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Welsh svarabhakti as stem allomorphy

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Abstract

In this paper I propose an analysis of the repairs of sonority sequencing violations in South Welsh in terms of a non-phonological process of stem allomorphy. As documented by Hannahs (2009), modern Welsh uses a variety of strategies to avoid word-final rising-sonority consonant clusters, depending in part on the number of syllables in the word. In particular, while some lexical items epenthesise a copy of the rightmost underlying vowel in the word, others delete one of the consonants in a cluster. In this paper, I argue that at least the deletion is not a live phonological process, and suggest viewing it as an instance of stem allomorphy in a stratal OT framework (Bermúdez-Otero 2013). This accounts for the lexical specificity of the pattern, which has been understated in the literature, and for the fact that cyclic misapplication of deletion and diachronic change are constrained by part-of-speech boundaries.

In this paper I address the issue of the division of labour between phonology and other components of grammar. I consider a set of phenomena in Welsh that have previously been analysed as falling fully within the purview of phonological computation, and argue that they are best treated as involving a mix of productive phonology and lexical insertion. Although this approach suffers from a version of the 'duplication problem' (e. g. Kenstowicz & Kisseberth 1979), I suggest that it is better supported empirically, and argue that the 'problem' is better understood as arising in the course of the life cycle of phonological patterns. As discussed by, among others, Bermúdez-Otero (2007, 2015); Bermúdez-Otero & Hogg (2003); Paster (2012), phonological patterns have a tendency to shape the underlying forms of lexical items; the duplication of labour between such underlying forms and live phonological computation is only to be expected if a proper theory of this influence is available, and is not necessarily a 'problem'. I argue that svarabhakti in (South) Welsh is just such a case.

This paper is organised as follows. In section 1 I survey the received view of the data and provide an overview of potential exceptions to the usual picture. In section 2, I sketch the analysis proposed

for (North) Welsh svarabhakti by Hannahs (2009) and show that it faces a number of difficulties, particularly when applied to South Welsh dialects: I show that it is, in fact, incompatible with a view of sonority-driven consonant deletion in South Welsh as a phonological process. Instead, in section 3 I argue that several svarabhakti-related patterns in Welsh are best viewed as instances of stem allomorphy rather than as the effects of 'live' phonological computation, and show that this approach can provide a principled account of several previously unanalysed phonological irregularities. In section 4 I discuss some further diachronic and synchronic implications of the proposed analysis. Section 5 concludes.

1. SVARABHAKTI IN WELSH

A characteristic feature of many varieties of Modern Welsh is the ban on most types of rising-sonority word-final clusters. More specifically, many sequences of the type 'obstruent — sonorant' are not tolerated in native vocabulary. Hannahs (2009), in a paper focusing on North Welsh varieties, has shown that Welsh dialects deploy several responses to this restriction (all examples are from Fynes-Clinton 1913; hyphens show morpheme boundaries).

(1) Epenthesis
    a. ['pɔbɔl]   *pobl*   'people'
    b. ['pɔbl-ɔð] *pobloedd* 'peoples'

(2) Deletion
    a. ['fɛnast]   *ffenestr*   'window'
    b. ['fnɛst**r**-i] *ffenestri* 'windows'

(3) Metathesis
    a. ['ɛwɨrθ]   *ewythr*   'uncle'
    b. [ɛ'wəθr-a] *ewythrau* 'uncles'

However, certain words do allow such rising-sonority clusters: notably, this applies to [v]-initial sequences and English borrowings:

(4) Sequences with [v]
    a. ['gavr]   *gafr*   'goat'
    b. ['ɔvn]   *ofn*   'fear'

(5) Borrowings
    a. ['bɛkn]   'bacon'
    b. ['nɔbl]   'noble'

Traditionally, the pattern exemplified in (1) is known by the term *svarabhakti*, and I adopt this usage here. Since metathesis appears limited to a couple of forms (*ewythr* 'uncle' and *dieithr* 'alien'), I do not consider it further in this paper, and concentrate on the choice between epenthesis and deletion.

Most sources agree that in the default case, epenthesis is associated with 'monosyllabic' forms (more precisely, those that would be have been monosyllabic had epenthesis not happened), whereas deletion is limited to 'polysyllabic' forms; see e. g. P. W. Thomas (1996, §§III.35, IV.24). Thus, forms such as *ochr* 'side', *budr* 'vile', *llyfr* 'book' are expected to undergo epenthesis: more specifically, an exact copy of the vowel immediately preceding the cluster is inserted between the obstruent and the sonorant. When the preceding syllable is headed by a diphthong (*llwybr* 'path', *sawdl* 'heel'), the inserted vowel is a copy of the glide: [ˈɬʊɪ̯bɪr], [saʊ̯dʊl]. In contrast, polysyllabic forms such as *aradr* 'plough', *ffenestr* 'window', and *posibl* 'possible' are expected to undergo deletion of the final consonant.

Hannahs (2009) adopts this explanation and proposes to view this diversity of processes as stemming from a unified phonological motivation. He suggests that, apart from loanwords, which are listed as exceptional in some manner, the relevant manipulations are the product of phonological computation. Therefore, the choice of whether to delete the final sonorant or epenthesise a vowel is made at a single point in the derivation, with reference solely to the phonological context. Hannahs (2009) formalises this in Optimality Theory (Prince & Smolensky 1993), as discussed in more detail below.

One very clear prediction of this phonological approach is that the conditions triggering epenthesis or deletion should exactly follow the phonological contexts. For instance, if these phenomena are triggered by the avoidance of certain sonority profiles (see below for explicit discussion), we expect the clusters to surface unchanged when sonority requirements are met: in other words, we expect alternations such as those seen in (1)–(3) to happen in **all** cases when the sonority profile requires them, and **only** in those cases.

In the following I consider a range of data, mostly from South Welsh dialects, that go against this prediction and generally appear to be incompatible with the account of Welsh svarabhakti proposed by Hannahs (2009). I point out several cases of 'irregular' svarabhakti which involve mismatches in vowel quality, lack of sonority-related motivation, and apparent cyclic misapplication. I also argue that the view of Welsh prosodic structure that is necessary to sustain Hannahs' analysis is not applicable to South Welsh varieties, and consequently that the analysis needs important amendments.

In this paper I adopt the traditional distinction between North and South Welsh, and use the Bangor dialect as described by Fynes-Clinton (1913) as representative of North Welsh, and Pembrokeshire Welsh as described by Awbery (1986) as representative of South Welsh.[1] These sources make

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[1]An anonymous reviewer raises the concern of whether these data are comparable, in view of the fact that Fynes-Clinton's data were gathered much earlier than Awbery's, and of the fact that Pembrokeshire Welsh shows a number of features not found elsewhere in the south. For our purposes the main difference between North and South Welsh is the presence of a vowel length contrast in penultimate syllables, which is discussed in more detail in section 2.2; the situation described by Fynes-Clinton (1913) is not, in this respect, significantly different from what is found in later descriptions of North Welsh such as A. R. Thomas (1966). The same applies to the prosodic system of Pembrokeshire Welsh vis-à-vis other South Welsh varieties. For South Welsh, I have also used the description of the Nantgarw dialect by C. H. Thomas (1993). This variety is quite deviant in many respects, and in addition C. H. Thomas (1993) does not write vowel length explicitly, so any pronouncements on the prosodic structure of this variety would require more explication than would be appropriate in the context of the present paper. Nevertheless, I use the rich lexical resources

different transcriptions choices with respect to vowel quantity and quality. In general in Welsh, long vowels are 'tense' [iː uː eː oː] and stressed short vowels are 'lax' [ɪ ʊ ɛ ɔ] (there is no distinction for [ə], which is always short, and probably not for [a(ː)]), see Mayr & H. Davies (2011). Unstressed vowels are described as variable in quality. To simplify cross-dialectal comparison, I have rewritten all forms to reflect both quantity and quality. The reader should therefore keep in mind that the epenthetic vowel, which is assumed to be identical to the preceding one in some phonological sense, may sometimes change its [tense] value; this is irrelevant to the present argument.

1.1. Exceptions to svarabhakti: lack of phonological motivation

One issue that complicates the view of svarabhakti as a straightforward phonological process is the existence of vowel-zero alternations reminiscent of svarabhakti which cannot be ascribed to a ban on word-final rising-sonority clusters. Some relevant examples from Pembrokeshire Welsh (Awbery 1986) are given below:

(6) a. [ˈheːlɛm]   *helm*   'helm, corn stack'
    b. [ˈhɛlm-i]   *helmi*   'corn stacks'

(7) a. [ˈguːðʊg]   *gwddf*   'neck'
    b. [ˈgʊðg-e]   *gyddfau*   'necks'

In these examples, the sequences [lm] and [ðg] are broken up by what looks like svarabhakti vowels in word-final position. This is despite the fact that under standard assumptions on sonority, nasals are less sonorous than liquids, and (voiced) stops are less sonorous that (voiced) fricatives: in both cases the sonority profile at the right of the word is falling rather than rising.

In fact, these words may lack svarabhakti vowels in other Welsh varieties, both in the north and in south; the following example shows cognate forms in Nantgarw, south-east Wales (C. H. Thomas 1993).[2]

(8) a. [ɛlm]   *helm*   'corn stack'
    b. [ɛlm-i]   *helmi*   'corn stacks'

(9) a. [ˈguːðʊg]   *gwddf*   'neck'
    b. [gəˈðək-a]   *gyddfau*   'necks'

In Nantgarw, there is no epenthesis in *helm*, as expected based on the sonority profile. As for *gwddf*, while it must have contained the svarabhakti vowel historically, synchronically the [ʊ] found between [ð] and [g] behaves as an underlying /u/.

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of that description to complement the explicit phonological focus of Awbery (1986). Where appropriate, I also refer to the dialectal glossaries of Pembrokeshire Welsh by Morris (1991 [1910]) and Owens (2013). These sources use Welsh spelling, which is transparent enough to be reasonably sure of the intended pronunciation; they certainly reflect the presence or absence of svarabhakti vowels. Occasionally I offer these examples in IPA for ease of comparison; I mark these cases with an asterisk following the IPA form and give the orthographic form as in the source.

[2]The alternation between [g] and [k] in 'neck' is irrelevant for the present purposes.

Historically, there is significant variability in svarabhakti in falling-sonority clusters. In Middle Welsh (Schumacher 2011; Simon Evans 1964) svarabhakti appears to have been regular in the sequences [rv], [lv], [rm], [lm], and [ðv]:[3] *araf* 'weapon', *baryf* or *baraf* 'beard', *furyf* 'form', *palyf* 'palm'. Although the appearance of an excrescent vowel is not unusual in sonorant-obstruent sequences of this sort,[4] and although Simon Evans (1964, §16.a) claims that the 'modern dialects' show a full vowel in these contexts, the situation in modern varieties appears to be more complex.

For instance, word-final [rv lv] are definitely allowed in South Welsh: Pembrokeshire [fɪrv] 'form', Nantgarw [palv] 'paw', [fɪrv] 'shape'. At the same time, other words with these clusters do seem to undergo svarabhakti: Nantgarw ['bɑːrav] 'beard', pl. ['barva] (Morris 1991 [1910] also gives *baraf* for Pembrokeshire, but with no plural).[5]

Crucially, the application of svarabhakti in these cases seems to be lexically specific, unlike in the case of rising-sonority clusters, which undergo epenthesis across the board.

We also find some examples of less straightforward interactions between svarabhakti and other sound patterns. Consider the following examples from North Welsh:

(10)   a.   ['gʊðʊ]   *gwddf*   'neck'

        b.   ['gəðv-a]   *gyddfau*   'necks'

(11)   a.   ['tʊrʊ]   *twrf*   'noise'

        b.   ['tərv-ɨ]   *tyrfu*   'to make a noise'

Here, the singular appears to undergo the widespread process of deletion affecting word-final [v], which creates alternations such as the following:

(12)   a.   ['treː]   *tref*   'town'

        b.   [trɛv-ɨð]   *trefydd*   'towns'

If we allow this process as part of the phonology of North Welsh, the facts in (10) can be accounted for by assuming underlying /guðv/ and /turv/[6] which, when unsuffixed, undergo epenthesis first and [v]-deletion later.

There are, however, two issues problematic for such a straightforward phonological account. First, the [v]-deletion is lexically irregular: an inspection of relevant headwords in the dialect survey of A. R. Thomas (2000) shows that there is clearly no general constraint against word-final [v]; for instance, North Welsh varieties generally preserve the final [v] in *prawf* 'proof' or *claf* 'ill'. Therefore, even if North Welsh does have a phonological process of word-final [v] deletion, it must somehow be lexically restricted. This presents a particular challenge to modular approaches to grammar

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[3]For historical reasons, [rm] and [lm] are very rare in Middle Welsh.

[4]Indeed, a similar process is found in the related Goidelic languages, see e. g. Bosch & de Jong (1997); Hall (2006); Hind (1996); Ní Chiosáin (1999) and also Hannahs (2009) for some discussion. See also Warner et al. (2001) for discussion of a similar phenomenon in Dutch.

[5]Other examples of svarabhakti in such items are ['fuːrʊm], pl. ['fərme] 'bench' (Wmffre 2003); *berem* 'barm', *bermu* 'to froth' (Morris 1991 [1910], s. vv.).

