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Getting to the root of the Maltese broken plural

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Abstract

This study argues that the Maltese broken plural is derived from a tri- or quadriliteral root, as opposed to from an existing word from. Additionally, this study argues that the 'pattern' (that is, the proposed skeletal CV morph) is not a morph, but rather an epiphenomenon of the derivation. To support these arguments, the present study sketches a decompositional, late-insertionist derivation of the Maltese broken plural utilizing the frameworks of Distributed Morphology and Optimality Theory. It is argued that the [+plural] feature projects in two different nodes in the morphosyntax (in the n head and in the Num head), resulting in the derivation of either a sound plural or a broken plural. Vocalic melody allomorphs are specified to a set of root morphemes and compete with one another for insertion at Spell-Out. On the phonological branch of the derivation, Optimality Theory is able to capture the attested variation in prosodic structure of the broken plurals by positioning the vocalic melodies within the root morph, as per the constraints on syllabic well-formedness. Thus, it is the interaction between the constraints, vocalic melody, and root that give rise to prosodic variation, not a 'pattern' morph.

Keywords: Maltese, broken plural, plurality, Distributed Morphology, Optimality Theory, allomorphy, non-concatenative morphology

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Chapter 0

Introduction

Maltese is a Semitic language spoken by over half a million people worldwide, the majority of whom reside in the country Malta, a Mediterranean archipelago consisting of two inhabited islands Malta and Gozo and two smaller uninhabited islands. Though small, Malta and Gozo each host a number of regional dialects of Maltese, notably the Cottonera dialect (Mt. *Kottoneran*) spoken in the Three Cities (Bormla, Isla, and Birgu), the Marsaxlokk dialect (Mt. *Xlukkajr*) spoken in parts of the southern region, and the dialects of Nadur and Sannat (Mt. *Naduri* and *Sannati*) spoken in Gozo. The Maltese diaspora has carried Maltese far from Malta and has birthed other varieties such as Maltralian (Mt. *Il-Maltraljan*), spoken by the diaspora in Australia (Vella 2013). Significant populations of Maltese speakers are found both in the United Kingdom and the United States, however little research has been done on these dialects. The study at hand is concerned with the morphology of Standard Maltese, the dialect of Maltese used in written media, at university, and in government.

0.1 Malta: A brief linguistic history

Malta has a rich and fascinating history stretching back to the Neolithic period, however the linguistic history of the archipelago as it pertains to the evolution of Modern Maltese and its dialects can be restricted to the time around the arrival of the Arabs in Malta in the ninth century, the Latinization of Malta in the eleventh to eighteenth centuries, and the Anglicization of Malta from the nineteenth century up to present day. Each of these subsequent eras has had a profound impact on the Maltese language and helped to shape it into the linguistically unique and interesting language spoken today.

Upon arrival to the islands in 870 CE, the Arabs displaced the local population; however, they didn't establish a settlement in Malta until 1048 CE. The size of this settlement is believed to have been around five thousand Arabic-speaking Muslims and slaves (Brincat 2008), and historical linguists assert with confidence that these settlers spoke the Sicilian Arabic (Siculo-Arabic) dialect. The expulsion of the Arabs by the Normans in the late eleventh century propelled the Latinization of Malta–religiously, culturally, and, perhaps most importantly, linguistically. Nearly four and a half centuries of Norman rule saw the spread of Christianity across the islands and the isolation of the local population from the greater Arabic-speaking region. An influx of Italian and Sicilian immigrants to the islands began sprinkling the now-isolated Siculo-Arabic dialect with Romance vocabulary. It is believed that during this period the language split from Arabic and evolved into a sort of Proto-Maltese (Brincat 2008). At the beginning of the sixteenth century, Malta was placed under the protection of the Knights Hospitaller, and for nearly three centuries the order of the Knights of Saint John ruled over the island and its inhabitants. Under the Knights, Italian was declared the official language of the islands, and the influence of Italian on the blossoming Maltese language was intensified (Bovingdon & Dalli 2006). At this point in history, Maltese was still a spoken language. It had no written tradition, and existed in a diglossic relationship with Italian.

Although it was the French that ousted the Knights from Malta, it was the British that were able to gain control of the islands at the turn of the nineteenth century, and they retained control for over a century and a half. At the beginning of the British occupation, the Maltese elite resisted the English imposition and instead clung to Italian, the language of culture and of the Church; however, by the turn of the twentieth century, more Maltese people spoke English than Italian (Brincat 2017). Additionally, at around this time the first Maltese newspapers began circulating around the islands. The tandem growth and recognition of Maltese and English as the spoken languages of the public led to the declaration of Maltese and English as the national languages of Malta in 1939 (Brincat 2017). By the time the British officially

left the island in the latter half of the century, English had been established as a true co-official language, and a strong bilingual tradition was firmly in place across the archipelago. The impact of British colonization on the linguistic dynamics of Malta cannot be overstated, and the near-nationwide rate of Maltese-English bilingualism in Malta is a testament to this (Gatt & Cutajar 2023).

It is important to note that the type of language contact occurring in Malta in the present is unlike other instances of language contact in the past. The type of diglossia that existed within the Maltese social strata during the later years of Arab rule and during the rule of both the Normans and the Knights was clearly drawn along the lines of socioeconomic standing. High status languages like Arabic and Italian were restricted in use to the educated and wealthy Maltese (Brincat 2011), whereas lower status languages like Siculo-Arabic and Maltese were spoken (and, crucially, not written) amongst the populace. This is in stark contrast to the linguistic situation in the present day, where both English and Maltese have official status and are spoken to varying degrees of competency across all strata of society. As this type of bilingualism is relatively new to the island, it will be interesting to see the effect of language contact on both Maltese and English in the future. That, however, is a study for another time.

0.2 Maltese: A brief linguistic overview

Maltese is a Semitic language, having in all probability evolved from a now-extinct dialect of Arabic once spoken more widely in Sicily, Malta, and the islands of the south central Mediterranean. Unsurprisingly, due to the colonial history of the islands, Maltese has been heavily influenced by Sicilian and Italian and, to a lesser extent, English. These linguistic influences have penetrated deep into the grammar of Maltese, impacting more than just the vocabulary. In fact, Sicilian and Italian are so intertwined with Maltese that Mifsud (1995) goes as far as splitting his analysis of loan verbs into the 'Semitic' Maltese portion of the grammar and the 'Romance' Maltese component of the grammar. In the description to follow, these components of the grammar are renamed 'Semitic' Maltese and 'non-Semitic' Maltese.

0.2.1 Semitic Maltese

When it comes to morphology, Semitic Maltese refers mostly to the root-based, often non-concatenative processes that are found in Maltese and that are typical of Semitic languages more generally. Non-concatenative Semitic morphology is typically considered to involve three 'morphemes': the consonantal root, the vocalic melody, and the pattern (McCarthy 1981, Arad 2005, among others). These 'morphemes' are interleaved with one another and linked to the pattern which assigns a prosodic structure to the word. A root is usually composed of three or four radical consonants, and each root represents some abstract concept (e.g., the root $\sqrt{\text{KTB}}$ generally refers to 'writing'). Vowels and servile consonants (affixal, non-root consonants) are inserted between the radical consonants and supply the word with additional grammatical meaning. The result is a group of words with the same root representing the same abstract concept but with different grammatical functions.

Verbal forms	gloss	**Nominal forms**	gloss
k**i**t**e**b	'to write'	***kt**ie**b***	'book'
*n**k**i**t**e**b***	'to be written'	***kt**ejje**b***	'booklet'

Table 1: Select non-concatenative derivations of the root $\sqrt{\text{KTB}}$ in Maltese.

Non-concatenative morphology is found throughout the grammar of (Semitic) Maltese. In the verbal system, the insertion of vowels and servile consonants can affect the argument structure of the verb forms, the aspect of the verb, or the itertativity of the verb, amongst other functions. Similarly, the insertion of vowels and servile consonants has several functions in the nominal domain. Non-concatenative morphology is used to mark plurality, diminutive or augmentative size, or agentivity of the noun. The study at hand is concerned with the nature of the non-concatenative nominal plural, called the 'broken' plural or the 'internal' plural, which is detailed in the following section.

0.2.2 Non-Semitic Maltese

Non-Semitic Maltese is the counterpart to Semitic Maltese and is concerned mostly with the concatenative morphology borrowed over into Maltese from Italian, Sicilian,

and English. More specifically, non-Semitic Maltese is categorized by its use of a stem rather than a root. Stems in some instances are fully-fledged words on their own and, in general, both prefixes and suffixes can be attached to stems. It is important here to note that concatenative morphology is utilized in Semitic morphology as well, but the 'Romance Maltese', as Mifsud describes it (i.e., non-Semitic Maltese), it characterized by stem and affix formations.

Verbal forms	gloss	**Nominal forms**	gloss
(i)ċċirkond-a	'to surround'	*reduplika-zzjoni*	'reduplication'
(i)kkalpest-a	'to trample upon'	*xempj-i*	'samples'
(i)ppark-ja	'to park'	*drajv-er*	'driver'
(i)ssejv-ja	'to save (on the computer)'	*gangwej-s*	'gangways'

Table 2: Non-Semitic Maltese stems and affixes in both verbal and nominal derivations. The bracketed *(i)* in the verbal forms is a euphonic vowel inserted to aid pronunciation.

The concatenative stem-and-affix morphology of non-Semitic Maltese is quite robust. Loan verbs from both English and Italian/Sicilian are adapted to Maltese in a morphologically regular way, with a suffix /*-ja*/ for English loans or /*-a*/ for Italian/Sicilian loans and often with the gemination of the word-initial consonant. In the nominal domain, suffixes express several grammatical functions, such as plurality, dimiuntivity, and grammatical gender. English-origin words are often suffixed with English-origin suffixes (like /*-s*/), whereas Romance-origin suffixes (such as /*-zzjoni*/, /*-i*/) have a more widespread distribution. In fact, as will be shown in the following section, a significant portion of Maltese nouns are pluralized with the Italian-origin suffix /*-i*/.

0.3 The Maltese plural

Maltese has an inventory of pluralization strategies, but the most productive strategy is the affixation of a plural suffix to a nominal stem. This type of plural is known as the 'sound' plural, and there are a number of sound plural suffixes in the repertoire of Maltese. In most cases, the selection of a sound plural allomorph is phonologically or morphologically conditioned (e.g., [*i*]-final nouns are typically pluralized with /*-in*/, [*a*]-final feminine nouns are typically pluralized with /*-iet*/, etc., Borg & Azzopardi-Alexander 1997), but etymology also plays a role in the selection process (consider

(g) in Table 3, the English plural suffix /-*s*/). Apart from the sound plural suffixes, Maltese also utilizes suppletion (*mara* → *nisa* 'woman/women'), zero affixation (*verġni* → *verġni* 'virgin/s'), ablaut (*rqiq* → *rqaq* 'thin/pl.'), and broken plural formation (*ħanżir* → *ħnieżer* 'pig/s' to express plurality.

Singular	**Plural**	gloss
(a) *bomba*	*bomb**i***	'bomb/s'
(b) *ċena*	*ċen**iet***	'supper/s'
(c) *derivazzjoni*	*derivazzjon**ijiet***	'derivation/s'
(d) *ġellied*	*ġellid**in***	'quarrelsome/pl.'
(e) *ħaddied*	*ħaddied**a***	'blacksmith/s'
(f) *triq*	*triq**at***	'street/s'
(g) *park*	*park**s***	'park/s'

Table 3: Examples of sound plural suffixes in Maltese.

The 'broken' plural is a perfect example of the coexistence of the 'Semitic' Maltese and 'non-Semitic' Maltese grammatical systems, and, as such, is a prime component of the grammar to examine in-depth. Morphologically, the broken plural is a clear exploitation of the non-concatenative morphology that is characteristic of the Semitic language family. Interestingly, a large proportion of nouns (46.5% of the present data set, Chapter 3) that are pluralized 'internally' (i.e., with a broken plural) are words loaned in from Italian, Sicilian, and English. The productivity of the broken plural with non-Semitic-origin words in Maltese is what sets it apart from other elements in the non-concatenative grammar of Maltese.

Much like the sound plural, which itself has several plural suffix allomorphs, the broken plural surfaces as one of several attested broken plural 'types.' There is no distinguishable plural morpheme that can be extracted from a broken plural form. Rather, broken plurals are differentiated from their singular counterparts by the prosodic structure that is derived from the interleaving of a consonantal root and a vocalic melody. In brief, broken plurals are formed by manipulating the internal structure of a word. Unlike the sound plural allomorphic suffixes, the selection of one broken plural type over another for a given root isn't always overtly intuitive or phonologically conditioned. Further, some roots surface in more than one broken plural type, and some roots can take both a sound or a broken plural.

Root	**Singular**	**Plural**	**CV structure**	gloss
(a) $\sqrt{\text{TRQ}}$	*triq*	*toroq*	$C_1VC_2VC_3$	'street/s'
(b) $\sqrt{\text{BLT}}$	*belt*	*bliet*	$C_1C_2VVC_3$	'city/ies'
(c) $\sqrt{\text{LJL}}$	*lejl*	*ljieli*	$C_1C_2VVC_3V$	'night/s'
(d) $\sqrt{\text{BTL}}$	*btala*	*btajjel*	$C_1C_2VjjVC_3$	'holiday/s'
(e) $\sqrt{\text{LSN}}$	*lsien*	*ilsna*	$VC_1C_2C_3V$	'tongue/s'
(f) $\sqrt{\text{NDF}}$	*nadif*	*nodfa*	$C_1VC_2C_3V$	'clean/pl.'
(g) $\sqrt{\text{DBR}}$	*dabra*	*dbabar*	$C_1C_2VVC_2VC_3$	'ulcer/s'
(h) $\sqrt{\text{TPT}}$	*tapit*	*twapet*	$C_1wVVC_2VC_3$	'carpet/s'
(i) $\sqrt{\text{BRML}}$	*barmil*	*bramel*	$C_1C_2VVC_3VC_4$	'bucket/s'

Table 4: A list of the broken plural types in Maltese with corresponding roots and examples.

The study at hand seeks to shed some more light on the formation of the broken plural. This study explores and accounts for the prosodic variation that exists across the different broken plural types using a late-insertionist approach to morphology, to be discussed in the following section.

Additionally, this study seeks to accommodate three interesting phenomena associated with the plural system in Maltese. The first of these involves nouns that can be pluralized both internally ('broken') and externally ('sound'), such as the noun *kaxxa* → *kaxex*∼*kaxx-i* ('box/es'). The second phenomenon is nouns that can surface in multiple broken plural forms, such as the noun *ċorma* → *ċrum*∼*ċorom* ('large number/s'). Lastly, this analysis seeks to accommodate semantically related words that are seemingly built from a root but nevertheless act as a stem-derived form, such as the words *moxt* → *moxt-ijiet* ('comb/s'), *maxat* ('to comb'), *maxxat* ('to comb vigorously').

0.4 Structure

This dissertation begins in Chapter 1 with a summary of past descriptive studies on the broken plural in Maltese. Chapter 2 synopsizes the theoretical frameworks that will be used in the analysis of the Maltese broken plural, as well as a justification for the role of the root as a morpheme. Chapter 3 presents the data set that serves as the foundation of the study at hand. Chapter 4 lays out an analysis of the broken plural that derives the broken plural from the root and accounts for the prosodic variation using a list of ranked constraints. Chapter 5 revisits the questions asked

here in the introduction and proposes avenues for further study. Chapter 6 concludes.

Chapter 1

Literature Review

Having only fairly recently garnered interest from the linguistics community, the Maltese broken plural is a relatively underdeveloped topic. Regardless of this, several substantial papers on the Maltese broken plural have been published in the past century, and the scope of these papers has evolved throughout the years. Early publications sought to catalog the seemingly 'unpredictable' broken plural forms by categorizing them on the basis of prosodic structure and vocalic melody (Sutcliffe 1936, Aquilina 1959, Aquilina 1965, Borg 1978, Borg & Azzopardi-Alexander 1997). Around the turn of the century, linguists chose to disregard the variation in vocalic melodies and instead collapsed several sub-categories of broken plural forms into broader categories on the basis of prosodic structure only (Mifsud 1994, Cardona 1996, Schembri 2006, 2012). Recent studies have departed from the purely descriptive nature of earlier publications and have focused on the theoretical aspects of broken plural generation (Mayer et al. 2013), broken plural comprehension (Nieder et al. 2021a, 2021b), and computational modeling of broken plurals (Nieder et al. 2021b, Nieder et al. 2022, Court et al. 2023).

1.1 Early descriptive studies

Early descriptive works focused purely on categorizing the broken plurals on the basis of prosodic structure and, in contrast to later studies, by vocalic melody. To this end, the broken plurals *forok* (sg. *forka*, 'gallow') and *dbabar* (sg. *dabra*, 'ulcer') would belong to two different types based on the difference in their prosodic structures (CVCVC vs. CCVVCVC), and broken plurals *balal* (sg. *balla*, 'bundle') and *bolol* (sg. *bolla*, 'stamp'), although prosodically identical, would belong to two

different types based on the difference in their vocalic melodies ({a,a} vs. {o,o}). As one can expect given the variety of prosodic structures represented by the broken plurals and the quantity of permissible vocalic melodies in Maltese, the number of distinct broken plural categories is quite large in the early descriptive works, although the exact number varies between studies.

The categorization of broken plural forms is described in great detail in Aquilina (1959) and, although treated separately, both Semitic Maltese nouns and non-Semitic loan nouns are considered. Even though Aquilina identifies only fourteen distinct prosodic structures, variations in the attested vocalic melodies within these structures result in thirty-seven unique broken plural types. In total Aquilina describes thirty-seven distinct broken plural types, a graphical summary of which is shown below. According to this work, all thirty-seven types are fully represented in Semitic Maltese, but only fourteen broken plural types are attested in the non-Semitic loan word data. Some peculiarities of note in this description are types 18-19, type 30, and types 31-37, all of which will be examined in turn.

Type(s)	**Prosodic structure**	**Attested melodies**	**N melodies**
1-4	$C_1C_2V{:}C_3$	a, ie, i, u	4
5-9	$C_1C_2V{:}C_3V$	{a:,a}, {ie,a}, {a:,i}, {ie,i}, {u:,a}	5
10-11	$VC_1C_2C_3V$	{i,a}, {o,a}	2
12	$C_1VC_2C_3V$	{o,a}	1
13-17	$C_1VC_2VC_{2,3}$[1]	{a,a}, {ie,a}, {a,i}, {ie,i}, {u,a}	5
18-19	$C_1VC_2(C_3)V{:}n$	{i,ie}, {o,ie}	2
20-23	$C_1C_2VyyVC_3$	{a,a}, {a,e}, {e,e}, {e,a}	4
24-27	$C_1C_2V{:}C_3VC_3$	{a:,a}, {a:,e}, {e,a}, {ie,e}	4
28	$C_1VC_2C_2VC_3$	{o,ie}	1
29	$VC_2VC_3C_3V$	{ɐe,e,a}	1
30	$C_1V{:}C_2V(Y)$	{o:,i}	1
31-34	$mC_1V{:}C_2VC_3$	{a:,a}, {a:,e}, {ie,a}, {ie,e}	4
35-36	$mC_1V{:}C_2VC_2$	{a:,a}, {e:,e}	2
37	$mC_1V{:}C_2V$	{ie,e}	1

Table 1.1: The categorization of broken plural forms from Aquilina (1959).

The prosodic structure of types 18-19 (e.g., *nar* → *nirien* 'fire/s') contains a servile consonant /*n*/ word-finally and, based on the attested vocalic melodies

[1]This type also includes geminate roots, notated differently (QvTvT) compared to non-geminate roots (QvTvL), in these plurals of identical prosodic structures.

provided, it could be said that these words have a word-final particle /-*ien*/. This particle /-*ien*/ itself is a sound plural suffix (e.g., *bieb* → *bibien* 'door/s') and, given that Aquilina devotes an entire subsection of the grammar (p. 251) to describing the 'plural of plurals' (i.e., double plurals, *tarf* → *truf-ijiet* 'edge/s'), it's surprising that these two types are considered to be distinct broken plural forms rather than double plurals (type 12 broken plurals with the /-*ien*/ suffix). The majority of broken plural roots provided by Aquilina that fit types 18-19 are biconsonantal,[2] which, in addition to the final suffix /-*ien*/, are pluralized via a change in the vowel between the first and second radicals. This is further support that the roots in these types could reasonably be considered to be a subset of type 12 roots.

Type 30 seems out of place because not only does it prosodically match types 13-17 in structure, but it is regarded as 'obsolete' in Aquilina's grammar. Additionally, no other types are identified that are specifically dedicated to the radical Y ([j]). In fact, as an excerpt from the grammar explains below, the description of types 1-4 explicitly states that the third radical in these types '...may be inconstant **Y** or **W**...'. Furthermore, while Aquilina addresses the occurrence of the semivowels Y and W in the roots of other types (22, 25-27, 34, 37), he never goes as far as to suggest that they belong to distinct types. Thus, if type 30 were to follow the lead of the other types and assume that Y is simply just another radical consonant, then type 30 roots would actually belong to types 13-17.

Lastly, the prosodic structures of types 31-37 all include a servile consonant /m/ word-initially. In the descriptions of types 31-36, Aquilina explicitly states that they are 'formed with a morphological prefix **m**...', therefore identifying that these broken plural forms are morphologically complex. This statement could be extended to type 37, as well. Although Aquilina doesn't define the grammatical function of the prefix, one could assume that it acts as the nominalizing prefix /m-/ common of Semitic languages in the formation of mimated nouns of place (cf. Arabic $\sqrt{\text{KTB}}$ *kataba* 'to write', *maktab* 'office') or instrument nouns (cf. Arabic $\sqrt{\text{FTH}}$ *fataha* 'to

[2]Just one triconsonantal root is identified: $\sqrt{\text{QDB}}$ *qadi:b* → *qodbien* 'wand'.

open', *miftah* 'key'). Considering that the /m/ prefix does not interact with the morphological process of pluralization (it is always prefixed in the singular and plural forms), one could argue that it doesn't attach to the noun until after the noun has been pluralized. In that view, forms belonging to types 31-36 would be analyzed independently of the /m/ prefix (m-C_1V:$C_2VC_{2,3}$) and therefore belong to types 13-17, instead. Taking the same approach for type 37 forms (m-C_1VC_2V), they could be reanalyzed reasonably as type 12.

Aquilina's description is noteworthy because it acknowledges the role of the root and the position of the vowels relative to the radical consonants of the root in the broken plural formation, albeit rather indirectly. For example, take his description of the type 1 broken plurals:

> 1. (i) **QTa:L**. Formed with the 1st two rad[icals] in phonological junction and **a:** between the 2nd rad[ical] which may be inconstant **Y** or **W** and the 3rd rad[ical]. (p. 229)

Although it seems rather intuitive to describe the different types in this way, in this description the root and the vocalic melody aren't simply combining on the basis of conforming to prosodic principles, but rather they are interacting in a way that that situates the vocalic melodies positionally within the root to satisfy constraints on syllable structure. This type of interaction is the backbone of the present study. In the analysis to follow Chapter 4, it is argued that the root and vocalic melody interact with one another in the phonological branch of the derivation to produce the attested broken plural surface forms. Even though Aquilina deviates from this type of analysis, other linguists in these early descriptive works take note of the positional aspect of word formation.

In 1965, Aquilina penned a simplified grammar aimed at teaching Maltese to the foreign learner. In his description of the broken plural in this simplified grammar, Aquilina reduces the number of types of broken plurals from thirty-seven in his earlier (1959) grammar down to twenty-seven types. These types were still determined on the basis of both prosodic structure and vocalic melody. They have been arranged

below in a similar way to the way the types of Aquilina (1959) were presented above.

Type(s)	**Prosodic structure**	**Attested melodies**	**N melodies**
1-4	$C_1C_2V{:}C_3$	a, ie, i, u	4
5-9	$C_1C_2V{:}C_3V$	{a:,a}, {ie,a}, {a:,i}, {ie,i}, {u:,a}	5
10	$C_1VC_2C_3V$	{o,a}	1
11-12	$VC_1C_2C_3V$	{i,a}, {o,a}	2
13-16	$C_1VC_2VC_{2,3}$	{a,a}, {a,e}, {i,e}, {o,o}	4
17-19	$C_1C_2VyyVC_3$	{a,a}, {e,e}, {e,a}	3
20-22	$C_1C_2V{:}C_3VC_3$	{a,a}, {a,e}, {ie,e}	3
23	$C_1VC_2C_2VC_3$	{o,ie}	1
24-27	$C_1C_2V{:}C_3VC_4$	{a,a}, {a,e}, {ie,a}, {ie,e}	4

Table 1.2: The categorization of broken plural forms from Aquilina (1965).

Firstly, Aquilina eliminated three vocalic melodies from three different types, assumedly because they were found only in words that were considered obsolete in 1965. Additionally, Aquilina did away with the distinction of the [m-] prefixed forms, types 31-37. The 'double plural' forms of types 18-19 were also eliminated, as was type 29 and type 30, the type reserved for Y radicals. These deletions bring the total number of types down to 23, but Aquilina added four more types (24-27) to account for forms with quadri-consonantal roots, bringing the total back up to 27 types. The four additional types are prosodically identical to types 20-22, with the only difference being the phonological realization of the final syllable (C_3VC_3 in 20-22 and C_3VC_4 in 24-27). In an analysis like the one to follow in which word formation happens in the syntax and before the phonology is supplied, types 20-22 and 24-27 would be considered identical roots deriving identical broken plural forms.

Borg (1978) differs starkly from Aquilina (1959, 1965) in that the number of broken plural types is reduced to just fifteen, which is quite low compared to other grammars outlined in this subsection. Remarkably, even though there is such a limited number of types, Borg still manages to distinguish types on the basis of both prosodic structure and vocalic melody. Borg achieves this by underspecifying certain vowels in the broken plural type pattern. The fifteen types have been reproduced below, in Borg's original notation.

Borg's assignment of the broken plural types is thorough but arbitrary. For instance, it isn't clear why the [*aa*]∼[*ii*] vowel alternation in types 4-5 is enough

Type(s)	Prosodic structure
1	CiCeC
2	CaCaC
3	CoCoC
4-5	CCaaC (or CCiiC)
6	CCuuC
7	CCVCa
8	CoCCiiC
9	VCCCa
10-11	CCVyyVC or (CwVyyVC)
12	CVCiin/aan
13	CoCCa
14	CCVCi
15	CCaaCVC/CCiiCVC

Table 1.3: The categorization of broken plural forms from Borg (1978).

to invoke two distinct types, whereas the same alternation in type 12 and type 15 does not. For the type 15 alternation, Borg supports his stance by arguing that the surfacing of either [*aa*] or [*ii*] is dependent on a morphophonemic rule[3], although this rule only operates in Romance plurals of this type. For Semitic plurals, Borg cites the phonological process of *imaala* as the reason for the [*aa*]∼[*ii*] alternation. Borg does not offer any explanation for the same alternation in types 4-5 or type 12 forms, but even if one were to extend the *imaala* justification to these types, the question of why types 4-5 don't collapse into a single type (like type 12) remains open.

Two other points of contention with Borg's descriptive analysis will be briefly discussed. The decision to split types 10-11 into two distinct types harks back to the previous critique of the [*aa*]∼[*ii*] vowel alternation. The difference between types 10-11 is the realization of the second radical consonant. If the second consonant is /w/, the entire word form belongs to its own type. Borg doesn't explain the reasoning behind splitting this type, but as mentioned above in the discussion of Aquilina's grammars, the analysis to follow would not support the splitting of this type simply on the basis of the phonological realization of the second radical consonant. The analysis to follow argues that the word form receives its phonology only after the syntax has finished manipulating the underlying word structure. Thus, it doesn't

[3] "The rule governing the incidence of the high vowel as against the low one in these forms is the following: if the stressed vowel in the singular form has the feature [+ front], the plural takes /ii/; but if it has the feature [+ back] , the plural takes /aa/." (p. 331)

matter if the second radical consonant is /w/ or not, since the syntax won't be able to access the phonology until after the prosodic structure has been constructed.

