv]. And yet, this word does not receive the second pitch accent. I suggest that words with the suffix /e̹ˈriː/ constitute a new class of exceptions to the rules of second pitch accent.[24]

Riad (p.c.) suggests a different analysis. What I transcribe as [ˌsliːpe̹ˈriː] 'grindery' (with two stresses and two long vowels), Riad would argue contains one stress and one long vowel: [sli(ˑ)pe̹ˈriː]. The first vowel is [i(ˑ)] rather than [ɪ], the normal outcome of /i/ in an unstressed syllable. The reason for this is the fact that the root 'grind' is lexically stressed. The idea is to have the vowel undergo **V length** by still having a stress. Subsequent deletion of that stress then counterfeeds **V length**, which is why we see traces of vowel length in the surface form. This analysis appears to work, although one would need to account for why the surface vowel is [i(ˑ)] rather than [iː]. As was shown (or rather, was not shown) in section 3, Consonant Theory does not propose a rule like **V short**.

However, even though such an analysis might be perfectly adequate empirically, I suspect that individual Consonant Theorists may disapprove of it. It requires us to adopt Riad's theory of lexical stress, and many scholars have analysed Swedish stress without his assumptions (e.g. Bruce 1993 and the many references in R: 193). They prefer to treat stress as predictable, albeit with fairly complicated generalisations ("trisyllabic words with an open penult and closed final syllable get antepenultimate stress", Frid 2001: 30) and numerous lexical exceptions (R: 194).

Even if Riad's theory of stress is accepted – as I think it should be – one would need a theory of phonology which can account for the counterfeeding rule interaction. Depending on one's theory, this may be difficult or undesirable (see Kager 1999, ch. 9 for a useful overview of opacity in Optimality Theory, for example). The situation worsens when one realises that words such as 'grindery/place for grinding' would require a Duke of York derivation if the first vowel in this word really is shortened phonologically. It is underlyingly short, as all vowels are in Consonant Theory. It then lengthens because its morpheme 'grind' is lexically stressed. Stress is then shifted to the suffix, and the vowel becomes short again. Many theories which explain opacity well fail to implement Duke of York derivations such as this one (e.g. McCarthy 2007 for Optimality Theory with Candidate Chains).

Summarising our discussion, Riad's solution for these words could probably be made to work. Had I believed in Consonant Theory, I would be proud to have thought of such an analysis. Even so, it remains to be seen whether other followers of Consonant Theory are willing to accept this analysis with lexical stress, counterfeeding opacity and Duke of York derivations. Those who do not will have to provide a different analysis, as I have done in the framework of Vowel Theory, and as Löfstedt (1992) did by invoking a cyclical phonological component. Regardless of the analysis of the 'critical' alternations, we have seen that one still needs a phonological rule of vowel shortening in SCSw. I have provided both internal and external evidence for **V short**, along with analyses of related phenomena using morphology and phonetics rather than phonology.

4.3 Shortening after Long Vowels

The third and final rule needed in Vowel Theory is **Shortening after Long Vowels** (**SLV** for short). In prose, **SLV** is: "Shorten a consonant after a long vowel". Formally, it is: $C_i \rightarrow Ø$ / V:_C_i The need for this rule is slightly controversial. Only some of the data actually support **SLV's**

24 Perhaps the two classes of words could even be unified under a single analysis. Riad (2015: 226-229) suggests that words like 'creative' are actually phrases, and shows that the pitch pattern is the same as for some phrases. Perhaps words in /e̹ˈriː/ are also phrases, only with the stress on the second element of the phrase rather than the first.

predictions, while the rest contradicts it. The key question is: "What is the outcome of an underlying form /VːC_iC_i/?" It should be obvious that **SLV** predicts [VːC_i], with shortening after the long vowel. Consonant Theory makes a different prediction here. As long vowels are not underlying, the question is asking what happens to the sequence /VC_iC_i/ instead. This will obviously lead to a surface form [VC_iː]. As mentioned above, the data appear to support both options, depending on which morphological context one considers:

(26) Confusion
Support for Consonant Theory
a) Neuter /t/

Consonant Theory's prediction	Vowel Theory's prediction	Translation
/vit/ → [viːt^h]	/viːt/ → [viːt^h]	white, common
/vit-t/ → **[ˈvɪt^{h}ː]**	/viːt-t/ → ***[viːt^h]**	white, neuter

b) Preterite /de/

Consonant Theory's prediction	Vowel Theory's prediction	Translation
/blød/ → [bløːd]	/bløːd/ → [bløːd]	bleed!
/^{2}blød-de/ → **[^{2}blø̞dːe̞]**	/^{2}bløːd-de/ → ***[^{2}bløːde̞]**	bled (preterite)

Support for Vowel Theory
c) Possessive /s/

Vowel Theory's prediction	Consonant Theory's prediction	Translation
/ˈruːs/ → [ˈruːs]	/rus/ → [ˈruːs]	rose
/ˈruːs-s/ → **[ˈruːs]**	/rus-s/ → ***[rʊsː]**	rose, possessive

d) Present /r/

Vowel Theory's prediction	Consonant Theory's prediction	Translation
/ˈhyːr/ → [ˈhyːr]	/ˈhyr/ → [ˈhyːr]	rent!
/ˈhyːr-r/ → **[ˈhyːr]**	/ˈhyr-r/ → ***[ˈhʏrː]**	rent, present tense

The forms in bold are the crucial ones, and as the asterisks show, only Consonant Theory correctly predicts a) and b), while only Vowel Theory correctly predicts c) and d). It appears that whichever theory one subscribes to, there will always be some contexts which are simply 'morphological exceptions'. Specifically, I suggest that is a morphological rule of vowel shortening before suffixes like neuter /t/ and preterite /de̞/. So the derivation for [ˈvɪt^{h}ː] 'white, neuter' runs /viːt-t/ → ˈvɪt-t (morphological shortening) → [ˈvɪt^{h}ː] (phonological rules). Meanwhile, the possessive form of 'rose' has /ˈruːs-s/ → [ˈruːs] by the regular phonology, including **SLV**. Certain suffixes have a diacritic feature which triggers vowel shortening, while other suffixes lack it. The Consonant Theory explanation would presumably be identical, but with the diacritic feature on the complement set of suffixes.

