Safety in numbers: Geminates in Lisbon Portuguese[*]

S a m u e l   A n d e r s s o n
C h r i s t ' s   C o l l e g e,   U n i v e r s i t y   o f   C a m b r i d g e

ABSTRACT This article discusses the variety of Portuguese spoken in Lisbon, with focus on two morphophonological problems. Some vowels escape the normal vowel reduction rules of the language, and there are unexpected plural forms of nominals ending in /l/. The data have been known in the linguistics literature since at least the 19th century (Gonçalves-Viana 1883/1941), but have yet to receive a satisfactory analysis. I will argue for a new analysis, where both of these seemingly unrelated phenomena are explained by underlying or derived geminate vowels, which degeminate by a phonological rule. This allows us to solve a number of previously unexplained problems in a unified way. I will also argue that the synchronic derivation of a phonological pattern may lack any relation to the set of sound changes which initially created it, and that both phenomena investigated here exemplify this.

1 INTRODUCTION

In this article, we will examine two problems in the phonology and morphology of Lisbon Portuguese (LP). I will argue that the appropriate solution to both problems involves geminate vowels, either underlying or derived, which subsequently degeminate by a phonological rule $V_i V_i \rightarrow V_i$, where V_i is any vowel. The analysis builds on that of Spahr (2016), who has already used geminates, but not degemination, in explaining similar problems in the language. We will begin by examining lexical exceptions to vowel reduction. These are forms which, for various historical reasons, do not reduce in unstressed syllables, even though such reduction appears to be productive in LP (Andersson 2017). Two types of solution have been suggested in the literature. One has it that these forms are simply exceptions, and that nothing can be done other than marking them as such in the lexicon (Mateus, Brito, Duarte & Faria 1994, Mateus & d'Andrade 2000). The second argues, more or less explicitly, that the historical surface forms are still the underlying forms in LP today, with the diachronic sound changes copied into the synchronic phonology (Mateus 1982, Mattoso Câmara 1970). The first approach fails to explain a significant part of the Portuguese lexicon, while the second faces learnability problems: how do children in Lisbon today come to learn forms which have not been present in the language for centuries?

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[*] I am grateful to Ollie Sayeed for discussion of this article. Remaining errors are entirely my own responsibility.

As an alternative to these previous analyses, I argue that vowels which do not reduce when unstressed are underlyingly geminate, regardless of their historical origin. The reduction rules only apply to singleton vowels (as in Spahr 2016), and geminates are subsequently degeminated. This is an example of a counterfeeding chain shift, where A → B and B → C, without A → C. This involves an extension of a degemination rule found to be productive in Andersson (2017). By extending the rule's environment to stressed and unstressed syllables, and to more vowels, we can find a single explanation for all exceptional forms using the synchronic phonology. My approach also has a learnability advantage over some previous theories, since it does not rely on speakers having access to forms which are no longer present in the input.

We then turn to the plural forms of nominals ending in /l/. These fall into three classes, depending on stress and the preceding vowel. Previous research has focussed on what I call Class III, which represents the elsewhere case: when the /l/ is preceded by any vowel other than /i/. In this class, the /l/ of the singular surfaces as a [j] in the plural. A number of analyses already exist of this class in the literature, but they cannot easily be generalised to Classes I or II, where the singular ends in /il/. By modifying the analysis of Class III, I am able to find a solution which does generalise to Class I. I take it that Class III involves not l → j, but l → i. After a vowel, unstressed i then becomes a glide by a phonological rule. Defending this analysis forces us to reanalyse minimal pairs for high vowels and glides in LP, which I accomplish by means of another counterfeeding chain shift analysis. In Class I, /il/ turns to ii by the l → i rule. This derived geminate is simplified by the degemination rule we have already seen. Class II, where /il/ → [ɐj], is not successfully accounted for by any analysis. Morales-Front & Holt (1997) provide the best attempt of explaining all classes in my opinion, but make incorrect predictions about other areas of LP phonology. I will do nothing here other than sketching a theoretically possible analysis of Class II. However, I take it that the integration of Classes I and III still represents progress in our understanding of these nominals, and leave Class II as a problem for future research.

I conclude that geminates and degemination are valuable tools for phonologists working on LP, and European Portuguese more generally. A secondary, methodological goal of this article is to show that it is possible to find principled synchronic explanations of phonological patterns which do not merely recapitulate the history of a language's sound changes. The remainder of this article is structured as follows. Section 2 introduces the data from LP, and features some historical notes. Section 3 provides a unified explanation of exceptions to vowel reduction, based on degemination of underlying geminates. Section 4 analyses pluralisation of /l/-final nominals, focussing on Classes I and III. Section 5 concludes the article.