The other point of contention is the decision to treat type 8 as its own type. According to Borg, just two forms constitute the entirety of type 8 forms: [*għ*]*orrief* (sg. [*għ*]*aaref*, 'wise man') and [*għ*]*ozziiB* (sg. [*għ*]*aazeB*, 'bachelor'). The digraph /għ/ has been added to Borg's original notation in these examples. The present study argues that /għ/-initial words don't deserve to be treated as a separate type, but given the dearth of /għ/-initial examples in Borg (1978), this topic is tackled in the discussion of Borg & Azzopardi-Alexander (1997) to come. It is argued here that in the syntax, /għ/ is treated just as any other radical consonant is treated, and that phonological alterations occur after the phonology has been supplied (post-syntactically). These phonological alterations explain why /għ/-initial word forms differ in prosodic structure from other attested broken plural types.

Borg (1978) shines in that it discusses the historical development of the broken plural types and even parallels attested Maltese broken plural types with Old Arabic types. Maltese itself descends from dialectal Arabic, and as such it is important to incorporate a historical linguistic element into any analysis regarding word form derivation. With this in mind, the following section considers the treatment of the broken plurals across the Semitic languages while under the lens of the current study at hand.

Borg & Azzopardi-Alexander (1997) is regarded as the foundational contemporary descriptive grammar of Maltese, and as such contains a detailed account of the broken plural. As is the case with the rest of the grammars in this subsection, Borg & Azzopardi-Alexander distinguish broken plural types on the bases of both prosodic structure and vocalic melody, and they surpass Aquilina (1959) in detailing forty-one distinct broken plural types, while also noting that some additional minor types are not included in the grammar. Those types included in the grammar are graphically represented below.

Although it's not explicitly stated, Borg & Azzopardi-Alexander's description

Type(s)	Prosodic structure	Attested melodies	N melodies
1-4	$C_1C_2V{:}C_3$	a, ie, i, u	4
5-9	$C_1C_2V{:}C_3V$	{a:,a}, {ie,a}, {a:,i}, {ie,i}, {u:,a}	5
10-11	$VC_1C_2C_3V$	{i,a}, {o,a}	2
12	$C_1VC_2C_3V$	{o,a}	1
13-17	$C_1VC_2VC_3$	{a,a}, {a,e}, {i,e}, {o,o}, {u,e}	5
18-19	$C_1VC_2(C_3)V{:}n$	{i,ie}, {o,ie}	2
20, 22, 24, 26	$C_1C_2VjjVC_3$	{a,a}, {a,e}, {e,e}, {e,a}	4
21, 23, 25	$C_1VC_2VjjVC_3$	{a,a,a}, {a,a,e}, {e,e,e}	3
27-30	$C_1C_2V{:}C_3VC_4$	{a,a}, {a,e}, {ie,a}, {ie,e}	4
31	$C_1VC_2VC_3VC_4$	{e,ie,e}	1
32	$C_1VC_2C_2VC_3$	{o,ie}	1
33-36	$mC_1V{:}C_2VC_3$	{a,a}, {a,e}, {ie,a}, {ie,e}	4
36-38	$mC_1VC_2VC_2$	{a,e}, {e,e}	2
39	mC_1VC_2V	{ie,e}	1

Table 1.4: The categorization of broken plural forms from Borg & Azzopardi-Alexander (1997).

of the broken plural seems to borrow heavily from Aquilina (1959), with some key exceptions. To avoid redundancy, the critique of Aquilina (1959), namely, the double plurals (types 18-19) and the mimated nouns of place and instrument nouns (types 33-39), will not be rehashed here. Instead, the focus will be on types 21, 23, 25 and type 31. The unifying feature of the roots in these four types is that the first radical is always /għ/, a 'silent' phoneme in Maltese that historically corresponded to the Arabic back consonants.

In their introduction to the broken plural forms, Borg & Azzopardi-Alexander directly address the matter of treatment of the /għ/ consonant:

> "The orthographic symbols **għ** and **h** do not correspond, in most positions, to any segment, but represent underlying (historical) back consonants. For present purposes this treatment follows orthographic practice and treats them as "normal" radicals." (p. 177)

The present study concurs with Borg & Azzopardi-Alexander about the treatment of the consonants /għ/ and /h/ as "normal" radicals. In the analysis to follow, the same approach is taken. Whether or not these consonants have a phonological realization in Modern Maltese, at some point they were pronounced and more importantly were functioning radicals in numerous roots. Even though their phonology was lost over

time, the consonants weren't simply erased from the language. They act as silent placeholders in both tri- and quadri-consonantal roots and thus in the word forms that have been derived from these roots (see Brame 1972).

The study at hand does not agree with the decision of Borg & Azzopardi-Alexander to allocate four separate types to /għ/-initial word forms. In doing so, they weaken their stance of treating /għ/ as a "normal" radical, since the nouns that comprise the entirety of each of these types are all /għ/-initial. These types have been reproduced below, with a singular and corresponding broken plural example.

21:	$C_1aC_2ajjaC_3$	*għadira* → *għadajjar*	'lake/s'
23:	$C_1aC_2ajjeC_3$	*għarusa* → *għarajjes*	'bridegroom/s'
25:	$C_1eC_2ejjeC_3$	*għabura* → *għebejjer*	'year-old sheep/pl.'
31:	$C_1eC_2ieC_3eC_4$	*għafrid* → *għefiered*	'fiend/s'

A brief explanation for this disagreement over the treatment of /għ/ will be provided here, although a further elaboration will follow in the analysis to come. In essence, the disagreement boils down to when the phonology is theorized to be inserted in the process of word formation, and thus at which phase of the derivation the 'type' is identified. It is argued in this study that the epenthetic vowel that appears between C_1 and C_2 in the above examples is simply that: epenthetic. If that epenthetic vowel is removed from Borg & Azzopardi-Alexander's proposed prosodic structures above, then the resulting types are identical to existing types (21 → 20, 23 → 22, 25 → 24, 31 → 30). In the present analysis, it is argued that once the root and vocalic melody have been inserted accordingly into the syntax, then the phonology is supplied and the prosodic structure of the word is generated. At the first stage, /għ/-initial roots are considered identical to other triconsonantal roots that share this common form. Once the phonology is supplied, phonological adjustments are made, and epenthetic vowels are inserted into /għ/-initial broken plurals.

Perhaps the earliest description of the Maltese broken plural, Sutcliffe (1936) prefaces the section of his grammar devoted to the 'internal plural' in this way:

> "Practice is the only means by which it is possible to learn the form or the forms of plural taken by different nouns." (p. 41-42)

Although it is the oldest of the grammars discussed here, it has been chosen for analysis at the end of this subsection because it seems to bridge the gap between the earlier and later studies on the broken plural. Sutcliffe's analysis divides the broken plurals into twenty-two different types.[4] As with the rest of the studies in this section, these types are identified on the basis of prosodic structure and vocalic melody. The types have been condensed and presented below in a reconstruction of the data from Sutcliffe's grammar.

Type(s)	**Prosodic structure**	**Attested melodies**	**N melodies**
1-3	$C_1C_2V{:}C_3$	a/ie, i, u[5]	3
4-6	$C_1C_2V{:}C_3V$	{a:/ie,a}, {a:/ie,i}, {u:,a}	3
7-8	$VC_1C_2C_3V$	{i,a}, {o,a}	2
9	$C_1VC_2C_3V$	{o,a}	1
10-14	$C_1VC_2VC_3$	{a,a}, {a,e}, {i,e}, {o,o}, {u,e}	5
15-18	$C_1C_2VjjVC_3$	{a,a}, {a,e}, {e,e}, {e,a}	4
19-20	$C_1C_2V{:}C_3VC_3$	{a:/ie,a}, {a:/ie,e}	2
21	$C_1VC_2C_2VC_3$	{o,ie}	1
22	$C_1C_2VC_3C_3V$	{e,a}	1

Table 1.5: The categorization of broken plural forms from Sutcliffe (1936).

Despite the year of publication, Sutcliffe's grammar is inconsistent with most of the rest of the grammars in this time period in that it describes a comparatively reserved number of broken plural types. One reason for this is Sutcliffe's consideration of the phonetic process *imaala* which is active in Maltese. In fact, this very reason is why this grammar is being considered as a bridge between the older and more recent studies. In the most basic terms, *imaala* is the process by which the low vowel [a] raises to [i], and is sometimes realized at an intermediate stage as [e] (Borg 1976). This phonetic change is conditioned by the consonant that follows the vowel, and thus certain classes of consonants block *imaala* from occurring (specifically back consonants). Sutcliffe accommodates this phonetic process by collapsing vocalic melodies containing either [a] or [ie] (/ɪ:/) into a single melody and type. In doing this, the inventory of broken plural types in this analysis is reduced by five.

[4]Schembri (2006) notes that the relatively small number of types in Sutcliffe (1936) is in part due to the fact that Sutcliffe "inexplicably left out" (p. 6) certain types.

[5]To use Sutcliffe's notation: type (1) is classified qtâl, qtiel, type (2) is classified qtîl, and type (3) is classified qtûl.

Curiously, when it comes to types 15-18, Sutcliffe seems to abandon the idea that different vowels on the surface may have the same underlying representation. What's even curiouser is that Sutcliffe hints that the surface realizations of the vowels in these types may be phonologically conditioned by the consonants that follow them:

> "This type [e,a] differs from the previous one [e,e] only in that the words which follow it, having a gutteral or aspirate for a third radical, prefer **a** as the final vowel." (p. 46)

> "This type [a,a] is distinguished from the preceding [a,e] only by the final vowel. This is due to the third radical of nouns which form their plurals according to this type being a gutteral or an **r**. These letters favor the vowel **a**." (pp. 46-47)[6]

In the two types described above (types 16 and 18), Sutcliffe is essentially outlining what happens when the phonetic process *imaala* is blocked from occurring. Recall that *imaala* describes the raising of [a] to [i] (with an intermediate stage [e]) in environments that don't precede a back consonant. 'Gutterals,' the term used by Sutcliffe here, are back consonants, so their 'preference' for [a] is not surprising. Were Sutcliffe to follow the [a/ie] convention above, types 15-18 could be reduced to types 15-16.

In contrast to the other grammars analyzed thus far, Sutcliffe does not advocate for separate broken plural types for nouns containing /għ/ as the first radical of the consonantal root. He argues that:

> "The initial vowel in **egħziez** is not part of the plural form, but is euphonic only, as 'għajn' cannot be pronounced without a vowel." (p. 42)

The orthography of /għ/-initial words of this period (egħziez) differs from modern orthography (għeżież) in a couple of ways, namely, the //għ/ + V/ cluster and the orthographic representation of [z], but focus will be drawn to the former. The stance

[6] In these excerpts, the bolded text is true to Stucliffe (1936); the text in brackets is my own.

of the present study with regard to /għ/ as the first radical of the root has been discussed, but the truth is that the existence of għajn itself is hotly debated. This is clearly evidenced in the orthography of these words. In having the euphonic vowel precede the għajn orthographically, Sutcliffe avoids the need to formulate additional types to accommodate new prosodic structures. Azzopardi-Alexander and Borg (1997), for example, follow the modern orthographic conventions, and in doing so put themselves in the position of needing to allocate new types for the //għ/+V/-initial words (types 21, 23, 25, and 31). All of this being said, orthography isn't always representative of morphophonological processes, and the topic of the status of word-initial għajn will be taken up later.

The early descriptive works of the twentieth century were foundational in that they sought to bring some sort of order to a linguistic phenomenon that was at one point thought to be completely random. The analysis which follows makes a complete departure from these studies insofar as the broken plurals are not analyzed on the basis of their prosodic structure, but rather on their underlying root and its interaction with the vocalic melodies in the syntax. In any case, a critique of these early studies is their overspecificity, both in differentiating between vocalic melodies and with general overspecificity of the prosodic structure (e.g., $mC_1V{:}C_2VC_3$ vs. $C_1V{:}C_2VC_3$).

1.2 Later descriptive studies

At around the turn of the century, linguists researching the Maltese broken plural began to focus on the generalizability of the broken plural patterns, and thus collapsed several sub-categories of broken plurals into single types on the basis of prosodic structure only. Therefore, in these studies broken plural forms with identical prosodic structure such as *sħaħar* (sg. *saħħara* 'witch') and *skieken* (sg. *sikkina* 'knife') are considered to belong to the same type, even though their vocalic melodies differ ({a,a} vs. {ie,e}). This group of studies pushes the scope of analysis beyond the purely descriptive, and instead seeks to understand the underlying mechanisms of broken plural formation.

In the introduction to his work, Mifsud (1994) presents six points outlining the dual-morphological nature of the Maltese language, as well as the status of loan words in the broader mechanism of the broken plural, which he refers to as 'internal pluralization.' The latter three points will be highlighted later, as they describe the challenges relating to the adaptation of loanwords into the broken plural mechanism, but firstly Mifsud's reclassification of the broken plural types will be presented. In all, Mifsud records thirteen types, and his analysis takes a similar approach to Borg (1978) in that some vowels are specified and others are underspecified. The table is reconstructed below, in 1.6. The 'SM' notation refers to 'Semitic Maltese'.

It is to be noted that in the table notation, italicized [*aa*] represents any long vowel, be it [a:] or [i:]. Additionally, although 14 types are identified, it is assumed that types 13 and 14 are considered a single type, using the analogy that although the final subtype in each of the following groups has a prefixed /m/, 10a and 10b are both type 10, and 11a-d are all type 11. This brings the total of types to thirteen, just as Mifsud states.

In taking the historical approach to the Maltese broken plural, Mifsud is able to capture the evolution of Maltese from a dialect of Arabic to an independent Semitic language with substantial North African Arabic influence. His description highlights the loss of unstressed vowels in open syllables (e.g., type 9: Arabic *ki'baar* → Maltese *kbaar*, p.93) and the collapsing of several broken plural types into a single type (e.g., type 6). By underspecifying both the vocalic melodies and the root consonants in these types, Mifsud is able to statistically analyze the occurrence of each of these types more broadly and reliably. Thus he is able to establish frequency of attested types within the list of attested types, although these statistics don't necessarily reflect the frequencies of the types in speech.

Mifsud's analysis meshes well with the late-insertionist theory of morphology in that broken plural types are not affected by the phonological realizations of the radical consonants in the root. In other words, the syntax is concerned only with the morphological structure of the word and is blind to the phonology. For example, all

Type	Arabic Plural	SM Plural	Non-SM Plural
1	1a2i^{j}3	12i^{j}3	–
2	1u22aa3	1v22*aa*3	–
3	$^{?}$a12i3a $^{?}$a12i3aa$^{?}$ $^{?}$a12u3	v123a	–
4	1u2u^{w}3a	12u^{w}3a	–
5	1a2aa2a(j) 1a2aa3aa	12*aa*3a	–
6	1a23a(j) 1u2a3aa$^{?}$ $^{?}$a12i3aa$^{?}$	1v23a	–
7	1u23aan 1i23aan	1v(2)3*aa*n	1v3*aa*n
8	1u2u^{w}3	12u^{w}3	12u^{w}3
9	$^{?}$a12aa3 1i2aa3	12*aa*3	12*aa*3
10a. 10b.	1a2aa3i^{n} ma1aa2i^{n}	12*aa*3i m1*aa*2i	12*aa*3i
11a.	1a2aa3i4 1a2aa3i^{j}4	12*aa*3v4	12*aa*3v4
11b.	1aWaa2i3 1aWaa2i^{j}3	1W*aa*2v3	1W*aa*2v3
11c.	1a2aa2i3 1a2aa2i^{j}3	12*aa*2v3	12*aa*2v3
11d.	ma1aa2i3 ma1aa2i^{j}3	m1*aa*2v3	(m1*aa*2v3)
12	1a2aa$^{?}$i3	12vjjv3	12vjjv3
13	1i2a3 1a2a3 1u2u3 1u2a3 1u23	1v2v3	1v2v3
14	–	m1v2v3	–

Table 1.6: The categorization of broken plural forms from Mifsud (1994).

of the broken plurals that belong to type 11 have the prosodic structure CCVVCVC. Regardless of whether or not the second radical is a weak consonant or is reduplicated, the broken plural with this prosodic structure is considered type 11.

Subtype 11d portrays an interesting approach to handling Maltese broken plurals of mimated nouns. Mimated nouns in Arabic are formed by attaching the prefix [mV-] to a nominal stem. Mifsud's analysis of the Maltese broken plural does not take this same stance. Instead, the servile consonant /m/ is considered to be part of the prosodic structure of the type (as is the case in subtype 10b). Thus, the two broken plurals below are considered to be morphologically identical in Mifsud's analysis.

		12v:3v4	
(a) $\sqrt{\text{FKRN}}$	*fekrun*	*fkieren*	'tortoise/s'
		m1v:2v3	
(b) $\sqrt{\text{MQDF}}$	*moqdief*	*mqadef*	'storing place/s'

Table 1.7: Mimated nouns (b) are derivationally identical to quadri-consonantal nouns (a) in Mifsud (1994).

Mifsud ignores the morphological complexity of the mimated nouns and instead argues that word-initial cluster /m+C/ in type 14 broken plurals acts as a single consonant "...without effecting any important changes to the syllabic configuration of the original form." (p. 101). The following analysis departs from Mifsud's treatment of the mimated nouns and instead treats /m/ as the first radical of the consonantal root.

Despite Mifsud's willingness to underspecify consonants and vowels in prosodically identical broken plurals (e.g., type 13), his analysis retains some relics of the older descriptive works, namely types 1, 8, and 9. Below are examples of these types from Mifsud (1994).

Type 1[7]	*ħafif* → *ħfief*	'light/pl.'
Type 8	*qalb* → *qlub*	'heart/s'
Type 9	*twil* → *twal*	'tall/pl.'

Table 1.8: Some prosodically identical forms are considered separate types in Mifsud (1994) on the basis of the vocalic melody.

[7]Mifsud actually does not give any examples for this type, but instead states that it's a rare type (n=16) and that most broken plurals of this type are adjectives (p. 97).

Prosodically, these three forms are identical, but Mifsud does not remark on why he chose to treat them as three different types. Perhaps he was considering other factors beyond prosody alone. Type 1 forms are relatively rare and restricted almost exclusively to adjectives, whereas type 9 forms seem to have evolved from the merging of two Arabic broken plural patterns. In any case, had this analysis been strictly based in prosody, we could predict that types 1, 8, and 9 would be collapsed into a single type.

Perhaps the most novel element of Mifsud (1994) is the acknowledgement and analysis of loan words with broken plural forms. For the first time, the process of loan word adaptation to the broken plural system is described in detail and within the same parameters as non-loan words. Mifsud proposes two components that aid in loan word adaptation, namely consonant clustering and morphological 'windows'. These will be discussed further in Chapter 3, but the rationale behind these ideas is that the polyconsonantal nature of Romance vocabulary needs to be manipulated before those loan words can be adapted to the tri- and quadri-consonantal types displayed above. Mifsud's notion of 'consonant clustering' is integrated into the analysis of loan words to follow.

The categorization of the broken plural types in Cardona (1996) is quite similar to Mifsud (1994), with a few minor differences. Like Mifsud (1994), Cardona's analysis categorizes the broken plural types from a historical point of view. Cardona defines sixteen broken plural types, which is the greatest number of types defined in this subsection. They have been reproduced below in 1.9.

Cardona introduces one type that is not found in Mifsud's analysis. Type 10 is represented by just four broken plurals in the data set.[8] Of these four plurals, three contain /għ/ as the medial radical in the root. To avoid redundancy, the issue of għajn will not be taken up here. Cardona also deviates from Misfud's analysis by splitting 12v3v4 forms across two types, 14 and 15. It appears that the division is based on the status of the form as a Romance loan word or a Semitic word, with some

[8]These four broken plurals are *bagħar* → *ibgħar* 'dung/pl.', *bagħal* → *ibgħal* 'mule/s', *fagħal* → *ifgħal* 'activity/ies', *tajra* → *itjar* 'kite/s'.

Type	Prosodic structure
1	1v2v3
2	12v3
3	12v^{u}3
4	12v^{j}3
5	12v3a
6	12v^{u}3a
7	12v3i
8	1v23a
9	v123a
10	v12v3
11	12vJJv3
12	1v22v3
13	1v(2)3vn
14	12v3v4
15	12v3v4
16	(1)v2v3

Table 1.9: The categorization of broken plural forms from Cardona (1996).

exceptions. The examples that Cardona gives for type 14 forms are all Semitic (e.g. *dbabar*, *mħażen*, *tnabar*), whereas the examples for type 15 forms are all Romance loans with consonant clusters (e.g. *stalel*, *gwerer*, *trofof*). Again, the issue of splitting prosodically identical forms on the basis of consonantal realizations of their roots will not be rehashed here.

Schembri (2006) (and subsequently Schembri 2012) is regarded as the foundational work on the Maltese broken plural in present research. What sets Schembri (2006) apart from previous studies is that for this study, in addition to a descriptive analysis of the broken plural types, an experimental component is included in which participants were prompted to produce nonce words for certain productive types (types A-D). In short, the participants were provided with a nonce singular and asked to produce the plural counterpart (or vice versa). In doing so, Schembri hoped to demonstrate that it is possible to predict the plural form from the singular form and thus show that there is some sort of derivational relationship between the singular and plural forms. An evaluation of the study will be discussed after introducing Schembri's proposed types. She describes eleven types which have been reproduced here. In recent studies (Mayer et al. 2013, Neider et al. 2021, 2022, and others), these types are taken to be the standard categorization.

Type[9]	Prosodic structure
A	CCVVCVC
B	(C)CVCVC
C	CCVVC
D	CCVjjVC
E	CCVVCV
F	VCCCʔ
G	CVCCʔ
H	(għ)VCVC
I	VCVC
J	CVCCVVC(V)
K	(għ)VCCV

Table 1.10: The categorization of broken plural forms from Schembri (2006).

Schembri's types are organized according to frequency, with type A forms (n=231) appearing more frequently in the data set, and type K forms (n=2) appearing less frequently. This study succeeds in portraying a categorization that is nearly based on prosody alone, and not by phonological realization of the vowels and/or consonants. The exceptions to this of course are types H and K, which Schembri has allocated for /għ/-initial forms. The issue of /għ/-initial forms has already been discussed briefly above and will be discussed further in the analysis to come.

Schembri's analysis resolves several of the issues that have been pointed out above with other descriptions of the broken plural. Notably, Schembri has recategorized forms ending in /-*an*/ or /-*ien*/ as sound plurals, stating simply that "...there is little internal variation in the stem; merely a change in vowel quality and length, sometimes with the addition of a 'weak' consonant such as /j/..." and that "[t]he process of lengthening or shortening in itself does not constitute a broken form." Sutcliffe (1936) takes a similar stance, as does Aquilina (1959). Additionally, Schembri does not make any special distinctions for roots containing the weak consonants /w/ and /j/.

This study also incorporates the idea of prosodic circumscription (McCarthy and Prince 1990b, McCarthy 2000) and the moraic structure of the broken plural forms. In short, prosodic circumscription involves breaking a form into syllables or morae. Morphological processes are performed on one of these prosodic elements,

[9]Schembri (2006) labels the types alphabetically, so that notation has been adopted here.

and the other is left unchanged. The form is then reassembled with the appropriate morphophonological change happening to the appropriate part of the form. In Schembri's analysis, prosodic circumscription is quite useful when deriving certain loan words, as shown below.

umbrella 'umbrella'	*pożambrella* 'umbrella stand'
um | *brella*	*pożam* | *brella*
um | *brelel*	*pożam* | *brelel*
umbrelel 'umbrellas'	*pożambrelel* 'umbrella stands'

Table 1.11: Examples of prosodic circumscription from Schembri (2006).

Schembri also uses another tool to facilitate the incorporation of Romance and English loans into the non-concatenative morphological system of the broken plural. She follows the lead of Mifsud (1994) and argues that some initial consonant clusters – those that occur as clusters in both the singular and the plural forms – are treated as a single unit. The above examples have been reproduced here.

umbrella 'umbrella'	*pożambrella* 'umbrella stand'
um | [*br*]*e*[*l*][*l*]*a*	*pożam* | [*br*]*e*[*l*][*l*]*a*
um | $C_1VC_2C_3V$	*pożam* | $C_1VC_2C_3V$
um | $C_1VC_2VC_3$	*pożam* | $C_1VC_2VC_3$
um | [*br*]*e*[*l*]*e*[*l*]	*pożam* | [*br*]*e*[*l*]*e*[*l*]
umbrelel 'umbrellas'	*pożambrelel* 'umbrella stands'

Table 1.12: Word-initial consonant clusters are treated as a single unit in Schembri (2006).

Schembri defines type B broken plurals as having a CVCVC prosodic structure. At first glance, broken plural forms *umbrelel* and *pożambrelel* don't belong to this type based on their prosodic structures. However when the forms undergo prosodic circumscription and the initial cluster /br/ is treated as a single unit, the forms match the defined prosodic structure of the type. In the analysis to come, the same approach will be taken with regard to word-initial consonant clusters in loan words.

Schembri's analysis includes a production study in which participants were prompted to provide the plural forms of nonce singulars, and the singular forms of nonce plurals. This study was meant to show that speakers can predict the broken plural type of a nonce singular based on the phonological and prosodic correspondence between the singular and plural forms. In essence, the study tried to demonstrate

that speakers build the broken plural form from the singular form, rather than from the root. The nonce plurals and singulars in this study were only modeled after the four most common broken plural types (A-D), so less common types were not directly elicited from the participants.

Overall, the data don't seem to strongly support the argument that a form can be predicted from its singular/plural counterpart. An excerpt of Schembri's data table has been reproduced below. Broken plural forms produced by participants are italicized, compared to sound plural forms produced by participants which are not.

Type B	Plural forms given by participants (n=11)						
Nonce sing.	P1	P2	P3	P5	P8	N sound	N broken
ħożda	ħożdijiet	*ħożod*	ħożdiet	ħożd	*ħżud*	9	2
forpa	forpi	*forop*	forpiet	*forop*	*friep*	5	6
raska	*raskek*	raskijiet	raskiet	*rasak*	*rsieki*	8	3

Table 1.13: Data from the elicitation study in Schembri (2006) that have a type B prosodic structure.

Even though just a portion of the data is represented, the diversity in responses is exhibited throughout the study. For example, the data above reflect the responses given by participants after they were presented with a nonce singular modeled after the prosodic structure of attested type B singular counterparts. Participants responded with both broken plural forms and sound plural forms. Of those that responded with a broken plural form (in italics), there was variation in which type was produced. Some participants produced the expected type B broken plural, while other participants produced a different broken plural type. Additionally, there was variation in the vocalic melodies represented in the elicited broken plurals.

Outwardly, the data from type A broken plurals paint a different picture. An excerpt of the data table has been reproduced below. It has been edited slightly to match the conventions above.

In the greater type A data table, all broken plural forms supplied by the participants are type A broken plurals. While it would be tempting to argue that these data support the hypothesis that a plural form can be predicted from its singular form, in Schembri's descriptive analysis there is only one type that accommodates

Type A	Plural forms given by participants (n=6)						
Nonce sing.	P1	P2	P3	P5	P6	N sound	N broken
xuħħa:t	xuħħa:ti	xuħħa:ti	*xħaħat*	*xħaħet*	*xħieħet*	3	3
kerd:us	*kriedes*	*kriedes*	*kriedes*	*kriedes*	*kriedes*	0	6
kasta:r	*ksa:tar*	kasta:ri	*ksa:tar*	kasta:ri	*ksieter*	2	4

Table 1.14: Data from the elicitation study in Schembri (2006) that have a type A prosodic structure.

quadri-consonantal roots, type A. Therefore, it seems to be a bit of a stretch to deduce that participants are predicting the broken plural type from the singular form, rather than from the consonantal root. Schembri's mini production study laid the groundwork for future production studies involving the Maltese broken plural.

The studies described in this section were influential because although they acknowledged the variability of the vocalic melodies in the broken plural types, they chose to classify the broken plurals solely on their prosodic structures. In doing this, they helped to further dismantle the notion that the broken plurals are unpredictable and ungeneralizable. As mentioned previously, most (if not all) current studies consider the eleven types described in Schembri (2006, 2012) to be the most accurate categorization of the broken plurals.