However, there is a way to tell which contexts constitute morphological exceptions. In first-language acquisition, there is often a difference between regular phonological operations and irregular morphological ones. An English-speaking child might give the simple past of 'keep' as *keeped* rather than *kept*. The child has acquired the past tense morpheme and its allomorphy, but has not yet learnt that 'keep' is one of the English verbs with an /iː/-/ɛ/ alternation (like sleep-slept, creep-crept etc.; Stemberger 1995: 252). In Vowel Theory, the suffixes which are diacritically marked for shortening are like 'keep'-type verbs in English. They show an irregular morphological alternation, which is nevertheless shared by other lexical items, and which has to be learnt for each word/suffix. This predicts that, just as with English *keeped*, one sometimes fails to see the irregular morphological process applied. In other words, suffixes like the neuter /t/ should sometimes fail to cause vowel shortening. The acquisition data cited in Linell (1978: 126) confirm this prediction. In the table below, it can be seen that children sometimes produce precisely those ungrammatical forms in a) and b) which Vowel Theory predicts:

(27) How to say *keeped* in Swedish

UR (Vowel Theory)	SR (target)	SR (actual)	Translation
a) The neuter suffix /t/			
/ˈviːt-t/	[ˈvɪt^{h}ː]	[ˈviːt^{h}]	white, neuter
b) The preterite suffix /de̜/			
/^{2}blød-de/	[^{2}blø̜dːe̜]	[^{2}bløːde̜]	bled, preterite

While adults never use the SRs marked ungrammatical in (26) a) and (26) b), children do. This gives striking confirmation that a) and b) are the morphological exceptions, and that in the regular phonology of SCSw., /V:C_iC_i/ becomes [V:C_i], as in (26) c) and (26) d). This motivates a phonological rule **SLV**. This has implications for one of the arguments in section 3. Remember that the strongest argument for Consonant Theory I could find involved data showing a contrast between /t/ and /tt/. The /tt/ morpheme I used to make this argument was the neuter adjectival suffix in [ˈviːt^{h}] 'white, neuter'. We have now seen external evidence that such forms only exist because of a diacritic mark on the suffix. The regular form would be * [ˈviːt^{h}], as in (27) above. Consequently, there is no phonological contrast between /t/ and /tt/. There is one /t/ which does not cause shortening and another which does: morphology rather than phonology.

This case is a good demonstration of the limitations of internal evidence in phonology. The data in (26) are what they are, and they are not magically going to change in favour of one theory or another. It was only by using acquisitional data that we were able to tease out the exceptions from the regulars. In this particular case, solving this problem also helped us refute one of the strongest arguments for Consonant Theory in section 3. The use of external evidence in phonology, then, can be crucial in evaluating theories. We have now seen all of the theoretical machinery of both theories, and it is time we began comparing the two.

5 Counterarguments

Many readers may feel that it would be somewhat premature to accept Vowel Theory already. There are still many arguments from section 3 which I have yet to provide an answer to. In this section, we will examine the ones which have not come up in previous discussions. We will see that there are counterarguments even to the strongest of arguments, and by the end of the section, we will have answered all of section 3's reasons to believe in Consonant Theory.

One argument was that long and short vowels show such a close interaction that it would seem unjustified to treat them as separate phonological units, as Vowel Theory does. It is true that there are rules like **V short**, where long vowel phonemes are shortened to their short counterparts. However, this does not mean they cannot be separate phonemes. It is perfectly possible for rules to exchange phonemes, as in languages with a voicing contrast in stops, and final devoicing. In fact, there are also processes where long and short vowels behave differently. This is not impossible to explain in Consonant Theory, but it shows that there is justification for treating long and short vowels as separate units.

Firstly, there are historical sound changes. Swedish previously had four mid unrounded vowels: /eː, ɛː, e, ɛ/. But in modern SCSw., short /e/ and /ɛ/ have merged as /e̞/ (see R: 23-24, Leinonen 2010: 21 and references therein). This merger explains why SCSw. has 17 vowel phonemes and not 18, as one would expect from nine long-short vowel pairs. So this sound change shows long and short vowels being treated separately, as though they were separate phonological units. However, it goes without saying that languages change over time. We cannot be sure that the phonological system of Swedish, at the time of the merger, is the same as the one we have today. Therefore, let's look at a synchronic phonological rule instead. SCSw. has an optional rule neutralising short /ø̞/ and /ɵ/ to [ɵ] before /r/ (e.g. R: 86-88 and Wenner 2010). As with the heat-bonnet merger immediately above, the long vowels /oː/ and /ʉː/ are unaffected.

(28) Darken vs rotten

UR (Vowel Theory)	SR	Translation
a) The short vowels optionally merge		
/₂ˈmoerkn-a/	[₂ˈmɵrːkna] ~ [₂ˈmø̞rːkna]	to darken
/₂ˈmɵrkn-a/	[₂ˈmɵrːkna], *[₂ˈmø̞rːkna]	rotten, pl. and def. sg.
b) The long vowels never merge		
/ˈbøːr/	[ˈbøːr], *[ˈbʉːr]	should, ought to
/ˈbʉːr/	[ˈbʉːr], *[ˈbøːr]	cage, noun

Even in synchronic Swedish phonology, then, long and short vowel phonemes are treated differently by some processes. One might also be tempted by the transcriptions of SCSw.-speaking children in the Göteborg corpus (Plunkett and Strömqvist 1992, Strömqvist, Richtoff, and Anderson 1993) in the Germanic section of CHILDES (MacWhinney 2000: 274-323). The transcriptions indicate that all five of the Swedish children there have vowels harmonising for backness. Long back /ɑː/ seems to behave differently to short central /a/ for these children. That seems like another process where a long vowel behaves differently from a short one. But here, one must be sceptical. Transcriptions are in Swedish spelling, not in the IPA. Therefore, they might lack crucial phonetic detail. There are also words from all children which do not undergo harmony. This suggests that there is really no phonological rule of vowel harmony at all. However, (28) still provides synchronic phonological evidence for long and short vowels behaving differently.