[6]The alternation between [u] and [ə] is irrelevant here; for simplicity, I follow the majority of the literature (e. g. Bosch 1996; Cartmill 1976; Hannahs 2007; A. R. Thomas 1984) in assuming that /ʊ/ is the underlying segment in these cases.

that cannot make use of diacritic marking of phonological strings as (non-)undergoers of particular processes (e. g. Bermúdez-Otero 2012).

In the particular case of [ˈɡʊðu] 'neck' and [ˈtʊru] 'noise', it is, in principle, possible to view deletion as an instance of a regular phonological pattern of [v]-deletion in the context u____ #. This, however, creates the problem of *opacity*: under this approach, the epenthesis appears to *overapply*, because the vowel insertion is presumably motivated by the presence of the [v] (as otherwise a vowel would be inserted after all final instances of [ð], which is manifestly not the case), but the [v] is deleted. This type of process interaction is notoriously problematic for approaches based on parallel OT (see e. g. Bye 2011), to which Hannahs (2009) subscribes.[7]

Any account of svarabhakti which sees the process as triggered exclusively by the avoidance of word-final rising-sonority clusters on the surface inevitably falls short in the face of the data discussed in this section. If svarabhakti is a purely phonological, sonority-driven process, the data show both overapplication (unmotivated svarabhakti in rising-sonority clusters and opaque interaction with consonant deletion) and underapplication (lexically specific application in some clusters)

1.2. Exceptions to svarabhakti: irregular copying

Another phenomenon that is reminiscent of svarabhakti but raises phonological issues involves cases where the 'epenthetic' vowel is not a complete copy of the preceding one. One class of these cases has a principled motivation, specifically the inadmissibility of certain vowels ([ə] in most varieties; [ɛ] in the south-east and north-west) in final syllables. This gives rises to incomplete copying, as in the following examples:

(13) Pembrokeshire Welsh

    a. [ˈɬəvir]   *llyfr*   'book'

    b. *[ˈɬəvər]

    c. [ˈɬəvre]   *llyfrau*   'books'

(14) Nantgarw Welsh

    a. [ˈtreːvan]   *trefn*   'arrangement'

    b. *[ˈtreːvɛn]

    c. [ˈtrɛvni]   *trefnu*   'arrange'

However, since the restrictions on final-syllable vowels are general in the phonology of the relevant dialects, such cases can probably be reconciled with the broader phonological grammar (Iosad 2012). More problematic is the residue of cases where no such principled explanation is available, and vowel-zero alternations cannot be transparently ascribed to an epenthesis process. Compare the following pairs:

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[7]Additionally, both epenthesis and [v]-deletion appear to make crucial reference to word-final position. This means that this instance of counterbleeding opacity cannot be handled through level ordering as implemented in Stratal OT (e. g. Bermúdez-Otero 2011; Kiparsky 2000): both processes are word-level, and the opacity must thus be stratum-internal.

(15) Pembrokeshire Welsh

    a. [ˈoːvɔn]   *ofn*   'fear'

    b. [ˈɔvn-i]   *ofni*   'to fear'

(16) Nantgarw Welsh

    a. [ˈoːvan]   *ofn*   'fear'

    b. [ˈɔvn-a]   *ofnau*   'fears'

The alternation in Pembrokeshire Welsh follows the rules of svarabhakti perfectly: it involves a rising-sonority cluster, and the inserted vowel is a full copy of the underlying one. In Nantgarw Welsh, however, the inserted vowel is [a] rather than [o]. There is, however, no general restriction against final-syllable [o] in Nantgarw Welsh, so this fact is unexplained under the standard account. Further examples are Nantgarw [ˈgweːkɪl] 'nape, neck', pl. [ˈgwɛgla] (*gwegil, gwegilau*) and Pembrokeshire *papur* 'paper' (presumably [ˈpapɪr]*) but *papre* '(news)papers' recorded by Morris (1991 [1910]).

1.3.   Exceptions to svarabhakti: morphology-phonology interactions

Another problematic issue arises with a parallel account of svarabhakti-related phenomena in Welsh when with their interaction with morphology is considered.[8] The sonority-driven deletion in polysyllables is not fully regular phonologically, especially in clusters of the form 'coronal obstruent + [l]' (Russell 1984; Schrijver 1995; P. W. Thomas 1995; Wmffre 2003). Crucially, the irregularities are implicated in cyclic overapplication — but only within the boundaries of a given part of speech. This fact has no principled explanation under a fully parallel account, but, as I discuss in section 3.1.1, follows straightforwardly from the conception of svarabhakti proposed here.

The irregularities are mostly found in the case of polysyllabic words. According to Hannahs (2009), the normal response to the presence of a rising-sonority word-final clusters in these cases is the deletion of one of the consonants in the cluster (examples from Nantgarw Welsh).[9]

(17) a. [ˈfeːnast]   *ffenestr*   'window'

       b. [fɪˈnɛstr-i] *ffenestri* 'windows'

(18) a. [ˈpeːrɪg]   *perygl*   'danger'

       b. [pɛˈrəkl-on] *peryglon* 'dangers'

In most cases, the deletion affects the final sonorant, as in the previous examples. However, there is also a number of cases where the deletion affects the non-final consonant. This is particularly frequent in South Welsh in forms which contain the final sequence [dl] in the literary language.

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[8]I thank Ricardo Bermúdez-Otero for drawing my attention to the importance of the argument presented in this section.

[9]The alternations not involving svarabhakti seen in this forms are independent of the phenomenon at hand, so I do not consider hem here.

According to P. W. Thomas (1995), among polysyllabic forms this deletion is particularly frequent in [ˈaːnal] 'breath' (Bangor [ˈanadl]), [ˈbaːnal] or [ˈmaːnal] 'broom' (Bangor [ˈbanadl]), and [ˈkeːnɛl] 'people' (Bangor [ˈkɛnɛdl]).

In South Welsh varieties this deletion may persist in related forms with vowel-initial suffixes, in which it is not phonologically motivated, creating an apparent instance of morphologically motivated opacity:

(19)   Llandygwydd, south Ceredigion (E. J. Davies 1955 cited in P. W. Thomas 1995)

    a.   [ˈaːnal]   *anadl*   'breath'

    b.   [aˈnaːl-e]   *anadlau* 'breaths'

The lack of [d] in *anadlau* can be accounted for if we assume that suffixation follows [d]-deletion. Crucially, however, these irregularities may be restricted by part of speech: corresponding lexical items belonging to a different part of speech may show the form regularly expected in the prosodic context. In the same dialect of Llandygwydd, for instance, the **verb** *anadlu* 'to breathe' appears as [aˈnadli] rather than *[aˈnaːli]. There does not appear to be a purely phonological explanation for the difference between *anadlau*, where deletion applies, and *anadlu*, where it fails. Consequently, morphology must play some sort of rôle in accounting for the facts — see section 3.1.1 for more examples.

The behaviour of items such as *anadl-* thus presents two challenges for a purely phonological account of svarabhakti like that proposed by Hannahs (2009). First, where deletion does apply, it targets the non-final obstruent, rather than the final sonorant as in all other cases. This requires supplementing the analysis by a set of constraints which somehow derive the exceptional behaviour of [dl], or by an appropriate way of marking [dl]-final words as exceptions.

Second, even if such a parallel phonological analysis can be made to work, it faces well-known problems with accounting for cyclic effects. Specifically, if deletion in [ˈaːnal] is compelled by some phonological factor (such as sonority sequencing restrictions offered by Hannahs 2009), then a purely parallel OT account predicts that in the absence of that factor (outside word-final position, for instance) no unfaithful mapping (such as deletion) should ever be effected. In derivational theories, the existence of such mappings follows from the fact that the non-triggering context is created only after the process in question has occurred. This situation arises for morphological reasons, due to paradigmatic relationships.

Within OT, numerous devices, such as Output-Output Correspondence and Paradigm Uniformity, have been proposed to account for paradigmatically driven misapplication (for overviews, see, for instance, Albright 2011; McCarthy 2007). Most of these approaches rely, in one way or another, on identifying a 'reference' form that evinces the relevant unfaithful mapping for principled reasons and making the output preserve the necessary aspects of that form. My contention in this paper is that the morphosyntactic restrictions on such misapplication apparent in South Welsh make it impossible to identify the 'reference form' in a **principled** manner, which makes a parallel, purely phonological account problematic. Instead, I propose an analysis relying on stem allomorphy, which allows us to draw a straightforward connection between the very existence of phonological irregularity and the fact that its extent is constrained by the morphosyntax.

A reviewer expresses a worry that much of the evidence against a phonologically regular pattern of svarabhakti and deletion adduced in this section comes from disparate dialects of Welsh. It

might therefore be worth reiterating that these examples do **not** rely on cross-dialectal comparison: each datum can stand on its own within the individual dialect. The number of examples given here is usually small. This is due both to the scope of lexical coverage in existing sources and to the fact that the number of potentially pertinent lexical items in the language is not large to start with (this is especially true of polysyllables), and has also been winnowed by language change: for instance, potentially pertinent lexical items such as *cenedl* 'nation', *hoedl* 'age', *edn* 'bird', while amply attested in Middle Welsh and still used in the standard language, are not found in the relevant dialects. Nevertheless, the types of exceptions identified in this section are securely attested in the dialects, and hence they do require an account. Before I present this account, however, I will need to reconsider the feasibility of the purely phonological analysis, with special attention to the facts of South Welsh dialects.

2.   The phonological analysis

In this section I argue that a purely phonological analysis of epenthesis and deletion is impossible, at least for South Welsh. I review the proposal by Hannahs (2009), which crucially relies on a particular type of foot structure to enforce epenthesis in 'monosyllabic' words, and show that the this type of foot structure is not available in South Welsh. I show that while a purely phonological analysis of epenthesis is still feasible for South Welsh, but also demonstrate that phonological factors alone are not sufficient to enforce deletion rather than some other repair in polysyllabic words.

2.1.   *Analysis by* Hannahs (2009)

In this section I briefly summarise the analysis of epenthesis and deletion proposed by Hannahs (2009); I leave aside details which are irrelevant to the matter at hand, such as metathesis and the choice of the epenthetic vowel. The crucial constraints that enforce epenthesis in monosyllables but deletion in polysyllables are as follows:

- SonSeq: 'a coda cluster must have falling sonority'

- DepIO: 'output must not contain segmental material not contained in the input'

- MaxIO: 'output must contain all the segmental material of the input'

- FtBin: 'feet are binary under moraic or syllabic analysis'

The first three constraints are relatively straightforward: SonSeq prohibits the illicit clusters, DepIO is violated by epenthesis, and MaxIO is violated by deletion. The constraint FtBin comes into play if we accept the fairly widespread assumption that stress is represented as the head of a metrical foot. The grammar of Welsh generally requires that stress fall on the penultimate syllable (with complications that we leave aside), and thus that a foot be constructed with the head on that syllable. The constraint FtBin then requires that this foot should contain exactly two syllables, or exactly two morae (possibly within a single syllable). The combined effect of these constraints is as follows:

In the case of monosyllables, epenthesis serves both to satisfy FtBin and remove a SonSeq violation. This is shown in (20), with parentheses marking foot boundaries

(20) Analysis of North Welsh [ˈpɔbɔl] 'people' according to Hannahs (2009)[10]

/pobl/		SonSeq	FtBin	Max-IO	Dep-IO
a.	[(ˈpɔbl)]	*!	*		
b. ☞	[(ˈpɔbɔl)]				*
c.	[(ˈpɔb)]		*!	*	
d.	[(ˈpoːb)]			*!	*
e.	[(ˈpoː)bɔl]				**!

The fully faithful form, candidate (a.), both contains an illicit cluster and consists of a single syl-lalble with a short vowel, and is thus monomoraic, violating FtBin. Candidate (b.) uses epenthesis, violating DepIO, but since this allows it to satisfy all the highly ranked constraints, it emerges as the winner. Candidates (c.) and (d.) both resolve the cluster problem through deletion. However, can-didate (c.) is also monomoraic and thus loses. Candidate (d.), with deletion and vowel lengthening, does satisfy FtBin but this comes at the cost of a DepIO violation: it thus ties with (b.) on DepIO, but also accrues a MaxIO violation that the winning (b.) lacks. Finally, candidate (e.) is also a loser, since it satisfies all the highly ranked constraints but does worse than (b.) on DepIO, accruing two violations: one for the epenthesis and one for the vowel lengthening.[11]

As for the case of deletion in words like [ˈpɔsɪb] 'possible',[12] the crucial rôle belongs to FtBin:

(21) Analysis of North Welsh [ˈpɔsɪb] 'possible' according to Hannahs (2009)

/posibl/		SonSeq	FtBin	Max-IO	Dep-IO
a.	[(ˈpɔsɪbl)]	*!			
b.	[(ˈpɔsɪbɪl)]		*!		*
c. ☞	[(ˈpɔsɪb)]			*	
d.	[(ˈpoː)sɪb]			*	*!

Here, according to Hannahs (2009, p. 33), the form [pɔsibɪl] is knocked out since it is trisyllabic, and this in violation of FtBin. He does not address the possibility of a candidate [pɔ(ˈsibɪl)], with epenthesis and a disyllabic foot: however, this is not fatal to the analysis, for at least two reasons. First, this candidate could be suboptimal because of the initial syllable, which is either unfooted or parsed into a monosyllabic, FtBin-violating foot (see now Hannahs 2013, §5.3 for some discussion

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[10]The presence of the foot is presumably forced by an undominated constraint requiring all content words to have stress (Culminativity) — the constraint is not shown here to reduce clutter.