1.3 Psycholinguistic and computational studies

Recent studies on the Maltese broken plural have taken a step away from pure description and have instead focused on the processing mechanisms utilized in the comprehension of the broken plural. Moreover, these studies have sought to understand how the discreet units that compose broken plurals are stored and accessed in the brain during comprehension and production. The first study to be discussed is a production study, whereas the latter three studies examine computational models.

With regard to the Maltese broken plural, Nieder et al. (2021a) set out to explore several questions surrounding the relationship between the singular and plural forms. The production study was concerned with the storage and accessibility of the forms in the brain, and whether or not the selection of a broken plural allomorph could be predicted based on the singular input form. Moreover, the study sought to understand if speakers rely on any analogical cues from Maltese to pluralize nonce singular forms.

For this production study, three lists of nonce word forms were generated from and set of existing singular nouns in Maltese. In each list, either the vowels, the consonants, or both the vowels and consonants of the attested singular forms were systematically changed. Half of the attested singulars had a broken plural counterpart, and the other half had a sound plural counterpart. In the experiment, speakers were prompted via a computer program to produce the plural form of the nonce singular presented on the screen. In total, eighty speakers participated and produced nearly nine thousand nonce plurals.

The results of the study showed that speakers were more likely to produce a nonce sound plural when both the consonants and vowels were changed, but were more likely to produce a nonce broken plural when just the vowels or just the consonants were changed. Further, participants were more likely to produce nonce sound plurals from nonce singulars that were built from attested singulars with sound plural counterparts. The same observation holds for attested singulars with broken plural counterparts. To this end, Nieder et al. (2021a) concluded that speakers produce novel words based on analogy to existing words.

Each of the computational studies to be outlined here tested the predictive ability of linguistic models on the surface forms of Maltese plurals. For the sake of space, the results of each study will be be briefly detailed. Neider et al. (2021b) tested the ability of a Discriminative Learning model to accurately predict the surface form of Maltese plurals. Their model was able to predict both sound and broken plural forms with accuracy, which offers support for the hypothesis that there are some regularities in the plural system that can serve as cues to speakers. Nieder et al. (2022) concluded that, based on their model's performance, there is a possible split in the lexical storage of the Maltese speaker. Their data supported the hypothesis that inflectional words (like broken plurals) are stored as whole-word forms, where as derivational words (like verbs) are stored as morphemes. Further, they argued that the Maltese broken plural can be modeled without morphemes. Lastly, Court et al. (2023) built upon previous studies by examining the predictive power of certain phonological

and meta-linguistic factors. Their study found that both etymology and phonology contribute non-redundant information when predicting the plural inflection of a noun. Although each of these studies lacked physical human participants, they offer clues as to how speakers might be processing and producing inflected nouns. The present study differs from the computational studies presented here in that the broken plural is considered to be stored as individual morphemes, not as a whole-word form.

1.4 Derivational studies

Compared to the number of descriptive, psycholinguistic, and computational studies on the Maltese broken plural, there is a surprising lack of derivational studies. 'Derivational' is used here to describe studies that propose a theoretical framework or outline of how the broken plural is derived in the grammar of a speaker. As opposed to psycholinguistic and computational models that utilize elicited data or models, derivational studies instead sketch a formal analysis of attested data using rules, constraints, conditions, and paradigms, among other architectural tools. As of this writing (and to the author's knowledge), just one derivational study exists for the Maltese broken plural, and that study seeks to account for the prosodic variation that appears on the surface.

No.	**Rule**	**Example**
1	A peripheral (i.e., initial and final) vowel in the singular never shows up in the plural	*borm<u>a</u>* → *borom*
2	In bisyllabic singulars (ignoring final vowels), a final geminate corresponds to a singleton in the plural	*furke<u>tt</u>a* → *friek<u>et</u>*
3a	Onset clusters in the singular are never broken up in the plural	*<u>bl</u>okka* → *<u>bl</u>okok*
3b	Non-onset clusters in the singular are broken up in the plural	*be<u>lt</u>* → *b<u>l</u>ie<u>t</u>*
4	A vowel (or, less frequently, an infix) is inserted into the stem (in most cases to break up a non-onset consonant cluster)	*bixkilla* → *bxi<u>e</u>kel*
5a	Along vowel in the plural form must have a complex onset preceding in the same syllable	*banda* → *<u>bna:</u>di*
5b	Plural forms cannot be of the form 'short vowel – long vowel'	*b<u>a</u>ll<u>u:</u>n* → *bl<u>a:</u>l<u>e</u>n*

Table 1.15: The list of ordered rules that derive the broken plural from the singular, as stated in Mayer et al. (2013).

Mayer et al. (2013) propose a framework of broken plural derivation that centers around a list of ordered rules that derives the broken plural form from the existing singular form. In total, Mayer et al. propose five ordered rules (and two ordered sub-rules) which are defined in Table 1.15. These rules are largely phonological and rely on a direct transformation from the singular form to the plural form. The rules are strictly ordered so that any singular form in the input will generate the correct broken plural form on the surface. The proposed rules govern syllable structure (1, 4, 5a, 5b), cluster membership (3a, 3b), and gemination (2), and are applied serially to the input form. The rules were applied to a database of 654 nouns, and a program was able to produce the correct broken plural form with an accuracy of 75%.

The present study seeks to add to the scant literature of derivational broken plural studies. It departs in two major ways from the rule-based analysis presented in Mayer et al. (2013). Firstly, the study at hand rejects the idea that broken plurals are built from their corresponding singular form. Instead, it argues that both the singular form and the plural form share a common root but are otherwise morphologically unrelated. Secondly, the present study employs constraints rather than rules to account for the prosodic variation of the broken plurals. It is possible for one constraint to do the work of a set of rules. Just as an example, rules 3a, 3b, 5a, and 5b can all be accounted for with one constraint requiring plural forms to have an word-initial cluster. That being said, the findings of Mayer et al. (2013) were quite influential on the present study.

1.5 Summary

Although studies on the Maltese broken plural are relatively few in number, the studies that do exist are stratified in purpose. Several studies have been presented over the years that seek to describe and categorize the broken plural system. In more recent literature, the processing, production, and comprehension of the broken plural has been modeled using psycholinguistic experiments and computational models. Beyond these studies, just one formal, derivational study exists. This present analysis of the broken plural seeks to add another derivational study to the growing literature

on the Maltese broken plural.

Chapter 2

Theoretical Background

The analysis of the Maltese broken plural to follow utilizes two frameworks, Distributed Morphology (Halle & Marantz 1993) and Optimality Theory (Prince & Smolensky 1993). What follows below are simple descriptions of the major components of both Distributed Morphology and Optimality Theory, and they are meant to convey only what is essential for understanding the analysis presented here. The reader is encouraged to consult the following sources for deeper exploration into Distributed Morphology (Embick & Noyer 2001, 2007, Bobaljik 2017, Harley & Noyer 1999, Matushansky & Marantz 2013) and Optimality Theory (Kager 1999, McCarthy 2008, Prince 2002a, Tesar & Smolensky 1998, Wolf 2008).

The latter half of this section discusses the morphemic status of the 'root' and the 'pattern', canonically two of the main components of non-concatenative morphology, also known as root-and-pattern morphology. Typically, Semitic non-concatenative morphology is considered to come about via interactions between three 'morphemes': the tri-/quadriliteral consonantal root, the vocalic melody, and the prosodic template/pattern (McCarthy 1981). In recent years, the system of root-and-pattern morphology has undergone a reanalysis (Bat-El 1994, 2001, Ussishkin 1999, 2005, Kastner 2019, 2020). The morpheme-hood of both the roots and the 'patterns' has been called into question, as has the general notion of non-concatenative morphology. Linguists have sought to bridge the gap between concatenative and non-concatenative morphology and to bring the two systems together under a single framework (Wallace 2013, Lahrouchi & Lampitelli 2014, Lahrouchi & Ridouane 2016).

2.1 Distributed Morphology

Distributed Morphology (henceforth DM) is a late-insertionist theory of morphology that makes two major assumptions about the grammar that separate it from other morphological theories. The first assumption is that there is no separate word-building entity (Lexicon) whose output is inserted into the syntax. In DM, morphology and syntax utilize the same component of the grammar. In fact, the rejection of the Lexicon is the most distinguishable tenet of DM (Siddiqi 2010).

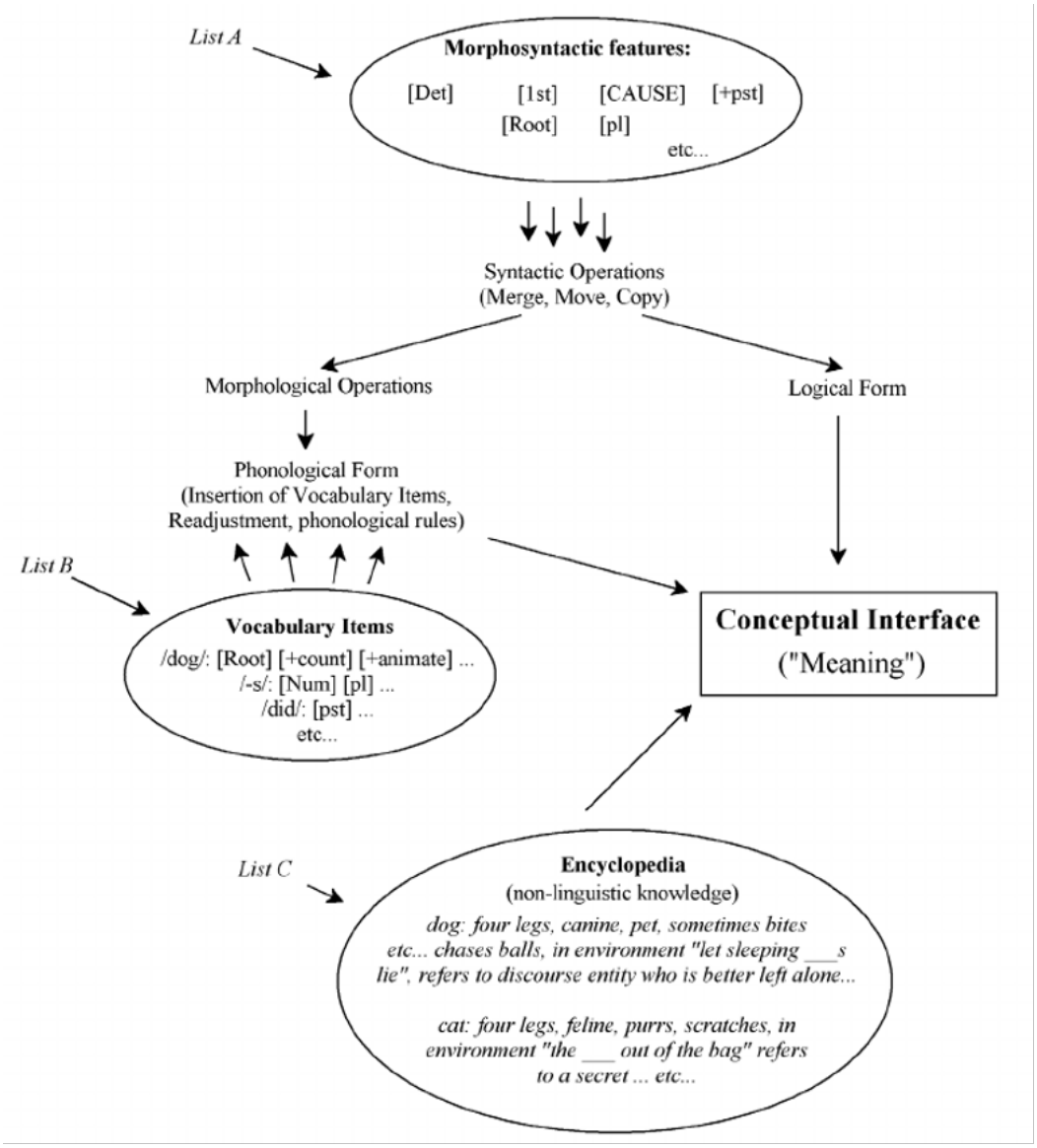


Figure 2.1: A schematic representation of Distributed Morphology, from Harley & Noyer (1999, p.3).

The second assumption about the grammar ties into the notion of late-insertion. Late-insertionist frameworks argue that the syntax and the phonology comprise

two distinct components of the grammar. In other words, the syntax is blind to phonology until the implementation of the phonological component. Halle & Marantz argue, as the name of the framework suggests, that the derivation of the fundamental components of the word, the syntax, the phonology, and the semantics, is *distributed* across the grammar. The syntax manipulates abstract features which are bundled at terminal nodes in the syntactic structure. These feature bundles relate to a list of phonological Vocabulary Items, and the Vocabulary Item that is the most specified for the bundle is inserted at Spell-Out. Simultaneously, features are interpreted semantically in a separate component of the derivation. The last phase of the derivation is the interpretation of the phonological and semantic information as they relate to extra-linguistic knowledge (Harley & Noyer 1999). These steps are represented as interaction between three Lists: List A, List B, and List C. These are expanded upon below.

2.1.1 List A: Morphosyntactic features

List A contains all of the morphosyntactic features available to a language, from tense and mood features to case features. These features are arranged in nodes on a branching structure akin to a syntactic tree (hence the shared component of the grammar utilized by the syntax and morphology). These nodes are susceptible to the syntactic operations Move and Merge and can be bundled together. Crucially at this stage, phonology has yet to be introduced; the syntax manipulates simple abstract features. In DM terminology, the content of a terminal node, be it a feature, a feature bundle, or null, is called a 'morpheme.' This differs from other theories of morphology where a 'morpheme' is a phonological, atomic element within a word. In other words, a morpheme in DM is a set of abstract features. In DM, morphemes are related to phonological forms from List B (to be discussed), and typically morphemes and their phonological counterparts exist in a one-to-one relationship.

Roots[1] are found within the innermost node of the structure and are acategorical, abstract representations of some concept. Roots are distinguished from other mor-

[1]Here, the concept of the 'root' refers to an abstract, acategorical concept, not a consonantal 'root' that is found in Semitic languages.

phosyntactic features by their notation; they are typically entirely capitalized and follow the root symbol [$\sqrt{}$], as introduced by Pesetsky (1995) (e.g., $\sqrt{\text{TREE}}$ 'tall, has leaves, photosynthesizes,' etc.). Roots aren't intrinsically assigned a lexical category. Their lexical category is determined by a (typically) local categorizing head (n, v, a). Category underspecification means that the same root can realize semantically-related words of different categories (think ***destr****oy,* ***destr****oying,* ***destr****oys,* ***destr****uction*). This also means that a root *must* combine with a categorizing head in the syntax.

The last step in this phase of the derivation is the application of morphological rules. These rules include Fission, Fusion, and Impoverishment, and operate on the terminal nodes and morphemes themselves. Noyer (1997) proposes the operation Fission as a way to split a morpheme (feature bundle) into multiple morphemes in different nodes of the structure. Fission is utilized when one morpheme realizes more than one Vocabulary Item. For example, in Spanish the morpheme [+masculine, +plural] is realized by two Vocabulary Items, [o] and [s], respectively, by way of Fission. Fusion operates in the opposite manner. Fusion combines morphemes in different nodes into a single node. Often a fused node is spelled-out as a portmanteau morph. Consider the Latin morph [ae] in *mens-ae* 'tables (nom.)', where [ae] spells out the fused features [Nom], [+plural], [-masculine]. Impoverishment, proposed by Bonet (1991), is a morphological operation that acts as a feature-deleting mechanism. The application of Impoverishment can occur in a more general context or can occur when specific features co-occur (Calabrese 1995). In the latter cases, Impoverishment acts as a filter to prevent certain feature co-occurrences, such as the first person feature and dual feature (*[1dual]) in Modern Standard Arabic (Calabrese 1995). In Arabic, there is no first-person dual realization. A universal hierarchy of features (Noyer 1992) dictates which feature is deleted by Impoverishment; in this case it is the [dual] feature that is deleted.

The intricacies of the behavior of the morphosyntactic features and of the morphological operations that act on them are worthy of much deeper exploration; however the brief outline given here should suffice for the analysis at hand. To

summarize, morphosyntactic features sit in terminal nodes of a branching structure. These features are devoid of phonology and can be bundled with one another in the same node. Syntactic and morphological operations further manipulate the structure so that the morphemes are compositionally ready for the next step in the derivation, Vocabulary Insertion.

2.1.2 List B: Vocabulary Items

List B is comprised of the phonological strings available to a language. These individual phonological units are called Vocabulary Items (henceforth VIs), and typically a VI and its corresponding morpheme (feature bundle) exist in a one-to-one relation. What this means is that a morpheme is linked to a VI on the basis of its featural composition (see List B in Figure 1). This relationship is denoted with a double-headed arrow [↔]. In DM terminology, a VI *spells-out* a morpheme. When a VI is inserted into a node, the features that are expressed by the VI are discharged. VIs are inserted into the syntactic structure until all of the features have been discharged. This phase of the derivation is called Spell-Out. However, not all Vocabulary Insertions are as straightforward. In DM, three very important notions are at play during Vocabulary Insertion: underspecification, competition, and phases.

Competition refers to the selection of one VI over another (or multiple others) at Spell-Out. Halle (1997) puts forth a fundamental principle regarding the nature of Vocabulary Insertion called the Subset Principle. It states that a VI is inserted if it matches all *or a subset* of grammatical features present in the morpheme. Therefore, a VI can be *underspecified* for a morpheme if it doesn't match all of the features of the morpheme. Underspecification drives competition between VIs. The VI that matches the greatest number of features in a morpheme (i.e., the *most* specified VI) is selected for insertion. A VI that is specified for a feature that is not present in the morpheme will not be eligible for insertion under any circumstances.

Allomorphy also relies on the principle of competition within the DM framework. Featurally identical morphemes still compete with one another for insertion via contextual specification. The concept of contextual specification proposes that the

English present tense	
[3, sg., present]	↔ /−s/
[present]	↔ /∅/

Table 2.1: Underspecification in English inflectional morphology accounts for the null morph that surfaces in all present tense inflections, barring the third person singular.

insertion of VIs can be constrained to a certain phonological or morphological environment or to a closed set of defined roots. In the latter case of contextual specification, the set of roots to which a VI is contextually specified are listed within curly brackets ({...}). It follows that allomorphs in DM are subject to the Elsewhere Condition; in the case that a given root is not contextually specified to a certain VI, a general 'elsewhere' VI is inserted.

English plural nouns	
[+plural]	↔ /∅/]$_S$ {sheep, fish, moose,...}
[+plural]	↔ /-ren/]$_S$ {child}
[+plural]	↔ /-s/ (elsewhere)

Table 2.2: Contextual specification in English nominal morphology accounts for the number of plural allomorphs in the language.

Morphemes are spelled-out in a structured way, from the innermost-embedded morpheme in the structure outward. Further, the spell-out of morphemes is governed by the boundaries of *phases*. Phases were introduced in Chomsky (2001) as part of the Minimalist Program and continue to be a hotbed of discussion within DM literature (Embick 2010, 2020, Marantz 2013). In the simplest terms, phase theory argues that syntactic structures aren't spelled-out in full, but rather sections of the structure are sent to Spell-Out in phases and the structure is spelled-out incrementally. Phasal spell-out has important consequences for the interactions between morphemes, specifically those that are non-local to one another. When a node is merged with a head that triggers a phase of spell-out, all nodes that are dominated by the trigger head are sent to be spelled-out. The internal structure of this section of the syntax becomes unavailable to the nodes above it in the structure. In essence, a morpheme can only 'see' other morphemes situated within its own phase. Although not uncontroversial, it is widely accepted that category-defining heads (those that merge with roots to assign a lexical category such as noun, verb, adjective, etc.) are heads that trigger a

phase of spell-out (Marantz 2001).

2.1.3 List C: Encyclopedia

The notion of the Encyclopedia is contested. Within the framework of DM, the Encyclopedia is a list of idioms; that is it contains a list of all of the non-compositional meanings in a language (McGinnis 2002). After the morphological operations have manipulated the nodes of the syntactic structure in the first step in the derivation, the resulting structure undergoes Vocabulary Insertion and Encyclopedic interpretation concurrently. VIs are mapped to meanings in the same way that morphemes are mapped to VIs. In addition to the meanings of individual roots (i.e., $\sqrt{\text{TREE}}$: *tall, leafy, has roots...*), idiomatic meanings and expressions are listed in the syntax (the popular example is *'kick'* in the expression *'kick the bucket'*, meaning 'to die'). The ambiguity of the Encyclopedia and its internal operations make it difficult to summarize in just a few short paragraphs. Luckily, the study at hand does not directly involve the mechanics of the Encyclopedia. The interested reader is directed to Marantz (1995), Harley & Noyer (2000), and Kelly (2013) for further discussion of the Encyclopedia.

2.2 Optimality Theory

Optimality Theory (henceforth OT) is a framework of phonological derivation that structures the phonological component of the grammar as a set of ranked constraints rather than as a series of phonological rules. The architecture of OT is arguably simple. Given a defined phonological input, a list of potential candidate forms is generated. From this list, the central mechanism that drives OT, which can be imagined as a series of powerful filters, allows only the most grammatically and phonologically well-formed candidate form, the *optimal* form, through. It is assumed that these mechanisms are not language-specific; within the OT framework, all languages utilize the same constraints, however the order in which these constraints apply to the list of candidates varies, giving rise to language variation. Each of these mechanisms, coined Gen, Con, and Eval, will be briefly detailed in turn. For a deeper discussion into the function of these actors, the reader is referred to (Kager 1999, McCarthy 2008,

Prince 2002a, Tesar & Smolensky 1998, Wolf 2008).

2.2.1 Gen: The generator

The role of Gen is to produce the list of candidates to be considered for evaluation. Gen operates under the property known as the 'freedom of analysis,' which states that there is no linguistic restriction to the candidates that are generated by Gen, regardless of the input (McCarthy 2007). In theory, Gen can generate infinitely many candidates for consideration, even though only one will be the most optimal. A sample OT tableau has been recreated in Table 2.3. All OT analyses are schematized this way, and the candidate set always appears in the leftmost column under the input, which has been bolded. Consider the candidates that Gen has generated.

bop-in	Con1	Con2	Con3	Con4
a. bopin				
b. bobin				
c. pumin				
d. æɮʁɳɔ̯æ				

Table 2.3: Gen generates infinitely many candidates, regardless of the input (top-left corner).

This property of 'freedom of analysis' is perhaps the most controversial component of OT. The overgeneration of candidates that 'freedom of analysis' allows captures every phonological distinction possible between candidates, especially at the featural level. In theory, every candidate forms a minimal pair with (at least) one other candidate. Candidates (a) and (b) differ only in the voicing of the second bilabial plosive. In fact, candidate (a) is identical to the input. This candidate is known as the *faithful candidate*. The type of language that selects candidate (b) is one that favors intervocalic voicing of consonants, whereas the type of language that selects candidate (a) is one where intervocalic voicing of consonants isn't as active. Overgeneration ensures that both of these candidates are available to compete for selection.

Candidate (c) is quite distinct from candidates (a) and (b), although it's still a plausible optimal candidate, given the input. A language that selects candidate (c)

is one that exhibits intervocalic nasalization of stops, vocalic height harmony, and perhaps word-initial devoicing of consonants. The criticism of 'freedom of analysis' is exemplified by candidate (d). There is no restriction on Gen that prevents the generation of candidates like (d). Even though candidates like (d) will be undoubtedly 'filtered out' by the constraints (to be discussed in the next subsection), it begs the question of how much cognitive processing is needed and utilized when generating a potentially infinitely long candidate set. Proposals abound for restrictions on the generating power of Gen, in some cases adjusting the architecture of OT quite drastically (McCarthy 2007, de Lacy 2007, among others); however, for the sake of the analysis at hand, the issue of overgeneration will not be discussed further.

2.2.2 Con: The constraints

Con is the set of ranked constraints in the architecture of OT and is the cornerstone of the framework. Constraints can be described according to the nature by which they constrain candidates, *markedness* constraints versus *faithfulness* constraints, and by their universality in application, *universal* constraints versus *language-specific* constraints. Each of these concepts will be discussed below in turn.

In general, constraints are split into two types: markedness constraints and faithfulness constraints. Although markedness constraints and faithfulness constraints are of equal consequence in OT (i.e., one is not 'stronger' than another), they relate to the candidate set in different ways. Markedness constraints regulate the general phonological well-formedness of the candidates. For example, markedness constraints can govern consonant cluster membership, stress assignment, and moraic composition of syllables. Faithfulness constraints, on the other hand, regulate the relationship between candidates and the input. As the name implies, faithfulness constraints are meant to restrict phonological deviation of candidates from the input. Two classic faithfulness constraints, Dep (Do not EPenthesize) and Max (preserve MAXimally), are perhaps the most restrictive. Dep prohibits the insertion of extra material not found in the input, whereas Max prohibits the deletion of any string present in the input (McCarthy & Prince 1995). Faithfulness constraints do a lot of

the work of whittling down the candidate set (think of candidate (d) in 2.3 compared to the input).

Tied into the notions of markedness and faithfulness are the notions of universal constraints and language-specific constraints. To start, these terms can be misleading. As stated previously, the core strength of Con is that it is universal. All constraints are found in all languages, be they universal or language-specific constraints. This is accounted for by ranking the constraints; extremely low-ranked constraints are considered inactive in a language. Universal constraints are those that are general enough to operate across a variety of languages (i.e., NoCoda: syllables must not have codas). In contrast, language-specific constraints are tailored to a specific language or group of languages within the same language family (i.e., e-Depal: Consonants must be hard before [ɛ], Ukrainian, Rubach 2005). The line between universal and language-specific constraints is a blurry one, but typically analyses that utilize more universal constraints tend to be stronger than those that rely on language-specific constraints. Variation between languages arises by ranking the constraints; every language (and possibly dialect) has a unique constraint ranking.

Con is also responsible for the ranking of constraints. A constraint that is ranked higher than another is said to dominate that constraint. This relationship is written notationally 'C1 $\gg$ C2', read 'C1 dominates C2'. Two sample mini-tableaux are displayed in 1.4.

bop-in	Max	NoCoda
☞ a. bopin		*
b. bobi	*!	

bop-in	NoCoda	Max
a. bopin	*!	
☞ b. bobi		*

Table 2.4: These two tableaux demonstrate how a difference in constraint ranking can yield a different optimal candidate.

These mini-tableaux have an identical input, candidate set, and constraint inventory. In this case, Con is made up of two constraints, one markedness constraint

and one faithfulness constraint. The evaluation of candidates will be discussed in the following subsection, but what is important here is the ranking of the constraints Max and NoCoda. The highest-ranked constraint is the left-most constraint in the tableau. Ranking the constraints differently (Max ≫ NoCoda in the first tableau and NoCoda ≫ Max in the second tableau) yields a different optimal candidate. A tableau with a highly-ranked faithfulness constraint (Max) will yield an optimal candidate that is more similar to the input. The ☞symbol marks the optimal candidate.

As the constraint inventory of Con grows larger, the analysis becomes more intricate. Most analyses will display just five or six constraints per tableau at a time, but it is important to remember that these constraints are just snippets of a much larger Con that is representative of the language in its entirety. Ashley et al. (2010) tabulated that between 1995 and 2008, linguists published in four journals had proposed 1,666 phonological constraints, a little more than half of which (54%) were markedness constraints. These constraints range from universal constraints to language-specific constraints. Assuming all languages have the same inventory of constraints ranked in different orders, one may be curious to know just how large Con truly is and how much cognitive processing power is involved in the ranking process/re-ranking process as language evolves. These are intriguing questions, but ones that won't be discussed further here.

2.2.3 Eval: The evaluator

The role of Eval is self-explanatory: Eval runs the candidates through the constraint set to determine the optimal candidate. The candidates are evaluated in relation to whether or not they violate a constraint and, if so, how many times they violate the constraint. The optimal candidate isn't necessarily one that doesn't violate any constraints at all; it is the one that violates the highest-ranked constraints the *least*. Every candidate is evaluated concurrently and incrementally, starting with the higher-ranked constraints and moving toward the lower-ranked constraints. A candidate is eliminated if it violates a constraint, and a candidate can violate a

constraint multiple times.