2 The Data

Lisbon Portuguese has seven main oral vowel phonemes in stressed syllables: /i, e, ɛ, a, ɔ, o, u/ (Barbosa 1965: 33, Gonçalves-Viana 1883/1941: 33, Mateus & d'Andrade 2000: 36, Mateus, Falé & Freitas 2005: 174). Various rules create other vowels in

stressed syllables as well, notably [ɐ], which is an allophone of /e/ before palatal consonants (d'Andrade 1994: 35–39, Barbosa 1965: 44, Gonçalves-Viana 1903: 11, 38–39, Gonçalves-Viana 1883/1941: 50–53, Mateus 1982: 34–35, Mateus & d'Andrade 2000: 37–38, Mateus et al. 2005: 174) and of /a/ before nasals (Gonçalves-Viana 1903: 11, 40, Gonçalves-Viana 1883/1941: 49–50, Mateus & d'Andrade 2000: 37–38). In unstressed position, the following reductions typically take place (Barbosa 1965: 33–34, 158–159, Delgado-Martins 1982: 8–12, Faria, Pedro, Duarte & Gouveia 1996: 190–192, Gonçalves-Viana 1903: 38, Gonçalves-Viana 1883/1941: 33, Mateus 1982: 29–35, Mateus et al. 1994: 358, Mateus & d'Andrade 2000: 157–159, Mateus et al. 2005: 219):

(1) Vowel reduction

Stressed position	Unstressed position
[i]	[i]
[e, ɛ]	[ɨ] (sometimes written [ə])
[a]	[ɐ]
[u, o, ɔ]	[u]

This produces alternations like the following, taken from Mateus & d'Andrade (2000: 158):

(2) Alternations

SR	Orthography	Translation
['fitɐ]	*fita*	'band'
[fi'tiɲɐ]	*fitinha*	'small band'
['dedu]	*dedo*	'finger'
[dɨ'dadɐ]	*dedada*	'fingerprint'
['mɛɫ]	*mel*	'honey'
[mɨ'ladu]	*melado*	'sweetened with honey (masc. sg.)'
[vi'ɾar]	*virar*	'to turn'
['viɾɐ]	*vira*	'turns (3sg)'
['pɔrtɐ]	*porta*	'door'
[pur'tejɾɐ]	*porteira*	'doorkeeper'
['fogu]	*fogo*	'fire'
[fu'gejɾɐ]	*fogueira*	'bonfire'
['fuɾu]	*furo*	'hole'
[fu'ɾadu]	*furado*	'pierced (masc. sg.)'

A formalisation of the reduction rules will not concern us here; the interested reader is encouraged to read the discussions referenced immediately above (1).

We will be concerned instead with a number of contexts in which the expected reductions do not apply. Some of these are phonologically regular. For example, there is no reduction before an /l/ in the same syllable. A word like /sal'tar/ *saltar* 'to jump' is thus pronounced [saɫ'tar] and not *[seɫ'tar], and the suffix /-'avel/ -*ável* '-able' is ['avɛɫ] instead of *['avɨɫ] (Barbosa 1965: 158, Mateus 1982: 219–221, Mateus & d'Andrade 2000: 158–159, Mateus et al. 2005: 223). Mid vowels also fail to undergo the expected reductions in absolute word-initial position (Barbosa 1965: 137, Gonçalves-Viana 1883/1941: 22, 36–37, Mateus et al. 1994: 359–360, Mateus & d'Andrade 2000: 75–76, Mateus et al. 2005: 224).

Other restrictions are morphosyntactic in nature: there is no reduction in adverbial forms in the adverb suffix -*mente*, or diminutives in -*zinho*, for example (Barbosa 1965: 155–156, 216, Gonçalves-Viana 1903: 29, Mateus 1982: 208, 225–228, Mateus et al. 1994: 359–360, Mateus et al. 2005: 224–225). 'slow' is [dɨve'gar] *devagar*, and 'slowly' is [dɨvegar'mẽtɨ] *devagarmente* with [a] rather than *[dɨvegɐr'mẽtɨ] with [ɐ].

However, in addition to these well-understood exceptions, there are others which appear more mysterious. Why, for example, is the word for 'invader' [ĩva'zor] and not *[ĩvɐ'zor] (Mateus & d'Andrade 2000: 159; see other examples in Barbosa 1965: 158, Delgado-Martins 1982: 12, Gonçalves-Viana 1883/1941: 22, Mateus 1982: 222–224, Mateus et al. 2005: 224–225)? Unstressed /a/ in an open syllable is not normally exempt from reduction, cf. [mɐ'ʒiɐ] 'magic' from /ma'ʒia/. And why is the word for 'injector' [ĩʒɛ'tor] rather than *[ĩʒɨ'tor] (Mateus & d'Andrade 2000: 112, cf. Barbosa 1965: 158, Delgado-Martins 1982: 12, Gonçalves-Viana 1883/1941: 21–22, Mateus 1982: 222, Mateus et al. 2005: 224–225)? And why does the word for 'bullfighting', [to'radɐ], never surface as the expected *[tu'radɐ] (cf. Barbosa 1965: 158)?