[11]An anonymous reviewer notes that this analysis hinges on DepIO penalising both segmental insertion, as in (b.), and vowel lengthening, or mora insertion, as in (e.), and asks if splitting DepIO into Dep(segment) and Dep(mora) could give different results. I address this below in section 2.3

[12]I follow Hannahs' (2009) presentation here, although it appears that there no forms in Modern Welsh with the allomorph [pɔsɪbl], so the evidence for epenthesis (rather than an underlying /pɔsɪb/) is slim. This point is immaterial here.

of such structures). Another possibility is to rank DEPIO above MAXIO rather than leave them unranked as in (21); this has no adverse effects in (20). For our purposes, the important feature of the analysis is that in both cases the winning candidate builds a disyllabic foot consisting of two light syllables, namely the penult and the ultima. The vowel of the penult remains short, since lengthening introduces gratuitous violations of DEPIO. With this in mind, we turn to a consideration of the Welsh prosodic system.

2.2. *The prosodic structure of Welsh*

Although the pattern of svarabhakti in South Welsh is similar to that seen in North Welsh, the prosodic structure of the two varieties differs in a number of respects (for an overview, see Awbery 1984). In particular, there is a significant difference in the distribution of vowel length.

In both North and South Welsh, there are non-trivial restrictions on the length of stressed vowels in final syllables, which depend on the nature of the following consonant. Thus, for instance, stressed vowels are always long before voiced stops but always short before voiceless ones:[13]

(22) Vowel length in final stressed syllables: North and South Welsh

     a. [ˈtaːd]   *tad*   'father'

     b. * [ˈtad]

(23) a. [ˈtʊp]   *twp*   'stupid'[14]

     b. * [ˈtuːp]

However, these restrictions differ by dialect when the stressed vowel is not in the final syllable. In these cases, North Welsh does not allow long vowels, while South Welsh does, with some restrictions that closely (but not completely) mirror those found in word-final stressed syllables.[15] Thus, for instance, a vowel before a voiced stop in South Welsh must be long both in the penult and in the final syllable, meaning there is no alternation under suffixation:

(24) South Welsh

     a. [ˈtaːd]   *tad*   'father'

     b. [ˈtaːd-e]   *tadau*   'fathers'

     c. * [ˈtad-e]

Conversely, in North Welsh all stressed vowels in penultimate syllables are short, creating alternations such as the following:

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[13]This applies to native vocabulary. For more discussion, see Wells (1979).

[14]Not found in Fynes-Clinton (1913) but amply recorded in A. R. Thomas (2000, s. v.), including location 7 (Bangor).

[15]The long vowels in penultimate syllables are often phonetically described as 'half-long' (e. g. Jones 1971; Wmffre 2003).

(25) North Welsh

    a. [ˈtaːd]   *tad*   'father'

    b. [ˈtad-a]   *tadau*   'fathers'

    c. * [ˈtaːd-a]

For reasons of space, I do not offer a full analysis of how exactly vowel length interacts with consonantal melody (see Iosad 2012 for in-depth discussion). The basic pattern, however, is clear: there is a 'bimoraic norm' in both final and penultimate stressed syllables in South Welsh. When the input to the phonology contains a short vowel, then in some of these contexts — depending on the consonantal surroundings — this bimoraic norm must be achieved through vowel lengthening (as in [ˈtaːd] 'father' and Southern [ˈtaːde] 'fathers'). Thus in South Welsh, unlike North Welsh as analysed in section 2.1, polysyllables with penultimate stress must end in a ...HL# pattern — that is, a bimoraic (heavy) syllable followed by a light one.[16] This point applies equally to suffixed forms (as in the two foregoing examples) and to underived ones, cf. Pembrokeshire Welsh [ˈɡwɛːli] *gwely* 'bed', [ɪˈvɔːri] *yfory* 'tomorrow' (Awbery 1986, p. 25).

Crucially, forms with svarabhakti obey these restrictions. Compare the following sets of forms:

(26) North Welsh

    a. [ˈɔχɔr]   *ochr*   'side'

    b. * [ˈoːχɔr]

    c. [ˈɔχr-a]   *ochrau*   'sides'

(27) South Welsh ([f θ χ] are preceded by long stressed vowels)

    a. [ˈoːχɔr]   *ochr*   'side'

    b. * [ˈɔχɔr]

    c. [ˈɔχr-e]   *ochrau*   'sides'

The forms of *ochrau* show that the underlying form of the root must contain a consonant cluster: cf. forms such South Welsh [mʊˈduːle], North Welsh [məˈdəla] (*mydylau*) 'haycocks' from [ˈmu(ː)dʊl] 'haycock' (*mwdwl*), showing that there is no regular syncope process in those varieties, so that the second [ɔ] in [ˈo(ː)χɔr] must be epenthetic. The output for underlying /oχr/ in North Welsh is [ˈɔχɔr], with a short vowel. As we saw in section 2.1, this form defeats candidates with a long vowel such as [ˈoːχɔr], since there is no constraint favouring such vowel lengthening in that variety.

This analysis, however, cannot work for South Welsh, where [ˈoχɔr] is ill-formed, and [ˈoːχɔr] is the only phonotactically correct form. This is because the phonological grammar of South Welsh requires that a penultimate stressed vowel in certain contexts (for instance, before singleton voiced stops or the fricatives [f θ χ]) should be long. This makes it impossible to view epenthesis as a response to FtBin, as might be the case in North Welsh, since FtBin is satisfied by the length in the penultimate syllable. Thus, at the very least, the analysis by Hannahs (2009) is incomplete when

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[16]If a polysyllable has final stress, as in [kʊmˈraːɡ] 'Welsh language', the restrictions are identical to those in force in monosyllables.

applied to South Welsh, because it must be supplemented by some constraint which favours [ˈoːχɔr] over [ɔχɔr].

2.3. The motivation for epenthesis

Assume for the moment that epenthesis in South Welsh is a purely phonological process. This means that an input like /oχr/ for 'side' must be mapped to surface [ˈoːχɔr]. For our purposes, the winning form [ˈoːχɔr] must defeat the candidates *[ˈɔχɔr], which shows epenthesis but not the vowel lengthening that is obligatory in the dialect in this context, and *[ˈoːχ], which is allowed by the prosodic system and uses the deletion strategy normally associated with polysyllabic words.

A condition that requires feet to be binary at the moraic level is not, on its own, enough to account for the facts of South Welsh, because it is possible to satisfy the binarity requirement by building a disyllabic trochaic foot with a light stressed syllable, as in the analysis of North Welsh by Hannahs (2009). This is not the optimal prosodic parse in South Welsh, where, descriptively, words preferentially end in a HL prosodic pattern. This can be achieved by means of a constraint penalising the alignment of the right edge of the head foot with the right edge of the word: this can be alternatively formulated as NonFinality or Syllable Extrametricality, and I use the former for convenience here. The interaction of this constraint with a requirement to align stress to the right edge produces penultimate stress (see Hannahs 2013 and Iosad 2012 for OT analyses of Welsh stress placement).

NonFinality clearly outranks Dep-μ, the constraint prohibiting mora insertion, because [(ˈoː$_{μμ}$)χɔ$_μ$r], with lengthening in the penultimate syllable, defeats [(ˈɔ$_μ$χɔ$_μ$r)] with no lengthening but a misaligned foot. However, NonFinality is ranked too low to enforce a process of across-the-board epenthesis that would create the correct prosodic structure irrespective of the nature of the final cluster. Final clusters are in fact allowed: [(ˈfɔ$_μ$r$_μ$ð)] 'road' with no epenthesis is preferred to *[(ˈfoː$_{μμ}$)rɔ$_μ$ð] despite the fact that the latter is superior with respect to NonFinality violations.

Concretely, 'Dep' — a shorthand for the constraints that are violated when a svarabhakti vowel is introduced — must outrank NonFinality. This has a important consequence for the analysis of epenthesis: this ranking rules out the view of epenthesis as a way of creating an extra syllable to satisfy NonFinality.[17] For this reason, I will continue using SonSeq as a shorthand for the sonority-related constraints that disprefer the faithful candidate *[ˈɔχr].[18]

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[17]Ní Chiosáin (1999) proposes just such an account for Irish epenthesis, arguing that it is not *triggered* by particular sonority profiles but rather applies across the board and is only *blocked* by certain clusters. There is an important difference between Welsh and Irish: in Welsh there does not seem to exist a compelling generalisation that would cover potentially 'blocking' clusters in forms like *ffordd* 'road' or *plant* 'children', whereas in Irish such clusters are easily defined in terms of sonority distance and homorganicity.

[18]In reality, this is likely to be a shorthand for constraints that prefer sonority peaks to be syllable peaks and constraints on the sonority of possible nuclei; see e. g. de Lacy (2006); Morén (2001); Prince & Smolensky (1993). An anonymous reviewer wonders if SonSeq is not a cover for both sonority-related constraints like *Stop-Liquid-# in addition to OCP-like constraints targeting the feature [±son] (e. g. *[+son][+son] or *[−son +cons][−son +cons]). This is potentially attractive, in that it would allow us to explain some of the falling-sonority cases like *helm* or *gwddf*. There are, however, both conceptual and empirical difficulties with this. Conceptually, it is unclear why these constraints would only operate word-finally (cf. *hel*[ɛ]*m* but *helmi*). Empirically, such constraints do not solve the problem of lexically specific application of a pattern of epenthesis; nor do they account for the fact that some obstruent-obstruent clusters **are** allowed (*clust* 'ear', *gwallt* 'hair').

Although NonFinality prefers [('oː$_{μμ}$)χɔ$_μ$r] over *[('oː$_{μμ}$χ)], it cannot play the deciding rôle in that particular conflict, as epenthesis cannot be used to satisfy NonFinality, as the latter constraint is outranked by the anti-epenthesis cluster of constraints referred to as 'Dep' above. Therefore, there must be a **general** preference for epenthesis over deletion in South Welsh: [('oː$_{μμ}$)χɔ$_μ$r] and *[('oː$_{μμ}$χ)] are equally acceptable in terms of prosodic structure, but ['oːχor] is preferred since it avoids deletion. For convenience, I call the relevant anti-deletion constraint 'Max'. The argument is summarised in the following tableau:

(28) Preference for epenthesis over deletion in South Welsh

		SonSeq	'Max'	'Dep'	NonFin	Dep-μ
/oχr/	a. [('o$_μ$χr)]	*!			*	*
	b. [('oː$_{μμ}$χ)]		*!		*	**
	c. ☞ [('oː$_{μμ}$)χo$_μ$r]			*		***
	d. [('o$_μ$χo$_μ$r)]			*	*!	**
/forð/	e. ☞ [('fo$_μ$r$_μ$ð)]				*	**
	f. ['(foː$_{μμ}$r)]		*!		*	**
	g. ['(foː$_{μμ}$)ro$_μ$ð]			*!		***

As the tableau shows, the candidate with deletion (b.) is knocked out by relatively highly ranked 'Max'. The winner for North Welsh as analysed by Hannahs (2009), candidate (d.) competes with the winner (c.) on NonFin and Dep-μ, since they both violate what I call 'Dep', i. e. they both show svarabhakti vowels. Note the candidates (b.) and (d.) each accrue two violations of Dep-μ, on the relatively standard assumption that moraic structure is usually not present in the input and has to be inserted by the computation (see e. g. Morén 2001 for extended discussion), whereas (c.) accrues three violations of that constraint: two for the long vowel in the penult and one for the svarabhakti vowel. In this respect, Dep-μ as used here is the counterpart of DepIO in Hannahs (2009), in that it assigns the same relative violations to the relevant candidates, even though it does not refer necessarily to segmental insertion. Since in South Welsh NonFin outranks Dep-μ, (c.) is the winner due to its superior prosodic structure and despite the extra insertion operations.

In this section we have established that the phonology of North Welsh must have a general mechanism that prefers epenthesis to deletion to resolve sonority sequencing violations. This, however, presents a problem for the analysis of deletion.

2.4. The phonology of deletion

In this section, I show that the ranking required for epenthesis as established in the previous section gives incorrect results when applied to the ostensibly phonological deletion, as in ['feːnɛst] 'window' from underlying /fenestr/

Under the conditions on prosodic structure in South Welsh discussed above, the correct parse for this form is [('feː$_{μμ}$)nɛ$_μ$st]. However, given the interaction of conditions on prosodic structure

and faithfulness established on the basis of monosyllable data, this candidate always loses out to others which employ copy epenthesis, because of the ranking 'MAX'≫'DEP', as seen in the following tableau (candidates violating SonSeq and FtBin are not shown for brevity):

(29) Deletion is not preferred in South Welsh

/fenestr/	'MAX'	'DEP'	NONFIN
a. ☹ [('feː$_{\mu\mu}$)nɛ$_\mu$st]	*!		
b. ☞ [fɛ$_\mu$('nɛ$_\mu$s$_\mu$)tɛ$_\mu$r]		*	
c. [fɛ$_\mu$('nɛ$_\mu$stɛ$_\mu$r)]		*	*!
d. [('fɛ$_\mu$nɛ$_\mu$st)]	*!		*

Under the grammar required for monosyllabic facts, all candidates with deletion are not viable because of the ranking of MAX, and NONFINALITY ends up choosing the candidate with a penultimate syllable with a moraic coda, the pattern seen in monosyllabic words with epenthesis like ['ɬɛstɛr] 'dish' (plural ['ɬɛstri]).