A sample tableau has been created to demonstrate how Eval narrows down the candidate set to select the optimal candidate as the output. The constraints in this tableau have all been identified previously, barring NoOnset (a syllable must not have an onset). Syllable boundaries are marked with [.].

bop-in	Dep	Max	NoCoda	NoOnset
☞ a. bo.pin			*	
b. bop.in			**!	
c. bo.pi		*!		
d. bo.pi.ni	*!			

Table 2.5: A sample tableau showing how Eval selects the optimal candidate from a candidate set. A broken line between candidates indicates that a candidate on either side of the line can be ranked before the other without consequence to the selection of the optimal candidate.

Five candidates are competing to be the optimal candidate in this tableau, and syllable boundaries have been marked for each candidate. The constraints are ranked Dep ≫ Max ≫ NoCoda ≫ NoOnset. Eval begins by running the candidates through the highest ranked constraint, Dep. Dep assigns one violation for every phonological string found in the candidate but not in the input. Candidates (d) and (e) each have an epenthesized [i], so they are each assigned one violation mark (*). Since candidates (a), (b), and (c) don't violate Dep, candidates (d) and (e) are eliminated, shown here with an exclamation mark (!). The three remaining candidates are now evaluated against the second-highest-ranked candidate, Max. Max assigns a violation for every phonological string in the input that does not surface in the candidate. Candidate (c) deletes the final [n] from the input and is the only candidate to delete a string from the input, so it gets one violation and is eliminated (*!). Candidates (a) and (b) remain, so they are evaluated against the next-highest-ranked constraint, NoCoda. NoCoda assigns one violation for every syllable that has a coda. Both (a) and (b) violate NoCoda, but (b) violates NoCoda twice. The second violation assigned to (b) is considered fatal; it causes (b) to be eliminated, which means candidate (a) is the optimal candidate, shown with the pointing finger graphic (☞).

Figure 2.5 reiterates the importance of the constraint ranking. An observant reader would note that candidate (a) violates the lowest-ranked-constraint (NOONSET) twice, while candidate (b) only violates it once. Although this is true, it has no effect on the selection of the optimal candidate. Once the candidate set has been narrowed down to a sole candidate, EVAL stops evaluating. It doesn't matter if candidate (a) violates NOONSET a thousand times; it still violates the previously ranked constraint fewer times than candidate (b).

A final few notes about the tableau design is in order. Once a candidate has been eliminated, the rest of the cells in the tableau that follow the fatal violation are grayed out. Further, sometimes the ordering of a pair or triplet of constraints does not have an effect on the selection of the optimal candidate. For example, DEP and MAX in 2.5 could be swapped in ranking order and candidate (a) would still be selected. For this reason, the line on the tableau between DEP and MAX is dashed, rather than solid (as noted above). Other notational conventions exist, but these will suffice for the analysis to come.

2.3 A combined approach

The aims of this study are to describe a derivational framework of the Maltese broken plural that derives the plural form from the root and also to account for the prosodic variation that surfaces among the broken plural forms. To achieve this, the basic frameworks of both DM and OT will be utilized alongside one another. The broken plural will be represented syntactically, with VIs spelling out the morphemes found in the terminal nodes of the structure. From here, the analysis departs from traditional DM analyses. The VIs, that is, the phonological outputs of Spell-Out, serve as the *input* in an Optimality-Theoretic phonological derivation. They will be represented in the input as **[**morph$_1$**,** morph$_2$**, ...]**, and GEN will generate a candidate set. CON will contain a special constraint called CONTIGUITY that will allow for the morphs to be combined non-concatenatively, thus resulting in broken plural forms. The analysis will be sketched out in more detail in Chapter 4.

The advantage of combining DM and OT is that neither framework is alone

able to capture the intricacies of the Maltese broken plural. The DM framework is able to treat the allomorphy that arises across broken plural forms while also accounting for the separate derivation of the sound plurals. The OT framework offers a solution to the issue of non-concatenative morphology that is often the elephant-in-the-room within the DM literature (Bye & Svenonius 2012, Bruening 2017 address these shortcomings). The DM framework employs an extremely strong component at the end of the derivation called 'readjustment rules'. Readjustment rules apply post-Spell-Out and can be triggered "...on certain Vocabulary Items by some aspect of the morphosyntactic context...," (Haugen 2015). The ambiguity in this description (i.e., readjustment rules can be triggered by essentially any VI) is exactly the reason why readjustment rules are so controversial within the DM literature. They operate, in essence, without restriction. In fact, Bermúdez-Otero (2012) remarks that readjustment rules "utterly destroy the empirical content of morphological and phonological hypotheses," and this sentiment is shared by not an insignificant few (Harley & Noyer 2000, Siddiqi 2006, Haugen & Siddiqi 2013). For this reason, the present analysis opts for an OT derivation of the phonological material, rather than relying on readjustment rules.

2.4 Root-and-pattern morphology

Root-and-pattern morphology, also sometimes referred to as templatic morphology, is canonically considered to consist of three interacting players: the consonantal root, the vocalic melody, and a template/CV-skeleton (McCarthy 1981, McCarthy 1983, Levin 1983, Yip 1983, McCarthy & Prince 1990). An example of this type of analysis is Prosodic Morphology (McCarthy & Prince 1986), sketched in Figure 2.2.

In this view, the root and the vocalic melody sit on different 'tiers' and are associated to one another on the basis of autosegmental principles (Goldsmith 1976). In the derivation in Figure 2.2, the root morph *ktb* contributes the semantic meaning of 'writing', the vocalic melody {a,a} contributes mood and tense features, and the 'pattern' CVCCVC contributes a causative reading. Thus, within the Prosodic Morphology framework, a verb consists of no less than three morphs: the root, the

Figure 2.2: A schematic of the Arabic verb *kattab* ('cause to write') within the Prosodic Morphology framework (McCarthy 1983, p.290).

melody, and the pattern.

In recent years, the types of analyses of Semitic root-and-pattern morphology like Prosodic Morphology have been scrutinized. In particular, both the notion of the 'root' and the notion of the 'pattern' have been called into question. In the following subsections, these debates will be briefly spelled out. The present study takes the stance that indeed the basic unit of words in Semitic morphology (and in Maltese specifically) is the consonantal root. The 'pattern', however, is argued to be epiphenomenal; the prosodic structures that surface after the derivation are a consequence of the underlying interactions between the vocalic melody and the consonantal root. Therefore, the constituent structures in word derivation in Maltese are the root and the vocalic melody.

2.4.1 The role of the root

The root in terms of Semitic morphology is a discontinuous morph composed of (usually) three or four consonants that surface in a fixed linear order. The root provides a basic semantic meaning that is further expanded upon via intervening vowels and servile consonants and via affixes. Semantically related words share a common consonantal root, as shown in the Modern Hebrew example in Table 2.6.[2]

The verbal and nominal derivations of $\sqrt{\text{SGR}}$ here share a general meaning of 'closing', yet each word form has a unique, specific meaning related to 'closing'. This is achieved by the variation in vocalic melodies ({a,a}, i, {a,e}, {e,e}, o, e) and by

[2]It needs to be said that it is not always the case that words with a shared root are semantically related. Consider the verbal derivations of the Maltese root $\sqrt{\text{ĦRĠ}}$: *ħareġ* 'to exit', *tħarreġ* 'to train'.

affixation of various affixes and servile consonants ([hi-], [hi-,-t-], [-ayim], [mi-,-et]). Importantly, in each of these word forms the consonantal root $\sqrt{\text{SGR}}$ surfaces in *linear order* (cf., $\sqrt{\text{SRG}}$ ***sarag*** 'to be intertwined').

$\sqrt{\text{SGR}}$	Derived word	gloss
(a) verb	***sagar***	'to close'
(b) verb	*hi**sgir***	'to extradite'
(c) verb	*hi**stager***	'to cocoon oneself'
(d) noun	***seger***	'closure'
(e) noun	***sogr**avim*	'parenthesis'
(f) noun	*mi**sgrr**et*	'frame'

Table 2.6: Words derived from the Modern Hebrew root $\sqrt{\text{SGR}}$ share a semantic meaning of 'closing' (Harley 2014).

Opponents of the root-based approach to Semitic word formation opt instead for word-based approaches to word formation (Bat-El 1994, 2001, Ratcliffe 1998, Ussishkin 1999, 2000, 2005). These approaches differ from traditional analyses of non-concatenative Semitic morphology in that the 'base' from which word forms are derived is itself a prosodic word as opposed to a consonantal root. In this view, derived forms are built from the base utilizing the principles of Maximality (Itô 1989) and Template Satisfaction (McCarthy & Prince 1990) to produce phonologically sound word forms (Bat-El 1994). Critics of the word-based approach to Semitic morphology find weakness in identifying what exactly constitutes a 'base' form, especially in instances where a 'derived' word is built from a base that isn't attested in the surface representation (e.g., Arabic $\sqrt{\text{ṢLW}}$ *ṣallā*, Form II 'to pray', **ṣalā*, Form I).

The computational studies outlined in the previous Chapter proposed that the morphology of Maltese is split; inflectional forms are stored as whole-word forms and derivational forms are stored as morphemes. Under this view, inflectional morphology and derivational morphology are treated differently in the morphological component of the grammar. This argument is incompatible with the Distributed Morphology analysis that will be presented in Chapter 4. In Distributed Morphology, the distinction between inflectional morphology and derivational morphology is non-existent. In this framework, the morphosyntax is responsible for manipulating both 'types' of morphology. In essence, the distinction between derivational and inflectional

morphology is of little consequence in Distributed Morphology. This study aligns with the psycholinguistic studies in that it argues that the root-as-morpheme system is active in the grammar. The discrepancy between the study at hand and the psycholinguistic studies regards how much of the grammar is organized in this way.

Objectively, the strongest evidence for the root-as-morpheme argument comes from Prunet et al. (2000) and their study of an aphasic Arabic-French bilingual called 'ZT'. The authors tracked the speech errors produced by ZT in Arabic and in French and compared the two groups of speech errors (Arabic vs. French) using qualitative and quantitative metrics. The authors found that ZT produced far more consonant-metathesis errors in Arabic than in French, a phenomenon that is argued to support the notion that Arabic consonants 'float' (i.e., as a root morpheme), whereas French consonants are anchored. Furthermore, the authors found that ZT's metatheses in Arabic only involved root consonants. Consonants in prefixes and suffixes were never metathesized with one another or with root consonants. Likewise, vowels were never metathesized. What this suggests is that ZT's metatheses in Arabic do not operate across morpheme boundaries but are instead limited to the consonants available within the morpheme boundaries.

To avoid further tangential discussion, the reader is left to draw their own conclusions on the root-as-morpheme debate, although it is hoped that the elicited data reported in Prunet et al. (2000) skews readers in favor of the root-as-morpheme stance. The present study identifies the root as a morpheme and will treat it as such. This is especially important in the DM stage of the derivation. Leaving behind the discussion of the root, focus now shifts to the other component of root-and-pattern morphology, the pattern.

2.4.2 The role of the pattern

The other component of root-and-pattern morphology is, of course, the pattern. The pattern is also called the 'template' or the 'skeleton' and essentially the scaffolding that the root and the vocalic melody attach to. Patterns exist for verbs, nouns, adjectives, and basically anything root-derived.

$\sqrt{\text{KTB}}$	Pattern	Derived word	gloss
(a) verb	CaCaCa	***k*a*t*a*b*a**	‘to write’
(b) verb	Ca:CaCa	***k*a:*t*a*b*a**	‘to exchange letters’
(c) verb	istaCCaCa	*ista****k****ta****b****a*	‘to cause to write (something)’
(d) noun	maCCaC	*ma****k****ta****b***	‘office’
(e) noun	maCa:CiC	*ma****k****a:****t****i****b***	‘offices’
(f) noun	CiCa:C	***k*i*t*a:*b***	‘book’
(g) noun	CuCuC	***k*u*t*u*b***	‘books’
(h) noun	Ca:CiC	***k*a:*t*i*b***	‘author’

Table 2.7: Words derived from the Arabic root $\sqrt{\text{KTB}}$ in various patterns.

The patterns are composed of a CV prosodic structure and occasionally with servile consonants and vowels (c-e in 2.7). The appeal of defining patterns is that in theory every root that ‘fits’ into a given pattern will share an identical grammatical function or meaning. For example, the Arabic root $\sqrt{\underline{\text{K}}\text{ZN}}$ fits into the pattern in (d), yielding *ma*$\underline{k}$*zan* ‘storeroom’. Thus, the pattern maCCaC can have a loose interpretation of ‘somewhere where X is done’.

The analysis presented in McCarthy (1981) proposes the pattern as a morpheme, and this has been taken to be the standard until recently. Rather than being considered a fully-fledged morpheme, the ‘pattern’ is instead reanalyzed as epiphenomenal (Tucker 2011b, Bye & Svenonius 2012, Wallace 2013, Kastner 2016, 2019, 2020, Kastner & Tucker 2020). Most of these studies argue that (in simple terms) the thing that grammatically separates non-concatenative morphology and concatenative morphology is a constraint Contiguity that, based on its ranking relative to other constraints, dictates whether or not the phonological strings that make up a particular morph can surface as non-adjacent to one another. A language that ranks Contiguity relatively low will allow for morphs to be interleaved with one another, like what is seen in Semitic languages. In essence, the ordering of morphs and their constituent parts is governed by phonotactics, not by an abstract ‘template’ morph.

The advantages of the template-as-epiphenomenon approach are not insignificant. The biggest advantage is that the elimination of the template morph closes the gap between the Semitic languages and other language families. Typologically, it seems odd that only a handful of the world’s languages have developed a morphological

system that utilizes a 'template' morph. Non-concatenative morphology abounds in the world's languages (e.g., reduplication in Sakha, a Turkic language, infixation in Tagalog, etc.), yet these languages aren't associated with root-and-pattern morphology. By positing phonotactic constraints in lieu of a template morph, the Semitic languages can be analyzed in the same way that these other languages are analyzed, and without exception. Furthermore, the template-as-morpheme approach is redundant when paired with phonotactic constraints. If a language forbids complex onsets, a triliteral root $\sqrt{\text{CCC}}$ and a vocalic melody {v,v} can only be configured in one way (CvCvC). Universal constraints can do the same work as templates.

Lastly, a final critique of the template-as-morpheme approach is its ability to over-generate forms. In Arabic, there are ten verbal templates (fifteen templates if rare forms are included) to which triliteral roots can attach. Of the thousands of roots that exist in Arabic, none combine with each of the ten common verb form templates. In fact, most roots in Arabic take just two or three forms. By instead treating the template as the result of interacting constraints, the storage space in the grammar and the computing power necessary to accommodate the numerous 'template' morphs is alleviated. Further, the problem of over-generation is eliminated.

These ideas will be fleshed-out in greater detail in the OT analysis in Chapter 4, but for the moment the reader is encouraged to consider the advantages of viewing the template as epiphenomenal, as opposed to the traditional template-as-morph view. The present analysis will take the template-as-epiphenomenon approach, and will regard any 'templatic' effects as interactions between phonotactic constraints.

2.5 Summary

The present analysis will utilize the frameworks of both Distributed Morphology and Optimality Theory to model the derivation of the Maltese broken plural. Distributed Morphology is a late-insertionist framework that argues against the notion of the lexicon and instead posits a theory of word formation that distributes the realization of various components of the word across the grammar. Optimality Theory is a theory of phonological derivation that visualizes the grammar as a set of ranked

constraints as opposed to numbered rules. The output of the DM derivation, the Vocabulary Items, serves as the input to the Optimality Theoretic portion of the derivation. Ranked constraints operate on the root and the vocalic melody to derive the attested broken plural forms of Maltese. Crucially, this analysis argues *for* the root-as-morph approach and *against* the template-as-morph approach. The following chapter outlines the broken plural data set in detail in preparation for the analysis at hand.

Chapter 3

The Data Set

For the study at hand, a list of broken plural nouns and adjectives was culled from Schembri (2006) and Mayer et al. (2013) for analysis (see Appendix 1 for the complete list of broken plurals used in this study). In total, 587 unique broken plurals were identified,[1] 314 (53.5%) of which are non-loan words. From each of these broken plural forms, a tri- or quadri-consonantal root was extracted. Roots were identified for loan words, a process that is described in the following subsection. From the 587 broken plural forms, 577 unique roots were extracted. Some roots can be expressed as two or more different broken plural forms (e.g., $\sqrt{\text{ZPP}}$ *zopp* → *zpup* ∼ *zopop* 'lame person/people'), which is why there is a discrepancy between the number of broken plural *forms* and their corresponding *roots*.

Roots were further divided into triconsonantal roots[2] (n=449, 77.8%) and quadri-consonantal roots (n=128, 22.2%). Each root was tagged for the type of prosodic structure in which its corresponding broken plural surfaces. For triconsonantal roots, six possible prosodic structures are possible:[3] 1v2v3, 12vv3, 12vjjv3, 12vv3v, 1v23v, and v123v. For quadri-consonantal roots, three prosodic structures are possible: 12vv3v4, 12vv2v3, and 1wvv2v3. A keen reader would note that the latter two prosodic structures listed only have slots for roots with three consonants only, not four. Some triconsonantal roots (n=56) display medial consonant reduplication in the broken plural (e.g., ***salib*** → ***slaleb***, 'cross/es'). Additionally, there are some

[1] Schembri (2006) began with a much larger list of plurals, but her final list was narrowed down via usage surveys disseminated around Malta. Words that were considered archaic were eliminated from her final list, which this study adapts.

[2] Some roots in the triconsonantal group may be considered biconsonantal. This discussion is taken up in Section 3.2.3.

[3] In these prosodic structure representations, each number corresponds to a different root consonant, and *v* corresponds to any vowel (e.g., $\sqrt{\text{TRQ}}$ → 1v2v3 → *toroq* 'streets').

triconsonantal roots (n=10) that surface with the glide consonant /w/ between the first and second radical consonants (e.g., ***tapit*** → ***twapet***, 'carpet/s'). In each case, these broken plurals surface with an identical prosodic structure to the broken plurals of true quadri-consonantal roots (CCVCVC). To reduce confusion, the former six forms will be said to belong to a group of triconsonantal *forms*, whereas the latter three forms belong to a group of quadri-consonantal *forms*. Each form will be discussed separately in the following subsections.

Type	**N**	**Total**	**%**	**Example**	**gloss**
Non-loan forms	314	587	53.5%	*qlub*	'hearts'
Loan forms	273	587	46.5%	*ktieli*	'kettles'
Triliteral roots	449	577	77.8%	$\sqrt{\text{KTB}}$, *kotba*	'books'
Quadriliteral roots	128	577	22.2%	$\sqrt{\text{DNFL}}$, *dniefel*	'dolphins'
Tricons. forms	392	587	66.8%		
1v2v3	167	392	42.6%	*forom*	'shapes'
12vv3	119	392	30.4%	*xmux*	'suns'
12vjjv3	43	392	11.0%	*xmajjar*	'rivers'
12vv3v	38	392	9.7%	*ħbula*	'ropes'
1vv23v	12	392	3.1%	*ġonna*	'gardens'
v123v	12	392	3.1%	*ibħra*	'seas'
Quadri-cons. forms	194	587	33.3%		
12vv3v4	127	194	65.5%	*frieket*	'forks'
12vv2v3	56	194	28.9%	*dbabar*	'ulcers'
1wvv2v3	10	194	5.2%	*żwiemel*	'horses'

Table 3.1: Some statistics of the broken plural data used in this study.

3.1 Loan Words

One of the hallmarks of the Maltese broken plural construction is its relative productivity with nouns that have been loaned from Romance languages, English, and to an extent, other Semitic languages.[4] In fact, of the 587 unique broken plural forms that have been compiled for this research, 273 of those forms are loan words (46.5%); 174 of loans are of Romance origin (Italian, Sicilian, French, Latin, etc.), 15 loans come from English, and loans from other Semitic languages round out the total. Given that pluralization via the broken plural construction is overall quite rare in Maltese

[4]The 'loan' status of these Semitic-origin words is a bit of a slippery slope because one could argue that words loaned-in from Arabic to Maltese, a language evolved from an Arabic dialect, were simply part of the lexicon in the first place. In any case, each of the Semitic loans in the broken plural data set have been included after careful evaluation of historical etymologies.

(Borg & Azzopardi-Alexander 1997 estimate that just one tenth of plurals are formed this way), it is surprising that almost half of all attested broken plural forms come from words loaned-in from other languages. Thus, the treatment and analysis of loan words that take broken plural forms must be addressed. The process of theorizing consonantal roots from loan words is detailed below, with a special spotlight on loan words with consonant clusters.

3.1.1 Loan word status

The complex linguistic history of Maltese makes the task of assigning 'loan word' status to certain forms daunting. Luckily, the literature tracing the etymological history of the Maltese lexicon is quite rich (Aquilina 1972, Borg 1978, Gatt 2020). To assess the loan word status of each word in the data set, words were first searched on Ġabra, the online dictionary (Camilleri 2013). If a root was listed for a given word, that word was immediately rejected from loan-word consideration. For words that didn't have a root listed on Ġabra, their dictionary entries were accessed (Aquilina 1999). Aquilina's dictionary entries explicitly list if a given word is a loan and from which language(s) the loan is borrowed, if available. The table below breaks down the data by loan word origin.

Origin language(s)	**N in data**	**% of loan word data**
Mainland Italic (Italian, Calabrian)	86	30.9%
Sicilian	81	29.1%
Arabic (Levantine, North African)	70	25.6%
English	15	5.4%
Other Romance (Latin, French)	7	2.5%
Berber	2	0.7%
Mixed/unclear	12	4.4%
Total	273	100.0%

Table 3.2: Loan words with internal pluralization by linguistic origin.

3.1.2 Identifying loan word roots

In Semitic languages, the integration of a loan word into the grammar of an adoptive language can be assessed by examining the degree to which the loan word makes productive use of the root-and-pattern system of word derivation. Smeaton (1973) writes on this very idea with regard to loan word integration in Arabic: "[A] Word

[is] fully naturalized into the Arabic morphological system: if a noun, with internal pluralization. . . " (p. 61). With regard to Romance loan verbs in Maltese, Mifsud (1995) takes a similar stance in outlining the three-stage process by which loan verbs become fully integrated into the Maltese inflectional system, culminating in the final stage of the process in which a newly-formed 'loan' root is "...building up new forms according to the derivational mechanism of SM [Semitic Maltese], normally subjecting them to the SM inflexional morphology." (p. 55). To this end, it can be argued that loan nominals that are pluralized via internal pluralization can be regarded as *more* integrated into the root-based morphological system than loan nominals that are pluralized via concatenative suffixes. In the former case, the Semitic speaker must isolate a tri- or quadri-consonantal root morpheme that is capable of being manipulated in a way that produces a broken plural form. Therefore, it can be argued that loan nominals that are pluralized internally must have a discernible root that speakers are able to access during the pluralization process.

As to be expected, the dictionary entries of loan words identified in Aquilina (1999) and in Ġabra, the online dictionary (Camilleri 2013), do not explicitly list or identify a 'loan' root for nominals that are pluralized internally. Therefore, in this study loan roots for these nominals were theorized via analogy with existing broken plural roots in the data set. The two most important factors in identifying analogous existing roots were the prosodic structures of both the singular and plural forms and the occurrence of unique consonants in both the singular and plural forms. Table 3.3 below outlines the seven attested broken plural forms. It compares forms in the loan word data with existing non-loan broken plurals of comparable prosodic structure type. The proposed loan root is listed in the final column alongside existing roots. These seven prosodic structure 'templates' were applied to the rest of the loan data to yield predicted roots for most of the loan forms.

[5]Some of the roots that belong to this type are analyzed as biconsonantal and will be discussed later on in this Chapter.

[6]Although an exact broken plural form of this type doesn't exist in the non-loan data, a similar form *martell* is presented to justify the correspondence of a final geminate consonant to a singleton final radical in the root.

Prosodic structure	Examples	gloss	Root
1v2v3	(L) *xall* → *xalel*	'scarf/ves'	$\sqrt{\text{XLL}}$
	(N) *zopp* → *zopop*	'lame person/pl.'	$\sqrt{\text{ZPP}}$
	(L) *pinna* → *pinen*	'pen/s'	$\sqrt{\text{PNN}}$
	(N) *fidda* → *fided*	'silver/pl.'	$\sqrt{\text{FDD}}$
12vv3	(L) *vers* → *vrus*	'verse/s'	$\sqrt{\text{VRS}}$
	(N) *belt* → *bliet*	'city/ies'	$\sqrt{\text{BLT}}$
	(L) *bir* → *bjar*	'well/s'	$\sqrt{\text{BJR}}$
	(N) *but* → *bwiet*	'pockets/s'	$\sqrt{\text{BWT}}$
12vjjv3[5]	(L) *reġina* → *rġejjen*	'queen/s'	$\sqrt{\text{RĠN}}$
	(N) *rokna* → *rkejjen*	'comer/s'	$\sqrt{\text{RKN}}$
	(L) *skola* → *skejjel*	'school/s'	$\sqrt{\text{SKL}}$
	(N) *flus* → *flejjes*	'money/pl.'	$\sqrt{\text{FLS}}$
12vv3v	(L) *banda* → *bnadi*	'side/s'	$\sqrt{\text{BND}}$
	(N) *xibka* → *xbieki*	'fishing net/s'	$\sqrt{\text{XBK}}$
	(L) *sala* → *swali*	'hall/s'	$\sqrt{\text{SWL}}$
	(N) *xini* → *xwieni*	'galley/s'	$\sqrt{\text{XWN}}$
12vv3v4	(L) *barbun* → *braben*	'flounder/s'	$\sqrt{\text{BRBN}}$
	(N) *betbut* → *btiebet*	'reed pipe/s'	$\sqrt{\text{BTBT}}$
	(L) *karfusa* → *krafes*	'celery/pl.'	$\sqrt{\text{KRFS}}$
	(N) *qanpiena* → *qniepen*	'bell/s'	$\sqrt{\text{QNPN}}$
12vv2v3[6]	(L) *buzzell* → *bziezel*	'block/s with pulleys'	$\sqrt{\text{BZL}}$
	(N) *qartalla* → *qratel*	'wicker basket/s'	$\sqrt{\text{QRTL}}$
	(L) *bekkum* → *bkiekem*	'spidershell/s'	$\sqrt{\text{BKM}}$
	(N) *geddum* → *gdiedem*	'lower jaw/s'	$\sqrt{\text{GDM}}$
1wvv2v3	(L) *tapit* → *twapet*	'carpet/s'	$\sqrt{\text{TPT}}$
	(N) *difer* → *dwiefer*	'nail/s'	$\sqrt{\text{DFR}}$

Table 3.3: Loan words (L) are assigned a root via analogy to the prosodic structures of non-loan words (N).

3.1.3 Loan word roots from forms with word-initial clusters

Perhaps the biggest challenge of integrating loan words of Romance origin into the root-and-pattern system of the Semitic languages is accommodating the consonant-rich nature of Romance words to the tri- and quadri-consonantal root system. Different languages approach this problem in different ways. In Arabic, for example, adapting the loan word phonology to Arabic morphophonotactics is more important than preserving the structure of the loan word from the language in which it originated. The most obvious (and most common) technique for integrating longer loan words is to simply eliminate syllables at the periphery of the word until the desired consonant

count (three or four) is achieved ("refinery" > *fāinarī*, "concrete" > *kankrī*, "hospital" > *sbaitāl*, Smeaton 1973, p. 86).