It turns out that these three words — 'invader', 'injector' and 'bullfighting' — illustrate three different historical sources of exceptions to reduction. The first source, exemplified by 'invader', is a historical sequence of two adjacent vowels. This sequence fails to undergo reduction, and subsequently degeminates in the history of the language (Barbosa 1965: 158, Gonçalves-Viana 1883/1941: 22). The second group of words, exemplified by 'injector', all originally featured consonant clusters (Barbosa 1965: 158, Gonçalves-Viana 1883/1941: 21–22). This cluster protected the first vowel from reduction, even though the first member of the cluster has since been lost.[1] To understand the word 'bullfighting', we have to know that in Lisbon Portuguese, the historical [ow] of words like 'bullfighting' is now realised simply as [o] (Barbosa 1965: 158, Gonçalves-Viana 1903: 16, 40, Mateus 1982: 42, Mateus et al. 1994: 360, fn. 1). However, these [o]s are different to those which come from historical /o/, in that only the latter undergo reduction to [u] Barbosa (1965: 158).

This brief survey of LP vowels is all we need to know about the topic for the purposes of this article. We will now turn to nominals ending in /l/, and how their plurals are formed. The plural of nominals in Portuguese is usually formed by adding

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[1] However, this is not an entirely regular phenomenon. Barbosa (1965: 159) points out that Portuguese *encetar* 'to commence' does show reduction, even though there was a cluster in the Latin etymon *inceptāre*.

a sibilant to the end of the singular form, typically taken to be /s/ underlyingly (as in Morales-Front & Holt 1997), or else to be unmarked for voice and place (Mateus & d'Andrade 2000: 91). Depending on the following segment, it surfaces as either [ʃ], [ʒ] or [z] (see Barbosa 1965: 166–167, Faria et al. 1996: 186, 189, Frota 2000: 53–54 and passim, Gonçalves-Viana 1903: 36, Gonçalves-Viana 1883/1941: 24, Mateus 1982: 36–37, Mateus & d'Andrade 2000: 166–167, Mateus et al. 2005: 229–230 for details). In the forms we will consider here, only [ʃ] will appear. When the singular ends in /l/, which is velarised in syllable codas (see Barbosa 1965: 38, Faria et al. 1996: 190, Gonçalves-Viana 1903: 18–19, Gonçalves-Viana 1883/1941: 11, 26, Mateus 1982: 221, Mateus & d'Andrade 2000: 164, Mateus et al. 2005: 229–230)[2], there are three different treatments, depending on the preceding vowel and the position of the stress (Gonçalves-Viana 1883/1941: 45, Morales-Front & Holt 1997; the relevant facts are also found in any grammar of Portuguese, such as Hutchinson & Lloyd 2003: 15–17):

(3) Nominal classes

Class:	I	II	III
The singular ends in:	Stressed /il/	Unstressed /il/	/l/ preceded by another vowel (stressed or not)
Example singular:	[ĩfẽ'tiɫ] 'childish (sg.)'	['fasiɫ] 'easy (sg.)'	[ɐ'mavɛɫ] 'lovable (sg.)'
Example plural:	[ĩfẽ'tiʃ] 'childish (pl.)'	['fasɐjʃ] 'easy (pl.)'	[ɐ'mavɛjʃ] 'lovable (pl.)'
Descriptive generalisation:	Remove the /l/ and suffix /s/	Replace /il/ by [ɐj] and suffix /s/	Replace /l/ by [j] and suffix /s/

I have divided the /l/-final nominals into three classes, and will refer to them by their class number throughout the article.[3] Previous analyses have focussed on accounting for Class III. This class may either involve something like l → j / _ PL, as in Alcântara (2010: 7) and Mateus & d'Andrade (2000: 93–94). Alternatively, the plural is /es/, and Class III shows intervocalic /l/ deletion (Mateus 1982: 41, Mattoso Câmara 1970: 94). The latter is the correct diachronic explanation, as pointed out by Becker, Clemens & Nevins (2011: 14). A third alternative is the Optimality Theoretic analysis by Morales-Front & Holt (1997), who comment insightfully on earlier analyses. However, it is not immediately clear how any analysis of Class III

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[2] /l/ is also noticeably velarised in onset position, as recent phonetic studies have shown (Andrade 1998, 1999, Martins, Oliveira, Silva & Teixeira 2010). See also these sources' references to earlier literature on onset velarisation.

[3] A fourth class is found in a handful of words, including /'trɔl/ trol/troll 'troll', where /l/ surfaces unchanged in the plural: ['trɔɫʃ] rather than expected *['trɔjʃ]. The treatment of this fourth class is not discussed here, but the only solution appears to be restricting the normal rules for Class III so that they do not apply in this small set of words.

is able to produce the Class I and II forms above. We return to an analysis of Classes I and III in section 4, where I will also discuss the more problematic Class II.

3 Exceptions to Vowel Reduction

In this section, I will argue for a synchronic phonological explanation of the exceptions to vowel reduction discussed in section 2. We begin by examining the phenomenon of crasis (Pt. *crase*), where two adjacent /a/ vowels across a word boundary surface as [a] when unstressed, rather than [ɐ]. We will also consider Spahr's (2016) explanation of exceptions to pre-nasal raising, which has inspired the present analysis to a large extent. An analysis of exceptions to vowel reduction is then presented, where I argue that unreduced vowels are underlyingly geminates, independently of their diachronic origin. This is an improvement on previous analyses, which either leave the exceptions unexplained, or involve children having access to forms which do not exist in the input.