The crucial distinction between South Welsh and North Welsh as analysed by Hannahs (2009) is that in North Welsh epenthesis and deletion participate in the construction of binary feet, since the epenthetic vowel in a northern form like [('ɔχɔr)] is assumed to be footed. Thus, FOOT BINARITY may influence the choice of the repair mechanism for sonority sequencing violations. In South Welsh, FOOT BINARITY is always satisfied in the penultimate syllable, so it has nothing to say about forms with epenthesis — it is always satisfied via some prosodic parse of the syllable containing the underlying vowel. Therefore, FOOT BINARITY in South Welsh is inert with respect to svarabhakti phenomena, and cannot enforce a prosodically driven choice between epenthesis and deletion. This shows that a purely phonological analysis of the choice between epenthesis and deletion, where this choice is driven by considerations of surface prosodic structure, is not applicable to South Welsh varieties.

An anonymous reviewer points out that a phonological account could potentially apply to those varieties of Welsh where the vowel in an initial syllable in trisyllables is lost. Consider again the Nantgarw forms with deletion in the singular:

(30) a. ['feːnast]   *ffenestr*   'window'
     b. ['fɪnɛstr-i]   *ffenestri*   'windows'

(31) a. ['peːrɪg]   *perygl*   'danger'
     b. [pɛ'rəkl-on]   *peryglon*   'dangers'

Their cognates in Bangor, as given by Fynes-Clinton (1913), are as follows:

(32) a. ['fɛnast]   *ffenestr*   'window'
     b. ['fnɛstr-i]   *ffenestri*   'windows'

(33) a. [ˈpɛrɪg]   *perygl*   'danger'

      b. [ˈprəgl-on] *peryglon*   'dangers'

The suffixed forms in Bangor demonstrate vowel syncope in the first syllable, presumably because these initial syllables are unable to be parsed as a binary foot; both Awbery (1986) and Hannahs (2013) describe a process of 'antepenultimate deletion', where the same templatic requirement may lead to the entire initial syllable being deleted. The reviewer points out that the lack of epenthesis in *ffenestr* may be due not to some interaction of 'Max' and 'Dep', but rather to the effect of the templatic constraint, which I call Syncope for simplicity:

(34) Possible analysis of deletion

		Syncope	'Max'	'Dep'
/fenestr/	a. ☞ [(ˈfeːμμ)neμst]		*	
	b. [feμ(ˈneμsμ)teμr]	*!		*
	c. [(ˈfneμsμ)teμr]		*	*!
/fenestri/	d. [fe(ˈneμsμ)triμ]	*!		
	e. ☞ [(ˈfneμsμ)triμ]		*	

Although such an analysis is feasible, it cannot be accepted as a solution to all the difficulties besetting a purely phonological account of the choice between epenthesis and deletion. First, syncope of the kind seen in (32) is not obligatory in all Welsh dialects, nor indeed is it regular across the board in those dialects that have it. There may even be variation within a lexical item: for instance, Fynes-Clinton (1913), a source that reflects the existence of variation better than most, not infrequently cites both syncopated and unsyncopated forms, as in [kəˈmɛrɨd] or [ˈkmɛrɨd] 'take' (*cymryd*). This type of variability may indicate that 'antepenultimate deletion' may be (at least in part) an example of variation happening **outside** the phonological component, as a continuous, phonetic process (e. g. Myers 2000; Zsiga 2000) and/or in the usage component (cf. MacKenzie 2013; MacKenzie & Tamminga 2013).

Even if the process **is** phonological, it is clearly lexically specific. In some cases its failure might be explained with reference to independent phonotactic considerations (P. W. Thomas 1996, §IV.28[a]), as in Bangor [ˈmʊsɔg] 'moss', [mʊˈsɔglɨð] 'mossy', where *[msɔglɨð] is not phonotactically licit.[19] In other cases, it fails for apparently lexical reasons: [pɛˈnɔda] 'chapters' rather than *[pnɔda], [pɛˈnɨ̣ɟɔn] 'hymns' (*[ˈpnɨ̣ɟɔn]) despite [pnaʊn] 'afternoon', [pnɛlin] 'elbow' (Fynes-Clinton 1913). This lexical specificity can be implemented in a variety of ways, for instance through lexical indexation (e. g. Itô & Mester 1999; Jurgec 2010; Pater 2000, 2009), so that Syncope would rank above 'Max' for some words but below it for others. This explanation could potentially work, but in order for the ranking Syncope ≫ 'Max' to be responsible for deletion rather than epenthesis in polysyllables, **all**

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[19]It should be noted, however, that at least in some cases this syncope produces clusters that either are unattested in unsyncopated forms ([ˈɬɛθar] 'fetter' from *llyffethair*) or plausibly violate sonority restrictions ([mˈɡʲɛnax] 'different' from *amgenach*).

polysyllabic words with rising-sonority final clusters would have to end up in the class which is indexed for that particular ranking. This coincidence remains entirely unexplained.[20] In addition, such an analysis predicts that non-syncopating polysyllabic forms, for which the ranking 'Max' ≫ Syncope is in effect, should show *epenthesis*, which does not tally with reports of the absence of epenthesis in polysyllables.

In any case, forms of words like *ffenestri* and *peryglon* **are** in fact attested without syncope in South Welsh (Awbery 1986; C. H. Thomas 1993), so Syncope cannot outrank 'Max' at least in those varieties and for those words, and given the ranking 'Max' ≫ 'Dep' necessary for epenthesis in these varieties, the explanandum for the phonological account still remains. In the next section I present a different account of the svarabhakti facts in (South) Welsh.

3. Svarabhakti phenomena as stem allomorphy

In this paper I propose that at least the phenomenon traditionally treated as deletion is not the result of phonological computation, and instead represents a choice between two stored allomorphs of the stem associated with the relevant lexical item.

3.1. *The allomorphic approach*

In this paper I adopt important aspects of the view of phonological architecture proposed by Bermúdez-Otero (2012, 2013), in particular with respect to the division of labour between storage and computation in phonology. In a traditional feed-forward model, such as that found in Lexical Phonology and Morphology (e. g. Hargus & Kaisse 1993; Kiparsky 1982b, 1985; Mohanan 1986) or Distributed Morphology (Embick 2010; Embick & Noyer 2007; Halle & Marantz 1993; Harley & Noyer 1999), stems (or syntactic objects corresponding to stems) are built up piecewise from stored items — roots and relevant non-root morphemes — whereupon 'stem-level' phonological computation applies to the result of this concatenation to produce the final form of the stem (which is in turn fed into further cycles of phonological computation).

In the model espoused here, the basic unit of storage is the stem itself, complete with part-of-speech information. Similarities or differences among stems that appear to contain the same root are not due to their being derived on-line from that root: instead, if these generalisations are at all cognitively real, they operate in lexical redundancy mode à la Jackendoff (1975). I refer to Bermúdez-Otero (2012, 2013) for extensive discussion of the theoretical and experimental underpinnings of the proposed architecture.

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[20]An anonymous reviewer points out that lexical frequency might be somehow implicated in the triggering of syncope (presumably by syncope being more likely to affect more frequent words). It is relatively easy to find examples in Fynes-Clinton (1913) of less frequent items undergoing syncope even as more frequent items are not recorded in a syncopated form: for instance, Fynes-Clinton (1913) records [knərvˈjada] for *cynyrfiadau* 'disturbances' (6 hits in the *Cronfa Electroneg o Gymraeg*; Ellis et al. 2001) but only unsyncopated [kəˈnəði] for *cynyddu* 'increase' (106 hits in the CEG). Of course, individual examples are not at all decisive: a gradient effect of frequency may produce some mismatches in individual words (although if the effect of frequency is gradient, we might expect sonorant deletion to be gradient as well, which does not seem to be the case judging by the descriptions). Even if a connection with frequency is not implausible, the major point does not change: if deletion is triggered by syncope, then **every** lexical item that falls into the 'syncopating' class must **also** fall within the 'deleting' class. This can only be coincidental, irrespective of whether the classes are defined via brute-force indexation or frequency.

This approach leads us to a better understanding of the nature of 'exceptionality' in grammar. The exceptional cases discussed at length in section 1 can, at face value, appear to be rather marginal and isolated (which, unfortunately, also limits the amount of available material). Nevertheless, an explicit analysis of why and how particular forms resist the effect of otherwise general processes should make no less explicit predictions about what forms may be designated as 'exceptions' and how these 'exceptions' can be distributed within paradigms.

The analysis proposed here allows us to pinpoint the exact formal expression of notions such as 'analogy', which are commonly used in discussion of the relevant phenomena, and derive some predictions that make it possible to compare the allomorphic approach with the purely phonological one. Although the analysis builds on a rather limited amount of material — inevitably, due to the nature of available sources — I argue that the predictions it makes are not vacuous and show that it is more successful than a phonological account

3.1.1. *Stem allomorphy and part-of-speech restrictions*

Under this approach, we are immediately in a position to understand the part-of-speech restriction on cyclic overapplication in deletion, i. e. the fact that deletion still applies in [aˈnaːle], the plural of [ˈaːnal] 'breath', but not in [aˈnadli]. In the model used here, the forms of the noun [ˈaːnal] 'breath' derive from the nominal stem ⟦anal⟧$_N$. This is the underlying form in both singular (/⟦anal⟧/ → [ˈaːnal]) and plural (/⟦anal⟧e/ → [aˈnaːle]). There is, in other words, no 'irregularity' due to cyclic reapplication as suggested in section 1.3: the noun never shows the cluster [dl], so there is no reason to suppose that the nominal stem contains it at any point in the derivation.

Conversely, the verbal stem is stored as ⟦anadl⟧$_V$. This is the form found in inflection (as in /⟦anadl⟧a/ → [anadla] 'I will breathe') and in stem-to-stem derivation, as in the verbal noun [aˈnadli] 'to breathe' (see Borsley, Tallerman & Willis 2007, §3.1 for more discussion of the categorial properties of these 'verbal nouns'). Verbal forms, as discussed in more detail in section 4.2, are always derived by means of vowel-initial suffixes, so the [dl] cluster is never in jeopardy, and consequently appears throughout the paradigm.

In this approach, the similarity between the shapes of the nominal stem ⟦anal⟧$_N$ and the verbal stem ⟦anadl⟧$_V$ is all but relegated to a historical curiosity. The 'deletion' traditionally invoked to derive the string [anal] from underlying /anadl/ is, at best, a Jackendovian lexical redundancy rule (Bermúdez-Otero 2012; Jackendoff 1975), and not the outcome of computation done by the phonological component. Although this appears to result in a 'lost generalisation' (often discussed in the literature in the guise of the 'duplication problem'; Chomsky & Halle 1967; Kenstowicz & Kisseberth 1979, but also Paster 2012; Vaux 2008), below I argue that this absence of a 'live' phonological pattern is in fact a desirable prediction for South Welsh.

The Gwaun Valley dialect documented by Morris (1991 [1910]) provides a particularly interesting example of the part-of-speech-specific treatment of the historical [ðl] cluster. The root *bodlon* 'content' is reflected without the historical [ð] in the forms *bolon* 'contented' and *anfolon* 'discontented' but with hardening of the [ð] to [d] in *bidloni* 'to satisfy' and *bidlonis* 'contented'. In a stem-storage framework, this mismatch follows from domain structure: the former two derive from an adjective stem ⟦bolon⟧$_A$, whereas the former two are derivatives of a verbal-stem lexical item: ⟦bidlon⟧$_V$i and ⟦⟦bidlon⟧$_V$is⟧$_A$ respectively. The mismatch in the vowel serves to confirm these paradigmatic relationships.