Our next argument was that vowel lengthening appears to be productive in loanwords. This is not true anymore. Löfstedt's example, the word for 'panic', was borrowed into SCSw. in the middle of the 19th century (Svenska Akademiens Ordbok). English phonologists do not use Lewis Carroll's speech as evidence on modern English, and I will not use 19th century loanwords as evidence on modern SCSw. If one looks at more recent loanwords, they tend to show consonant lengthening instead:

(29) Recent loanwords into Swedish

SR (SCSw.)	SR and source language	Translation of SCSw. word
[ˈʂ̞ɪtʰː]	En. [ˈʃɪt̚]	shit
[ˈfakʰː]	En. [ˈfʌk̚]	fuck
[ˈve̞bː]	En. [ˈwɛb]	web (internet)
[²ˈɧɔpːa]	En. [ˈʃɒp̚]	to shop/shop![25]
[ˈbe̞tːɪŋ]	En. [ˈbɛtɪŋ]	betting

25 The pitch accent is caused by the infinitival ending /-a/, added onto the borrowed stem.

['tʰvɪtːe̞r]	En. ['tʰwɪtə]	Twitter
['sɵʂ̞ːɪ]/['sʊʂ̞ːɪ]	Jap. [sɯ̀ɕí↓]/[sɯ́↓ɕì]	sushi
['ʂ̞ɔkʰː]	Turk. ['tʃokʰ]	very (prefix)

An exception worth mentioning is that English /æ/ is often borrowed as long [ɛː]. As was just shown, SCSw. lacks a short /ɛ/-type vowel because of a sound change merging it with /e̞/. This leads to borrowings like ['ajːˌpʰɛːd] for 'iPad', ['mɛːkʰˌbɵkʰː] for 'Macbook' etc. In general, however, vowel lengthening is not productive in loanwords.

Nevertheless, our next argument seems to make a similar point about modern Swedish, using experiments on Swedes' pronunciation of Finnish. Remember from section 3 that in Karlsson's (1977) work, native speakers of Swedish pronounced Finnish words and seemed to apply vowel lengthening where Consonant Theory predicts it. I agree with Linell (1978) that these results are unreliable. The speakers often applied consonant lengthening and not vowel lengthening (Eliasson 1982: 191), the exact opposite of what Consonant Theory would predict. Linell (1978: 130) cites the forms with consonant lengthening as the most common pronunciations. Moreover, one cannot exclude influence from spelling. In writing, Swedish quantity is only represented in the consonants. ['siːl] is written <sil>, while ['sɪlː] is written <sill>. This means that the <CVCV> words used in the study would be read with a long vowel had they been Swedish words. It is possible that subjects were backtracking to an underlying form using the Finnish orthography rather than the Finnish surface form. In other words, it becomes a real possibility that the reason for vowel lengthening is orthographic and not phonological (Linell 1978: 130). Eliasson himself admits that there is a risk of this (Eliasson 1982: 191), so we cannot if these results say anything at all about Swedish phonology.[26]

Some linguists have also argued that Vowel Theory is typologically unrealistic because it gives the language 17 vowel phonemes. But this is not particularly high from a crosslinguistic perspective. First of all, remember from section 2 that the long vowels are diphthongs. We are then left with 8 short vowels and 9 diphthongs. Now consider the Musa Dagh variety of Armenian, reported on by Vaux (1997). It has 8 short vowels, 5 long vowels and 31 diphthongs (23 of which appear in roots). If learners can arrive at such a large vowel inventory, why should the 17 phonemes of SCSw. be implausible? Examples such as these are not difficult to come by. For example, South Sami has 13 short monophthongs and 14 diphthongs, for a total of 27 vowel phonemes (Vinka and Kråik 2013).

With all of these things considered, there is not much reason to believe in Consonant Theory. But of course, it remains a theoretical possibility. The rules from section 3 can still explain the data we have seen, even if the arguments for those rules do not stand up to scrutiny. In the next section, I will try to show that there is data for which those rules do not work, and that SCSw. vowel length is not predicted by the rules of Consonant Theory.

6 Comparing Predictions

In the previous sections, we have looked at Vowel Theory and the evidence for it. We have also argued against Consonant Theory, and seen that in some cases, Vowel Theory seems preferable. In this section, I will show that Consonant Theory in fact makes a large number of incorrect predictions. Vowel Theory makes correct predictions at every turn, which is why I

26 Eliasson's (1982) transcriptions also imply that the Swedish speakers mapped Finnish [t] onto Swedish [tʰ] (both of which are written <t>), even though Swedish [d] would seem to provide a closer perceptual match. This is another reason to think that Karlsson's (1977) results were influenced by spelling.

am arguing for it. We will begin with a number of predictions that Consonant Theory makes, which turn out to be false.

1) There are no long vowels in closed syllables, except word-finally before single consonants (Löfstedt 2010: 8 and 59, Raffelsiefen 2007: 49; Lorentz 1996: 112 for Scandinavian in general, and Rice 2006: 1172 for Norwegian)
2) There are no short vowels in open stressed syllables (Schaeffler 2005: 7, Witting 1977: 33 and the analyses referred to in E: 104)
3) Every stressed syllable is heavy (bimoraic), while every unstressed syllable is light (monomoraic; Löfstedt 1992, 2010, *passim*, and R: 159 and references therein)
4) There are no minimal pairs for vowel length (Eliasson 1978a: 118[27], E: 107, Eliasson 2010: 28, Riad 1992: 281 and R: 165)
5) Vowel length is predictable from consonant length (Eliasson 1978: 118, E: 103-4 and the references therein and Löfstedt 1992: 96)

Looking back at the formulation of **V length** in section 3, one sees that it it cannot produce a surface form like [V:CC] within a morpheme. There are a few exceptions to this, all recognised in the literature. For example, words like [^{2}se:bra] 'zebra' show open-syllable lengthening because these two consonants can form an onset: ^{2}seː.bra (R: 170). It is also at least possible that some of these cases arise through counterbleeding of a vowel deletion rule. These are words with a vowel-zero alternation, like ['gu:ge̥l] 'Google' ~ [^{2}gu:gla] 'to Google'. Perhaps the underlying form contains /e̥/, and the lengthening in the verb applies before that vowel has been deleted. These exceptions, then, are not problematic at all for Consonant Theory.