Maltese takes a different approach to loan word integration. As the bulk of the Maltese loan-word inventory is comprised of loans from Italian and Sicilian, the grammar has to face the additional challenges of gemination and consonant clustering. Maltese overcomes these challenges by reinterpreting just what constitutes a single radical in tri- and quadriliteral roots. Traditionally in the Semitic morphophonological system, a single phonemic consonant is mapped to a single radical position in the root. Triliteral roots are comprised of three consonants, and quadriliteral roots are composed of four consonants. When integrating polyconsonantal loan words into the Semitic morphological system, rather than truncating the loan word (as is done in Arabic), Maltese prefers to squeeze all of the consonants into the tri- and quadriliteral root consonant slots. This results in consonant clusters occupying individual radical slots in the root (e.g., Italian *scalpello* 'chisel' > Maltese *skarpell* → *skriepel* $\sqrt{\underline{\text{SK}}\text{RPL}}$). These resulting clusters act as a single consonantal unit in the root and cannot be split apart when undergoing morphological operations (internal pluralization, for example) (Mifsud 1995).

A simple diagnostic was performed on the loan word dataset in order to determine if word-initial clusters were to be treated as individual consonants or as a single consonantal unit. Albeit simple, this step is quite important because of the 587 unique broken plural forms in the dataset, 394 (67%) forms contain a word-initial cluster. The majority of these forms are Semitic in origin and thus cannot be interpreted as having a word-initial cluster that acts as a single consonantal unit. Instead, the clusters in these forms are overwhelmingly just a clustering of the first and second radicals of the root at the beginning of the broken plural form that otherwise don't cluster in the singular form. Thus, if an identical word-initial cluster surfaced in both the singular and plural forms of the same lemma, it was considered a cluster acting as a single consonantal unit in the root.[7] This is illustrated in Table 3.4.

[7]Cluster Fusion: If an onset cluster in a fully-integrated loan word is identical in composition and placement in both the singular form and plural form of the same lemma, the consonant cluster

Singular	Plural	gloss	Proposed root
(a) ***bl**okka*	***bl**okok*	'block/s'	$\sqrt{\underline{\text{BL}}\text{KK}}$
(b) ***gw**erra*	***gw**erer*	'war/s'	$\sqrt{\underline{\text{GW}}\text{RR}}$
(c) ***gv**erta*	***gv**ieret*	'blanket/s'	$\sqrt{\underline{\text{GV}}\text{RT}}$
(d) ***tr**inka*	***tr**inek*	'trench/es'	$\sqrt{\underline{\text{TR}}\text{NK}}$

Table 3.4: Cluster-initial loans with triliteral roots.

The identical word-initial consonant clusters in the singular and corresponding broken plural forms have been bolded in the table above, and the corresponding cluster acting as a single consonantal unit in the root has been underlined. At a glance, one could be tempted to argue that there is no need to muddy the water with talk of consonant clusters acting as single consonantal units. After all, by looking at the data above it makes more sense to argue that instead of being integrated into the Semitic system as triliteral roots, these forms have been integrated as quadriliteral roots and follow the broken plural prosodic pattern characteristic of quadriliteral non-loan roots (12vv3v4). This argument becomes tenuous with the incorporation of the data in the table below. If Cluster Fusion wasn't active, these forms would we quinto-consonantal, which is disallowed by the grammar.

Singular	Plural	gloss	Proposed root
(a) ***sk**arpell*	***sk**riepel*	'chisel/s'	$\sqrt{\underline{\text{SK}}\text{RPL}}$
(b) ***sk**arpan*	***sk**rapan*	'shoemaker/s'	$\sqrt{\underline{\text{SK}}\text{RPN}}$
(c) ***skw**erra*	***skw**erer*	'set square/s'	$\sqrt{\underline{\text{SK}}\text{WRR}}$ or $\sqrt{\underline{\text{SKW}}\text{RR}}$[8]

Table 3.5: Cluster-initial loans with quadriliteral roots.

These forms above are theorized to have quadriliteral roots, with the first radical of the quadriliteral roots consisting of a consonant cluster acting as a single consonantal unit. Following the criteria laid out above, all of these forms have an identical consonant cluster word-initially in both the singular and plural forms. The difference between the forms in Table 3.4 and the forms in Table 3.5 is that, barring the initial cluster, the plural forms in Table 3.4 have three consonants. In Maltese (and Semitic

is considered to be a single consonantal unit occupying a single slot in a tri- or quadri-consonantal root.

[8]If this Cluster Fusion is to be followed exactly, the onset cluster [skw] is considered to occupy a single consonant slot as it exists in both the singular and plural forms in the same position within the word and is composed of the same consonants. Whether the underlying root consists of a biconsonantal cluster and three singleton consonants or a triconsonantal cluster and two singleton consonants does not pose any issue with the analysis at hand.

languages in general), bi-, tri-, and quadriliteral roots exist, but the grammar does not support any roots composed of beyond four radicals. Therefore, if the argument that word-initial consonant clusters don't exist as a single consonantal unit is to be followed, the forms above pose an issue with the internal pluralization mechanism of Semitic morphology. Instead, if word-initial consonant clusters *are* permitted to inhabit single slots in the root, the data above are uncontroversial. The resulting broken plural prosodic structures above behave just as non-loan quadriliteral roots behave (12vv3v4).

3.2 Triconsonantal forms

Triconsonantal forms comprise the bulk of the data, with 392 (66.8%) unique forms identified. There are six different prosodic structures in which triconsonantal forms surface: four which will be detailed here, and the other two will be discussed in section 3.4. These sections serve to describe the nature of each prosodic structure represented and the distribution of the roots that realize these structures when pluralized internally.

3.2.1 Type 1v2v3

Broken plurals that have the prosodic structure 1v2v3 form the largest group in the broken plural data, representing 42.6% of the triconsonantal forms and 28.4% of the total data (n=167). Loan words (those without a defined root in Ġabra and/or Aquilina 1999) comprise over half of the 1v2v3 data (n=109, 65.3%), and of the 179 loan words that surface as triconsonantal broken plurals, 61.2% surface as 1v2v3 forms. Some examples of 1v2v3 broken plural forms (of both loan and non-loan origin) have been provided below.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\text{RML}}$	*armel*	*romol*	'widower/s'
(b) $\sqrt{\text{BNK}}$	*bank*	*banek*	'bank/s'
(c) $\sqrt{\text{STT}}$	*setta*	*setet*	'sect/s'
(d) $\sqrt{\text{XRK}}$	*xriek*	*xorok*	'stone slab/s'
(e) $\sqrt{\underline{\text{KL}}\text{KK}}$	*klikka*	*klikek*	'clique/s

Table 3.6: Type 1v2v3 broken plural forms.

Type 1v2v3 forms, being the largest group in the data, have a myriad of singular forms. The diversity is shown in Table 3.6 to further dispel the hypothesis that broken plural forms are built from their corresponding singular forms via phonological rules.

Type 1v2v3 broken plurals are disyllabic structures composed of one light /CV/ syllable and one heavy /CVC/ syllable.[9] In both cases, the nucleus of the syllable is a short vowel, and stress is assigned to the first syllable. Thus, the prosodic structure of 1v2v3 broken plurals is /ˈCV.CVC/.[10] Several different types of roots have a 1v2v3 broken plural prosodic structure: geminate roots (roots with an identical second and third radical, e.g., *tikka* → *tikek* 'dot/s'), weak roots (roots with a /w/ or /j/ as the second or third radical, e.g., *iswed* → *suwed* 'black/pl.'), and roots with a cluster occupying the first radical position, e.g., *pjazza* → *pjazez* 'square/s'. Further, ten different vocalic melodies surface in broken plurals of this type. The variation in root type and vocalic melodies coupled with the proportion of 1v2v3 forms compared to the rest of the data hint that 1v2v3 might be the 'default' broken plural form. This could also explain why over half of the 1v2v3 data consists of loan words. Although an interesting hypothesis, that discussion deviates from the study at hand.

3.2.2 Type 12vv3

Broken plurals of type 12vv3 are the second-largest group in the triconsonantal data (n=119, 30.4%), and the third-largest group overall (20.3%). Compared to type 1v2v3 broken plurals, loan words comprise a smaller portion of the 12vv3 data; just 27.7% (n=33) of 12vv3 broken plurals are loan words.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\text{BJT}}$	*bejt*	*bjut*	'roof/s'
(b) $\sqrt{\text{TFL}}$	*tifel*	*tfal*	'boy/s'
(c) $\sqrt{\text{SNN}}$	*sinna*	*snien*	'tooth/teeth'
(d) $\sqrt{\text{GħDD}}$	*għodda*	*għodod*	'tool/s'

Table 3.7: Type 12vv3 broken plural forms.

As was done with type 1v2v3 forms, the corresponding singular forms of 12vv3 broken

[9] Here the stance is made that onset consonants do not contribute any moraic weight to the syllable, following Hayes (1995).

[10] A reviewer notes that in some forms, C_2 could be analyzed as being ambisyllabic, serving as both the coda of the first syllable and the onset of the second syllable. Although an intriguing observation, the present study will sustain the /CV.CVC/ analysis of type 1v2v3 broken plurals.

plurals are shown in Table 3.7 to show the implausibility of the plural forms being built from the singular forms. There are ten adjectives that pattern like 'donkey/s' (*ħmar* → *ħmir*), however they are not included in this study because adjectives may exhibit a different behavior than nouns.

Type 12vv3 broken plurals are super-heavy monosyllables. They are distinguished by an initial consonant cluster, a long vowel, and a coda consonant. The initial cluster in these forms is not to be confused with the clusters proposed with Cluster Fusion. The clusters in type 12vv3 broken plurals are two distinct radical consonants that share the onset position of a single syllable. Although they are monosyllabic, they meet the minimum requirements of super-heaviness and have a /ˈCCV:C/ prosodic shape. Similarly to type 1v2v3 broken plurals, type 12vv3 broken plurals are realized by a variety of roots, including geminate roots and weak roots. The vowels in type 12vv3 broken plurals are overwhelmingly /u:/ (39.3%) or /ie/ (35.5%) and, in a minority of forms, /a:/ (22.4%) and /i:/ (1.9%).[11] This is unremarkable, as each of these vowels can be long in a syllable that warrants lengthening. It is interesting that the vowels in 12vv3 forms are, in most cases, high vowels.

Probably controversially, a significant number of għajn-initial forms (n=10, 8.4%) have been included in type 12vv3 broken plurals. The morphophonological status of għajn [għ] and akka [h] have been hotly debated by Maltese linguists throughout the years, and a clear classification of these consonants has yet to reveal itself. The issue surrounding these consonants is that għajn and akka used to correspond to phones in Siculo-Arabic that are either no longer present in the modern language or have merged with existing phones. As its name would suggest, għajn historically corresponded with the voiced pharyngeal fricative [ʕ] (Arabic 'ayn), which itself had merged in Maltese with the voiced velar fricative [ɣ], and akka is the remnant of a tripartite merger of the voiceless uvular fricative [χ], the voiceless glottal fricative [ħ], and the voiceless pharyngeal fricative [h], a merger now orthographically represented in modern Maltese with the letter ħe [ħ] (Brincat 2011).

[11]The vowels /ie/ and /a/ are bring represented here orthographically. The vowel /ie/ is a long, front vowel [ɪː], and the vowel /a/ is a low, mid vowel [ɐ] which can be either long or short.

In spite of their linguistic history, these consonants are pronounced in somewhat predictable phonological environments, specifically word-finally and when part of a consonant cluster (Borg & Azzopardi-Alexander 1997). In the latter case, għajn and akka are only pronounced in clusters containing għajn, akka, or ħe. In some instances, these consonants are pronounced when in stem-final position and followed by certain morphemes (the negation suffix [-x], for example). If għajn or akka are found in any of these environments, they are realized phonologically as [ħ].

Cluster		
(a) *ta**għħom***	/ˈtaħħom/	'their, theirs'
(b) *ru**ħħa***	/ˈruħħa/	'her soul'
Word-final position		
(c) *tfi**għ***	/ˈtfiəħ/	'throwing'
(d) *bolo**h***	/ˈboloħ/	'foolish (pl.)'
Stem-final position		
(e) *ma xeba**h**-x*	/ma ʃe ˈbaħʃ/	'He did not resemble...'
(f) *ma bie**għ**-x*	/ma ˈbiəħʃ/	'He did not sell...'

Table 3.8: Għajn and akka are pronounced in certain environments (from Aquilina 1965).

The phonological presence of għajn in word-initial and word-medial environments is a bit more complicated. Early Maltese linguists have suggested that the historical presence of għajn in these positions has affected the quality of adjacent vowels (Aquilina & Cassar-Pullicino 1957, Borg 1978, Agius 1981), and this theory has persisted into present-day research. Although several studies in favor of this theory have contributed to this debate, the extent of għajn's influence on neighboring vowels remains inconclusive. Some proponents argue that għajn affects adjacent vowels in all environments (Brame 1972), whereas others argue that its phonological influence is more restricted (Puech 1979, Hume et al. 2009, and others). The latter study argues that, although lengthening of vowels in għajn-adjacent environments compared to għajn-less environments is predictable in some cases, other factors such as vocalic position within the word and even speaker dialect need to be considered. In any case, għajn-conditioned vowel lengthening was observed in some minimal pairs (*għadd* [a:tt] vs. *att* [att]), so it is reasonable to assume that għajn has *some* effect on adjacent vowels (Hume et al. 2009).

For this reason, għajn in word-initial position will be considered bound to the vowel that follows it. The [għajn+vowel] compound will act as a single radical, much like some initial consonant clusters are considered fused (i.e., Cluster Fusion). Thus, a type 12vv3 broken plural like *għodod* [ɔ̰:dɔt][12] is considered morphologically to have a word-initial consonant cluster, even though phonologically it is vowel-initial. This controversial stance harks back to the time when għajn historically was pronounced. The implications of this stance on the Distributed Morphology derivation will be discussed in the following section.

3.2.3 Type 12vjjv3

Broken plurals that are type 12vjjv3 comprise 11% (n=43) of the broken plural data. This type of broken plural is almost equally represented by loan words and non-loan words; 53.5% (n=23) of type 12vjjv3 broken plurals are non-loans. This type of broken plural differs from the rest of the triconsonantal forms in that in addition to vowels, an entire consonantal infix [-jj-] surfaces between the root consonants. Some examples of type 12vjjv3 broken plurals are listed below.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\text{BXR}}$	*bxara*	*bxajjar*	'announcement/s'
(b) $\sqrt{\text{FTR}}$	*ftira*	*ftajjar*	'type of bread/pl.'
(c) $\sqrt{\text{NBD}}$	*nbid*	*nbejjed*	'wine/s'
(d) $\sqrt{\text{GŻR}}$	*gżira*	*gżejjer*	'island/s'
(e) $\sqrt{\text{GħMR}}$	*għamara*	*għamajjar*	'furniture/pl.'
(f) $\sqrt{\text{TBGħ}}$	*tebgħa*	*tbajja'*	'stain/s'
(g) $\sqrt{\text{LT}}$	*ċikkulata*	*ċikkulajjet*	'chocolate/s'

Table 3.9: Type 12vjjv3 broken plural forms.

Type 12vjjv3 broken plurals are disyllabic and are composed of two heavy /(C)CVC/ syllables. The geminate [-jj-] infix serves as the coda of the first syllable and the onset of the second syllable. The two vowels that serve as the nucleus of each syllable are short, and stress falls on the penultimate syllable. This yields a /ˈCCVC.CVC/ prosodic structure. Just two vowels /a/ and /e/ ([ɛ]) surface in type 12vjjv3 broken plurals which allows for four different vocalic melodies to appear in

[12]The diacritic [̰] is used here to represent a vowel that is in an environment affected by an adjacent għajn in some way.

the broken plural forms.

The surfacing of the [-jj-] infix does not appear to be random. In nearly all cases of type 12vjjv3 broken plurals, the [-jj-] infix seems to be compensating for a lack of morphophonological weight in the stressed syllable. Over half of type 12vjjv3 broken plurals (n=23) are susceptible to the operation Cluster Fusion. We have seen that Cluster Fusion converts polyconsonantal forms into quadriliteral roots and quadriconsonantal forms into triliteral roots. But what happens when Cluster Fusion applies to triconsonantal forms? Keeping with the pattern, it converts triconsonantal forms into *biliteral* roots. One could argue that the 'Semitic' Maltese phonological system compensates for the biliteral roots by inserting a 'dummy' radical [-jj-] infix to add prosodic weight to the word form. In Moroccan Arabic, glide-insertion is a mechanism utilized to add weight and thus attract stress to a given syllable (Marouane 2017). Therefore, it is plausible that Maltese utilizes glide-insertion for a similar purpose.

Moving away from cases of Cluster Fusion, the [-jj-] infix is inserted to add prosodic weight to other broken plurals. In the triconsonantal broken plural data, there are only two roots with a final għajn radical (*sengħa* → *snajja'* 'craft/s' and *tebgħa* → *tbajja'* 'stain/s'). Both have a type 12vjjv3 broken plural. As għajn is phonologically not pronounced in final position (amongst other environments), it would make sense that Maltese would use the [-jj-] infix to add prosodic weight to these broken plurals. Further, there are four more instances of biliteral roots in the 12vjjv3 data. These forms are special in that they are seemingly composed of both a stem *and* a root, and they are all loan words.

Root	**Singular**	**Plural**	**gloss**
(a) stem+$\sqrt{\text{LT}}$	*ċikku-lata*	*ċikku-lajjet*	'chocolate/s'
(b) stem+$\sqrt{\text{RN}}$	*giżi-rana*	*giżi-rajjen*	'necklace/s'
(c) stem+$\sqrt{\text{RT}}$	*inċi-rata*	*inċi-rajjet*	'raincoat/s'
(d) stem+$\sqrt{\text{VT}}$	*ingra-vata*	*ingra-vajjet*	'tie/s'
(e) ?prefix+$\sqrt{\text{GSS}}$	*in-gassa*	*in-gases*	'noose/s'
(f) ?prefix+$\sqrt{\text{FRR}}$	*in-forra*	*in-foror*	'dress lining/s'

Table 3.10: Type 12vjjv3 broken plurals with a stem and biliteral root construction compared to type 1v2v3 broken plurals with a prefix and triliteral root construction.

They appear to be composed of both a stem *and* a biliteral root. In each instance, the words have a disyllabic 'stem' that remains constant in the singular and plural forms followed by a disyllabic form that appears to be derived from a biliteral root. In the singular, this disyllabic form has a /CVCV/ prosodic structure, and in the plural it has a /CVjjVC/ prosodic structure. In the same way that the [-jj-] infix adds prosodic weight to the Cluster Fusion roots above, perhaps the [-jj-] infix adds prosodic weight to these biliteral roots. Notice that the trisyllabic forms *ingassa* and *inforra* do not behave in the same way, but rather they take a type 1v2v3 broken plural. The nature of these six forms is quite interesting, but they will be a topic for future research.

3.2.4 Type 12vv3v

The final broken plural type to be discussed in this subsection is type 12vv3v. These broken plurals are just a small minority of the triconsonantal data set (n=38, 9.7%), with loan words comprising a little more than a third of type 12vv3v broken plurals (n=14, 36.8%). Some 12vv3v broken plurals are shown below.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\text{KTL}}$	*kitla*	*ktieli*	'kettle/s'
(b) $\sqrt{\text{QMR}}$	*qamar*	*qmura*	'moon/s'
(c) $\sqrt{\text{TWQ}}$	*tieqa*	*twieqi*	'window/s'
(d) $\sqrt{\text{SDR}}$	*sidrija*	*sdieri*	'waistcoat/s'
(e) $\sqrt{\dot{\text{G}}\text{RW}}$	*ġeru*	*ġriewi*	'puppy/ies'
(f) $\sqrt{\text{GħLQ}}$	*għalqa*	*għelieqi*	'field/s'

Table 3.11: Type 12vv3v broken plural forms.

It has been argued that some of these broken plurals are 'mixed' plurals; that is, they consist of a broken plural base and a sound plural suffix, such as /-i/ in *sdieri* 'waistcoats' (Schembri 2006). For example, type 12vv3v broken plural *ħnieki* ('gums') also exists as a type 12vv3 broken plural *ħniek*, with the same meaning. Of the 38 type 12vv3v broken plurals, just four (10.5%) have a type 12vv3 counterpart. While perhaps the double-plural argument can be made for these four forms, it doesn't hold for the 12vv3v data as a whole.

Type 12vv3v broken plurals are disyllabic forms composed of a heavy /CCV:/

syllable followed by a light /CV/ syllable. Stress is assigned to the heavy initial syllable, and thus type 12vv3v broken plurals have a /'CCV:.CV/ prosodic structure. The long vowel in the first syllable is either /ie/ (n=23), /a/ (n=10), or /u/ (n=4), and the final vowel is either /i/ (n=24) or /a/ (n=14). The long vowel /u/ never surfaces with a following short vowel /i/, thus there are five unique vocalic melodies that surface in type 12vv3v broken plurals. Interestingly, loan word broken plurals never surface with final /a/.

Of all of the broken plurals considered in this analysis, type 12vv3v broken plurals are the only broken plurals that have a final open syllable. As discussed previously, the final vowel doesn't appear to be an affix. The surfacing of the final vowel in type 12vv3v broken plurals *might* be phonologically conditioned according to sonority and syllable well-formedness constraints. In the data, 55% (n=20) of the final consonants of type 12vv3v broken plurals are highly sonorous ($\geq$ 7 on the sonority scale to be detailed in section 3.5.2). Conversely, just 31% (n=37) of the final consonants of type 12vv3 broken plurals are highly sonorous ($\geq$ 7). Perhaps the addition of a final vowel, a highly sonorous phoneme, enhances the falling sonority from the long vowel to the 'final' consonant. Another consideration is the place of articulation of the 'final' consonant. In type 12vv3 broken plurals, back consonants [q] and [ħ] are nearly always preceded by [u]. In type 12vv3v broken plurals, back consonants /q/ and /ħ/ are always preceded by /ie/ and followed by /i/. Of course, this is just conjecture, but an explanation is needed as to why both type 12vv3 broken plurals *and* 12vv3v broken plurals surface.

3.3 Quadri-consonantal forms

Quadri-consonantal forms make up about a third of the broken plural data (n=194, 33.2%), of which 94 (48.5%) are loan words. Loan words occupy a considerably larger portion of the quadri-consonantal data than the triconsonantal data simply because loan words from Romance languages tend to be consonant-rich. Quadri-consonantal forms exhibit considerably less variation than triconsonantal forms, and, in fact, each of the subtypes to be discussed below share an identical prosodic structure. Variation

comes about due to the diversity of roots that take quadri-consonantal broken plurals (both tri- and quadriliteral roots).

3.3.1 Type 12vv3v4

Broken plurals that belong to type 12vv3v4 are the most numerous of the quadri-consonantal forms (n=127, 65.5%). Loan words make up 46.5% (n=59) of this total, and a majority of loan words that take a quadri-consonantal broken plural are of type 12vv3v4 (59.6%). Some examples are displayed below.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\text{DNFL}}$	*denfil*	*dniefel*	'dolphin/s'
(b) $\sqrt{\dot{\text{C}}\text{RKT}}$	*ċurkett*	*ċrieket*	'ring/s'
(c) $\sqrt{\dot{\text{Z}}\text{N}\dot{\text{Z}}\text{N}}$	*żunżan*	*żnażan*	'wasp/s'
(d) $\sqrt{\text{G}\hbar\text{SFR}}$	*għasfur*	*għasafar*	'bird/s'
(e) $\sqrt{\text{MQDF}}$	*moqdief*	*mqadef*	'oar/s'
(f) $\sqrt{\underline{\text{SK}}\text{RPN}}$	*skarpan*	*skrapan*	'shoemaker/s'

Table 3.12: Type 12vv3v4 broken plural forms.

Type 12vv3v4 broken plurals are disyllabic and composed of two heavy syllables. The first heavy syllable /CCV:/ has an onset cluster and a long vowel, and the second syllable /CVC/ has a singleton onset, a singleton coda, and a short vowel. Stress falls on the penultimate syllable, resulting in a /ˈCCV:.CVC/ prosodic structure. The long vowel is reliably /ie/ or /a/, whereas the short vowel surfaces as either /a/ or /e/. Therefore, four vocalic melodies are attested. Several different types of quadriliteral roots are realized as type 12vv3v4 broken plurals, including għajn-initial roots, cluster-initial roots, and 'mimated' roots.

In Aquilina's dictionary (and in other studies), mimated nouns in Maltese are composed of a triliteral root with a mimated prefix attached to the stem. For the analysis at hand, the mimated nouns on the data set (n=20) are considered to be composed of a quadriliteral root, with /m/ as the first radical. In Arabic, the mimated prefix is still considered just that: a prefix. In Maltese, however, the data suggest that mimated nouns have been reanalyzed as monomorphemic, with a quadriliteral root. This is on account of the invariability between mimated plural prosodic structures, to be expanded upon below. Some mimated nouns are presented in Table 3.13.

Root	Singular	Plural	gloss
(a) $\sqrt{\text{MKTR}}$	*maktur*	*mkatar*	'handkerchief/s'
(b) $\sqrt{\text{MNSB}}$	*mansab*	*mnasab*	'bird-catching net/s'
(c) $\sqrt{\text{MĦŻN}}$	*maħżen*	*mħażen*	'storing place/s'
(d) $\sqrt{\text{MQDF}}$	*moqdief*	*mqadef*	'oar/s'
(e) $\sqrt{\text{MSRĦ}}$	*misraħ*	*msieraħ*	'open square/s'

Table 3.13: Mimated nouns with type 12vv3v4 broken plural forms.

Aquilina's dictionary lists 71 mimated nouns, although only those that are still in use today (as per Schembri's 2006 surveys) are included in the current study (n=22). In all 71 of these forms, the mimated nouns have a type 12vv3v4 broken plural. If one were to argue that the Maltese mimated nouns consist of a triliteral root and a prefix, it is expected that one would find much more prosodic variation among them, given the variability in the data set as a whole. For example, one could expect to find at least a few /mv-12vv3/ or /mv-12vjjv3/ forms among 71 mimated nouns, but that just isn't the case. Therefore, this analysis treats mimated nouns as derivations of quadriliteral roots that have /m/ as the first radical.

3.3.2 Type 12vv2v3

The roots that belong to type 12vv2v3 broken plurals behave in an unexpected way. Roots of type 12vv2v3 are triliteral but behave as if they were quadriliteral. This type of broken plural makes up about a third of the quadri-consonantal broken plurals (n=56, 28.9%), and of this third, a little more than half are loan words (n=31, 55.4%). It must be reiterated here that roots assigned to loan words were checked against existing non-loan broken plural roots. Some of these forms are sketched below.

Root	Singular	Plural	gloss
(a) $\sqrt{\text{DĦN}}$	*duħħan*	*dħaħan*	'smoke/pl.'
(b) $\sqrt{\text{ŻRG}}$	*żerriegħa*	*żrieragħ*	'seed/s'
(c) $\sqrt{\text{DWR}}$	*dawra*	*dwawar*	'stroll/s'
(d) $\sqrt{\text{GLN}}$	*gallun*	*glalen*	'gallon/s'
(e) $\sqrt{\text{KZL}}$	*kazzola*	*kzazel*	'saucepan/s'
(f) $\sqrt{\text{XRQ}}$	*xerqa*	*xrieraq*	'cough/s'

Table 3.14: Type 12vv2v3 broken plural forms.

Although the singular forms of the non-loan words above have a geminated second consonant that surfaces (a-b), the underlying root is triliteral. This is best

supported by the fact that the bare verb derived from these roots is triliteral (e.g., *żara'* 'to sow'). Loan words that exhibit similar prosodic structures in the singular and plural forms (like d-e) are given triliteral roots by analogy.

Like type 12vv3v4 broken plurals, type 12vv2v3 broken plurals are composed of two heavy syllables /CCV:/ and /CVC/. In these forms, stress also falls on the penultimate syllable, yielding a surface prosodic structure /ˈCCV:.CVC/. Just as in type 12vv3v4 forms, the long vowel in 12vv2v3 forms is always either /a/ or /ie/, and the short vowel is always either /a/ or /e/. Four vocalic melodies are attested. However, unlike type 12vv3v4 forms type 12vv2v3 broken plurals aren't derived from any għajn-initial roots, 'mimated' roots, or cluster-initial roots. Geminate roots and weak roots do not surface as type 12vv2v3 in the plural, either.[13]

As should be obvious, there isn't a difference between the surface forms of type 12vv3v4 and type 12vv2v3. The prosodic structures are identical. The only difference between these types lies in the identity of the root from which they are derived. The analysis to follow will hopefully shed light on how this kind of distribution is possible within the framework of Distributed Morphology, and how triliteral roots seem to readily surface in quadri-consonantal forms.