There are many Portuguese words which end in unstressed /a/, as /a/ appears as a suffix in both nominal and verbal paradigms. These /a/s surface as [ɐ] by the vowel reduction rules from section 2. There are also many Portuguese words beginning in unstressed /a/, which again surfaces as [ɐ]. This means that there are many situations where a sequence /…a a…/ appears across a word boundary, where both /a/s are unstressed. In these cases, the sequence typically surfaces as unstressed [a] rather than [ɐɐ], a phenomenon known as crasis or *crase* in the literature (Barbosa 1965: 93, Frota 2000: 55 and passim, Gonçalves-Viana 1903: 44–47, Gonçalves-Viana 1883/1941: 44, Mateus & d'Andrade 2000: 171). Below are some representative examples from Carvalho, cited in Spahr (2016):

(4)   Crasis

UR	SR	Orthography	Translation
/**a a**ˈmiga/	[**a**ˈmigɐ]	*a amiga*	'the friend (fem.)'
/ˈkaz**a a**ˈzul/	[ˈkaz**a**ˈzuɫ]	*casa azul*	'blue house'
/ˈpag**a a** ˈkõta/	[ˈpag**a**ˈkõtɐ]	*paga a conta*	'pay the bill!'
/ˈɛɾ**a a**ˈli/	[ˈɛɾ**a**ˈli]	*era ali*	'it was there'

Andersson (2017) reports on an experiment carried out on native speakers of Lisbon Portuguese, which attempted to test the productivity of crasis. I first presented speakers with the spoken nonce word [ɐˈtu], with the made-up meaning 'cat'. Speakers were told it was an Egyptian word, and two hieroglyphs were used to represent it orthographically. I explained that the second hieroglyph represented the [u] sound, and asked them to say the word without that sound/hieroglyph. We will focus on the responses from one of my speakers, AM. AM responded to this first task with [ˈat], rather than *[ˈɐt]. This shows that AM had assigned the unstressed [ɐ] in the original word to underlying /a/, applying the a → ɐ vowel reduction rule

in unstressed syllables.[4] AM was presented with a second nonce word, also written with two hieroglyphs and with the made-up meaning 'dog'. I explained that the first hieroglyph was pronounced ['ilɐ] and the second [ɐ'ti]. AM was then asked to read the whole word, and produced the expected [ila'ti] with crasis, rather than *[ilɐɐ'ti] without. In Andersson (2017), I argue that these responses suggest that at least for AM, and probably for other speakers, crasis is phonologically productive. By the regular phonology, unstressed /a/ goes to [ɐ] and unstressed /aa/ to [a]; a rule of degemination counterfeeds the reduction rule.

The fact that geminates are able to escape phonological rules is used in Spahr (2016) to provide an explanation for exceptions to pre-nasal raising. This rule raises /a/ to [ɐ] before nasals (as mentioned in section 2, see there for references). His analysis relies on the fact that the sequence /aa/ escapes vowel reduction, and he reasons that if it escapes reduction rules, then perhaps it escapes pre-nasal raising as well. For minimal pairs such as [ɐ'mɐmuʃ] *amamos* 'we love' vs [ɐ'mamuʃ] *amámos* 'we (have) loved', he therefore sets up the underlying forms as *am*/am/*os* and *am*/aam/*os* respectively. The singleton /a/ before a nasal in the present tense forms raises before /m/ as expected, but the geminate /aa/ is unaffected.

Spahr argues that the vowel in *am*/aam/*os* should be longer than the corresponding vowel in *am*/am/*os*, and cites tentative evidence to this effect. However, none of the existing literature on Portuguese phonology which I am aware of makes the claim that there is a vowel length difference in these pairs. For this reason, I will assume that the vowel is short. I take it that the productive degemination found in unstressed syllables is part of an across-the-board degemination rule, applying to both stressed and unstressed syllables. The need for a more general scope of this rule will become apparent shortly.

Having seen Spahr's analysis of exceptions to raising, it is time to turn to my analysis of exceptions to reduction. My solution will come as no surprise; I take it that all unreduced vowels in unstressed syllables are underlyingly geminate. Although we have only discussed /a/ so far, I propose that the degemination rule applying to this vowel is again maximally general: $V_i V_i \rightarrow V_i$, where V_i is any vowel.[5] This allows us to explain why exceptions to reduction are not limited to the vowel /a/. Some exceptions and their derivations are given below (data from Mateus 1982: 222–224 and Barbosa 1965: 158):

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4. This could not represent a rule ɐ → a in stressed syllables, since [ɐ] does appear in this environment (see section 2) . The theoretical implications of AM's response to this task, and other responses to similar tasks from other speakers, are discussed in Andersson (2017).

5. There are a few surface geminates in LP, notably involving stressed vowels across word boundaries (suggesting that word structure may feature in the rule, cf. Frota 2000), as well as sequences of more than two adjacent vowels underlyingly (Gonçalves-Viana 1903: 45–47). For apparent exceptions such as ['ojsuu] *oiço-o* 'I hear him/it (masc.)', see section 4.