However, it is generally acknowledged that there are a handful of genuinely problematic forms. Löfstedt (2010: 59), for example, says that although the ban on long vowels in closed syllables ”is exceedingly robust, there are two monomorphemic exceptions”. The view that this pattern is somehow marginal in Swedish is also found in Riad, who says that there are ”a few monomorphemic forms /…/ before the coronal consonant clusters [ln] and [st]” (R: 171). Earlier work by Löfstedt also mentions three exceptions before ”the coronal cluster /st/” (1992: 96). The general consensus seems to be that there are very few exceptions, and that they all have something in common, like appearing before /st/ or /ln/. This is not true. Below I list all the exceptions I am currently aware of. Words marked with % either have alternative pronunciations for some people, or are so rare that some native speakers may not know them.

(30) The many [V:CC] words in SCSw.

UR (Vowel Theory)	SR	Translation
a) Content words with retroflexes perceived to be native		
/ˈɑːrt/	[ˈɑːʈ^h]	kind, species
%/ˈstɑːrt/	[ˈstɑːʈ^h]	start, n.
/^{2}toːrt-a/	[^{2}t^{h}oːʈa]	cake
/ˈsnɑːrt/	[ˈsnɑːʈ^h]	soon
/ˈsmɑːrt/	[ˈsmɑːʈ^h]	smart
/^{2}voːrt-a/	[^{2}voːʈa]	wart
/ˈpoːrte̥r/	[ˈp^{h}oːʈe̥r]	stout (beer)
/ˈkɑːrt/	[ˈk^{h}ɑːʈ^h]	unripe fruit

27 Eliasson does mention ”some truly marginal cases”, but does not say what they are. He is presumably referring to paralinguistically short vowels, discussed in Eliasson (2010: 10).

/^{2}ɑːrt-a sẹj/	[^{2}ɑːʈa sẹjː]	to look good (in e.g. ”It's starting to look good now”)
/^{2}kɑːrt-a/	[^{2}kʰɑːʈa]	map, n.
/^{2}ɑːrt-ɪ(g)/	[^{2}ɑːʈɪ(g)]	polite
/ˈpɑːrt/	[ˈpʰɑːʈʰ]	share, n.
/ˈfɑːrt/	[ˈfɑːʈʰ]	speed, n.
/^{2}ʉːr-ɑːrt-a/	[^{2}ʉːrɑːʈa]	to degenerate, spin out of control
%/ˈpuːrt/	[ˈpʰuːʈʰ]	gate, large door
%/^{2}vɑːrsẹ/	[^{2}vɑːʂẹ]	aware (in ”to become aware of something”)
%/^{2}ɧuːrt-a/	[^{2}ɧuːʈa]	shirt
%/^{2}juːrtrɔn/	[^{2}juːʈrɔn]	cloudberry
%/^{2}ɕuːrtẹl/	[^{2}ɕuːʈẹl]	kirtle
%/ˈkuːrt/	[ˈkʰuːʈʰ]	card
%/^{2}muːrtẹl/	[^{2}muːʈẹl]	mortar

b) Content words without retroflexes perceived to be native

/ˈmoːln/	[ˈmoːln]	cloud
/ˈɑːln/	[ˈɑːln]	ell (unit of length)
/^{2}ɕøːln-a/	[^{2}ɕøːlna]	kiln
/^{2}oːsn-a/	[^{2}oːsna]	donkey
/^{2}støːdj-a/	[^{2}støːdja]	to support
/^{2}uːdl-a/	[^{2}uːdla]	to grow (transitive; agriculture)
/^{2}øːdl-a/	[^{2}øːdla]	lizard
/^{2}stɛːvj-a/	[^{2}stɛːvja]	to stifle
%/ˈliːnjẹ/	[ˈliːnjẹ]	line, noun
%/ˈvɛːnj dẹj/	[ˈvɛːnj dẹj]	get used to, imperative
%/^{2}hɛːvd-a/	[^{2}hɛːvda]	to claim, assert
/^{2}vɛːdj-a/	[^{2}vɛːdja]	to beg, plead
%/^{2}iːdk-a/	[^{2}iːdka]	to practise
/^{2}ɕeːdj-a/	[^{2}ɕeːdja]	(to) chain, noun and verb
%/ˈglɛːdj dẹj/	[ˈglɛːdj dẹj]	rejoice, imperative
/^{2}miːdj-a/	[^{2}miːdja]	waist
%/ˈboːld/	[ˈboːld]	noble, mighty, proud etc.

c) Names of people and places

/ˈlɑːrs/	[ˈlɑːʂ]	-
/ˈvɑːlbɔrj/	[ˈvɑːlbɔrj]	-
/ˈsuːlvẹj/	[ˈsuːlvẹj]	-
%/ˈheːdvɪg/	[ˈheːdvɪg]	-
%/ˈeːdvɪn/	[ˈeːdvɪn]	-
/^{2}koːlsrʉːd/	[^{2}koːlsrʉːd]	-
/ˈɑːdlẹr/	[ˈɑːdlẹr]	-
/^{2}eːdla/	[^{2}eːdla]	-
/^{2}soːlna/	[^{2}soːlna]	-
%/^{2}rɑːmløːsa/	[^{2}rɑːmløːsa]	-

d) Loanwords and names perceived to be foreign

/ˈɕøːrtʂɪl/	[ˈɕøːʈʂɪl]	Churchill
/ˈoːstẹr/	[ˈoːstẹr]	Auster (name)