3.3.3 Type 1wvv2v3

As with the type before them, type 1wvv2v3 broken plurals don't behave in a predictable way. Within the quadri-consonantal forms, type 1wvv2v3 are quite rare (n=10, 5.2%). What more, this type of broken plural is equally composed of loan words and non-loan words. Like type 12vv2v3 broken plurals, type 1wvv2v3 broken plurals are derived from a triliteral root. Historically, /w/-insertion is a phonological process utilized in Arabic to prevent hiatus between two long vowels on the surface. In Arabic, this repair is both robust and flexible. It can occur between a stem and a suffix, as a dummy consonant for biliteral roots, and between the first and second radical in some broken plurals (Naaser & Saranja 2020).

Unfortunately, the few theories of broken plural /w/-insertion in Arabic that

[13]There are just two weak-root exceptions: *dawra* → *dwawar* 'stroll/s' and *fawra* → *fwawar* 'sensation/s of hotness'.

exist (McCarthy 1982, Hammond 1988, Idrissi 1997) are incompatible with the late-insertionist analysis at hand. These theories rely too heavily on templates and infix insertion rules. The literature on broken plural /w/-insertion in Maltese is even more sparse. The present analysis treats type 1wvv2v3 broken plurals as being affected by root allomorphy, a topic that will be discussed in section 4.1.4.

Root	**Singular**	**Plural**	**gloss**
(a) $\sqrt{\dot{Z}ML}$	*żiemel*	*żwiemel*	'horse/s'
(b) $\sqrt{T\dot{G}N}$	*taġen*	*twaġen*	'frying pan/s'
(c) $\sqrt{DFR}$	*difer*	*dwiefer*	'nail/s'
(d) $\sqrt{TVL}$	*tavla*	*twavel*	'plank/s'
(e) $\sqrt{\dot{C}VT}$	*ċavetta*	*ċwievet*	'key/s'
(f) $\sqrt{XBL}$	*xabla*	*xwabel*	'sabre/s'

Table 3.15: Type 1wvv2v3 broken plural forms.

Type 1wvv2v3 broken plurals, like the rest of the quadri-consonantal forms, are disyllabic and composed of two heavy syllables /CWV:/ and /CVC/. Unlike the rest of the quadri-consonantal forms, the second consonant in the onset cluster of the initial syllable is a glide, /w/. The composition of the onset cluster has no impact on the prosodic weight of the word. Stress on the penultimate syllable of the word yields a /'CWV:.CVC/ surface prosodic structure. The underlying root of type 1wvv2v3 forms is triliteral, as modeled after the non-loan type 1wvv2v3 broken plurals.

3.4 Outlying forms

Most studies on the Maltese broken plural include type 1v23v and type v123v broken plural forms (see examples in the tables below). In the current study, however, they are removed from the data set. Presenting these types as non-productive broken plural forms here serves two purposes: a) to justify why certain forms have been removed from the analysis, and b) to highlight the diachronic collapse of the once-robust broken plural system. Type 1v23v broken plurals are excluded from data because they are overwhelmingly adjectives, not nouns, and because they closely resemble their Arabic counterparts. It is argued here that these forms have been borrowed wholesale from Arabic, not as morphological constituents. Type v123v broken plurals are excluded from this study because in a nonce word study with eighty participants

(Nieder et al. 2021a), nonce singulars were assigned a type v123v broken plural nearly never. The same observation can be made with type 1v23v broken plurals in that same study. These broken plural types are further described below.

3.4.1 Type 1v23v

A small set of the total broken plural data (n=12, 2.0%) are of type 1v23v. These broken plurals are interesting because the singular and plural prosodic structures of type 1v23v forms are the inverse of what one would expect; the prosodic structure of the plural form is characteristic of Maltese singular forms, whereas the prosodic structures of the singular forms are characteristic of Maltese broken plural forms. In other words, the surface forms of the singular and plural appear to be flipped. Table 3.16 below displays this relationship. The Arabic cognates to these forms have been supplied (Wehr 1976).

Maltese sg.	**Maltese pl.**	**Arabic sg.**	**Arabic pl.**	**gloss**
(a) *fqir*	*foqra*	*faqīr*	*fuqarā*	‘poor/pl.’
(b) *ġdid*	*ġodda*	*jadīd*	*judud*	‘new/pl.’
(c) *ktieb*	*kotba*	*kitāb*	*kutub*	‘book/s’
(d) *ġnien*	*ġonna*	*janna*	*janna*	‘garden/s’
(e) *marid*	*morda*	*marīd*	*mardā*	‘sick/pl.’
(f) *nadif*	*nodfa*	*nazīf*	*nuzafā*	‘clean/pl.’
(g) *qadim*	*qodma*	*qadīm*	*qudamā*	‘old/pl.’
(h) *qasir*	*qosra*	*qaṣīr*	*qiṣār*	‘short/pl.’
(i) *saqaf*	*soqfa*	*saqīfa*	*suqūf*	‘roof/s’
(j) *tabib*	*tobba*	*ṭabīb*	*aṭibbā*	‘doctor/s’
(k) *għamja*	*għomja*	*‘amjā*	*‘umj(ān)*	‘blind/pl.’
(l) *għanja*	*għonja*	*ġanīy*	*aġniyā*	‘rich/pl.’

Table 3.16: Plural forms with a 1v23v prosodic structure and their Arabic counterparts (Wehr 1976).

The dearth of 1v23v plurals in the data suggests that 1v23v is not a productive ‘pattern’ in Maltese.[14] While it may be the case that roots belonging to this type exist as a closed class, it is also possible that these entire word forms have been borrowed wholesale from Arabic and lexicalized. The fact that all of the Maltese broken plurals with this prosodic structure have the same vocalic melody ({o,a}) and

[14]Schembri (2006) lists just six more 1v23v forms in the appendix as a supplementary collection to the main data set (*bnin* → *benna*, *ixheb* → *xehba*, *demus* → *disma*, *feles* → *filsa*, *iblaq* → *bolqa*, *trab* → *torba*).

all of the singular counterparts also share a common vocalic melody (monosyllabic ie/i, disyllabic {a,i}) further suggests that these words have been borrowed wholesale. This study takes this approach.

The Arabic counterparts of the Maltese word forms following the 1v23v structure have been provided in the second column of Table 3.16. A majority of these words are adjectives, and two of the most productive broken plural adjective types in Arabic are 1v23v and 1v2v3v. Also, type 1v23v forms are used in Arabic for denoting plurals of professions (i.e., doctors). Adherence to these patterns in Arabic can explain the identical vocalic melodies in the corresponding Maltese forms. Furthermore, the interaction between stress and syncope in Maltese can explain the adaptation of the Arabic forms into Maltese (CV.CV.CV → CVC.CV). The phenomenon is even clearer with the adaptation of the singular forms. Singular forms (e-l) are essentially borrowed over completely, whereas singular forms (a-d) are adopted over with syncope of the initial syllable.

Moreover, speakers are unlikely to coin new broken plurals with this prosodic structure. In a nonce word study (Neider et al. 2021a), speakers were prompted to elicit plural forms of nonce singulars. Of the nearly nine thousand responses given by eighty speakers over a series of trials, just 0.09% of the elicited plurals had a 1v23v prosodic structure. This percentage reflects the exclusion of elicited broken plural forms of existing singulars (*ktieb* → *kotba*, for example), and the exclusion of forms that could be interpreted as a sound plural form (*xarfa* → *xarfi*). Overall, the data support the hypothesis that the 1v23v prosodic structure is either not productive in modern Maltese or was never productive to begin with.

In sum, broken plurals that have 1v23v prosodic structure comprise just a small fraction of the overall broken plural data. They share an identical vocalic melody in the plural ({o,a}) and singular (monosyllabic ie/i, disyllabic {a,i}) forms. Additionally, the Maltese singular and plural pairs presented in this section are nearly identical to their Arabic counterparts, with minor prosodic differences reflecting stress and syllable constraints in Maltese. Therefore, it is argued that the broken plural

prosodic structure 1v23v is not productive in Maltese, but instead these forms have been borrowed wholesale from Arabic and modified slightly to Maltese phonotactic constraints. The lack of 1v23v nonce plurals in a nonce word study further supports this claim. For these reasons, these forms have been excluded from the study at hand.

3.4.2 Type v123v

Another identically small subset of the total broken plural data set (n=12, 2.0%) takes the prosodic structure v123v. These forms are unusual because, above all else, they are vowel-initial. The status of onset-less syllables in Maltese is unclear (Galea 2016, Azzopardi 1981), so it is peculiar that broken plurals of the form v123v exist at all.[15] Apart from the prosodic structure itself, broken plurals belonging to this subset share an identical vowel melody, predictable phonological changes notwithstanding.[16] The twelve forms have been reproduced below.

Singular	**Plural**	**Alternate plural**	**gloss**
(a) *ġifen*	*iġfna*	*ġfien*	'vessel/s'
(b) *qasam*	*oqsma*	*qsam, qsum*	'agricultural estate/s'
(c) *xiber*	*ixbra*	*xbar*	'span/s'
(d) *xedaq*	*ixdqa*	*xdieq*	'jaw/s'
(e) *baħar*	*ibħra*	*bħar, bħur, bħura*	'sea/s'
(f) *sider*	*isdra*	*sdur, sdura*	'chest/s'
(g) *qabar*	*oqbra*	*qbur, qbura*	'grave/s'
(h) *ġemel*	*iġmla*	*ġmula*	'camel/s'
(i) *seqer*	*isqra*	*soqra*	'falcon/s'
(j) *leħen*	*ilħna*	*leħnijiet*	'voice/s'
(k) *ġisem*	*iġsma*	–	'body/ies'
(l) *lsien*	*ilsna*	–	'tongue/s'

Table 3.17: Type v123v broken plurals alongside alternative plural forms.

A native speaker has explained through personal correspondence that for many of the type v123v plurals listed above, there exists an alternative plural which is sometimes preferred over the v123v form, although some of these alternate forms

[15] A reviewer notes that type v123v broken plurals could be interpreted as containing a glottal stop onset. Thus, the prosodic structure would resemble /ʔVC.CCV/ or /CVC.CCV/. Even still, this reinterpretation of the prosodic structure poses some issues with the current analysis and is not considered.

[16] The underlying vocalic melody can be argued to be {i,a}. In Table 3.17, the vocalic melody of forms (b) and (g) is {o,a}. This is predictable, as the first vowel in the melody precedes a guttural consonant [q]. Backing of vowels adjacent to guttural consonants is a well attested phenomenon in Maltese (Brame 1972, van Putten 2020).

are dispreferred for other native speakers. A quick dictionary search (Aquilina 1990) substantiates this intuition. With the exception of *ġisem* and *lsien*, the entries of all of the nouns in Table 3.17 list a type v123v plural and an additional one or two (or three!) alternative plural forms. Seven of the twelve forms have a type 12vv3 alternant, and four of the twelve forms have a type 12vv3v alternant. Interestingly, the alternative plural of *seqer* has a type 1v23v prosodic structure, which as previously mentioned is quite a rare and unproductive prosodic structure. Finally, the alternative plural of *leħen* is surprisingly the sound plural form *leħnijiet*. The issue of roots that take both sound and broken plural forms will be discussed further in Chapter 5.

As with type 1v23v broken plurals, data elicited from native speakers in a nonce word study (Neider et al. 2021a) can shed light on the actual productivity of the type v123v broken plurals. Much like type 1v23v broken plurals, speakers were very resistant to produce nonce broken plurals with a v123v prosodic structure. Overall, just 0.14% of the elicited responses were of type v123v. What more, the nonce singular *beħer* yielded over half (n=8) of the v123v forms produced by the participants in the study. The nonce singular *beħer* bears remarkable resemblance to the existing singular *baħar*, with a change in vocalic melody being the only difference between the two. Participants may have produced a type v123v nonce broken plural via analogy to the existing plural of *baħar*, which itself is a type v123v broken plural. As with type 1v23v forms, the type v123v forms are not productive. With this in mind, type v123v broken plurals have been excluded for the current study.

3.5 Root analysis

Before the analysis of the morphology of the Maltese broken plurals could take place, a preliminary analysis of the roots themselves needed to be done. The purpose of this preliminary analysis was to determine if the distribution of roots across the broken plural types could be phonologically motivated. In other words, it must be determined if the composition of individual radicals within a root predict the surface prosodic structure of its broken plural. If this is the case, then the morphophonological analysis at hand need not be proposed. If the roots themselves determine the prosodic

structure, then constraints on syllable structure are unnecessary.

For this preliminary analysis, the entire root list was compiled in a spreadsheet, and each root was decomposed into individual radicals. The radicals were coded for a variety of phonetic factors, such as place and manner of articulation, voicing, and sonority (see Appendix 2 for an abridged version of this table). In addition to phonetic factors, the prosodic structures of both the singular and plural forms that each root realizes were recorded. The origin of each word (loan or non-loan) was listed. Lastly, the vocalic melody in each broken plural form was coded. Some other categories were also coded (vowel-final forms, cluster-initial forms, geminated roots, etc.) for ease of sorting. The results of each portion of the root analysis is detailed below.

3.5.1 Place and manner of articulation and voicing

Each root consonant was coded for both place of articulation (**A**lveolar, **F**(ph)aryngeal, **G**lottal, **L**abial, **P**alatal, **V**elar) and manner of articulation (**A**ffricate, **F**ricative, **G**lide, **L**iquid, **N**asal, **S**top). The consonants were also coded by continuancy (**C**ontinuant or **O**cclusive) and sonorancy (**S**onorant or **O**bstruent). The sequences of each of these distinctive features for each root was listed as well. Since the number of attested place of articulation sequences and manner of articulation sequences were nearly one hundred in each case, root membership to each sequence was too low to make any trend or prediction regarding surface prosodic structure. The sonorancy codes did identify some trends. For example, the second radical in type 12vv3 broken plurals is overwhelmingly a sonorant consonant. However, none of these trends proved significant in predicting surface prosodic structure.

Root consonants were also coded according to their voicing (**V**oiced or voice**L**ess), and the sequence of voicing features for the radicals in the bi-, tri-, and quadriliteral roots was recorded (e.g., **VV**, **VVL**, **LVL**, **LVVL**). Of the 28 possible voicing sequences, 26 are attested in the root data. Perhaps to be expected, there is no significance between voicing sequence and surface prosodic structure. This is unsurprising partially because of productive voicing assimilation in Maltese. Root

consonants are susceptible to both progressive *and* regressive voicing assimilation, and word-final consonants are always devoiced (Borg 1975). Considering that the same voicing constraints don't affect all lemmas of the same root in the same way ($\sqrt{\text{ĠKT}}$: *ġakketta* → *ġkieket*; [dʒak:et:a] → [dʒgɪ:get]; 'jacket/s'), it makes sense that voicing does not determine surface prosodic structure.

3.5.2 Sonority

Sonority is a measure of amplitude, and consonants and vowels can be ranked with respect to one another on a sonority hierarchy. For this root analysis, a sonority hierarchy was established from a sonority scale from Galea (2016), based on Parker (2011). It has been reproduced below.

High sonority

Low sonority

12	Low vowels	/ɐ ɐː/
11	Mid vowels	/ɪ ʊ ɛ ɛː ɔ ɔː/
10	High vowels	/i iː uː/
9	Glides	/j w/
8	Laterals	/l r/
7	Nasals	/m n/
6	Voiced fricatives	/v z/
5	Voiced affricates	/dʒ/
4	Voiced stops	/b d g/
3	Voiceless fricatives	/f s ʃ h/
2	Voiceless affricates	/tʃ ts/
1	Voiceless stops	/p t k ʔ/

Figure 3.1: A sonority hierarchy of Maltese sounds (Galea 2016, p.21). The proposed sonority scores defined in this study have been added to the left of the natural class (1-12).

Every consonant was assigned a sonority 'score' based on its relative position in the sonority hierarchy; voiceless stops [p, t, k, q] have a sonority score of 1, whereas the low vowel [a] has a sonority score of 12. In general (and perhaps obviously), consonants with higher sonority scores are more sonorous. The sonority sequence of each root was recorded, as well as the sonority distance between root consonants, calculated as |(Sonority of C_1) – (Sonority of C_2)| and |(Sonority of C_2) – (Sonority of C_3)|.

Of the metrics examined in this analysis, the sonority values had the most potential to predict the surface prosodic structures of broken plurals. Sonority is tightly intertwined with notions of syllable well-formedness. The Sonority Sequencing Principle (SSP) defines syllable well-formedness in terms of the sonority of vowels and consonants in a language's phonemic inventory (Selkirk 1984). According to the SSP, the nucleus of a syllable must be the most sonorous phoneme in the syllable (typically a vowel, but not always), and the consonants flanking the nucleus descend in sonority toward the edge of the syllable. This rising and falling creates sonority peaks and sonority troughs.

Following the SSP, it would seem intuitive that consonant clusters in broken plural forms (like type 12vv3v4 and type 12vv3 broken plurals) would rise in sonority before the nucleus (i.e., C_1 would be less sonorous than C_2). If C_1 is more sonorous than C_2, we would expect that the broken plural would instead surface as a type 1v2v3 broken plural, where a vowel separates the two initial consonants. Otherwise, the sequence of a highly sonorous consonant preceding a less-sonorous consonant would lead to a sonority reversal. However, this expected observation isn't represented in the data.

Root	**Plural**	**Sonority sequence**	**gloss**
(a) $\sqrt{\text{DH̄N}}$	*dħaħan*	4,3,**12**,3,**12**,7	'smoke (pl.)'
(b) $\sqrt{\dot{\text{G}}\text{DR}}$	*ġdur*	5,4,**10**,8	'turnips'
(c) $\sqrt{\text{FKRN}}$	*fkieren*	3,1,**11**,8,**11**,7	'turtles'
(d) $\sqrt{\text{XFR}}$	*xfafar*	3,3,**12**,3,**12**,8	'blades'
(e) $\sqrt{\text{SH̄B}}$	*sħab*	3,3,**12**,4	'friends'
(f) $\sqrt{\text{BDBD}}$	*bdabad*	4,4,**12**,4,**12**,4	'he-goats'

Table 3.18: Not all broken plurals follow the SSP. Nuclei are distinguished with bolded font.

In Table 3.18, (a-c) are broken plurals with an initial consonant cluster in which C_1 is more sonorous than C_2, contra the SSP and leading to a sonority reversal. Forms (d-f) equally dissatisfy the SSP because the sonority of C_1 and C_2 is equal, leading to a sonority plateau. In fact, this type of behavior is found throughout the grammar of Maltese (Galea & Ussishkin 2018), and Maltese permits both sonority reversals and plateaus. For this reason, sonority is not a predicting factor for surface

prosodic structures of broken plurals.

3.5.3 Prosodic structure

The prosodic structures of both the singular and plural forms for each root were recorded as well. The plural prosodic structures were further grouped into broader types. Type 12vv3, type 12vv3v, and type 12vjjv3 broken plurals were grouped together as Type I (CCVC(V)), and type 1v2v3 broken plurals were left as Type II (CVCVC). Type 12vv3v4, type 12vv2v3, and type 1wv2v3 broken plurals were grouped together as Type III (CCVCVC), and type 1v23v and type v123v broken plurals each comprised a type of their own, Type IV (CVCCV) and Type V (VCCCV), respectively. The advantage of having both types and subtypes is capturing any trends that may be shared across multiple subtypes (the quadri-consonantal forms specifically).

As expected, there is no significant correspondence between singular forms and their corresponding broken plurals. The exception to this is the correspondence between the singular and plural forms of the quadriliteral roots. They reliably have the same singular prosodic structure 1v23v4.

Singular PS	**Attested corresponding broken plural PS(s)**
(a) 1v23v	12vv2v3, 1wvv2v3, 12vv3, 12vv3v, 12vjjv3, 1v2v3
(b) 1v23	12vv3, 12vv3v, 12vjjv3, 1v2v3
(c) 12vv3v	12vjjv3
(d) 12vv3	12vv3v, 12vjjv3, 1v2v3, 1v23v, v123v
(e) 1v2v3	12vv2v3, 1wvv2v3, 12vv3, 12vv3v, 12vjjv3, 1v23v, v123v
(f) v12vv3	1v2v3
(g) 1v22v3(v)	12vv2v3, 12vjjv3
(h) 1v23v4(v)	12vv3v4

Table 3.19: There is no generalizable correspondence between the prosodic structures of the singular and broken plural forms. Here 'PS' refers to 'prosodic structure'.

However, in general, it does not hold that the singular form can predict the surface prosodic structure of its corresponding broken plural. Further, individual broken plural types have multiple corresponding singular forms. This supports the hypothesis that broken plurals are derived from their root, *not* from their singular form, and vice versa.

3.5.4 Vocalic melodies

Lastly, the vocalic melodies of the singular and plural form of each root were noted. This metric is geared more towards assessing the predictability of the surface vowel(s) in the broken plural forms. Just the [a]-initial vocalic melodies of the singular forms in the data set are shown in Table 3.20.

There is little predictability between the singular form vocalic melody and the corresponding broken plural vocalic melodies. What this relationship hints at is that surface vowels in Maltese are susceptible to the influence of the consonants that they are adjacent to. For example, /a/ tends to surface in a syllable when it is adjacent to /r/, although not always. This idea is teased out a bit more in Chapter 5.

Singular VM	**Attested corresponding broken plural VMs**
(a) a	a, u, ie, {a,e}, {o,o}
(b) {a,a}	a, u, {a,a}, {a,e}, {a,i}, {e,e}, {i,a}, {o,a}, {o,o}, {u,a}, {u,u}
(c) {a,e}	ie, {a,e}, {ie,e}, {ie,i}, {o,o}, {u,a}
(d) {a,i}	a, ie, {a,a}, {a,e}, {e,e}, {ie,a}, {ie,e}, {o,a}
(e) {a,o}	{a,a}, {a,e}
(f) {a,u}	{ie}, {a,a}, {a,e}, {ie,e}
(g) {a,u,a}	{a,a}, {a,e}, {ie,e}

Table 3.20: Singular vocalic melodies (VM) have multiple corresponding broken plural vocalic melodies.

3.5.5 Results

The root analysis was conducted to explore the idea that the surface prosodic structure of roots that are realized as broken plurals can be determined by the phonological makeup of the individual root consonants. A variety of phonetic factors were considered, including voicing, place and manner of articulation, and sonority. Phonological factors like prosodic structure correspondences and vocalic melody correspondences were also considered. In short, the root analysis provided heavy support *against* this idea. Although some trends can be identified in the data, overall it is not possible to predict the surface prosodic structures of broken plurals based solely on the root consonants that realize them.

3.6 Summary

This section presented the data set that will be used in the analysis to follow. In total, 577 unique roots were identified, 46.5% of which were loan roots and assigned via analogy to existing roots of non-loan broken plurals. The roots of ɡħajn-initial forms, cluster-initial forms, and 'mimated' forms were discussed in detail. The root data were split into two broad categories based on the number of consonants that surface in their respective broken plural forms, triconsonantal and quadri-consonantal. Triconsonantal forms include type 12vv3, type 12vjjv3, type 12vv3, and type 1v2v3 broken plural forms. Quadri-consonantal forms include type 12vv3v4, 12vv2v3, and type 1wvv2v3 broken plural forms. Type v123v and type 1v23v broken plural forms were excluded from the data.

Triconsonantal and quadri-consonantal forms exhibit similar yet opposite behaviors. Triconsonantal plurals surface in a variety of different prosodic structures (CVCVC, CCV:C, CCV:CV, CCVjjVC), yet they are all derived from some sort of triliteral root. Quadri-consonantal plurals, on the other hand, surface in just one prosodic structure (CCV:CVC). The variation that arises in quadri-consonantal plural forms comes from differing root types: quadriliteral roots, triliteral roots with a reduplicated radical, and triliteral roots with a /w/ dummy radical. The allomorphy that exists between roots will be discussed in a later Chapter.

Lastly, a root analysis was conducted on the roots in the data set to test the hypothesis that surface prosodic structures of broken plurals can be predicted based on the phonological make-up of the root consonants. The root analysis provided support against this idea. Instead, there must be some other mechanism in play that is responsible for the prosodic variation that exists across the broken plural data. Prosodic variation will be discussed within the framework of Optimality Theory in the following section, alongside the Distributed Morphology analysis of the broken plural derivation.

Chapter 4

Deriving the Broken Plural

The present proposal of the derivation of the Maltese broken plural will be detailed here in two stages. The first stage of the derivation occurs in the morphosyntax: the structure and arrangement of the various morphological features in the syntax and the insertion of Vocabulary Items in Spell-Out. The subsequent stage of the derivation occurs post-Spell-Out, on the phonological branch. This stage evaluates potential candidates against a ranked set of constraints to select the optimal candidate from a list of candidates based on the Vocabulary Items inserted in Spell-Out. The former stage of the derivation is associated with the framework of Distributed Morphology, and the latter stage of the derivation is associated with the framework of Optimality Theory.

4.1 The morphosyntactic branch

The morphosyntactic branch of the derivation is responsible for generating the underlying abstract structure of the word via features that are bundled in terminal nodes. The bundled features are associated with Vocabulary Items that are inserted into the structure phase-by-phase during Spell-Out. The process is detailed below, with special attention paid to the 'Abstract Item' (the innermost node of the structure), the node(s) where the [+plural] feature resides, phasal Spell-Out, and a brief note about AI allomorphy.

4.1.1 The Abstract Item in Maltese

Preliminarily, it must be stated again that the grammatical item being referred to in this analysis as the Abstract Item (AI) is more widely known as the 'root,' as explained in Chapter 2. To rehash, the term 'root' is being avoided here to mitigate

confusion between an abstract root (e.g., $\sqrt{\text{BOOK}}$) and the Semitic tri-/quadriliteral root morph (e.g., **[ktb]** → ***kt**ie**b***). In the former case, the abstract root $\sqrt{\text{BOOK}}$ represents the notion of 'book-ness' (i.e., *has pages, is bound, found in a library, ...*), whereas in the latter case, the Semitic root morph [ktb] is a morph (Vocabulary Item) with semantic associations and phonology. The grammatical difference between the two is that one *root* ($\sqrt{\text{BOOK}}$) exists solely as a morpheme on the morphological branch, while the other *root* ([ktb]) exists as a morph in the surface form.

The justification for the AI convention is actually twofold. The second reason is that an AI can be spelled out with either a tri-/quadriliteral root morph *or* with a stem morph. A root morph consists of three or four (or less often, two) consonants, whereas a stem morph consists of a string of consonants and vowels (see Table 4.1). It is argued here that the Maltese inventory of both root morphs and stem morphs is a result of prolonged and intense contact with Romance languages (Sicilian and Italian specifically) and with English. The root morphs are of course from Arabic, from which Maltese originates. In fact, a fundamental difference between the Romance and English morphological systems and the Semitic morphological system is the building blocks of a word: the stem versus the root.

Language (family)	**Abstract Item**	**Derived words**
(a) Romance	$\sqrt{\text{ZIJ–}}$	*zij-u* 'uncle' *zij-u* 'uncle' *zij-iet* 'aunts and uncles'
(b) English	$\sqrt{\text{PARK}}$	*park* 'park' *park-ijiet* 'parks'
(c) Semitic	$\sqrt{\dot{\text{G}}\text{BR}}$	*ġabra* 'set' *ġabbar* 'collector' *ġabar* 'to collect'

Table 4.1: Influence languages of Maltese have grammatically different Abstract Item types.

As is convention, AIs are written notationally as the VIs that spell them out. Both Romance (a) and English (b) AIs (stems) can surface alone or with affixes, whereas Semitic (c) AIs (roots) need to surface with a vocalic melody. This notion is revisited later in this section.