(5) Exceptions

UR	/prɛɛ'gaɾ/	/traa'tor/	/too'rada/
Reduction	————	————	too'radɐ
Degemination	prɛ'gaɾ	tra'tor	to'radɐ
SR	[prɛ'gaɾ]	[tra'tor]	[to'radɐ]
Orthography	*pregar*	*tractor*	*tourada*
Translation	'to preach'	'tractor'	'bullfighting'

Degemination must also apply in stressed syllables, to explain forms such as /'tooɾu/ *touro* 'bull', related to *tourada* 'bullfighting' in (5) above, surfacing simply as ['toɾu] and not *['tooɾu]. This allows us to provide a synchronic explanation for the absence of reduction in certain words, rather than simply treating them as unexplained exceptions (as in e.g. Mateus et al. 1994: 360, Mateus & d'Andrade 2000: 159).[6] The present analysis, then, explains more forms than previous analyses. But an alternative does exist. It is most often applied to instances of historical [ow], and can be found in Mateus (1982: 42–43). On this analysis, the underlying form of unreduced [o] is still /ow/. When these words began appearing with [o] instead of [ow] in the history of Portuguese, the rule ow → o was added to the phonology, again counterbleeding reduction rules. However, it remains unclear to me how children are meant to learn underlying forms with /ow/. Recall that in Lisbon Portuguese today, [ow] does not exist. Speakers hear forms like ['toɾu] 'bull' and [to'radɐ] 'bullfighting', and there is nothing in those forms which would make a child realise that the underlying representation of the first vowel is /ow/. Using the historical surface forms as underlying forms has been explicitly rejected by some authors in words like 'invader' and 'injector', presumably precisely because the historical underlying forms are unlearnable (Mateus & d'Andrade 2000: 159). Barbosa (1965: 160) is explicit on this point, mentioning that some of the sound changes are over 500 years old and therefore cannot be part of a synchronic description. The sound change ow → o is more recent,[7] but it seems to me that as [ow] is not present in Lisbon surface forms, underlying /ow/ is just as impossible to learn.[8]

On the other hand, speakers do have evidence from crasis that geminate vowels escape reduction, and so it would be natural for them to set up underlying forms like /too'radɐ/ when they hear [to'radɐ] 'bullfighting'. In this sense, my proposal has

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[6] Mateus's (1982: 224–225) analysis of some of these words is somewhat parallel, as it also relies on degemination. However, Mateus believes that some of these words retain their historical consonants in the underlying form, and does not propose an opacity-based analysis. Instead, Mateus marks the relevant vowels as [-reduction] to make them escape the reduction rules.

[7] Barbosa (1965: 158) points out that this change, however, "does not date from our times either" (my translation).

[8] A radically different perspective is discussed in Mateus (1982: 233), who says that "it is undoubtably the case that, in many circumstances, there exists a correspondence between the system of rules applied in sound changes and the system of rules applied in a synchronic description" (my translation), and that diachronic developments can therefore even be used as external evidence in evaluating theories.

a learnability advantage over competing ideas. It involves underlying forms which can be deduced from the input, and phonological rules which are independently motivated. I think that there is an important lesson here as regards the construction of underlying forms. When working on languages whose diachronic history is well-understood, phonologists rely on historical information far too often, even in cases where learners of the language have no access to it (cf. Hale & Reiss 2008: 160–161). However, this does not mean that phonologists should abandon the enterprise of attempting to explain exceptions which may have arisen through earlier sound changes. As my analysis above shows, it will in some cases be possible to explain them in a principled way without copying sound changes into the synchronic phonology.

4 Plurals of /l/-final nominals

Having seen that geminates and degemination can explain previously unsolved problems in one area of the phonology, we will now ask whether there are other problems which might be solved in a similar way. I will argue that such problems exist, and that the plurals of Class I and III /l/-final nominals is an example. The three classes of /l/-final nominals from section 2 are repeated here for convenience:

(6)   Nominal classes

Class I	Class II	Class III
Sg. ends in stressed [iɫ]	Sg. ends in unstressed [iɫ]	Sg. ends in [V$_i$ɫ] (V$_i$ ≠ [i])
Pl. ends in stressed [iʃ]	Pl. ends in unstressed [ɐjʃ]	Pl. ends in [V$_i$jʃ]

Class III appears to involve the fewest unexpected changes. The regular plural ending is suffixed to the singular as usual, but the /l/ surfaces as [j] instead of [ɫ]. As mentioned above, one analysis is a morphological rule l → j / _ PL (Alcântara 2010). This is also more or less the analysis of Mateus & d'Andrade (2000: 93–94), who argue that the /l/ becomes attached to the nucleus, and therefore becomes a glide. Another has the plural as underlyingly /es/, with a rule of /l/ deletion; the /e/ then glides to [j] (Mateus 1982: 39–41, Mattoso Câmara 1970: 94). Yet another analysis is found in Morales-Front & Holt (1997), in the framework of Optimality Theory. They also argue for the so-called nucleation of /l/ in Class III. They provide an OCP-based analysis of Classes I and II, differentiating between them by claiming that the vowel changes in Class II are blocked in Class I because stressed vowels are more resistant to changes. Their analysis, however, with the OCP and don't-change-stressed-vowels constraints undominated, will not work. As mentioned in section 2, both /e/ and /a/ undergo changes under stress in Portuguese, and there are surface violations of the OCP (see footnote 5).