%/ˈsɛːnde̩rs/	[ˈsɛːnde̩ʂ]	Sanders (name)
%/ˈsøːrvɪs/	[ˈsøːrvɪs]	service
%/ˈskɑːrf/	[ˈskɑːrf]	scarf
/ˌɑːfte̩rˈskiː/	[ˌɑːfte̩ˈʂkiː]	after-ski
/ˈstɛːndap/	[ˈstɛːndap^h]	stand-up (for some also [ˌstɛːnˈdap^{h}ː])
/ˈsɑːrs/	[ˈsɑːrs]~[ˈsɑːʂ]	SARS
/ˈbɑːske̩t/	[ˈbɑːske̩t^h]	basketball (the game)
%/ˈmoːtsart/	[ˈmoːtsaʈ^h]	Mozart
/hʊˈrɑːtsɪɵs/	[hʊˈrɑːtsɪɵs]	Horace
/ˈgrɑːtsɪe̩/	[ˈgrɑːtsɪe̩]	pleasure
/^{2}iːsrae̩l/	[^{2}iːsrae̩l]	Israel
%/ˈkeːnja/	[ˈk^{h}eːnja]	Kenya
/ˈsvɑːlˌbɑːrd/	[ˈsvɑːlˌbɑːɖ]	Svalbard

Hopefully reader is able to appreciate that there are far more exceptions than the two cited in Löfstedt (2010: 59). Depending on differences between idiolects, the list above shows between 41 and 63 exceptions, hardly ”marginal to the system”, as has been claimed in the literature (Eliasson 2010: 13). Given these attested examples, I do not fully understand why Löfstedt (2010: 49) claims that this phonotactic pattern is ungrammatical.

Some may feel that this list contains wrongly included words, so it is worth taking some time to justify them in more detail. Retroflexes, for example, are just a single segment on the surface, even though they are taken to come from a consonant cluster underlyingly (see R, ch. 4 and references therein). So even though [ˈɑːʈ^h] 'kind, species' comes from /ˈart/ in Consonant Theory, could one not claim that retroflexion applies first, giving aʈ, which then allows vowel lengthening exactly as in /ˈsil/ 'sieve'? The answer to this is no. Such a solution cannot explain words with long retroflexes, like [ˈk^{h}vaʈ^{h}ː] 'quarter of an hour'. Riad's solution to this retroflex problem is that words like [ˈɑːʈ^h] are /ˈart/ underlyingly, while words like [ˈk^{h}vaʈ^{h}ː] are /ˈkvarrt/ underlyingly (see the transcriptions in R: 79).[28]

One could easily extend this solution to non-retroflex cases, such as [ˈmoːln] 'cloud' versus [ˈk^{h}ø̩lːn] 'Cologne', which would be /ˈmoln/ and /ˈkølln/ respectively. Riad (p.c.) claims that this undesirable, given that there are so few [ˈmoːln]-type words. Eliasson and LaPelle (1973: 140) say it is “obviously a non-desirable result.” Yet as the list above shows, there are actually quite many [ˈmoːln]-type words (11-17 native content words; 15 in my idiolect). Why would one use the geminate solution for retroflexes (for which there are 13-21 native content words, 14 in my idiolect), but not elsewhere? The only other alternative would be admitting lexical vowel length for [ˈmoːln] and the other 10-16 words of this type. Consonant Theorists must choose whether they prioritise having an economical theory over accounting for the pronunciations of Swedish words.[29]

One could also argue that some of these long vowels are in open syllables. SCSw. syllables can begin /sk/, so a word like [ˈbɑːske̩t^h] 'basketball (the game)' should be syllabified [ˈbɑː.ske̩t^h], with the expected lengthening in a stressed open syllable. But that syllabification makes incorrect predictions. If a word like [ˈhe̩sːt] 'horse' is underlyingly /ˈhest/, it should get a long vowel if a vowel-initial suffix is attached to it. So /ˈhest-ar/ 'horses', should be

28 In section 3.2, I used this analysis when I included lengthening before /r/ and coronal consonants as the fourth environment of **V length**. It is also worth noting that Riad's transcriptions are slightly inconsistent here; R: 61 has /ˈkʉrs/ as underlying form of [ˈk^{h}ɵʂː], even though it should be /ˈkʉrrs/.

29 It is hopefully obvious what my position is. A phonologist's job is to explain the pronunciations of a language. If a theory does not account for all the pronunciations, then it is clearly not the theory native speakers use. Having a neat theory is always subordinate to being able to explain the actual data.

syllabified 'he.star and undergo open-syllable lengthening. This is not what we see. The plural 'horses' is [²hẹsːtar], not *[²heːstar]. This either means that Swedish lacks onset maximisation when dividing words into syllables, or that the word 'horse' should be /'hesst/ in Consonant Theory. I suggested the latter solution for words like ['kʰø̣lːn] 'Cologne' above for independent reasons.

While on the topic of basketball, it is worth mentioning Riad's (2014) treatment of ['bɑːskẹtʰ]. He suggests that Swedish has a suffix /ket/ 'to do with sports/games', which we also see in e.g. ['rakːẹtʰ] 'racket'. Since there is now a morpheme boundary between the s and k, vowel lengthening is predicted. As a native speaker, this analysis does not correspond to my intuitions. Native English speakers might want to consider whether they find /bɑːs-kɛt-bɔːl/, /ɹæ-kɛt/ and /krɪ-kɛt/ appropriate morphological divisions for 'basketball', 'racket' and 'cricket'. Even if this analysis were true, such a morpheme boundary does not explain the many other words in (23) above which neither end in /ket/ nor have to do with sports.

Individual solutions like the one for 'basketball' can be found for other words as well. Riad (p.c.) suggests that [²uːdla] 'to grow' may be /²ud-l-ɑ/, with a verbal suffix /l/. The problem is that there is no reason to think that there is a verbal suffix /l/ in Swedish. There is no meaning it could possibly have, and the hypothetical stem /ud/ never appears without it. Again, this analysis doesn't correspond to native speaker intuitions. If decompositions like these are real, how come native speakers, who have access to their own lexicons, claim that they are incorrect? The same decomposition argument could be made against verbal forms with /j/ as the second consonant. But according to Riad (R: 173), the verbal /j/ suffix causes preceding vowels to shorten. So whether the words of the shape [Vːj] above contain this suffix or not, the long vowel is still unexplained.