In sum, the term AI is a blanket term used to promote the idea that both stem

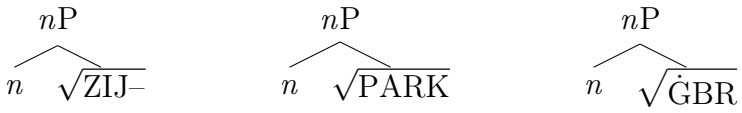


Figure 4.1: Stem and root AIs can both serve as the innermost node in the structure and combine with a categorizing head (left-to-right: Romance, English, and Semitic).

morphemes *and* root morphemes can exist as the innermost node in the morphosyntax (Figure 4.1). Although both types of AIs can be expressed in the morphosyntax, they are not treated equivalently. The following section describes how the morphosyntax accommodates both stem AIs and root AIs, and details the implications that each AI has on the underlying plural morphosyntactic structure.

4.1.2 The [+plural] feature in Maltese

Although this study is primarily concerned with the broken plural in Maltese, it is necessary to touch upon the formation of the sound plural, as well. After all, the sound plural is by far the most utilized pluralization mechanism in Maltese. Thus, it is important to highlight not only how the morphosyntax accounts for broken plurals but also how the morphosyntax differs between these two plural types. This study argues that the [+plural] feature is expressed in two distinct nodes in the morphosyntax. In brief, a [+plural] feature in the node that is local to the AI (the categorizing head) produces a broken plural, whereas a [+plural] feature in a node higher up in the tree produces a sound plural.

To be clear, the sound plural versus broken plural divide exists in other Semitic languages, too, not just in Maltese. Even though internal pluralization is utilized in a majority of cases in Classical Arabic, the sound plural suffix [-aat] is also quite productive. Lahrouchi & Lampitelli (2014) tackle the sound versus plural division in Moroccan Arabic using the DM framework. In their study, they argue that the [+plural] feature is housed both within the *n*P projection and within the Num head. The former feature is spelled-out by a vocalic melody, and the latter feature is spelled out by the plural suffix [-at]. This is demonstrated in Figure 4.2.

Following the analysis presented in Lahrouchi & Lampitelli (2014), the present study argues that in Maltese, broken plurals are expressed with a [+plural] feature

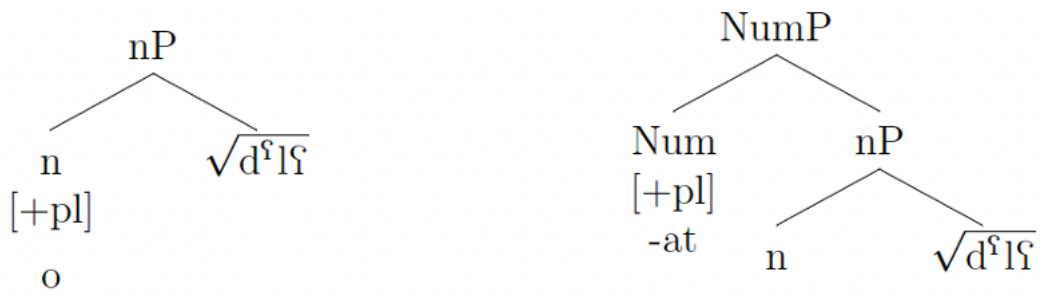


Figure 4.2: The morphosyntactic representations of *dʕloʕ* (left) and *dʕilʕat* (right) (both 'muscles,' *dʕilʕa* 'muscle') in Moroccan Arabic (Lahrouchi & Lampitelli 2014).

in the *n*P projection, and sound plural are expressed with a [+plural] feature within the Num head.

Lahrouchi & Lampitelli (2014) just scratched the surface of the analysis of the plural in Moroccan Arabic, having only presented the derivations of one broken plural (*dʕloʕ*) and one sound plural (*dʕilʕat*). There is much more variation in Moroccan Arabic broken plural types, just as in Maltese. This study seeks to account for all of the Maltese broken plural types (and a brief analysis of the sound plural, as well) utilizing the same underlying morphosyntactic structure. To achieve this, it is argued that each vocalic melody that surfaces in a broken plural form is a separate VI, and these VIs are allomorphs. The same argument holds for each sound plural suffix, as well.

Given that each vocalic melody VI can potentially spell out the [+plural] feature in the *n* head, the vocalic melody VIs are in competition with one another for insertion. Since none of the VIs are more featurally specified than the others, the grammar must handle this allomorphy in a different way. It is argued here that each vocalic melody VI is specified to a set of root morphemes, as shown in Figure 4.3.

(a) [+plural] ↔ {u:,a} $]_R$, where R ∈ {$\sqrt{\text{ĦBL}}$, $\sqrt{\text{RĦL}}$, $\sqrt{\text{QMR}}$, . . . }
(b) [+plural] ↔ {a:,e} $]_R$, where R ∈ {$\sqrt{\text{KRTL}}$, $\sqrt{\text{SLTN}}$, $\sqrt{\text{MQDS}}$, . . . }
(c) [+plural] ↔ {a,a} $]_R$, where R ∈ {$\sqrt{\dot{\text{C}}\text{PP}}$, $\sqrt{\dot{\text{G}}\text{MR}}$, $\sqrt{\text{LBR}}$, . . . }
(d) [+plural] ↔ {o,o} $]_R$, where R ∈ {$\sqrt{\text{XFF}}$, $\sqrt{\text{SDD}}$, $\sqrt{\text{B}\dot{\text{C}}\dot{\text{C}}}$, . . . }
(e) [+plural] ↔ {ie} $]_R$, where R ∈ {$\sqrt{\text{ĦNK}}$, $\sqrt{\text{RGL}}$, $\sqrt{\text{KLM}}$, . . . }
etc...

Figure 4.3: Vocalic melody VI allomorphs are specified for a set of root morphemes.

Therefore, the vocalic allomorphs are (locally) sensitive to the AI root morpheme.

It is important here to highlight the R notation in Figure 4.3. Vocalic melody VIs can only be inserted if the AI is a root morpheme (hence R). An example of the morphosyntactic structure of a broken plural in Maltese is sketched in Figure 4.4.

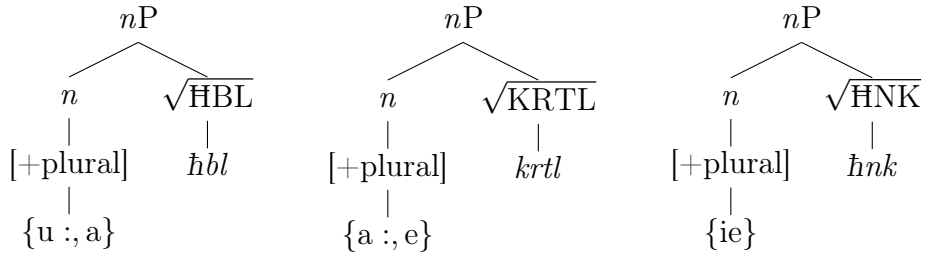


Figure 4.4: Vocalic VIs spell-out the [+plural] feature in the n head and are sensitive to the AI (left-to-right: *ħbula* 'ropes', *kratel* 'small barrels', *ħniek* 'gums').

The same type of competition can be envisioned for the allomorphic sound plural suffixes, except instead of inheriting the [+plural] feature from the n head, sound plurals inherit the [+plural] feature from the Num head. Crucially, this means that the [+plural] feature is absent from the n head. In this analysis, the allomorphic sound plural suffixes are specified to a set of stems, as shown in Figure 4.5.

(a) [+plural] ↔ {-i}]$_S$, where S ∈ {tessut, skrivan, konflitt,...}
(b) [+plural] ↔ {-iet}]$_S$, where S ∈ {ġewż, ravjul, marżebb,...}
(c) [+plural] ↔ {-ijiet}]$_S$, where S ∈ {reputazzjoni, kanvas, ħabs,...}
(d) [+plural] ↔ {-s}]$_S$, where S ∈ {skript, servej, rafil,...}
etc...

Figure 4.5: Sound plural allomorphic suffixes are specified to a set of stem morphs.

The notation in 4.5 differs from the notation in 4.3 in that the sound plural allomorphs are specified to a stem (S) morph, rather than a root (R) morpheme. Sound plural allomorphic suffixes are sensitive to the stem morph.

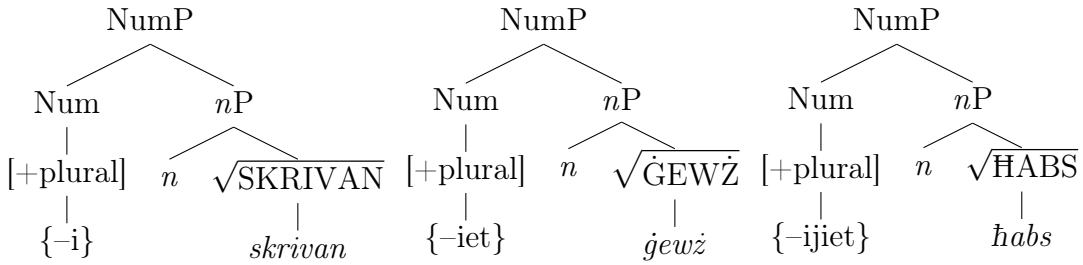


Figure 4.6: Sound plural suffix VIs spell-out the [+plural] feature in the Num head. (left-to-right: *skrivani* 'desks', *ġewżiet* 'nuts', *ħabs* 'prisons').

It has been argued in this section that the [+plural] can exist in the n head and/or in the Num head. A [+plural] feature in the n head is spelled-out by a vocalic

melody allomorph that is specified to a set of root morphemes. Allomorph selection and insertion is governed by the AI in the innermost node of the morphosyntax. A [+plural] feature in the Num head is spelled-out by a suffixed allomorph that is specified to a set of stem morphs. Likewise, allomorph selection and insertion is governed by the stem in the innermost node of the morphosyntax. Thus, broken plurals are associated with a [+plural] feature in the *n* head and sound plurals are associated with a [+plural] feature in the Num head.

4.1.3 Phasal Spell-Out

A major difference between the derivation of a broken plural and the derivation of the sound plural relates to the hypothesis of Phasal Spell-Out (Chomsky 2001). As noted in Chapter 2, a categorizing head (like *n*) is theorized to trigger the first phase of Spell-Out in a derivation. This means that in the derivation of a noun, the *n* head and every node that is c-commanded by *n* is sent to be spelled-out together. This study argues that in a broken plural derivation, the [+plural] feature is in the *n* head, whereas in a sound plural derivation the [+plural] feature is in the Num head. The *n* head and the Num head sit on different sides of a phase boundary, so the derivation of the two plural types will be different.

The derivation of the sound plural is relatively straightforward under the analysis presented here. The first phase of the derivation is triggered by the categorizing head *n*. The *n* head c-commands the AI, so they are spelled out together. Although the *n* head is 'empty' in this analysis, many linguists that follow the lexical decomposition approach (and, in most cases, DM) contend that *n* also hosts gender features associated with the AI (Ferrari 2005, Acquaviva 2008, 2009, Kramer 2014, 2016). Spell-Out from this phase yields a stem and any gender affix.

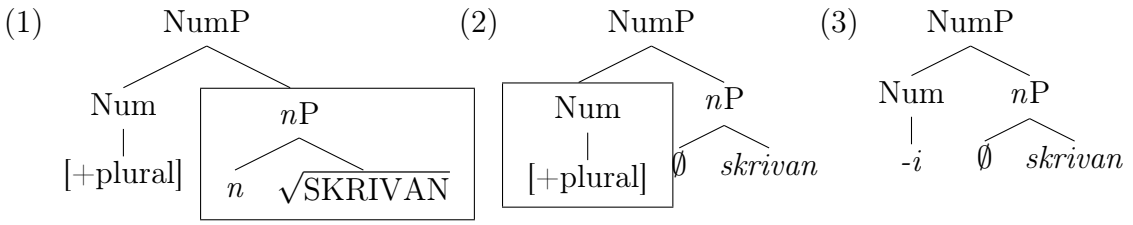
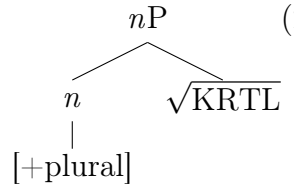


Figure 4.7: In the derivation of *skrivani* 'desks', the AI and categorizing head are spelled-out together in the initial phase (1), followed by the [+plural] feature in a subsequent phase (2).

The next phase of the derivation is triggered higher up in the tree, at the Num head (or perhaps higher). The Num head (which contains the [+plural] feature) is sent to Spell-Out. The allomorphic VIs that spell-out the [+plural] feature compete with one another for insertion. Recall that each allomorph is specified to a set of stems. Thus, the allomorph that is specified to the stem that was spelled-out in the first phase is inserted into the Num head, and the derivation is complete. As the present study is concerned with the broken plurals, the rest of the derivational process (i.e., the phonological branch) of the sound plurals will not be discussed further.

The derivation of the broken plural follows similarly to that of the sound plural, but with several key differences. Firstly, since the [+plural] feature is located in the n head, the broken plural is derived in the first phase of the derivation. The [+plural] feature and the AI are sent to Spell-Out together as individual morphemes. The [+plural] feature in the n head is spelled-out by allomorphic vocalic melody VIs. In contrast to the sound plural suffix allomorphs, the vocalic melody allomorphs are specified to root AIs, not stem morphs.

(1)



(2)

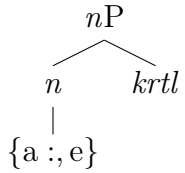


Figure 4.8: In the derivation of the broken plural *kratel* 'small barrels', the complete derivation occurs in the first phase of Spell-Out.

Thus, the allomorph that is specified to the root AI (c-commanded by n) is inserted. At the end of this phase of the derivation, two VIs have been inserted: the root morph and the vocalic melody. This completes the morphosyntactic stage of the derivation, and the two VIs are sent to the following stage of the derivation, the phonological branch.

4.1.4 Root morph allomorphy

It is necessary here to briefly discuss the possibility of allomorphy among the VIs that spell-out AIs. As it stands, there is no consensus on whether or not these particular

VIs are inserted based on competition between competing allomorphs. The notion is currently being researched within the wider context of DM (Chung 2009, Siddiqi 2006, 2009, Harley 2014), but here it will be discussed as it pertains to the Maltese broken plural.

In the present study, root morph allomorphy is proposed specifically with the derivation of the quadri-consonantal broken plurals of types 12vv2v3 and possibly 1wvv2v3. Recall that broken plurals of these two types are derived from a triconsonantal root (e.g., $\sqrt{\text{SLB}}$ *salib* → *slaleb* 'cross/es'; $\sqrt{\text{TPT}}$ *tapit* → *twapet* 'carpet/s'). This analysis opens up the possibility of another solution: contextual allomorphy. Instead of having the same root morph derive both the singular and the plural forms, perhaps two allomorphs of the same root morpheme compete with one another for insertion. As just shown above, in this analysis the head containing the [+plural] feature in the broken plural derivation is immediately local to the AI node. The present analysis argues that for certain roots, the presence of a [+plural] feature in the *n* node triggers allomorphy of the AI morpheme. Thus, in the case of *salib* → *slaleb*, the [+plural] feature triggers insertion of a root morph *sllb*, rather than *slb*. In the case of *tapit* → *twapet*, the [+plural] feature triggers insertion of a root morph *twpt*, rather than *tpt*.

Moreover, a similar argument could be made for the roots of mimated nouns. In section 3.3.1, mimated nouns were argued to be composed of an /m/-initial quadriliteral root. In discussing the notion of root allomorphy, a question arises regarding the relation of these /m/-initial roots to their non-/m/-initial counterparts. For example, consider the two semantically related words *qadef* 'to row (v.)' and *mqadef* 'oars (n.)' and their respective roots $\sqrt{\text{QDF}}$ and $\sqrt{\text{MQDF}}$. Though there is no contesting the semantic relatedness of these words, one wonders how their roots interact with one another in the morphosyntax. There are (at least) two ways to approach this query. The first way is argue that the roots $\sqrt{\text{QDF}}$ and $\sqrt{\text{MQDF}}$ exist in an allomorphic relationship. Some feature or head (such as a categorizing head) triggers the insertion of one root over the other at Spell-Out. The other approach is

to posit that the roots $\sqrt{\text{QDF}}$ and $\sqrt{\text{MQDF}}$ exist independently of one another in the morphosyntax. Although they are semantically related, perhaps the reanalysis of mimated nouns as nouns with an /m/-initial root has spurred the evolution of 'mimated' roots as independent roots.

A weakness of the root allomorphy hypothesis for the mimated nouns is identifying which feature or node triggers the proposed allomorph selection. An obvious candidate for the *qadef*∼*mqadef* pair is the categorizing head; v triggers the insertion of $\sqrt{\text{QDF}}$ and n triggers the insertion of $\sqrt{\text{MQDF}}$. Although this solution seems probable for this pair, the inclusion of the noun *qaddief* 'rower' seems to be evidence against the idea that n triggers the insertion of $\sqrt{\text{MQDF}}$. Instead, these three words might allude to the notion that $\sqrt{\text{QDF}}$ and $\sqrt{\text{MQDF}}$ both exist in the morphosyntax but not in an allomorphic relationship. Under this view, the root $\sqrt{\text{MQDF}}$ is limited in its derivational output (*moqdief* and *mqadef*), whereas the root $\sqrt{\text{QDF}}$ has a greater derivational output (*qadef*, *qaddef*, *nqadef*, *qaddief*, etc.).

The suggestion of root morph allomorphy as explained here is purely conjecture. This hypothesis remains open for further research, however the scaffolding is presented here as a way to explain the broken plurals of types 12vv2v3 and 1wvv2v3, a meager subset of the data (11.4%), and mimated plurals. Type 1wvv2v3 broken plurals are attested in Arabic, so perhaps the answer lies in a comparison between the Maltese and Arabic derivational processes. In any case, this study assumes that a type of contextual allomorphy is at play for these broken plural types.

4.1.5 Transitioning to the phonological branch

The transition of the derivation from the morphological branch to the phonological branch is a crucial junction in the derivation overall. Recall Figure 2.1 in Chapter 2. After features have been assembled in the morphosyntax, two processes occur in parallel. The features are sent off to receive their phonology at Spell-Out, and the structure is simultaneously sent to receive its logical form (i.e., semantics). At this point, the phonological branch is manipulating only strings of phonology. In essence, the phonological strings are devoid of any information that is supplemental

to basic phonological information. It is precisely for this reason that the sound plural derivation does not continue to the phonological branch in this study. In the morphosyntax, information regarding the root-hood or stem-hood is readily available. Once the features are sent to Spell-Out, the phonology is blind to this information.

4.1.6 Summary

The morphosyntactic branch constitutes the first branch of word formation within the DM framework. It is argued here that both stems and roots exist as AIs, the innermost node of the morphosyntax. It is also argued that the [+plural] feature can exist in the n head and/or in the Num head. The former realizes a broken plural allomorph, and the latter realizes a sound plural allomorph. These two structures are derived differently as per the conditions set forth by Phasal Spell-Out. For broken plurals, the result of the morphosyntactic derivation is two VIs: the root morph and the vocalic melody. The following section continues the derivation on the phonological branch.

4.2 The phonological branch

The derivation of the broken plural continues on to the phonological branch by means of an Optimality Theoretic analysis. The VIs inserted in the morphosyntactic branch (the root morph and the vocalic melody) serve as the input to this stage of the derivation. The grammar evaluates infinitely many potential candidates against a series of ranked constraints and chooses the optimal candidate. This section will introduce and define the constraints that will be ranked in this analysis, with special attention paid to the constraint Contiguity. An example plural from each of the broken plural types described in Chapter 3 will be subsequently derived, as well. The constraint ranking provided will select the optimal candidate for each broken plural type.

4.2.1 The constraints and ranking

Since in this analysis the 'pattern' is not a morph but instead is an epiphenomenon, the constraints and their ranking are responsible for generating the 'shape' of the

broken plural (i.e., the prosodic structure). The constraints must be defined and ranked in a way that ensures all of the attested broken plural types can surface. This analysis relies on one highly-ranked faithfulness constraint and five markedness constraints to achieve this. These constraints will be briefly described in detail below.

Before discussing the higher-ranked constraints that are used in this analysis, the constraint Contiguity must be addressed. Contiguity is defined as follows:

> Contiguity: Segments adjacent in the input must be adjacent in the output. (Kenstowicz 1994)

Contiguity poses a problem for the present analysis and for many analyses of Semitic morphology. Two independent morphs serve as the input for the present OT analysis (e.g., [*ħbl*, {u:,a}]). The constraint Contiguity prohibits the interleaving of the two morphs, thus causing the attested surface for *ħbu:la* to be eliminated. In fact, with Contiguity ranked highly, the only potential optimal candidates are **ħblu:a* or **u:aħbl*. To avoid this, the present analysis ranks Contiguity extremely low, which allows for the interleaving of morphs. In the tableaux to follow, Contiguity will not be displayed, but it is assumed to be ranked quite low.

The faithfulness constraint defined in this analysis is Linearity, and it governs the ordering of phonemes in the output. It is defined as follows:

> Linearity: S1 is consistent with the precedence structure of S2, and vice versa. (McCarthy & Prince 1995)

Many non-Semitic studies use this constraint to prohibit metathesis of consonants within a single morpheme. It is used in the present study to prohibit variation in the ordering of the root morph consonants and (separately) of the vowels in the vocalic melody. Thus, with an input [*ħbl*, {u:,a}], forms like **bħu:la* and **ħablu:* are non-optimal and eliminated. This constraint is the highest-ranked constraint in this analysis.

The first three markedness constraints to be discussed are NoHiatus, Onset, and RootFinalHeavy (RFH). These three constraints govern syllable sequences

and syllable structure. They are defined below.

> NoHiatus: Within a foot, and in two adjacent feet, it is illformed to have two adjacent vowels. (Pulleyblank 1998)
> Onset: Syllables must have an onset. (Prince & Smolensky 1993)
> RFH: A light syllable must not be final. (Bat-El 2002)

These constraints are straightforward. NoHiatus assigns a violation to a candidate that has a sequence of adjacent vowels (**ħbu:al*), and Onset assigns a violation to each syllable in a candidate that does not have an onset (**u:ħbal*). RFH assigns a violation to a candidate with a final light syllable (V, CV).

The following two markedness constraints *Complex and *CV: govern the sequence of consonants and vowels in the candidate set. They are defined as follows:

> *Complex: No more than one C may associate to any syllable position node. (Prince & Smolensky 1993)
> *CV:: A long vowel must not follow a singleton consonant onset.

The *Complex constraint bans clusters of consonants in the onset or the coda of a syllable, but not across a syllable boundary (**ħu:abl*). The *CV: constraint bans the surfacing of long vowels in syllables that do not have a complex onset (**ħu:bal*).

In the present analysis of the broken plural, the constraints defined above are ranked in the following order:

> Linearity ≫ NoHiatus , Onset ≫ *Complex ≫ *CV: ≫ RFH

This ranking is rigid, barring NoHiatus and Onset. Either of these two constraints can dominate one another, as long as they both dominate *Complex, *CV:, and RFH.

4.2.2 Type 1v2v3 derivation

Below is a tableau deriving a type 1v2v3 (CV.CVC) broken plural. The input morphs for this derivation are the consonantal root [trq] and the vocalic melody {o,o}.

trq, {o,o}	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. trqo.o		∗!				
b. tor.qo						∗!
c. tro.qo				∗!		
☞ d. to.roq						
e. ot.roq			∗!			

Table 4.2: A tableau deriving the type 1v2v3 broken plural *toroq* 'streets'.

The constraint *CV: is not active in the represented candidates because there is no long vowel in the input. Candidate (a) is eliminated by NoHiatus because it contains a sequence of vowels [o.o]. Candidate (e) is eliminated by Onset because its initial syllable [ot] is onsetless. Candidate (c) is eliminated by *Complex because its initial syllable [tro] has an onset cluster. Finally, candidate (b) is eliminated by RFH because its final syllable [qo] is light. Candidate (d) is selected as the optimal candidate.

4.2.3 Type 12vv3 derivation

Below is a tableau deriving a type 12vv3 (CCV:C) broken plural. The input morphs for this derivation are the consonantal root [xmx] and the vocalic melody {u:}.

xmx, {u:}	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. xmxuː				∗∗!		
b. uːxmx			∗!			
c. xuːmx				∗	∗!	
☞ d. xmuːx				∗		

Table 4.3: A tableau deriving the type 12vv3 broken plural *xmux* 'suns'.

In the candidates shown in this derivation, NoHiatus is not active because there is only one vowel in the input. Candidate (b) is eliminated because it does not have an onset. Candidates (a), (c), and (d) each violate *Complex, however candidate (a) is eliminated because it violates the constraint twice (a sequence of three consonants). Candidate (c) is eliminated by *CV: because the long vowel [u:] follows a singleton onset. Candidate (d) is selected as the optimal candidate.

4.2.4 Type 12vjjv3 derivation

Below is a tableau deriving a type 12vjjv3 (CCVj.jVC) broken plural. These plurals are special in that most of them have an initial consonant cluster that cannot be

separated (as per Cluster Fusion, Chapter 3). This functionally biliteral root is repaired in Maltese with an epenthetic consonant [-jj-].The input morphs for this derivation are the consonantal root [ftr] and the vocalic melody {a,a}.

ftr, {a,a}	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. ftra.a		*!				
b. fta.ar		*!				
☞ c. ftaj.jar				*		
d. ftar.ja				*		*!
e. a.ftar			*!			
f. aft.ar			*!*			

Table 4.4: A tableau deriving the type 12vjjv3 broken plural *ftajjar* 'type of bread (pl.)'.

The constraint *CV: is not active in the represented candidates because there is no long vowel in the input. Candidates (a) and (b) are both eliminated by NoHiatus because each candidate has a sequence of vowels [a.a]. Candidates (e) and (f) both violate Onset at least once, and since other viable candidates do not violate Onset, both (e) and (f) are eliminated. Candidates (c) and (d) both have an epenthetic consonant. In (c), the consonant is inserted between the 'two' radicals, and in (d) the consonant is inserted after the 'second' consonant. Both candidates (c) and (d) violate *Complex, so neither candidate is eliminated. Candidate (d) is eliminated by RFH because the final syllable [ja] is light. Candidate (c) is selected as the optimal candidate.

4.2.5 Type 12vv3v derivation

Below is a tableau deriving a type 12vv3v (CCV:.CV) broken plural. The input morphs for this derivation are the consonantal root [bdw] and the vocalic melody {ie,a}.

bdw, {ie,a}	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. bdwie.a		*!				
b. bie.dwa				*	*!	
☞ c. bdie.wa				*		
d. ie.badw			*!			
e. ieb.dwa			*!			

Table 4.5: A tableau deriving the type 12vv3v broken plural *bdiewa* 'farmers'.

Candidate (a) is eliminated by NoHiatus because it contains a sequence of vowels

[ie.a]. Both candidates (d) and (e) are eliminated by Onset because the first syllable in each candidate is onsetless. Candidates (b) and (c) both violate *Complex equally, but candidate (b) is eliminated by *CV: because its first syllable contains a long vowel preceded by a singleton onset. Candidate (c) is thus the optimal candidate.

4.2.6 Types 12vv3v4, 12vv2v3, and 1wvv2v3 derivations

Below is a tableau deriving a type 12vv3v4 (CCV:.CVC) broken plural. This tableau is representative of type 12vv2v3 and type 1wvv2v3 broken plurals since the prosodic structures of all three types are identical. The input morphs for this derivation are the consonantal root [żrbn] and the vocalic melody {a:,e}.

żrbn, {a:,e}	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. żrbnaː.e		∗!				
b. żaː.rebn				∗	∗!	
☞ c. żraːben				∗		
d. żraː.bne				∗∗!		
e. aːżr.bne			∗!			
f. żrbaː.ne				∗∗!		

Table 4.6: A tableau deriving the type 12vv3v4 broken plural *żraben* 'shoes'.