Another example of svarabhakti-related phenomena being restricted by part of speech is provided by the treatment of the item corresponding to standard Welsh *llwfr* 'cowardly' in Nantgarw Welsh. In this variety, nouns derived from this root show no svarabhakti vowel in a phonologically transparent manner:

(35) a. [ˈɬʊvrɪn]   *llyfryn*   'coward'
     b. [ˈɬʊvrɔd]   *llyfriaid*   'cowards'
     c. [ˈɬʊvran]   *llyfren*   '(female) coward'

The adjective *llwfr* itself is realised with a svarabhakti vowel, again, as expected. Crucially, however, lexical items that are derived from that adjective carry this svarabhakti vowel over even when the phonological context does not require it:

(36) a. [ˈɬuːvʊr]   *llwfr*   'cowardly'
     b. [ɬʊˈvʊrdra]   *llwfrdra*   'cowardice'
     c. [ɬuvʊˈrai]   *llyfrháu*   'to become cowardly'

In the case of *llwfrdra*, the epenthesis might, in principle, be motivated by the need to avoid a non-vocalic sonority peak.[21] In *llyfrháu*, however, the phonological motivation for epenthesis is clearly absent. The roots of the overapplication must be sought in the domain structure: the verbalising suffix /(h)a/ attaches not directly to a root but to a stem — in this case the adjective stem ⟦ɬuvur⟧$_A$ — while in the verbal noun *llyfrhau* the nominal stem is built over the verbal one: /⟦⟦⟦ɬuvur⟧$_A$a⟧$_V$i⟧$_N$/.[22] This interaction of domain structure and epenthesis is not unique to the root *llwfr* in the Nantgarw dialect:

(37) a. [ˈduːvʊn]   *dwfn*   'deep'
     b. [duvʊˈnai]   *dyfnháu*   'to deepen'
     c. [ˈdəvndar]   *dyfnder*   'depth'

(38) a. [ˈduːr]   *dŵr*   'water'
     b. [ˈdəvrɔð]   *dyfroedd*   'waters'
     c. [duvʊˈrai]   *dyfrháu*   'to water'

In the case of *dyfnháu*, we observe that the verb uses the adjective stem even though a non-epenthesising allomorph of the root is available in the language. In the case of *dyfrháu*, we again encounter part-of-speech restrictions: the verbal stem is different from both stems used in nouns

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[21]Sources are generally silent about the treatment of words with such clusters in the dialects. Where the initial consonant in the cluster is [v], that consonant may be deleted, as in Nantgarw [ˈkɛndar] 'cousin' (*cefnder*); this is perhaps especially pronounced if the preceding vowel is round, as in Pembrokeshire [ˈdʊndɛr] 'depth' (*dyfnder*). It does seem that these clusters may be preserved at least in some words, as in Nantgarw [ˈdəvndar] 'depth', plural [dəvnˈderɔð].

[22]The existence of a domain boundary between the [a] and the suffix [i] can be inferred both from the morphological structure of such verbs, which build inflected forms on the basis of the [a]-final stem, and from the fact that the [ai] diphthong is stressed (see Iosad 2012 for a stratal analysis).

(it appears unlikely that we could postulate an underlying /duvr/ for WATER here), which leads us to the domain structure /⟦⟦duvura⟧ᵥᵢ⟧ₙ/.

Although unrelated to epenthesis, there is more evidence that the (POS-characterised) stem rather than the root may be the relevant unit of lexical storage in Welsh. As noted above in connection with opaque cases of epenthesis such as [ˈɡʊðʊ] 'neck', apparently from /ɡuðv/, many Welsh varieties show an irregular process of final [v]-deletion:

(39) a. [ˈtreː]   *tref*   'town'

  b. [ˈtrɛv-ɨð] *trefydd*   'towns'

A reviewer reminds that this alternation can be hypercorrectly extended to stems that are historically vowel-final. Consider the following forms from Nantgarw:

(40) a. [ˈɬeː]   *lle*   'place'

  b. [ˈɬeːvɪð]   *llefydd*   'places'

  c. [ˈɬeːɔl]   *lleol*   'local'

Historically, *lle* is vowel-final (cf. the earlier plural *lleoedd*), and the plural *llefydd* can be interpreted as an instance of rule reversal where PLACE is stored underlyingly as /ɬev/ and undergoes the same type of [v]-deletion as in *tref*. However, this change does not lead to a restructuring of the underlying representation in *lleol* (*llefol). This can be accounted for if the unit of lexical storage is the stem, so that the noun contains the stem ⟦ɬev⟧ₙ (or perhaps either ⟦ɬe⟧ₙ or ⟦ɬev⟧ₙ, as detailed in the following section) and the adjective contains the stem ⟦ɬeol⟧ₐ (or ⟦⟦ɬe⟧ₙol⟧ₐ), rather than both building on a single root √ɬe.

The unifying factor behind the exceptions discussed in this section is the fact that what appear to be (synchronically) different allomorphs of the same root cannot be derived from a single underlying representation by a battery of rules (or a constraint ranking) that provides for a phonological pattern of sonority-driven epenthesis or deletion. The exceptions, however, do not pattern randomly: instead, they submit to an analysis where the different underlying forms are associated with particular parts of speech, and allomorphy patterns do not straddle part-of-speech boundaries, as long as the cyclic domain structure follows the derivational history. This is precisely the insight expressed by the stem-storage theory coupled with a stratal model of phonology-morphology interaction.

3.1.2. *Stem allomorphy and input subcategorisation*

A different approach is required in cases such as that of [ˈfeːnɛst] 'window', plural [fɛˈnɛstri]. Here, the distribution of the allomorphs does not follow morphosyntactic boundaries. However, in section 2.4 we saw that a phonological solution, mapping input /fenestr/ to surface [ˈfeːnɛst] in the singular, is not tenable in view of the phonological grammar of South Welsh. (I am not making any claims about North Welsh here, since I have not discussed a phonological analysis of svarabhakti in that variety.)

I suggest that in the case of [ˈfeːnɛst] we are also dealing with an instance of stem allomorphy, albeit one where the two allomorphs are in competition for insertion at the word level; further, I

suggest that for South Welsh the more promising solution involves phonological subcategorisation (Bye 2007; Nevins 2011; Paster 2006; Yu 2007).

The basic idea is as follows. The South Welsh lexicon contains two lexical entries, both referring to the meaning WINDOW; these are shown in (41), where I adopt the formal conventions used by Bermúdez-Otero (2013).

(41) a. Lexical entry for $[\![\text{fenestr}]\!]_N$

$$\begin{bmatrix} 232 \\ \ldots \\ \text{SEM} \quad \text{'window'} \\ \text{SYN} \quad N_\alpha \\ \text{PHON} \quad [\![^{\mathcal{SL}}\text{fenestr}]\!]_\alpha \\ \text{SUBCAT} \quad [\![^{\mathcal{WL}}(X)\underline{\quad}\ (Y)]\!] \end{bmatrix}$$

    b. Lexical entry for $[\![\text{fenest}]\!]_N$

$$\begin{bmatrix} 233 \\ \ldots \\ \text{SEM} \quad \text{'window'} \\ \text{SYN} \quad N_\alpha \\ \text{PHON} \quad [\![^{\mathcal{SL}}\text{fenest}]\!]_\alpha \\ \text{SUBCAT} \quad [\![^{\mathcal{WL}}(X)\underline{\quad}\ ]\!] \end{bmatrix}$$

The lexical entry in (41a) reads as follows: the item in question is the exponent of a N syntactic node, and it defines a stem-level phonological domain ($[\![^{\mathcal{SL}}\underline{\quad}\ ]\!]$). This item is stated to subcategorise for a word-level domain, possibly containing other material ($[\![^{\mathcal{WL}}(X)\underline{\quad}\ (Y)]\!]$); this serves to delay the insertion of the correct stem allomorph until the word level. The phonological exponent of the N node is the string /fenestr/.

The entry in (41b) is very similar, with two exceptions. First, it has a different phonological component: /fenest/. Second, it has a more specific subcategorisation requirement: this item should be final in a word-level domain.

Assume the phonology seeks to spell out the singular form of 'window'. The morphological subcategorisation requirements of the relevant items (not shown in (41) for brevity) stipulate that the SG feature be realised by a phonologically zero suffix in this case. Thus, morphological subcategorisation produces the following underlying representation for WINDOW+SG:

(42) Underlying representation for WINDOW+SG before phonological subcategorisation

$$\left[\!\left[_{\mathcal{WL}} \left\{ \begin{array}{l} [\![^{\mathcal{SL}}\text{fenestr}]\!] \\ [\![^{\mathcal{SL}}\text{fenest}]\!] \end{array} \right\} \right]\!\right]$$

In this case, the phonological subcategorisation frame of (41b) is more specific: under the standard definition of the Elsewhere Condition (Kiparsky 1973), the set of contexts it defines is the subset of contexts defined by the frame for (41a). Therefore, the string /fenest/ is inserted and run through the phonological computation, ultimately being realised as [ˈfeːnest]. Crucially, as in the case of the apparent 'deletion' in a form like [ˈaːnal] 'breath' discussed in the previous section, the computation does not involve violation of anti-deletion constraints (such as MAX-IO), since the input to the phonological computation does not contain the offending cluster.

In the case of WINDOW+PL, the contested stem position is not word-final, since the syntax and morphological subcategorisation requirements force the addition of a suffix /i/:

(43) Underlying representation for WINDOW+PL before phonological subcategorisation

$$\left[\!\left[_{\mathcal{WL}} \left\{ \begin{array}{l} [\!\![^{\mathcal{SL}}\text{fenestr}]\!\!] \\ [\!\![^{\mathcal{SL}}\text{fenest}]\!\!] \end{array} \right\} [\!\![\text{i}]\!\!] \right]\!\right]$$

In this case, the subcategorisation frame for (41b) (/fenest/) is simply not met: the locus of the spell-out is not final in a word-level domain. Conversely, entry (41a) is available for insertion in this context, and this is what produces the underlying form /fenestri/, and eventually surface [fɛˈnɛstri].

As discussed by Bermúdez-Otero (2012), there are numerous alternative options available for handling this sort of lexically idiosyncratic allomorphy. For reasons of focus I do not discuss them all in detail here. However, I would like to point out that any correct account of the South Welsh facts requires at least some sort of arbitrary preference for the longer allomorphs (such as /fenestr/), whether in the relatively brute-force form proposed above or using some other mechanism. Crucially, I suggest that the selection cannot be driven exclusively by phonologically **optimising** allomorph selection, which ensures maximum harmony for the **output** form (see Nevins 2011 for discussion). The argument is as follows.

In principle, we could incorporate the phonological motivation of deletion by syllable-structure constraints even into an allomorphic framework, if the selection of [ˈfeːnɛst] ahead of [ˈfeːnɛstr] were to follow from the activity of the SonSeq constraint in allomorph selection. This is sketched in (44).

(44) Selection of [ˈfeːnest] 'window' by SonSeq

	WINDOW		SonSeq	Max-IO	Dep-IO
/fenestr/	a.	[ˈfeːnɛstr]	*!		
	b.	[ˈfeːnɛst]		*!	
/fenest/	c. ☞	[ˈfeːnɛst]			
	d.	[ˈfeːnɛstr]	*!		*

Here, the input ∼ output pairing /fenest/ ∼ [ˈfeːnɛst] allows the phonological computation to both satisfy SonSeq and avoid deletion, understood as violation of Max-IO, which is incurred by the candidate pairing /fenestr/ ∼ [ˈfeːnɛst].

However, a similar mechanism cannot be deployed in the plural without an arbitrary preference for the longer allomorph. Consider the following tableau:

(45) Phonologically optimising allomorphy for [fɛˈnɛstri] 'windows'

	WINDOW+PL	SonSeq	Max-IO	Dep-IO
/fenestri/	a. ☞ [fɛˈnɛstri]			
	b. [fɛˈnɛsti]		*!	
/fenesti/	c. ☞ [fɛˈnɛsti]			
	d. [fɛˈnɛstri]			*!

Here, SonSeq does not play any rôle because of the vowel-initial suffix, and faithfulness constraints will not decide between the two fully faithful options. It is in fact not entirely obvious what constraint could prefer the pairing /fenestri/ ∼ [fɛˈnɛstri] to /fenesti/ ∼ [fɛˈnɛsti], as the former presumably incurs additional violations of markedness constraints such as that against complex onsets.

It would be possible to incorporate phonological optimisation into a hybrid model such as that of Bonet (2004); Bonet, Lloret & Mascaró (2007); Mascaró (2007), who suggest that phonologically optimising allomorph selection coexists with morpheme-specific statements of preferred allomorphs. In this case, if the allomorph /fenestr/ were said to be preferred over /fenest/, the constraint Respect (requiring the enforcement of these preference statements) would favour /fenestri/ ∼ [fɛˈnɛstri], achieving the desired result. As far as I can see, the South Welsh data do not allow us to make a choice between the account I propose and this hybrid approach; the choice in the end hinges on a more general determination of whether the phonological computation may access the sort of lexically specific information required by Respect (see Bermúdez-Otero 2012; Scheer 2010 for some considerations on this aspect of phonology – lexicon interaction).

3.2. Phonologically arbitrary alternations

In this section I show how the allomorphic solutions proposed for deletion in section 3.1 are applicable to the epenthesis processes previously assumed to be the result of phonological computation, as well as certain other alternations. Recall that, as discussed in section 1.1, across South Welsh dialects we find numerous cases of epenthesis in final clusters that do not involve rising sonority. Some examples are shown below.

(46) Pembrokeshire Welsh (Awbery 1986; Morris 1991 [1910]; Owens 2013)

    a.   [ˈguːðʊg]   *gwddf*   'neck'
    b.   [ˈgʊðge]   *gyddfau*   'necks'
    c.   [ˈgʊgðe]*   *gwgdde*

(47) Cardiganshire Welsh (Wmffre 2003, p. 345)[23]

    a.   [ˈfuːrʊm]   *ffwrwm*   'bench'
    b.   [ˈfərmɛ]   *ffyrymau*   'benches'

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[23]Also *ffwrwm*, pl. *ffwrmydd* in Morris (1991 [1910], s. v.).

In a phonological account, SONSEQ apparently cannot account for epenthesis in sequences such as [ðg] and [rm], since they are not of falling sonority, and a different motivation would have to be found to enforce the insertion of a vowel (cf. also footnote 18 above). However, if the allomorphic account of 'deletion' in polysyllables is correct, it can also be co-opted for these cases of 'epenthesis', selecting forms such as /guðug/ word-finally but /guðg/ elsewhere through subcategorisation. The phonological arbitrariness of the pattern is of course explained straightaway under the present approach.