Another solution for the /Cj/ words could be counterbleeding opacity. Suppose that words like [²miːdja] 'waist' are underlyingly /²midi-a/. Then vowel lengthening can take place in open syllables as usual, counterbled by a hypothetical rule turning unstressed /i/ to j. Unfortunately, this does not work, since there's a contrast between unstressed /i/ and /j/: [fɪ 'uːl] 'violin' vs. ['fjuːl] 'last year, noun' (Elert 1979: 79, footnote 2). The situation in post-stress syllables is admittedly different, with optional neutralisation of /i/ and /j/, but the neutralisation is only optional. 'Media' may be pronounced either ['meːdja] or ['meːdɪa], while 'waist' is only [²miːdja], never *[²miːdɪa]. This suggests that 'waist' underlyingly has a /j/, while 'media' has an underlying /ɪ/ which optionally reduces to j in post-stress syllables. The words in the list above are only those which do not allow an alternative pronunciation with [ɪ].[30]

In Eliasson and LaPelle's (1973) analysis, some of the words in (23) are accounted for; their vowel lengthening rule predicts lengthening before sequences of [-son] and [+cons, +son, +cor] (Eliasson and LaPelle 1973: 139). But out of the 63 words in (23), this still leaves us with 57 exceptions. The wording in Eliasson (2010: 13) gives the same results. While these analyses remove a few exceptions, it is still the case that none of the Consonant Theoretic analyses in the literature can account for the words in (23) above.

From this we can conclude that point 1 in the list above is not true. SCSw. does allow [VːCC] clusters, and there are around 40-60 of these words, and not just 2-3 as many linguists have assumed. We will move on now to points 2 and 3, which will be discussed together. Point 2 bans short vowels in stressed open syllables. This is like the claimed English ban on words like *[lɪ], *[sɛ], or *[mɔ]. Lorentz (1996: 112), who is writing about Scandinavian in general,

30 Ollie Sayeed (p.c.) has suggested that we could still have the counterbleeding if there's a three-way contrast between/i/, /j/ and underspecified /J/. 'waist' would be /²'midJa/, which could plausibly allow vowel lengthening by V length. /J/ would then obligatorily be syllabified as the consonant [j].

explicitly says that there are ”no exceptions” to this generalisation.[31] Together with other quantity facts about Swedish, this has led many researchers to conclude that every stressed syllable in Swedish is heavy (has two moras), while every unstressed syllable is light (has one mora). This is point 3 above (see there for references). This generalisation is key in many analyses of Swedish, such as Löfstedt (1992, 2010) and Riad (2014). Rice (2006) even uses the bidirectional implication 'stressed syllable ↔ syllable with two moras' to justify an Optimality Theoretic analysis of Norwegian (Rice 2006: 1171), which is very similar to SCSw. when it comes to quantity.

These above-mentioned analyses, however, would struggle to account for the words that do have short vowels in stressed open syllables. I cannot present a long of such words, as for point 1, and there are in fact very few words of this type. Below are the three that I know of. Two of them are taken from Elert (1964: 35). Elert's work is extremely well-known and well-cited, but these words have escaped the notice of both Vowel and Consonant Theoretic linguists in previous treatments.

(31) What?!

UR (Vowel Theory)	SR
/ˈa/	[ˈa]
/ˈva/	[ˈva]
%/ˈjɵ/	[ˈjɵ]

[ˈa] means 'for' when referring to prices, as in *Två kex* [a] *5 kronor (styck)* 'Two biscuits **for** 5 kronor (each)'. It can also translate the 'to' of '10 to 20 biscuits.' [ˈva] is used to ask someone to repeat information ('come again'). Some speakers also use it as a filler at the ends of clauses, especially in long utterances. [ˈjɵ] is an adverb appearing in declarative clauses. It conveys that the speaker expects the information in the clause to be obvious or already known to the hearer; a translation might be 'of course'. It is also the first (and for some, also the second) 'the' in sentences like '*the* slower you walk, *the* longer it will take you to get there'.

There are also examples of open-syllable words where both a long and a short vowel are used in different contexts. Here I agree with Eliasson (2010: 10), who calls the forms with short vowels paralinguistic. The short-vowel forms always express the same meaning as the long-vowel forms, together with some emotion. For example, [ˈnoː] means 'well', while [ˈnɔ] is how one might say 'well' when impatient (E: 109). There is no reason to think these are separate lexical entries. But this is not the case for the words in (31). [ˈa] is not a paralinguistically shortened form of *[ˈɑː], which is ungrammatical with this meaning.[32] And while [ˈva] could plausibly be connected to the question word 'what', the two words don't overlap in meaning and can't be used interchangeably, like [ˈnoː] and [ˈnɔ] 'well'.

How could one analyse these words in Consonant Theory? There are no previous analyses to build on, but I will provide some suggestions here. It is possible that words like [ˈva] 'come again' are not really language at all. They are stored pronunciations, but they do not have anything to do with phonology. This might work for [ˈva], but it cannot explain [ˈa] and [ˈjɵ]. First of all, [ˈa] is a preposition. Why would prepositions be something other than lexical items with underlying representations? Prepositions in Swedish generally do not escape **V length**: [ˈiː] 'in' and [ˈpʰoː] 'on'. And [ˈjɵ] is an adverb, meaning that we can use syntactic word order facts to show that it definitely participates in linguistic processes. (32)

31 Lorentz acknolwedges that Faroese, Norwegian and Swedish are slightly different. However, the only difference he mentions concerns vowels in closed stressed syllables.

32 The situation with [ˈjɵ] is more complicated, as many speakers have [ˈjʉː] for this word. Exposure to different varieties will surely mean that some speakers allow both pronunciations with the same meaning.

below shows that [ˈjɵ], written <ju>, follows the main verb in main clauses, but precedes it in subordinate clauses, like other Swedish adverbs. These adverb facts are illustrated in the sentences below by the placement of *faktiskt* 'actually'. Syntactic derivations, of course, are usually taken to operate on lexical items.

(32) Word order in main and subordinate clauses

Det	**är**	**ju**	**faktiskt**	så.
It	**is**	**ju**	**actually**	so.

'Of course, it actually is that way.'

*Det	**ju**	**är**	**faktiskt**	så.
It	**ju**	**is**	**actually**	so.

Intended: 'Of course, it actually is that way.'