I will instead modify the first analysis slightly, in arguing that the correct characterisation of the rule is l → i / _ PL. The fact that the surface forms of Class III plurals

contains [j] rather than [i] is because of an independently motivated phonological rule i → j / V ＿ when unstressed. This rule is intended to generate the offglides in diphthongs as well, so that on the level of underlying forms, Portuguese lacks diphthongs. Because this gliding rule is not accepted by everyone (I have seen it only in Mateus 1982: 41 and Mateus & d'Andrade 2000: 47), we must take some time to motivate it. The two glides found in Portuguese, [j] and [w], are often taken to represent underlying /j/ and /w/ (Barbosa 1965: 185, Mateus et al. 2005: 177). There are minimal pairs for /u/ and /w/ (Gonçalves-Viana 1883/1941: 42, 53), making this analysis seem like the preferred option:

(7)   Minimal pairs

	SR	Orthography	Translation
	['ʁiw]	*riu*	'laughed (3sg)'
	['ʁiu]	*rio*	'I laugh; river'
	['viw]	*viu*	'saw (3sg)'
	['viu]	*vi-o*	'I saw him/it (masc)'

My analysis of this involves another counterfeeding chain shift. As we saw in section 2, there is a vowel reduction rule taking stressed /o, ɔ/ and turning them into [u] in unstressed syllables. I suggest that this reduction counterfeeds the gliding rule i, u → j, w / V ＿. However, it is possible that the clitic -*o* in the second example is underlyingly /u/ and fails to undergo the gliding rule because of the word boundary between it and its verbal host. The counterfeeding analysis is not merely an ad hoc way of explaining some problematic data; it is a theory which makes falsifiable predictions. Notice that if glides contrast phonemically with high vowels, we could have potential minimal pairs not only for [u]-[w], but also for [i]-[j]. However, if my theory is correct, a different prediction is made. There is a reduction rule creating new instances of [u] (making [u]-[w] pairs possible), but there is no obvious motivation for a corresponding rule creating new instances of [i] in this position. This predicts that there are no minimal pairs of the type ['ʁui] ∼ ['ʁuj]. Hypothetical underlying /'ʁui/ would become ['ʁuj] by the gliding rule, and there is no other underlying form which would surface as ['ʁui]. As it happens, forms such as *['ʁui] are indeed ungrammatical (Mateus & d'Andrade 2000: 47), so it seems that the glideless UR prediction is true. If glides are phonemic, we have no principled explanation for why words such as *['ʁui] are ungrammatical.[9]

It is still possible, even if the above argument holds, that the morphological rule for plurals is l → j, or indeed l → Ø/ V ＿ V with a plural marker /es/. However, I will

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[9]   It is worth providing a brief comment here about stress. One argument against deriving glides from high vowels is that the stress system becomes irregular. If the UR of saia 'skirt' is /sai-a/, we would expect *[sɐ'iɐ] rather than ['sajɐ] ([sɐ'iɐ] is grammatical with the meaning 'I/he/she left'). The only way to remedy this is by introducing contrastive stress, which some seek to avoid (see e.g. Mateus 1982). However, contrastive stress is inescapable in Portuguese, since there are many words with unexpected stress placement (Barbosa 1965: 220–222, Mateus 1982: 202). These include minimal pairs for stress (Delgado-Martins 1982: 12, Mateus 1982: 206). And it should be quite uncontroversial that words in a language with contrastive stress have a stress specification in their URs.

argue that it is instead l → i, and the output of this rule then undergoes the gliding rule in Class III forms:

(8)   Derivation of Class III *animais* 'animals'

UR	/aniˈmal-s/
l → i	aniˈma**i**s
i → j	aniˈma**j**s
Other rules	**ɐ**niˈmajʃ
SR	[ɐniˈmajʃ]
Orthography	*animais*
Translation	'animals'

This analytical move, postulating that what looks like A → C is actually A → B followed by B → C, is a free ride in the sense of Zwicky (1970) (see McCarthy 2005 for discussion of a different definition of free ride). When examining Class III, it appears that there is nothing which allows us to tell which analysis is better. However, I will argue for the free ride analysis on the basis that it helps us find a unified explanation for Classes I and III. Recall that Class I plurals surface with no trace of the underlying /l/ in the singular form: [ĩfẽ'tiɫ] 'childish (sg.)' vs [ĩfẽ'tiʃ] 'childish (pl.)'. Based on Class III, we would have expected *[ĩfẽ'tijʃ] for the plural. Now, since *[ij] within a syllable is unattested in Portuguese (Gonçalves-Viana 1903: 12, Gonçalves-Viana 1883/1941: 13, Mateus et al. 2005: 170), it would be possible to set up a rule ij → i, motivated solely by Class I plurals. Another analysis which makes no connection between these classes is Mattoso Câmara (1970: 94), where Class III involves intervocalic /l/ deletion, but Class I a different rule of /l/ deletion before the plural marker. But if we accept my analysis, we can explain the Class I surface forms without any unmotivated rules of this type. Consider what happens when l → i applies to Class I forms:

(9)   Partial derivation of *infantis* 'childish (pl.)'