As an anonymous reviewer points out, cluster such as [ðg] and [rm] are rare in the lexicon: for instance, [ðg] in *gwddf* corresponds historically to [ðv] (an epenthesising cluster in Middle Welsh, as pointed out above), but other [ðv]-final nouns attested in Nantgarw all keep [ðv] and show no epenthesis (['dɛðv] 'law', ['grɛðv] 'instinct', ['ɬɛðv] 'sad, melancholy'). Therefore, epenthesis in examples such as *gwddf* and *ffwrm* does not necessarily demonstrate that he allomorphic approach is correct. If such clusters **always** undergo epenthesis, the generalisation that it is only triggered by rising-sonority clusters is false, but a phonological account is not necessarily excluded.

A stronger argument for an allomorphic analysis is provided by lexically specific svarabhakti, as in Nantgarw (C. H. Thomas 1993):

(48) a. ['bɑːrav]   *barf*   'beard'
      b. ['fɪrv]   *ffurf*   'form'

(49) a. ['soːvɔl]   *sofl*   'stubble'
      b. ['gwɛvl]   *gwefl*   'lip'

(50) a. ['keːvan]   *cefn*   'back'
      b. ['eːovn]   *eofn*   'confident'

If a cluster such as [rv] or [vl] has some phonological property that triggers an unfaithful mapping (as in *barf* or *sofl*), it is not clear why epenthesis is absent in *ffurf* and *gwefl*. By contrast, the pattern is easily accounted for if BEARD and STUBBLE, but not FORM or LIP, have two stored allomorphs as sketched in (41).

Given the essentially arbitrary nature of phonological relationship between the stem allomorphs, we might expect more obviously irregular allomorphy to be possible. This prediction is borne out. Recall, for instance, the following pairs from North Welsh:

(51) a. ['gʊðʊ]   *gwddf*   'neck'
      b. ['gəðva]   *gyddfau* 'necks'

(52) a. ['tʊrʊ]   *twrf*   'noise'
      b. ['tərvɨ]   *tyrfu*   'to make a noise'

As discussed above in section 1.1, if the interaction of epenthesis and [v]-deletion were phonological, we would be faced with an instance of opaque interaction. Under an allomorphic account, both epenthesis and [v]-deletion are facts of the lexicon, and subcategorisation decides the choice between, say, /guðu/ and /gəðv/.

Another irregular phonological process driven by contexts similar to svarabhakti is metathesis in word-medial [ðn vn] sequences, found in many South Welsh varieties. Since these sequences are also of rising sonority, we find that words containing these clusters undergo SonSeq-driven epenthesis in word-final position but metathesis prevocalically:

(53) Tawe Valley (P. W. Thomas 1995 citing Evans 1930)

    a. [ˈgwaːðan] *gwadn*   'sole'

    b. [ˈgwanðe] *gwadnau* 'soles'

(54) Cardiganshire (Wmffre 2003, p. 312)

    a. [ˈkeːvɛn]   *cefn*   'back'

    b. [ˈkɛnvɛ]   *cefnau* 'backs'

In principle, we could look for a phonological motivation for this medial methathesis: for instance, we could hypothesise that a Linearity-respecting form such as *[kɛvnɛ] for 'backs' is suboptimal in terms of syllable contact (e. g. Gouskova 2004; Murray & Vennemann 1983; Vennemann 1988) because of the rising sonority across a syllable boundary.[24] Nevertheless, we also find dialects where such a phonological account is untenable, providing further support for an analysis that refers to part-of-speech specification via stem storage and a cyclic architecture.

Consider the following triplet from the dialect of Dihewyd (P. W. Thomas 1995 citing E. J. Davies 1955):

(55) a. [ˈgwaːðan] *gwadn*   'sole'

    b. [ˈgwande] *gwadnau* 'soles'

    c. [ˈgwanði] *gwadnu*   'to leg it'

Here, in the plural [ˈgwande] we find not just metathesis, but also an alternation between [ð] and [d]. Again, in principle we could view this as the simultaneous application of metathesis — perhaps motivated by syllable contact as suggested above — and some feature of the phonological grammar militating against postnasal [ð], with a derivation /$\sqrt{\text{gwaðn}}$e/ → [ˈgwande]. However, the existence of the verb [ˈgwanði] shows that there is no **general** phonological restriction against surface [nð]. Therefore, the appearance of [nd] in *gwadnau* is purely arbitrary from the perspective of the phonological grammar. An analysis that postulates competition between two nominal stems (⟦gwað(a)n⟧$_N$ and ⟦gwand⟧$_N$) in addition to a verbal stem ⟦gwanð⟧$_V$ has no issues with accounting for the pattern.

Thus, the trio of forms shown in section 3.2 also serves to confirm another prediction of the current model not shared by a parallel phonological account. Specifically, it demonstrates how a root may be associated two allomorphs distributed along part-of-speech lines (as in ⟦anal⟧$_N$ vs. ⟦anadl⟧$_V$) as well as with two allomorphs with a distribution contingent on final position in a word-level domain (as in ⟦fenestr⟧$_N$ vs. ⟦fenest⟧$_N$). This is in contrast to a purely phonological account,

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[24]I assume that at least in South Welsh syllable boundaries always break up consonant clusters, because vowels are uniformly short before clusters even in positions where they otherwise lengthen

which leads us to expect that the verbal form (*gwadnu*) should pattern with the plural (*gwadnau*), due to their identical prosody. Technically, another instance of such a tripartite deletion is found in the case of *lle* 'place', *llefydd* 'places', and *lleol* 'local' discussed in section 3.1.1. If [v]-deletion is also a lexical redundancy rule (which is consistent with its lexical specificity), then the alternation in *lle* ∼ *llefydd* must be treated via the postulation of two competing allomorphs for the nominal stem. Although, unlike the case of *gwadnau* vs. *gwadnu*, two of the 'root allomorphs' are segmentally identical, their distribution follows part-of-speech and subcategorisation requirements rather than the phonological context.

In this section I have argued that a purely phonological account of the treatment of alternations involving consonant clusters in South Welsh faces both empirical and conceptual difficulties. I have suggested that viewing the patterns as instances of stem allomorphy resolves both types of issues. On the empirical side, the more powerful allomorphic approach, unsurprisingly, is able to deal with phonological irregularity. However, this increased power appears necessary to achieve proper empirical coverage, especially in cases where epenthesis coexists with other phonological processes in the derivatives of a single root. The allomorphic approach also has a number of conceptual advantages for a synchronic analysis. Most importantly, it provides a principled link between the lexical specificity of svarabhakti patterns and 'irregularities' such as apparent cyclic overapplication within part-of-speech boundaries. In the next section I provide further discussion of the advantages of the present approach.

4. Discussion

In the next section I discuss two further issues, namely the diachronic consequences of the proposal and a comparison with possible transderivational approaches to the issues of irregularity. Finally, I raise the question of whether even epenthesis in rising-sonority clusters, assumed to be phonological in the foregoing discussion, should not also be subsumed under the allomorphic account.

4.1. *Diachronic implications*

An immediate prediction of the approach which views svarabhakti-related deletion in polysyllables as an instance of stem allomorphy is that any diachronic changes involving 'deletion' are also to be viewed as changes in the lexically stored form of particular items. In other words, changes involving svarabhakti-related phenomena should proceed by lexical diffusion and not be an instance of Neogrammarian sound change (Bermúdez-Otero 2007; Bermúdez-Otero & Hogg 2003; Kiparsky 1995; Labov 1981). This prediction appears to be borne out quite well in South Welsh.[25]

Consider the root $\sqrt{\text{SIEVE}}$ (Standard Welsh *hidl* 'sieve', pl. *hidlau*, *hidlo* 'to sieve'). In most South Welsh dialects surveyed by P. W. Thomas (1995, p. 236), the noun shows a svarabhakti vowel: [ˈhiðɪl].[26] In the majority of these cases, the svarabhakti vowel is merely historical: in the few dialects where the plural is given, there is no vowel-zero alternation ([hɪˈðilɛ]), which suggests that the vowel has by now been fully incorporated into the underlying form of the stem by input restructuring (e. g. Albright 2004; Bermúdez-Otero 2007; Bermúdez-Otero & Hogg 2003; Kiparsky 1982a;

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[25]I thank an anonymous reviewer for many valuable points made in regard to this section.

[26]In a few cases it also shows metathesis *along with* svarabhakti: [ˈhɪlið] vel sim.

Ramsammy 2015; Roberts 2012).[27] At the same time the verb *hidlo* is almost universally realised with deletion: [ˈhɪlo].

Under the present approach, the divorce between the nominal and verbal stems is not at all surprising: after all, ⟦hiðil⟧ₙ and ⟦hil⟧ᵥ are entirely different lexical items, connected — at best — only by lexical redundancy rules. Crucially, the relationship between the forms of the two stems lacks Neogrammarian regularity. For instance, one could hypothesise that ⟦hil⟧ᵥ could historically be produced by the application of a regular sound change deleting [ð] before [l] (for discussion, see Russell 1984; Schrijver 1995; P. W. Thomas 1995; Wmffre 2003). However, we find that the effects of this change are not highly regular. Consider the following forms from the dialect of Llantrisant (P. W. Thomas 1995 citing Phillips 1955):

(56) a. [ˈiːðil]   *hidl*   'sieve'
      b. [ˈiːlo]   *hidlo*   'to sieve'[28]

(57) a. [ˈweːðal]   *chwedl*   'story'
      b. [ˈwɛðla]   *chwedlau*   'stories'
      c. [ˈwliːa]   *chwedleua*   'to tell stories'

(58) a. [ˈbɔlon]   *bodlon*   'contented'[29]
      b. [bɔðˈloːni]   *bodloni*   'to please'

The relevant comparison here is between *hidlo*, *chwedlau*, and *bodlon* . Assuming, the classic dichotomy of 'Neogrammarian change' vs. 'analogy', is the appearance of [ˈiːlo] and [ˈbɔlon] instead of the historical (presumably) [ˈɪðlo] and [ˈbɔðlon] due to a Neogrammarian rule of [ð]-deletion? If so, why is the [ð] preserved in [ˈwɛðla]? A rôle for the phonological context (such as the quality of the preceding vowels) does not appear to be feasible.[30] The conclusion thus appears that either there has been a regular change of [ð]-deletion with later analogical remodelling in *chwedlau*, or lexical diffusion of [ð]-deletion to *hidlo* and *bodlon*. Therefore, it is plausible that changes in patterns of svarabhakti do proceed by lexical diffusion in South Welsh, in that they affect the stored lexical items (i. e. stems) one by one.[31]

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[27]According to Iwan Wmffre (p. c.), many speakers are reluctant to produce the plural of 'sieve', since a household rarely has more one of these implements; presumably, the low frequency of the plural contributes to the paucity of the evidence for treating the second vowel of [ˈhiðɪl] as epenthetic.

[28]The actual form cited by P. W. Thomas (1995) is [ilo]; I presume that the vowel is long, since it is standard practice in Welsh dialectology not to write the length of tense stressed vowels.

[29]The actual form cited by P. W. Thomas (1995) is [bɔllon], clearly indicating a short vowel.

[30]The importance of frequency in these cases is difficult to pin down. The CEG (Ellis et al. 2001) raw counts are 5 for *hidlo* (all forms), 104 for *bodlon*, and 46 for *chwedlau* (145 for the lemma *chwedl*): in other words, among these three it is the form with the middle frequency ranking that resists the change. It might of course be questioned whether the written CEG corpus is a good measure of frequency in this context.

[31]The lack of complete regularity in these patterns is further confirmed by the difference in vowel length between *bodlon* and *hidlo* in Llantrisant. Historically, the vowel is short, so its shortness in [bɔllon] is expected. However, *hidlo* is given as [ilo], with a tense [i] probably implying a long vowel; under any scenario, this must be a later, irregular development.

In this regard, the findings in this section are consonant with the suggestion by Russell (2003) that Pembrokeshire Welsh forms with svarabhakti in [v]-sonorant clusters, such as [ˈtreːvɛn] 'order' and [ˈoːvɔn] 'fear' are innovative. Russell (2003) suggests that the historically regular development of *vC# involves vocalisation of the labial: Pembrokeshire Welsh [ˈəskawn] 'light' (*ysgafn*), [ˈsowl] 'stubble' (*sofl*), [ˈkɛndɛr] 'cousin' (*cefnder*, Old Welsh *keintiru* in Bodleian MS. Auct. F. 4. 32; 9th or 10th century). Russell (2003) does not state whether he considers the new forms to be formed by analogy with existing cases of svarabhakti or to be instances of borrowings from other varieties (northern dialects and/or the standard language), but either scenario is consistent with a lexical-diffusion account.