Det är viktigt att komma ihåg	att	det	**ju**	**faktiskt**	**är**	så.
It's important to remember	that	it	ju	actually	is	so.

'It's important to remember that of course, it actually is that way.'

?Det är viktigt att komma ihåg	att	det	**är**	**ju**	**faktiskt**	så.[33]
It's important to remember	that	it	is	ju	actually	so.

Intended: 'It's important to remember that of course, it actually is that way.'

For [ˈjɵ], there are also phonological reasons for thinking that it is not merely a stored, unanalysed whole. The pronunciation of the palatal approximant [j] as a palatal fricative [ʝ] is becoming more prestigious in Stockholm. This means that many SCSw. speakers are switching from /j/ to /ʝ/, or are at least beginning to allow both [j] and [ʝ]. This sound change is affecting [ˈjɵ] as well, suggesting that it is a lexical entry with a phonological representation. These words, then, really do have to be explained by phonological theories.

Another such explanation might be to say that these words are not actually stressed (Riad, p.c.). Riad (2015) shows that there is reason to think that Swedish has stressless words independently of points 2 and 3. Unfortunately, this approach seems not to work either. Remember section 4.1, where the French football player Benzema was discussed. His name was pronounced as [bẹnsẹˈma]. I would argue that the last vowel is phonologically stressed, but I would need to prove this. Fortunately, such proof is easy to come by. Remember the possessive form [bẹnsẹˈmasː]. In section 4.1 we discussed the problems posed to Consonant Theory by the geminate [sː], since this morpheme's underlying form must be singleton /s/. It turns out that that this long [sː] is going to cause even more problems. Geminates only ever appear in stressed syllables. When unstressed, everyone agrees that long consonants shorten (see section 2). The final syllable, then, really must be stressed. This means that the non-possessive base form must be stressed as well. This is what we see in every other word in Swedish, and there is nothing to suggest that this name is any different. Given, then, that short stressed vowels in open syllables are in fact allowed, there is no reason to suppose that citation forms of words like [ˈjɵ], [ˈva] and [ˈa] are stressless either.

The only other explanation which I can see would be to say that the words are underlyingly stressless, but become stressed later in the derivation. This would be an example

33 This is grammatical only with a pause after 'that'. I have the same judgements for the English sentence: “We have to ask ourselves what are we going to do?”. Without a pause, it is impossible, but with a pause, the question becomes reported speech and the sentence is acceptable.

of counterfeeding opacity, since the addition of the stresses applies too late to feed into **V length**. This approach may be empirically adequate, but nevertheless has a theoretical downside. To see this, consider the following quote from Riad, explaining one of the advantages of his theory. Note that his Stress-to-Weight is my point 3: stressed syllables need two moras.

> If a vowel is short in an open syllable and receives stress, it will lengthen to two moras by Stress-to-Weight (CV_{μ} > $CV_{\mu\mu}$, phonetically CV:). If a vowel is short and followed by a long consonant, then Stress-to-Weight is met by the short vowel and the mora of the consonant ($CV_{\mu}C_{\mu}$, phonetically CVC:). If a vowel is short and followed by a consonant cluster, part of which is in the same syllable, then Stress-to-Weight will make the postvocalic consonant moraic, i.e. weight will be instantiated by position ($CV_{\mu}C.CV$ > $CV_{\mu}C_{\mu}.CV$, phonetically CVC:.CV). These are the only three cases and they always result in heavy stressed syllables (R: 178)

He argues that it is advantageous that Consonant Theory generalises across all of these contexts using a single constraint. But if there is counterfeeding involved, this can no longer be. In the possessive [be̜nse̜ˈmasː], we now know that the word begins its life without a stress. **V length** fails to apply, as there are no stressed syllables. The possessive /s/ (remember that it must be a singleton in Consonant Theory) is then added, and the word becomes stressed. Subsequently, some version of Stress-to-Weight applies again, producing [be̜nse̜ˈmasː] and not *[be̜nse̜ˈmas]. In other words, vowel lengthening and Stress-to-Weight must apply at different points in time, meaning they cannot possibly be a single process. Even if one abandons any rule-based thinking to use Optimality Theory, it is clear that stressless /bensema/ cannot become stressed [be̜nse̜ˈma] using just an undominated constraint like Stress-to-Weight. Candidates with lengthening would always win. I leave it to future Consonant Theorists to decide how to analyse these facts.

The conclusion of this discussion is that Swedish has open syllables with short stressed vowels. This is equivalent to saying that point 2 is false. These words are also light (monomoraic) stressed syllables, which point 3 forbids. Therefore, analysing Swedish by using something like an undominated constraint requiring stressed syllables to be heavy is not going to work. I have only been able to find one way of analysing these facts in Consonant Theory. It involves counterfeeding and forces us to abandon any neat generalisations that Consonant Theory might be able to express. Meanwhile, the Vowel Theory analysis is as simple as can be. Some words have underlying short vowels, and these never lengthen. It is true that I am abandoning any teleological generalisations, such as point 3, but I can easily account for *all* Swedish words, and not just the majority of them.

Next we will see some more conclusions that we can draw based on the data we have seen. Point 4 has it that there are no minimal pairs for vowel length, and point 5 says that vowel length is predictable from consonant length. If one could falsify 4, one would be falsifying 5 as well. There's a widespread view in the literature that minimal pairs for any kind of quantity would be impossible. Eliasson (E: 107) says their absence ”must be strongly emphasized”; Riad says that minimal pairs for vowel or consonant length could not exist (R: 165), and Eliasson (2010: 28) claims that long and short vowels cannot contrast ”by logical necessity”. Firstly, note that due to differences in prosodic structure, there are perfect minimal pairs for both vowels and consonants, as we saw in section 2. But here we will look at another kind of minimal pair, one which has never been discussed in the literature until now. In (33) below, I show two perfect minimal pairs for the vowel phonemes /a/ and /ɑː/, without any differences in the duration, quantity or quality of any other segment:

(33) They exist

/ˈa/	[ˈa]	for (of price per item; see text below (31))
/ˈɑː/	[ˈɑː]	A (music), A (letter of the Latin alphabet), A (grade in schools)
/ˈva/	[ˈva]	come again (for elaboration, see text below (31))
/ˈvɑː/	[ˈvɑː]	to be, was/were, what (interrogative)[34]

Contrary to what has previously been claimed with such conviction, Swedish has perfect minimal pairs for vowel length; point 4 is false. It naturally follows that vowel length cannot be predicted from consonant length, so point 5 is also false. Only a theory with lexical vowel length can explain these data in a satisfying way. This also means that Consonant Theory is the only theory storing predictable information, namely consonant length, in the lexicon.