UR	/ĩfẽ'til-s/
l → i	ĩfẽ'tiis

This form features a derived geminate ii. And we have seen in section 3 that there are good reasons to assume that Portuguese has a degemination rule applying to forms such as this one. A possible analysis of Class I plurals, then, is immediately revealed: perhaps the rule of degemination bleeds the gliding rule. This would give us a way of explaining both Class I and Class III plurals with the same set of rules, and with no additional theoretical machinery. Derivations for both classes are provided here:

(10) Derivations of Classes I and III

UR	/ani'mal-s/	/ĩfẽ'til-s/
l → i	ani'ma**is**	ĩfẽ'ti**is**
V$_{ii}$ → $_i$	————	ĩfẽ'**tis**
i → j	ani'ma**js**	————
Other rules	**ɐ**ni'maj∫	ĩfẽ'ti**∫**
SR	[ɐni'maj∫]	[ĩfẽ'ti∫]
Orthography	*animais*	*infantis*
Translation	'animals'	'childish (pl.)'

Capturing this unity between the two classes is only possible if the morphological rule is l → i. Morales-Front & Holt (1997) appear to succeed without it, but as mentioned above, the OCP cannot be an undominated constraint in LP. Thus, any analysis which does not involve the free ride I propose will have to stipulate additional rules in order to explain the behaviour of Class I. With a free ride, the need for such rules disappears. My analysis, then, has an advantage over previous analyses in that it can easily explain the behaviour of both Classes I and III, rather than simply Class III.

Until now, I have been silent on the behaviour of Class II forms. There is no obvious way of accounting for this class in any theory of Portuguese phonology or morphology that I have seen, including existing ones as well as my own. Most previous analyses once again predict that a surface form with *[ij] should appear (following Class III), while my analysis predicts a form with [i] (following Class I). Instead, we have the puzzling diphthong [ɐj] in forms like ['fasɐj∫] 'easy (pl.)' from ['fasɨł] 'easy (sg.)'. There are no reduction rules applying to /i/ in unstressed syllables (as we saw in section 2), so where the surface vowel [ɐ] comes from is a mystery. It becomes slightly less of a mystery when we consider the underlying source of the vowel. [ɐ] before palatals (such as the following [j] here) comes from underlying /e/ in Lisbon Portuguese (as mentioned in section 2, see there for references). If we give the plural form of 'easy' an /e/ instead of its underlying /i/ from the singular, the derivation would work out.

However, we now have to explain the reason for this lowering in the plural form. One solution, found in Mattoso Câmara (1970: 94), involves an underlying /e/-final stem: /'fasile-s/ for 'easy (pl.)'. There is then a rule of vowel harmony,[10] creating 'faseles, intervocalic /l/-deletion, and gliding of e → j, with subsequent e → ɐ as usual. However, there is no motivation for such a harmony rule, and no explanation of the irregular loss of final /e/ in the singular *fácil*. Instead, one might attempt to use the /e/ form in both singulars and plurals. There is no contrast between /e/ and /ε/ before unstressed [ɨ] in LP, and the usual outcome is [εɨ] (see Barbosa 1965:

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[10] This differs from the description of Mattoso Câmara's analysis in Morales-Front & Holt (1997), who state that it involves dissimilation. However, the original citation from Mattoso Câmara (1970: 94) makes it clear that we are dealing with assimilation: "There is a mutation of /i/ to /e/ and the same changes as above, e.g. *facile: facele: face(l)es: fáceis*" (my translation).

118–119, 136–137, 155, Mateus & d'Andrade 2000: 75). It would be theoretically possible, then, to say that only [ɛ] appears here because underlying unstressed /el/ within a syllable becomes [ɨɫ]. We could then set up *fácil* 'easy' as underlyingly /ˈfasel/ rather than /ˈfasil/. The derivations would be as follows:

(11) A possible derivation of Class II

UR	/ˈfasel/	/ˈfasel-s/
l → i	——–	ˈfase**i**-s
VᵢVᵢ → Vᵢ	——–	———–
i → j	——–	ˈfase**j**-s
e → i / _ l.	ˈfas**i**l	———–
Other	ˈfasi**ɫ**	ˈfas**ɐj∫**
SR	[ˈfasiɫ]	[ˈfasɐj∫]
Orthography	*fácil*	*fáceis*
Translation	'easy (sg.)'	'easy (pl.)'

Although theoretically possible, this is not an analysis I will pursue here. There is no motivation for the raising rule other than Class II plurals, and I am unaware of any other facts in Portuguese which could plausibly be analysed using it. It seems, therefore, that this analysis makes the exact same predictions as an irregular, stipulative morphological rule of i → e in Class II forms. Until it can be shown that the two are predictively different, I see no point in arguing for one solution over another.