Finally, it is instructive to consider the possibility that 'sonorant deletion in polysyllables' was apparently never a single, regular sound change in Welsh. Much of the literature presents (synchronic) deletion in polysyllables as a regular process, yet we saw that in some dialects it was never implemented in parts of the native vocabulary (as in the case of [dl dn] clusters in North Welsh).[32]

Moreover, the neat division of labour between epenthesis (in monosyllables) and deletion (in polysyllables) is the product of two very different diachronic processes. It would appear that originally epenthesis was a strategy applied in **both** monosyllables and polysyllables in all Brythonic languages (e. g. Schrijver 2011, p. 40): it is amply attested in Old Cornish (including in forms such as *kinethel* 'nation', cognate with Welsh *cenedl*) and more tenuously in Old Breton, even though there are few traces of it in later stages of Breton.[33]

With regard to the Middle Welsh record[34] instances of epenthesis in polysyllabic forms are numerous: *perygil* for *perygl* 'danger' (Black Book of Carmarthen, 1st half of 13th century), *kenetyl* for *cened(d)l* 'nation' (White Book of Rhydderch, mid 14th century) with epenthesis. In addition, as we saw above, the obstruent may be deleted in sequences such as [ðl] (see P. W. Thomas 1995 for mediæval examples). The mediæval record shows numerous examples of overapplication of epenthesis before vowel-initial suffixes, where it is not clearly motivated by sonority considerations. Examples are found with both polysyllabic and monosyllablic stems. For monosyllables, in Old Welsh *centhiliat* 'singer' (cf. *cathl* 'song' from **kan-tlo-*);[35] in Middle Welsh cf., for instance, *amylach* 'more plentiful' (Modern Welsh *amlach*) in the Red Book of Hergest (late 14th century). For polysyllables, we find Old Welsh *cenitolaidou* 'generations' in the 9th- or 10th-century MS. Bodleian Auct. F. 4. 32 and throughout the Middle Welsh period (e. g. *kenedyloed* 'nations' from *kenedyl* in MS. Peniarth 15, late 14th or early 15th century).[36]

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[32]Interestingly, Morris-Jones (1894, p. xxiv) claims that word-final consonant clusters of rising sonority in contemporary (i. e. nineteenth-century) dialects could undergo clearly postlexical resyllabification, as in *ce|ned|l oedd| hon* 'it was (a) nation'. This suggests that there is (was) no active process in the phonology of those dialects which would combat final rising-sonority clusters at the word level.

[33]Old Welsh forms with no epenthesis are attested too, in both mono- and polysyllables (Falileyev 2000): *bacl* 'staff', *bisl* 'gall', *cenetl* 'nation'.

[34]Examples are from Simon Evans (1964) and P. W. Thomas, Smith & Luft (2007).

[35]Interestingly, this is attested also as *centhliat* with no overapplication in the same set of glosses (Juvencus). The word itself is a hapax, as a reviewer points out, but Falileyev (2000, s. v.) notes Middle Welsh *gorcheithleit* 'singers'.

[36]In fact, epenthesis in polysyllables has left a few traces throughout Welsh dialects. For instance, the GPC notes *menibyr* 'pickaxe or mattock handle' in Abergeirw (Gwynedd, North Wales), cf. *mynybyr* in the White Book of Rhydderch. The dialect of Nantgarw preserves a dual outcome of [r] deletion: C. H. Thomas (1993) records both [kɛˈbɪstar] 'halter' and [ˈkebast] as an expletive (contrast Bangor, where [ˈkebɪst] is recorded by Fynes-Clinton 1913 in both meanings).

Due caution must be exercised when taking mediæval sources to faithfully represent the diachronic ancestor of vernacular varieties attested in the modern era (cf. Laing & Lass 2006); it would appear, nevertheless, that at least some modern forms with sonorant deletion in fact descend from forms with epenthesis. This is certainly the assumption of Russell (1984) and Schrijver (1995), who both suggest that the svarabhakti vowel was deleted at a late (late Middle or even early Modern Welsh) date, followed by regular deletion that only affected [r] after coronals.

One possible exception here is the case of [r], which can be deleted quite early on in the presence of another rhotic in the form: Schrijver (1995, p. 367) cites *aradwr* 'ploughman' (implying *arad* for *aradr* 'plough') attested in the Black Book of Carmarthen (12th–13th century). A reviewer also points to the rhyme in *ny nawt vyd **aradyr** / heb hëyrn heb **hat*** 'it is not the custom for a plough to be without iron parts and without seed' from a poem in the Book of Taliesin (Haycock 2007, p. 343), with an uncertain dating for the poem but possibly as early as the 10th century. The rhyme between *aradyr* and *hat* (Modern Welsh *had*) 'seed' may indicate that the former had already lost the [r] (altough Haycock herself suggests that it was present but disregarded for metrical purposes).

Loss of final [r] is seen also in monosyllabic *brawd* 'brother', which must be from an (unattested) *brawdr, and *trawst* 'roof beam' (with plural *trostreu* in Middle Welsh, e. g. in the Book of Iorwerth, from Latin *transtrum*). Schrijver (1995), following Pedersen (1909), suggests that deletion in *brawd* and *trawst* is due to dissimilation (possibly affecting only tautosyllabic pairs of [r]) and that it predates Old Welsh epenthesis, let alone the later, more regular deletion.[37]

Other than these cases of consonants deletion that are securely dateable to a relatively early stage, the chronology is uncertain. It is clear that in Old Welsh at least polysyllabic words with final rising-sonority clusters underwent epenthesis (*cepister* 'halter', *tarater* 'column'). As noted above, Schrijver (1995, p. 367) suggests that the vowel was lost in early Modern Welsh, and goes on to claim, following Russell (1984), that there was a regular process of [r] deletion after a coronal following on from this deletion. Schrijver (1995) says that this loss of [r] 'cannot be proved to have occurred before the 16th century'. His dating is tentative (cf. also *amerawd* 'emperor' in NLW MS. Peniarth 21, early 14th century; *amherawd* in NLW MS. Llanstephan 27, late 14th century, both cited following P. W. Thomas, Smith & Luft 2007), but he is confident that loss of both the vowel and the sonorant 'can by no means be dated before Middle Welsh', which certainly suggests that epenthesis and sonorant deletion could not be part of a single process optimising syllable structure.

The situation with clusters other than 'coronal + [r]' is even less clear. The diachronic record does show some evidence for [l]-deletion (*tympestyl* in the 12th–13th century poet Brydydd y Moch but *temest* by the 16th century; [*m*]*ysogyl* 'moss' in 1545; Bangor [ˈmʊsɔɡ] noted above), but whether it was an across-the-board regular pattern remains less clear.[38] In any case, it seems quite certain that historically epenthesis and deletion as sonority-optimising mechanisms are quite separate processes, which means we do not necessarily expect them to be subject to the same restrictions and be driven by the same mechanism. Only [r] deletion following coronals approaches some regularity as a sound change.

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[37]Russell (1984) objects that dissimilation wrongly predicts deletion in the plural *trostreu*, but Schrijver's tautosyllabicity condition provides a plausible explanation. If Old Irish *trost* 'beam, doorpost', attested in the St Gall glosses (early 9th century) is borrowed from Brythonic, it provides further support for an early date of deletion in this item.

[38]Note that the borrowing from English *possible* is attested as both *poseibyl* and [*p*]*osseib* in a 1545 manuscript cited in the *Geiriadur Prifysgol Cymru* s. v. *posibl*.

Although the lack of a regular, across-the-board deletion of final sonorants in rising-sonority clusters would appear to be of mostly diachronic import, it is also relevant synchronically. Authors such as Bermúdez-Otero (2007, 2015); Bermúdez-Otero & Trousdale (2012); Kiparsky (1995); Ramsammy (2015); Roberts (2012) have discussed how synchronic phonological patterns emerge from regular processes of change, under the rubric of 'the life cycle of phonological processes'. If deletion has never been an exceptionless change in Welsh, there is no reason to expect that the **phonological** grammar of any period should have included a pattern arising from such a change. Alternatively, deletion is the lexically specific, phonologically unmotivated restructuring of underlying representations of individual stems. This is implied, for instance, by the suggestion by Schrijver (1995) that the possible presence of final [r] in standard forms like *ffenestr* is due to 'analogy' with the plural (see also section 4.3). In the model espoused here, such 'restoration' can be accounted for via potentially productive lexical redundancy rules connecting competing stem forms such as ⟦fenestr⟧ and ⟦fenest⟧. The existence of such redundancy rules is potentially confirmed by hypercorrect forms where historically obstruent-final stems acquire a final sonorant: an example is *arwest* 'string' (Irish *aires*, Proto-Celtic *ari-wed-tā; Greene 1962), which acquires a stem *arwestr* (in the plural *arwestri* but also in the singular), but also *arwestl* (see GPC s. v. *arwest*). Clearly, in this case the existence of a stem *arwest* in final position was taken as indicating the existence of a non-final stem with a sonorant. The model of stem allomorphy proposed in this paper has a ready account of such synchronic behaviour and the lexically diffusing nature of changes which affect the relevant items.

4.2. *Comparison with Optimal Paradigms*

The argument regarding part-of-speech differences in the application of svarbhakti presented in section 3.1.1 relied rather heavily on the fact that nouns and verbs may show non-identical behaviour in phonological contexts that appear to be identical in relevant respects. Although I have argued for a stem-centric approach, the data would appear at first glance to be equally amenable to a parallel treatment in terms of McCarthy's (2004) Optimal Paradigms theory. In Optimal Paradigms, in addition to constraints evaluating individual forms, the phonological shape of a particular form may be influenced by constraints requiring that certain features be preserved throughout a paradigm, even if they are not transparently motivated in some members of that paradigm. The requirement to avoid within-paradigm alternations can thus produce apparent opacity effects if constraints that force some optimising alternation in a subset of the paradigm act in concert with paradigm uniformity constraint enforcing the same alternation even where it is not, strictly speaking, required.

In the case of Welsh, the pattern of the overapplication of deletion in nouns but not in verbs (as in [aˈnaːle] 'breaths' but [aˈnadli] 'to breathe') could be connected to the structure of the respective paradigms. The majority of Welsh nouns are unsuffixed in the singular, with the conditions for svarabhakti in place, while nominal (inflectional) suffixes in Welsh are overwhelmingly vowel-initial.[39] Thus, we expect nouns to show vowel-zero alternations within a paradigm, as in singular [ˈɬɛstɛr] 'vessel', plural [ˈɬɛstri]. In verbs, however, **all** suffixes in dialects are normally vowel-initial. A rep-

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[39]However, there are cases where the singular is suffixed and the plural is unsuffixed, or where both forms are suffixed; this does not appear to impinge on the overall argument here. See Awbery (2009) for exhaustive discussion of these issues.

Tense	Person	Singular	Plural
Future	1	[a]	[un]
	2	[i]/[uχ]/[u]	[uχ]
	3	[if]	[an]
	Impersonal	[ir]	
Past	1	[ɛn]/[un]	[ɛn]
	2	[ɛt]/[ɛχ]/[ɛ]	[ɛχ]
	3	[ɛ]	[ɛ]
	Impersonal	[id]	
Perfect	1	[ɛs]	[on]
	2	[ɛst]/[oχ]/[o]	[oχ]
	3	[us]/[oð]	[on]
	Impersonal	[ud]	
Imperative	2	[a]/∅/[uχ]/[u]	[uχ]
	3	[ɛd]	[ɛd]

Table 1: Verbal suffixes in South Welsh

resentative set of verbal suffixes for South Welsh (Maenor Berwig, Carmarthenshire; Thorne 1976, vol. 1, pp. 132–134, 144) is shown in table 1.[40]

This asymmetry could be leveraged in Optimal Paradigms by enforcing paradigm uniformity within an inflectional class (for instance, via the constraint OP-MAX prohibiting deletion-conditioned segment-zero alternations within a paradigm), exactly in parallel to the Arabic case discussed by McCarthy (2004). This is shown schematically in (59); for simplicity I abstract from the question of why deletion is chosen over epenthesis and from the choice of segment to be deleted.

(59) Overapplication of deletion in nouns in Optimal Paradigms

/anadl+{∅, e}/	OP-MAX	SONSEQ	MAX
a. ⟨[ˈaːnadl], [aˈnadle]⟩		*!	
b. ⟨[ˈaːnal], [aˈnadle]⟩	*!		*
c. ☞ ⟨[ˈaːnal], [aˈnaːle]⟩			**

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[40]The characterisation of verbal paradigms as involving only vowel-initial suffixes is not entirely correct. Awbery (2009) identifies at least two contexts where Welsh verbs may have a zero suffix. One is the 3sg future, as in *gwêl* '(s)he will see' from *gweld* 'see', stem *gwel-*, against more common *gwelith* or *gweliff*; this, however, is usually a borrowing from the standard language and thus not necessarily representative of dialect phonology. The second context is the so-called verbal noun, which may occasionally have a zero suffix. However, the formation of verbal nouns is highly irregular, and I am not aware of a verbal stem with a final rising-sonority cluster that takes the zero suffix. Finally, we find that some suffixes do have zero variants (notably in the imperative) and past-tense suffixes in many dialects have variants with initial [s], as in [ˈlɪkɛn] or [ˈlɪksɛn] for 'I liked' (Breconshire; Jones 2000, p. 83). It would appear, however, that cluster-final stems usually take vowel-initial alternatives when this type of variability is possible. This could be treated as phonologically optimising allomorph selection for the suffixes.