There is one point that must be discussed in relation to minimal pairs, as well as the few words like /ˈa/ that exist in Swedish. There is a view among many linguists that marginal contrasts are unimportant, and that if something is only found in a handful of words, it can ignore it. In this question, I agree fully with the spirit of the following quote from Rice (2006: 1180) on a different topic: ”While there may be relatively few such words in Norwegian, their number is surely not as important as their status.” All native speakers of SCSw. can and do produce words with short stressed vowels in open syllables, and all of them have the minimal pairs in (33). Whatever theory their minds implement, it must be able to explain these facts. Any theory which fails to do this is not the one native speakers use. My goal as a phonologist is to find the theory native speakers use, and I hope this ambition is shared by other phonologists. One must account for all of the data, and not only the parts of it which happen to support one's theory. I am arguing that the best theory for all the facts of Swedish quantity is Vowel Theory. It correctly predicts the existence of these contrasts, whereas Consonant Theory incorrectly predicts their absence. Of the two theories, only Vowel Theory offers an explanation for all of a native speaker's phonological competence.

We have now falsified five crucial points of Consonant Theory. Some of them have been absolutely essential to the existence of that theory in the first place. All of our five points must now be replaced with the correct predictions of Vowel Theory. 1) There are long vowels in closed syllables, even before two or more consonants within a morpheme. 2) There are short vowels in open stressed syllables. 3) Not every stressed syllable in Swedish is heavy. 4) There are minimal pairs for vowel length. 5) Vowel length is not predictable from consonant length. Vowel Theory and Consonant Theory differ in empirical coverage, meaning that one does not have to use conceptual arguments to decide between the two. I would also like to emphasise how important it is that analyses account for all of the facts. I can only hope that all of the data presented here are discussed in future analyses of Swedish quantity, and that the data I have taken from Elert (1964: 35) are not ignored for another half a century.

7 Conclusion

In this article, we have examined two theories of Swedish quantity, Vowel Theory and Consonant Theory. We began by reviewing the phonological processes of Consonant Theory,

34 The pronunciation [ˈvɑː] is the dominant one for all three words in spoken SCSw. In formal registers [²ˈvɑːra], [ˈvɑːr] and [ˈvɑːd] are used for 'to be', 'was' and 'what' respectively.

the motivation for them, and saw some further arguments in favour of distinctive consonant quantity. In section 4, we introduced Vowel Theory, a different interpretation of the facts of Swedish phonology. I provided internal and external evidence for all of its rules. **C length** was the source of long consonants in Swedish, and we saw that it was productive even in the possessive clitic /s/, which Consonant Theory struggled to account for. I did not use **V short** in the way Consonant Theorists have suggested, as an explanation for the 'critical' alternations. Nevertheless, such a rule was still needed to account for some newly coined words, and the language game *rövarspråket* gave us external evidence for its existence. With **SLV**, it initially seemed as if we would only be able to hypothesise that it existed, as there were many exceptions to its predictions. However, using forms from first-language acquisition, we were able to show that those exceptions were due to morphology and not phonology.

We also looked at some counterarguments to the points in section 3. One example was the supposed contrast between /t/ and /tt/ in two suffixes. The child speech just mentioned led us to disregard that argument. We concluded that there were two suffixes, both /t/ phonologically, and that one of them had a diacritic feature which eventually caused it to be realised as a geminate. A lot of time was also spent on the 'critical' alternations, where we argued that they did not allow us to decide between the two theories. Moreover, we found 'critical'-type alternations in languages without consonant length; it was concluded that having 'critical' alternations was a weak argument for underlying consonant length to begin with.

In section 5, we examined the arguments from section 3 which had not already been answered. These were also found to be unconvincing. Some were based on incorrect typological generalisations, and others might have been true of the Swedish spoken 200 years ago, but are no longer true of the language as spoken today. Additionally, there was justification for treating long and short vowels as separate phonological units, in the form of phonological rules targetting only short vowels.

However, the most important part of my argumentation for Vowel Theory was in section 6. Almost all of the evidence presented in this section was new, and has not been discussed in the literature on Swedish until now. Section 3 argued that the limited distribution of vowels was an advantage of Consonant Theory, but section 6 showed that the distribution is not actually limited in the way Consonant Theory predicts. For example, I presented a long list of both native and borrowed words with [V:CC] clusters, contra Consonant Theory's predictions. Although there were not many previous analyses to build on, we were able to find a Consonant Theoretic solution, by changing our assumptions about possible underlying forms.

It was more difficult when we came to words with short stressed vowels in open syllables. These posed big challenges to Consonant Theory, where **V length** predicts that no such words exist. Every explanation for them was unsuccessful in some way, and even though there are few such words in Swedish, the few words that do exist are good evidence for Vowel Theory. It was these words that led us to perfect minimal pairs for vowel length. Some believe that minimal pairs would be logically impossible in Swedish, but they demonstrably exist. I argued that only a theory with distinctive vowel length can predict and explain this. At the end of the section, we concluded that many of Consonant Theory's major predictions are actually false. Vowel Theory, on the other hand, had no problem explaining any of the new data, and in fact predicted them to exist in the first place.

To conclude, we have seen arguments for Vowel Theory, counterarguments to Consonant Theory, and data on SCSw. which have never been discussed before. These new data had a big impact on which theory of length we choose, and they clearly favoured Vowel

Theory. I have tried my best to improve on the Consonant Theoretic analyses of Swedish in the literature, and I hope that Consonant Theorists will find this article helpful. However, my conclusion is that Vowel Theory is correct. The representations of pronunciation in the minds of native speakers of Standard Central Swedish have 17 vowels.

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