To conclude this section, I have argued that glides in Lisbon Portuguese are underlyingly high vowels. I have shown that if we modify the classical analysis of Class III plurals with this in mind, we can find a unified explanation of Classes I and III, something which has not been possible in previous analyses. The analysis is based on a morphological rule l → i before the plural marker, which in Class III feeds a gliding rule. In Class I, it instead feeds the degemination rule from section 3, since it creates a geminate. This in turn bleeds the gliding rule which applies in Class III. This represents, in addition to section 3, a further argument that geminates and degemination can be useful tools in helping us solve unsolved problems in the morphophonology of Lisbon Portuguese. However, the mystery of /l/-final nominals is not solved yet. I have shown that problems remain in our understanding of Class II, which does not pattern according to the predictions of any current theory. However, the unification of Classes I and III is still an example of progress in this area; it explains more forms than previous analyses, even if it fails to cover all of them.

5 Conclusion

In this article, I have argued that both underlying and derived geminates exist in Lisbon Portuguese, even if they degeminate before reaching the phonetic surface. I

argued for underlying geminates in words which fail to undergo the expected vowel reduction rules in unstressed syllables. These come from a range of sources in the diachrony of the language, only one of which is adjacent identical vowels. Some analyses (such as Mateus 1982) have sought to represent these diachronic sources in the synchronic underlying forms, but this approach fails to consider the fact that the historical forms are not present in the input available to children. As Barbosa (1965) makes clear, the relevant sound changes often took place over half a millennium ago. Barbosa reasons, therefore, that these exceptions cannot be explained by a synchronic analysis. This is the approach taken in works such as Mateus et al. (1994) and Mateus & d'Andrade (2000). But their analysis postulates that a significant part of the Portuguese lexicon is simply diacritically marked as exceptional, with no further explanation. By contrast, an analysis where the unreduced vowels are underlyingly geminate is successful in providing a synchronic explanation, even if it is in many cases different from the diachronic picture. My proposal, building on Spahr (2016) also rests solely on an extension of rules for which there is evidence in the input, and which have been shown to be productive for at least some speakers in Andersson (2017).

When discussing the plurals of nominals ending in /l/, we have also seen that derived geminates can be useful in the synchronic description of Lisbon Portuguese. Previous analyses have really only been able to make sense of what I call Class III nominals, where the final /l/ is preceded by a vowel other than /i/. This can be achieved by a rule turning /l/ into j before the plural marker /s/ (Alcântara 2010, Mateus & d'Andrade 2000), or by postulating intervocalic /l/ deletion in this context with subsequent gliding of /e/ to [j], if the plural marker is taken to be /es/ instead (Mateus 1982, Mattoso Câmara 1970). This is how Class III plurals came about diachronically (Becker et al. 2011). Both analyses, however, predict that plurals of nominals in /il/ should surface with the non-existent diphthong *[ij]. Since it does not exist, it would be possible to introduce a rule removing it, motivated by these forms and these forms alone. However, one might wonder whether there is not a possible solution which does not have to rely on previously unmotivated rules.

In section 4, I attempted to provide just such a solution. I argued that /l/ does undergo a change before the plural marker /s/, but instead of becoming j, it becomes i. When this derived i follows a vowel other than i (Class III), it undergoes a gliding rule which causes it to surface as [j]. The existence of this gliding rule is accepted by some (Mateus 1982, Mateus & d'Andrade 2000) but rejected by others (Barbosa 1965, Mateus et al. 2005). Section 4 also argues that in spite of minimal pairs for [u] and [w], there is reason to believe that glides are not present in the underlying forms of Lisbon Portuguese words. In the sequence /il/ before the plural marker (Classes I and II), the l → i rule creates a geminate ii. I argued that this sequence is degeminated, like the underlying geminates from section 3. Once this happens, there is no longer a high vowel after another vowel, so the gliding rule cannot apply. We saw that this explains Classes I and III in a unified way, but fails to explain Class II, where the /il/ surfaces as [ɐj]. Both phonological and morphological solutions are available here, neither of which relies on rules with independent motivation.

Therefore, I have left the question of a satisfactory explanation of Class II plurals for future research.

In conclusion, I have attempted to show the value of recognising geminate vowels as part of the phonology of Lisbon Portuguese. My discussion has covered underlying and derived geminates, as well as the degemination rule $V_i V_i \rightarrow V_i$. This allowed for a new understanding of two previously mysterious parts of Portuguese phonology and morphology: exceptions to vowel reductions, and plurals of /l/-final nominals. My analyses of both patterns is different from some previous work on these problems, which assumes that the historical sound changes of Portuguese are still active as synchronic rules today. Since child learners do not have access to the history of their own languages, discrepancies of this type are to be expected, such that diachrony is not always a useful tool in finding synchronic analyses. While work remains to be done on the problems studied, especially as regards the plurals, I hope to have shown that geminates and degemination have an important role to play in Lisbon Portuguese phonology.

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