In verbs, where all suffixes are vowel-initial, SonSeq cannot compel deletion, and OP-Max is vacuously satisfied by faithful forms:

(60) No overapplication of deletion in verbs in Optimal Paradigms

/anadl+{a, un, ...}/	OP-Max	SonSeq	Max
a. ☞ ⟨[aˈnadla], [aˈnadlʊn], ...⟩			
b. ⟨[aˈnaːla], [aˈnaːlʊn], ...⟩			*!*

Thus, Optimal Paradigms Theory appears to provide a solution to the overapplication problem without recourse to stratal models or stem storage. However, I suggest that the present approach has a number of empirical advantages over Optimal Paradigms.

First, Optimal Paradigms appears to have no explanation for the existence of tripartite divisions such as those seen in the dialect of Dihewyd (repeated from section 3.2):

(61) a. [ˈgwaˑðan] *gwadn*   'sole'

b. [ˈgwande] *gwadnau* 'soles'

c. [ˈgwanði] *gwadnu*   'to leg it'

The nominal forms show that OP-Linearity, the constraint prohibiting metathesis within a paradigm, must be dominated by some markedness constraint (e. g. one of the Dist+n family responsible for syllable contact effects; Gouskova 2004), and also that some constraint militating against the sequence [nð] must dominate the faithfulness constraint prohibiting the change in continuancy. In the verbal form, however, the change in continuancy is blocked. The difference in paradigmatic structures between nouns and verbs does not appear to furnish any explanation for this discrepancy, contrary to the predictions of Optimal Paradigms. The approach could be salvaged by arguing that the noun and the verb have diverged historically, and thus that the underlying forms are /gwanð/ for the verb and /gwaðn/ for the noun. This still forces the parallel approach to confront the derived environment effect, i. e. the fact that underlying /nð/ appears immune to the continuancy change whereas /ðn/ derived by metathesis is not. However, more importantly, such an approach effectively concedes the point: nouns and verbs do have to have different underlying representations, exactly as suggested by the stem-centric approach.

More generally, Optimal Paradigms appears unable to provide a principled account of cases where the same structure is repaired by different unfaithful mappings in different parts of speech. Recall the case of √sieve. At some point in the history of (South) Welsh, the underlying form of this root was /hiðl/; in many modern dialects, the stems are now ⟦hiðil⟧_N and ⟦hil⟧_V. The deletion in the verbal stem suggests that some constraint militating against the sequence [ðl] must have been ranked high enough to enforce the deletion of the [ð] in the verb — or, more precisely, prevocalically. If that was the case, however, why do we not find deletion in the noun, i. .e. plural *[ˈhɪle]? Lacking the formal means to distinguish beyond 'noun' and 'verb' beyond the (relevant) phonological properties of the affixes, Optimal Paradigms cannot account for this discrepancy:

(62) Ranking for [ð] deletion in prevocalic contexts

/hɪðl+{a, un, ...}/		OP-MAX	*ðl	DEP	MAX
a.	⟨[ˈhɪðla], [ˈhɪðlʊn], ...⟩		**!		
b.	⟨[hɪˈði:la], [hɪˈði:lʊn], ...⟩			**!	
c. ☞	⟨[ˈhi:la], [ˈhi:lʊn], ...⟩				**

(63) Ranking incorrectly predicts deletion in nouns

/hɪðl+{∅, e}/		OP-MAX	*ðl	DEP	MAX
a.	⟨[ˈhɪðl], [ˈhɪðle]⟩		**!		
b. ☺	⟨[ˈhi:ðɪl], [ˈhɪðle]⟩		*!	*	
c. ☺	⟨[ˈhi:ðɪl], [hɪˈði:le]⟩			**!	
d. ☞	⟨[ˈhɪl], [ˈhɪle]⟩				**

The phonology of the language must be able to enforce deletion of [ð] even in prevocalic contexts (not just word-finally), in order to account for forms such as [ˈhi:lo] 'to sieve'. However, when a noun is submitted to the same ranking, as in (63), both the historically correct paradigm with a vowel-zero alternation and the levelled paradigm always do worse than the paradigm that chooses the same repair as in verbs, i. e. deletion. This is not the result we observe in many dialects. In the stem-centric model, on the contrary, the connection between the verbal and the nominal stem is much more tenuous, since it only exists in lexical redundancy mode. Therefore, we do not expect that changes in one should immediately lead to changes in the other.

To sum up, Optimal Paradigms appears to provide a parallel alternative to the stratal, stem-centric model proposed in the present paper. However, it explicitly predicts that the patterning of exceptions should follow the availability of purely phonological conditioning of the various unfaithful mappings, unlike the stem-centric model which privileges reference to part-of-speech categories. In this section, I have argued that this prediction of Optimal Paradigms is incorrect. Despite being 'more powerful' and potentially overgeneralising, the stem-centric model turns out to be necessary in order to account for the full range of facts.

4.3. *The status of epenthesis revisited*

Finally, I suggest it is worth reconsidering the phonological status of epenthesis in rising-sonority clusters, i. e. the prototypical cases such as [ˈɬɛstɛr] 'dish', pl. [ˈɬɛstri]. Although this process is normally said to be completely regular, in section 1 we saw that there are case where it fails to apply, for instance in clusters containing [v], in [dl] clusters, and in borrowings from English.[41]

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[41]An anonymous reviewer notes that the clusters in North Welsh forms such as [ˈɔvn] and [ˈkɛnɛdl] normally do contain vowel-like portions in the transition from the obstruent to the sonorant. I would suggest, however, that this sort of 'epenthesis' is phonologically irrelevant, since it arises as a largely automatic consequence of gestural phasing in

In principle, we could look for phonological explanations for all these exceptions. Borrowings could be marked as non-undergoers of the relevant process. The special behaviour of [v] is not really surprising; in many respects, it behaves like a sonorant rather than a fricative in the Brythonic languages.[42] Special prosodic properties of the sequences [tl dl] are also frequent cross-linguistically.[43] However, I would suggest that looking for this sort of explanation is not necessarily productive.

As discussed in section 1.1, there are cases of epenthesis which appear entirely arbitrary and thus unmotivated by phonology: conceptually, extending the stem-based treatment to rising-sonority cases does not require supplementing the grammar with an ad hoc device that is not needed to account for other alternations. Similarly, cases of vowel-zero alternations where the alternating vowel is not an exact copy of the preceding one (section 1.2) must receive some sort of lexically specific analysis.

Of course, epenthesis into rising-sonority clusters is very widespread, so one could argue that the stem-centric approach 'misses a generalisation'. However, degree of attestation does not necessarily equal productivity. Epenthesis appears to have been very productive at earlier stages of the language, so much so that we find it even in polysyllables, where today it is all but unattested. The life cycle of phonological processes leads us to expect that many traces of this pattern should remain in the lexicon — but the evidence for the **productivity** of this alternation is tenuous.

In fact, forms with final rising-sonority clusters are found even in the most epenthesis-friendly dialects, and they must be accounted for. Consider the case of [vn]. Normally in South Welsh this cluster is broken up by epenthesis: Pembrokeshire ['treːven], Nantgarw ['treːvan] 'order, arrangement'. However, in both dialects we find (polysyllabic) forms where the SonSeq constraint is violated: Pembrokeshire ['əskavn] 'light', Nantgarw [kɔvˈɡolɔvn] 'monument'. Historical explanations for this discrepancy are available: the Pembrokeshire form likely derives from ['əskawn]; the Nantgarw one is likely a borrowing from the standard language.[44] However, explaining **why** such forms are exceptional is not the same as pinpointing **how** these facts should be represented in our account of the phonology of the language. Vowel-zero alternations are more frequent in the context of final rising-sonority clusters, but that alone is not sufficient evidence that it is non-alternation that should be treated as a special case (as it has to under a phonological account) rather than alternation (as in the stem-centric account allows to do by dispensing with a synchronic epenthesis pattern).

Note that the view of svarabhakti as stem allomorphy in the framework espoused here does not firmly preclude the existence of productive generalisations, as emphasised in section 4.1. As noted above, relationships between stems may be cognitively real, even if they mostly operate in lexical redundancy mode. A lexical redundancy rule involving epenthesis in word-final clusters might be posited on the basis of the suggestion by Russell (2003) that forms like ['treːvɛn] 'order' in (some) south Welsh dialects may be innovative. If Russell (2003) is right, then the behaviour of

[42]For instance, it alternates with the sonorant [m] in initial mutation, and does not (unlike stops) undergo laryngeal assimilation, e. g. in the ordinal numeral suffix *-fed*: *seithfed* 'seventh', not **seithffed*.

[43]Consider the well-known English pair of *a*[tʰ]*rocious* versus *A*[ʔt]*lantic*.

[44]Cf. the form ['kɛnɛdl] recorded by C. H. Thomas (1993) in Nantgarw. It must be a borrowing from the standard language: it has [d] instead of southern [ð] before [l], a short vowel in the penult where a long vowel is expected historically, and a final-syllable [ɛ] instead of [a].

these innovations is fully consistent with a stem-allomorphy account, as they do not show across-the-board regularity and instead proceed by lexical diffusion.

I suggest that the question of the productivity of svarabhakti cannot be satisfactorily answered in the present state of our knowledge. That lack of epenthesis is tolerated with borrowings from other varieties of Welsh and from English suggests that svarabhakti may not be part of the regular phonology of the language. Pertinent data could be gathered experimentally, for instance from production and perception experiments (e. g. word-likeness judgements), and this issue should be subject to further research.

5. CONCLUSION

In this paper I have argued that many, if not most, patterns in Welsh covered by the traditional term 'svarabhakti' are best viewed as the effects of lexical insertion — specifically of the subcategorisation-driven selection of stem allomorphs — rather than as the outcome of phonological processes such as epenthesis or deletion. I have suggested that this view strikes the correct balance between storage and computation, since it allows us to provide an account of both the regular and the 'irregular' aspects of the patterns, notably the connection between the misapplication of phonological rules and morphological category changes.

Such an approach is naturally open to the criticism that it runs afoul of the 'duplication problem' (Kenstowicz & Kisseberth 1979): it would appear that, under the present account, sonority sequencing violations are removed by the concerted action of architecturally unrelated processes (phonological epenthesis and allomorphy). I suggest, however, that such 'duplication' need not be seen as a 'problem' (cf. Paster 2012) under a régime in which phonetic and phonological patterns are subject to certain pressures which encourage their movement along the life cycle of phonological processes. Indeed, theories of phonologisation (e. g. Barnes 2006; Cohn 1998; Hyman 1976; Zsiga 2000) and of the life cycle positively predict the existence of such duplication — see in particular Bermúdez-Otero (2015), where this is treated under the rubric of 'rule scattering'.

Duplication is commonly seen as a 'problem' on the grounds of parsimony. However, parsimony is not an adequate criterion when the empirical content of two competing theories is different. I have shown that a view of svarabhakti and deletion as a unified response to a single phonological requirement is not tenable when applied to South Welsh varieties. Crucially, the divergence between the phonological analysis and the allomorphy-based approach defended in this paper does not boil down to relatively minor differences in the exact coverage of the relevant phenomena (such as the existence of non-epenthesising items or the behaviour of borrowings): the grammar required to effect sonority-driven epenthesis in South Welsh is fundamentally incompatible with the existence of a deletion process in the same variety. The alternative analysis, despite the 'duplication', is able to not only reconcile the existence of both phenomena in the same variety but also to make a number of non-trivial — and correct — predictions about the patterning of exceptions to the svarabhakti pattern. The 'missed generalisations' are not so much missed as refined: instead of a single process of rising-sonority cluster elimination, with identical productivity for both epenthesis and deletion, an approach based on allomorphy provides for differences between the two patterns in the degree and type of productivity. This non-negligible difference in empirical content between the two approaches means that parsimony cannot be used to reject the allomorphic approach out of hand.

This embrace of apparent redundancy among different components of grammar (see Nevins 2012 for another example of 'splitting up' a process between different modules for principled reasons) does not amount to a denial of the existence of the duplication problem in a narrower, technical sense. In the OT literature, the duplication problem is most often invoked in connection with the principle of Richness of the Base (e. g. McCarthy 2005), which requires the analyst to ensure that all possible inputs to the phonological computation map to phonotactically licit outputs. It has been suggested (e. g. by Paster 2012; Vaux 2008) that a historical explanation obviates the need to invoke phonology to explain the absence of certain patterns, undermining the importance of Richness of the Base. However, the two issues are not necessarily connected. Even if the history of the language shapes its lexicon (and thus the shape of phonological inputs), important insights can still be gleaned from considering the phonology of 'disharmonic' inputs. Returning to Welsh, under the standard analysis inputs with final rising-sonority clusters are mapped by the phonology to outputs with a svarabhakti vowel. Under the analysis proposed here, this is not necessarily the case: if svarabhakti is treated exclusively in terms of stem allomorphy, the avoidance of such clusters is the job of the lexicon. This potentially opens the analysis to a Richness of the Base criticism: what **does** the phonology do when faced with disharmonic clusters? A possible answer is that it allows them to surface faithfully — and, as we saw in section 4.3, this hypothesis has something to recommend it.

To conclude, I have argued that a stratal, stem-centric model, while in some sense 'more powerful' than the fully parallel, monostratal OT approach, provides better empirical coverage of the Welsh data. Moreover, I have shown that the 'duplication of effort' between grammatical components inherent in such a model is not problematic, but rather represents an important aspect of our understanding of morpho-phonological architecture.

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