Candidate (a) is eliminated by NoHiatus because it contains a sequence of vowels [a:.e]. Candidate (e) is eliminated by Onset because its initial syllable [aːżr] is onsetless. Candidates (b), (c), (d), and (f) each violate *Complex at least once, but candidates (d) and (f) violate it equally more times than candidates (b) and (c), so (d) and (f) are eliminated. Candidate (b) is eliminated by *CV: because its first syllable [ża:] has a singleton onset followed by a long vowel. Candidate (c) is selected as the optimal candidate.[1]

4.3 Summary

The analysis presented in this chapter is composed of two stages: the morphosyntactic branch and the phonological branch. It has been posited here that in the morphosyntactic stage, both stems and roots can spell-out the innermost node in the

[1] A reviewer notes that in Table 4.6 above, a potential candidate /ża:r.ben/ would be incorrectly selected as the optimal candidate. To mitigate this, the constraint *Complex could be reworded as *CC. This constraint stipulates that sequences of consonants (regardless of an intervening syllable boundary) are assigned one violation.

morphosyntax. Further, the [+plural] feature in the morphosyntax can be housed in either the n head or the Num head, and its location in the morphosyntax governs whether or not the plural will be sound or broken. For broken plurals, a root morph and a vocalic melody morph are inserted at Spell-Out. These morphs move on to the phonological branch where they serve as the input to an Optimality Theoretic derivation of the surface form. This derivation is governed by a fixed ranking of constraints. It was shown that the variation in broken plural types can be correctly derived by this ranking.

Chapter 5

Discussion

The current study has presented a novel approach to the derivation of the Maltese broken plural that posits the root and the vocalic melody as the main interacting morphological elements in the grammar. The incorporation of both the DM and OT frameworks in this analysis is a stark departure from traditional lexicalist approaches to the broken plural, yet it has brought together the domains of concatenative and nonconcatenative morphology in a unified analysis. The following discussion contextualizes lingering phenomena surrounding the Maltese broken plural within the frameworks of the present analysis and provides possible routes for future research on the Maltese broken plural and beyond.

5.1 Questions to revisit

The introductory chapter of this dissertation concluded with an allusion to three particular phenomena surrounding the Maltese plural system: plurals that can be realized in more than one broken form, plurals that can be realized both internally (broken) and externally (sound), and plurals that are seemingly composed of a root and melody, but are nonetheless realized externally. Each of these cases will be discussed in turn within the framework of the present analysis.

5.1.1 Roots with multiple broken plural types

Roots that surface as more than one broken plural type can be categorized into two groups: those that surface with variation in prosodic structure and those that surface with the same prosodic structure but with variation in vocalic melody. Barring subtle idiosyncratic meanings, these variants are otherwise synonymous. The framework presented in Chapter 4 is able to account for both types of variation, and each will

be discussed below.

Roots that surface in more than one broken plural type are less numerous than those that have variation in vocalic melody. In the present data set, just eight roots have more than one corresponding broken plural type, and just two of those eight roots have each variation form attested in Korpus Malti 3.0 (Gatt & Čéplö 2013), a corpus of Maltese. These roots and their corresponding forms are displayed below, with supplemental forms from Schembri (2006, 2012).

Root	**Plurals**	**Plural type**	**gloss**	**N in Korpus Malti**
(a) $\sqrt{\text{XBK}}$	*xbieki*	12vv3v	'fishing nets'	826
	xbiek	12vv3	'fishing nets'	228
(b) $\sqrt{\dot{\text{G}}\text{ML}}$	*iġmla*	v123v	'camels'	58
	ġmula	12vv3v	'camels'	11
(c) $\sqrt{\text{RDN}}$	*rdieden*	12vv2v3	'spinning wheels'	94
	rdejjen	12vjjv3	'spinning wheels'	2
(d) $\sqrt{\text{QLL}}$	*qliel*	12vv3	'type of jar (pl.)'	281
	qolol	1v2v3	'type of jar (pl.)'	1

Table 5.1: Roots with multiple surface prosodic structure types.

Prosodic variation of a single root is not constrained to any specific broken plural type or types, as Table 5.1 shows. Further, even though in most cases the total N indicates a clear preference for which variant is used, a finer analysis shows that this isn't necessarily true in all cases. For example, the *xbiek*∼*xbieki* alternation is observed in individual texts in the corpus.[1] A text from the European Law collection uses the *xbiek* variant six times and the *xbieki* variant thirty-eight times. Meanwhile, a different text from the European Law collection uses the *xbiek* variant twenty times and the *xbieki* variant seventeen times. There are texts that use the *xbiek* variant exclusively and texts that use the *xbieki* variant exclusively. Thus, it is important that a framework of morphology is able to handle this type of intra-speaker (or intra-text) variation.

The other type of surface variation within a single root is variation in vocalic melody. This type of variation is much more attested in the data set, with forty roots surfacing in the plural with at least two different vocalic melodies (but with the same

[1]It is worth noting here that these forms are not collective forms of the root (which has masculine singular agreement), but indeed broken plural forms with plural agreement.

prosodic structure).[2] The roots with variants that are most-attested in Korpus Malti 3.0 are listed in Table 5.2.

Root	Plurals	Vocalic melody	gloss	N in Korpus Malti
(a) $\sqrt{\text{KNTN}}$	*knatan*	{a:,a}	'building stones'	127
	knaten	{a:,e}	'building stones'	104
(b) $\sqrt{\dot{\text{C}}\text{NGN}}$	*ċnagen*	{a:,e}	'stone slabs'	23
	ċnagan	{a:,a}	'stone slabs'	17
(c) $\sqrt{\text{LNZ}}$	*lanez*	{a,e}	'fishing lines'	31
	lenez	{e,e}	'fishing lines'	6
(d) $\sqrt{\text{XTB}}$	*xtiebi*	{ie,i}	'gates'	37
	xtabi	{a:,i}	'gates'	3

Table 5.2: Roots with multiple surface vocalic melodies.

Unlike with the previous type of variation (prosodic structure), the variants that arise from variation in vocalic melody only rarely occur together in a single text in the corpus. For example, the *knatan*∼*knaten* variants are only attested together in three texts (out of 162 total texts that use either *knatan* or *knaten*). One of those three texts is a parliamentary debate, so it's possible that one speaker was using one variant and another speaker was using the other. The variants *ċnagan*∼*ċnagen* are found in 33 unique texts but never appear in the same text together. This distribution is found throughout the different roots that show this kind of variation. The framework of morphology must therefore also be able to account for this inter-speaker (or inter-text) variation.

The framework outlined in Chapter 4 is able to account for both of these types of variation using the same mechanism. One of the core mechanisms of the framework is allomorph selection, specifically the [+plural] allomorph selection. Recall that vocalic melody VIs are each specified for a set of root AIs (e.g., [+plural] ↔ {u:,a} $]_{\text{R}}$, where R ∈ $\sqrt{\text{ĦBL}}$, $\sqrt{\text{RĦL}}$, $\sqrt{\text{QMR}}$, ...). It may be the case that this relationship between vocalic melody allomorphs and root AIs is one-sided. That is to say allomorph VIs are specified to a set of root AIs, but root AIs are not specified to just one allomorph. This analysis supports a hypothesis that root AIs can be members of more than one

[2]Again, these data come from the surveys taken in Malta by Schembri (2006), and the forms with variation in the vocalic melody are attested by at least five individuals who completed the survey.

allomorph set. This relationship is displayed in Figure 5.1.

$$[+\text{plural}] \leftrightarrow \{\text{a:,a}\}\ ]_{\text{R}}\ \text{, where R} \in \{..., \sqrt{\text{NFR}}, ...\}$$
$$[+\text{plural}] \leftrightarrow \{\text{a:,e}\}\ ]_{\text{R}}\ \text{, where R} \in \{..., \sqrt{\text{NFR}}, ...\}$$
$$[+\text{plural}] \leftrightarrow \{\text{ie,e}\}\ ]_{\text{R}}\ \text{, where R} \in \{..., \sqrt{\text{NFR}}, ...\}$$

Figure 5.1: Different allomorph VIs can select the same root AI, resulting in variation in the broken plural form of 'scarecrow': *nfafar*, *nfafer*, *nfiefer*.

It can be posited that intrinsic speaker choice governs which vocalic melody is selected for insertion. This approach also provides the theoretical base for studies on dialectal variation of vocalic systems within the wider scope of word formation, although that is outside of the realm of the current study.

The underlying cause of variation of the type discussed here is the vocalic melody itself. By varying the length of the initial vowel (or by having a second vowel in the melody), the prosodic structure of the surface form changes, which accounts for the first instance of broken plural variation. Obviously variation in the selection of the vocalic melody morph also accounts for the latter type of variation, as well. Thus, one mechanism–the *selection* of the vocalic melody allomorph–is able to account for broken plurals that surface in multiple broken plural types and broken plurals that surface with multiple vocalic melodies.

5.1.2 Nouns with both broken plural and sound plural forms

Another phenomenon to ponder is nouns that can be pluralized both internally and externally.[3] The exact number of nouns in the data set that can be pluralized either way is variable across speakers, but one could guess that the number isn't a small one. Table 5.3 displays six of these sound∼broken alternations.

In nearly every instance in Table 5.3, the sound plural is formed by suffixing

[3]Interestingly enough, in doing research for this Chapter using Korpus Malti I came across this quote: *"In-nies dejjem trid tnaqqas il- varjanti. / Nismagħhom jistaqsu liem hi t-tajba* ***tapiti*** *jew* ***twapet,*** ***bolol*** *jew* ***bolli,*** ***bandieri*** *jew* ***bnadar,*** *daqslikieku jippreferu li jemmnu li hemm forma waħda biss, forsi għax huma lilha biss jużaw. / Dażgur li la rrid nimponi kelma u wisq anqas innaqqas il- libertà tal- poplu. / Anqas kieku rrid , kif nista'?"*

English: "People always want to reduce the variants. / I hear them asking what is best **carpets** or **carpets**, **stamps** or **stamps**, **flags** or **flags**, as if they prefer to believe that there is only one form, maybe because they only use it. / Of course I don't want to impose a word and much less reduce the freedom of the people. / Even if I want to, how can I?"

the morph /-i/ to the singular noun stem.[4] In (a-c), the sound plural form is most attested in Korpus Malti, and in (d-f) the broken plural form is most attested in Korpus Malti.

Root	**Plurals**	**Type**	**gloss**	**N in Korpus Malti**
(a) $\sqrt{\text{KXX}}$	*kaxxi*	sound	'boxes'	3,704
	kaxex	broken	'boxes'	573
(b) $\sqrt{\text{TZZ}}$	*tazzi*	sound	'glasses'	922
	tazez	broken	'glasses'	30
(c) $\sqrt{\text{GLN}}$	*galluni*	sound	'gallons'	121
	glalen	broken	'gallons'	101
(d) $\sqrt{\text{BLL}}$	*bolol*	broken	'stamps'	1,255
	bolli	sound	'stamps'	735
(e) $\sqrt{\text{TRQ}}$	*toroq*	broken	'streets'	68,556
	triqat	sound	'streets'	1,075
(f) $\sqrt{\text{TPT}}$	*twapet*	broken	'carpets'	219
	tapiti	sound	'carpets'	105

Table 5.3: Nouns that can be pluralized both internally and externally.

The framework in Chapter 4 deals with the sound∼broken alternation in a similar way as with the previous alternations. The answer lies again in allomorphic relationships between VIs. Recall that AIs can be spelled out either with root morphs or with stem morphs, and the insertion of a stem morph results in the spelling-out of a sound plural suffix higher up in the morphosyntax. If both a stem and a root compete for insertion into the innermost node (e.g., $\sqrt{\text{TRQ}}$ or $\sqrt{\text{TRIQ}}$), insertion of one over the other determines whether or not the plural will be sound or broken.

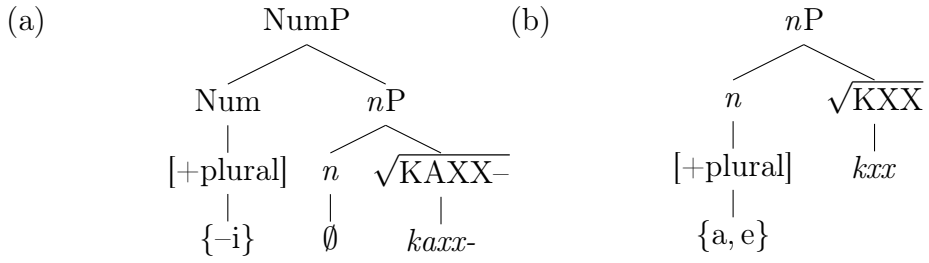


Figure 5.2: Morphosyntactic derivations of *kaxxi* (a) and *kaxex* (b) ('boxes') using the framework from Chapter 4.

Speaker variation or pragmatics might govern the insertion of one over the other, assuming that the stem and root VIs are both equally specified to the AI

[4]The only outlier is (e) *toroq*∼*triqat*, perhaps because both the stem and the suffix come from Arabic ([tari:q], [-a:t]).

morpheme. In the *kaxxi*∼*kaxex* alternation for example, one text in Korpus Malti of a parliamentary debate shows a single speaker use both variants in the same conversational turn. If both forms are seemingly interchangeable, it is not radical to propose that for some AIs, speakers store both a stem morph and a root morph in their list of VIs and insert them ad hoc.[5]

5.1.3 Root-derived sound plurals

This last phenomenon surrounding the Maltese broken plural to discuss is perhaps the most difficult to tackle. Some nouns that one would expect to be pluralized internally (that is, the nouns appear to be root-derived) are instead pluralized with a sound plural suffix. These nouns are semantically related to other words that are root-derived. A few examples are provided in Table 5.4.

Root	**Sing.**	**Plural**	**gloss**	**Other**	**gloss**
(a) $\sqrt{\text{ŻHR}}$	*żahra*	*żahr-iet*	'blossom/s'	*żahar*	'to blossom (v)'
				żahhar	'to cause to blossom (v)'
				żhajra	'small blossom (n)'
(b) $\sqrt{\text{DLM}}$	*dlam*	*dlam-ijiet*	'darkness/pl.'	*dalam*	'to get dark (v)'
				dallam	'to darken (v)'
				mudlam	'dark (adj)'
(c) $\sqrt{\text{FKR}}$	*fakra*	*fakr-iet*	'reminder/s'	*fakar*	'to remember (v)'
				fakkar	'to remind (v)'
				mafkar[6]	'memorial (n)'
(d) $\sqrt{\text{MXT}}$	*moxt*	*moxt-ijiet*[7]	'comb/s'	*maxat*	'to comb (v)'
				maxxat	'to comb regularly (v)'
				timxit	'combing (vn)'

Table 5.4: These sound plurals share a consonantal root morph with root-derived words.

Each of the singular forms above can be traced to a triliteral root in Arabic, and in Arabic each singular form is pluralized internally (with the exception of (b)). It can be clearly seen that in each case, the derived words relate to the singular form by means of a consonantal root. On these grounds, one would expect the singular form to take a broken plural, but that isn't the case.

[5]Of course, other factors are at play (e.g., pragmatics, interlocutor identity, etc.) but the general hypothesis still holds.

[6]This noun however takes a broken plural *mafkar* → *mfakar* 'memorial/s'.

[7]It should be noted that a broken plural form of this noun (*mxat*) is attested in Aquilina (1999); however both plural forms are rare in Korpus Malti.

There are two analyses of this phenomenon that can be supported by the framework described in the present study. The first analysis argues that for these nouns, the nominalizing head *n* itself is spelled out with a vocalic melody VI. The other analysis posits that the nominalizing head *n* triggers allomorphy of the innermost node resulting in the insertion of a stem morph. These analyses will be described briefly in turn, using the nominal pair *moxt* → *moxtijiet* 'comb/s'.

The first analysis argues that the plural forms of these nouns are still derived from the root, just like a broken plural. However, unlike the broken plural derivation, these nouns inherit a vocalic melody directly from the nominalizer *n*, not from a [+plural] feature. The [+plural] feature is spelled out with a sound plural suffix in the Num head, just like regular sound plurals.

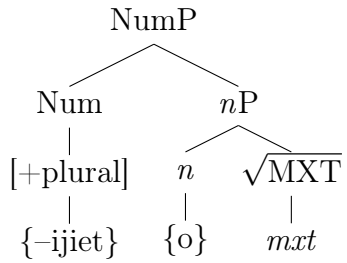


Figure 5.3: The sound plural *moxtijiet* 'combs' is derived from the root, with *n* spelling out a vocalic melody ($n \leftrightarrow \{o\}\ ]_R$, where $R \in \{\ldots, \sqrt{MXT}, \ldots\}$).

In this analysis, the first phase of Spell-Out spells-out the AI and the *n* head together, supplying the morphs [mxt, {o}] for the OT derivation and yielding *moxt* as the surface form. The second phase of Spell-Out spells-out the sound plural suffix /-ijiet/, which combines with *moxt* and provides the plural *moxtijiet*.

The second possible analysis utilizes contextual allomorphy to derive the sound plural surface from. It argues that the verbs that are semantically related to *moxt* (*maxat*, *maxxat*, etc.) are indeed derived from the root. Instead of an *n* head, the root combines with a *v* head, which spells-out the verbal vocalic melody. When deriving the plural noun, however, the presence of the *n* head triggers allomorphy of the VI that spells-out the AI. Instead of the root morph /mxt/, the stem morph /moxt/ is inserted.

In short, the Vocabulary List has two allomorphs to spell-out the abstract meaning

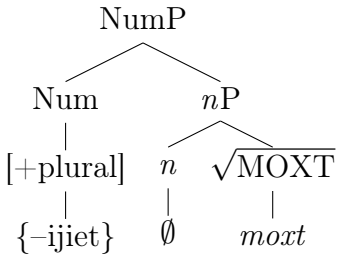


Figure 5.4: The *n* head triggers allomorphy of the innermost node during Spell-Out.

of 'comb-ness': a root morph /mxt/ and a stem morph /moxt/. The categorizing head is local to the innermost node and thus determines which VI is inserted based on whether the categorizing head is *n*, *v*, or *a*. In this case, the presence of *n* triggers the spell-out of the stem, and thus the derivation continues in two phases. The second phase spells-out a sound plural suffix which combines with *moxt* to provide the surface form *moxtijiet*.

The second analysis of this type of noun is stronger than the first analysis, yet both have weaknesses. The greatest weakness of the first analysis is that it betrays one of the core assumptions of the framework. The framework theorizes that a root morph in the innermost node causes the [+plural] feature to be spelled-out in the *n* node, whereas a stem morph in the innermost node causes the [+plural] feature to be spelled out in the Num node. In the first analysis, even though the innermost node is a root morph, the [+plural] feature is argued to be housed in the Num head. One could argue that the [+plural] feature is 'pushed out' of the *n* head by another feature (or by *n* itself), but that argument is tenuous. If anything, the analyses presented here provide a base for further study of these nouns that are potentially root-derived but are pluralized externally.

5.2 Avenues for future research

The present study introduces a pioneering approach to analyzing the morphology of Maltese and thus leaves the door open for its interpretation and utilization beyond the domain of the broken plural. This section first discusses the extension of the framework from Chapter 4 to other noun types, specifically the sound plurals and diminutive nouns, and then discusses utilizing the framework beyond the nominal

domain. This section closes with a discussion of the possibility of the phonological determination of vocalic melodies.

5.2.1 Within the nominal domain

The analysis of the sound plurals in Chapter 4 stopped short of the derivation on the phonological branch, and for good reason. The OT-based derivation proposed for the phonological branch is tailored to deriving broken plurals. The constraints are defined and ranked in a way that permits the interleaving of morphs, namely, the root morph and the vocalic melody morph.

biskott, -i	Lin.	NoHiatus	Onset	*Complex	*CV:	RFH
a. ☹ bis.kot.ti						∗!
☜ b. bis.ko.tit						
c. bi.si.kott				∗!		

Table 5.5: OT derivation of a sound plural. If Contiguity is ranked low, the analysis needs another constraint (or more) to prohibit the misselection of (b) as the optimal candidate.

As Table 5.5 shows, the permissibility of interleaving morphs poses a problem for sound plural derivations. Eval wrongly selects **biskotit* as the optimal plural form of *biskott* ('biscuit') instead of *biskotti*. One could wonder if more constraints need to be defined in order to account for both sound and broken plurals or if instead the grammar utilizes a completely different ranking for root-derived and stem-derived words.

Another set of nouns with curious plural behavior is diminutive nouns.[8] Like with pluralization, nouns can be morphologically diminutized either internally or externally, or diminutized lexically.[9] Following the analysis of the broken plural, one can posit that internal diminutives are derived from a root morph (/CCC/) and a diminutive morph (/-ej-/ or /-aj-/), and external diminutives are derived from a stem morph and a diminutive morph affix (/-ell/, /-ett/, etc.). The interaction between pluralization and diminutization is shown in Table 5.6. Regardless of whether the noun is diminutized internally or externally, the diminutive form is pluralized

[8]This also holds for augmentative nouns.

[9]For a deeper analysis of the diminutive (and augmentative) in Maltese, readers are directed to Cutajar (2018) and Bezzina (2020).

externally or lexically, but not internally. Both diminutive types will be discussed in brief, highlighting how a deeper analysis of each can fortify knowledge of the Maltese broken plural and of the noun phrase more generally.

Dim. type	**Sing.**	**Plural**	**gloss**	**Sing. dim.**	**Plural dim.**	**gloss**
(a) internal	*belt*	*bliet*	'city/ies'	*blejta*	*?blejt-iet*[10]	'small city/ies'
(b) internal	*ħobż*	*ħbejjeż*	'loaf/ves'	*ħbejża*	*?ħbejż-iet*	'small loaf/ves'
(c) internal	*fenek*	*fniek*	'rabbit/s'	*fnejnek*	*fniek żgħar*	'small rabbit/s'
(d) external	*biskott*	*biskott-i*	'biscuit/s'	*biskutt-ell*	*biskutt-ell-i*	'small biscuit/s'
(e) external	*artiklu*	*artikl-i*	'article/s'	*artikol-ett*	*artikol-ett-i*	'small article/s'
(f) external	*tavla*	*twavel*	'table/s'	*tavol-ett-a*	*tavol-ett-i*	'small table/s'

Table 5.6: The interactions between internal and external diminutization and pluralization.

Internal diminutives are composed of a root morph and a (diphthongal) vocalic morph, paralleling the composition of broken plurals. Thus, one could argue that the [+diminutive] feature is housed in the *n* head, like the [+plural] feature for broken plurals. When an internal diminutive is pluralized, it's as if the vocalic melody of the plural and the vocalic melody of the diminutive are competing with one another to be inserted into the surface form. Ultimately the diminutive vocalic melody (the diphthong) is inserted, and plurality is marked with a sound plural suffix.

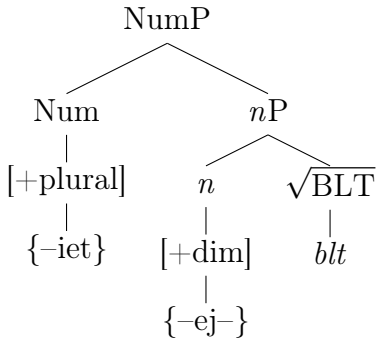


Figure 5.5: A proposed morphosyntactic derivation of the plural internal diminutive *blejtiet* 'small cities'.

Rather than viewing this as competition between VIs, it can instead be framed as a case of Impoverishment (*[+plural, +diminutive]). In the *n* head, the morpheme [+plural, +diminutive] undergoes Impoverishment, and the [+plural] feature is deleted from the morpheme. Rather than being deleted from the morphosyntax completely,

[10]It needs to be stated that Maltese informants were hesitant to produce morphological plural forms of internal diminutives, like (a-b). Instead they overwhelmingly preferred to produce lexical plural forms of internal diminutives, like in (c).

the [+plural] feature moves to the next available node, the Num head. The first phase of Spell-Out inserts the root morph and the diminutive diphthong morph, and the subsequent phase inserts a sound plural suffix to combine with the internal diminutive. This is shown in Figure 5.5.

External diminutives are composed of a stem morph and a suffixal morph, just like sound plurals. Recall however that the [+plural] feature for sound plurals exists in the Num head, not the *n* head. Thus, a [+diminutive] feature in the *n* head of a plural external diminutive derivation does not trigger Impoverishment because the *n* morpheme does not contain a [+plural] feature. Under this view, plural internal diminutives and plural external diminutives have nearly identical morphosyntactic structures; the only difference being a root or stem innermost node.

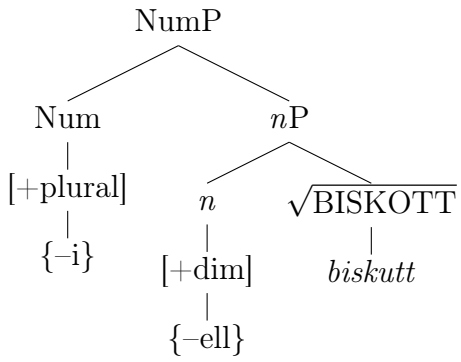


Figure 5.6: A proposed morphosyntactic derivation of the plural external diminutive *biskut-telli* 'small biscuits'.

There is justification for positing a [+diminutive] feature within the *n* node for external plurals. In Table 5.6 all of the external diminutives listed display a stem change (either a vowel change or vowel insertion). This stem change is only consistent with the [+diminutive] feature, and the stem change is evident in the plural diminutive, as well. According to Phase Theory, the categorizing head (in this case *n*) triggers the spell-out of the stem morpheme, and any feature above the phase boundary *n* is unable to trigger stem allomorphy within the phase. Therefore, the [+diminutive] feature must be situated in a head inside of the first phase boundary, which in this case is the *n* head (see Figure 5.6). The presence of the [+diminutive] feature triggers stem allomorphy and is responsible for the stem alternations that are present in Table 5.6.

Of course, these hypotheses surrounding the plural diminutive in Maltese are simply that: hypotheses. It has been shown here how one might analyze the diminutive in Maltese using the framework outlined in Chapter 4 of the present study. The interaction between diminutization and pluralization of nouns encourages the analysis of the Maltese noun phrase as a whole within a late-insertionist framework like DM. Beyond diminutive nouns, the present study also brings into question the (plural) behavior of other types of nouns, such as verbal nouns, agentive deverbal nouns, and collective nouns.

5.2.2 Beyond the nominal domain

The framework presented in this study is not restricted to nominal analyses, and in theory it is easily adaptable to root-based verbal and adjectival analyses, as well. Rather than dealing with the 'simple' sound∼broken plural alternation in Maltese nouns, future studies of the Maltese verb would need to define and incorporate morphs that spell-out tense, mood, and aspect features in addition to inflectional affixes. Although the morphosyntactic structure will have more projecting heads and levels, the basic mechanisms of the framework are unchanged.

A specific parallel can be drawn between nouns and verbs in Maltese. Just like nouns, Maltese verbs can be (roughly) divided into stem-derived verbs and root-derived verbs. The former set of verbs tend to be loan verbs, whereas the latter set are Semitic in nature.

Type	**Base verb**	**gloss**	**Derived form**	**gloss**
Root-derived	*teba'* (*tebagħ*)	'to print'	*mitbugħ*	'printed'
			tbigħ	'printing (n)'
Stem-derived	(*i*)*pprintja*	'to print'	(*i*)*pprintja-t*	'printed'
			(*i*)*pprintja-r*	'printing (n)'

Table 5.7: Maltese stem-derived and root-derived verbs and select derived forms.

Derivations of stem-derived verbs and their related forms in Maltese are largely affixal (like stem-derived nouns), whereas derivations of root-derived verbs and their related forms are largely based on vowels and their positioning within the root consonants (like root-derived nouns). Thus, although the functional category is different, the derivation of verbs and nouns in Maltese is quite similar under the

framework presented in Chapter 4. This study hopefully serves as a base for future studies on the Maltese verb in a late-insertionist framework.

5.2.3 Phonological determination of vocalic melodies

A final point to be made with regard to topics of future study is the possibility of phonologically-determined vocalic melodies in root-derived word forms. In the present framework, each vocalic melody is its own VI, and each vocalic melody is defined to a set of root morphemes. In the data set twenty-three unique vocalic melodies are attested, not taking into account length distinctions. With this in mind, one could wonder if there is a more efficient representation of the vocalic melodies in the morphosyntax and grammar as a whole.

Consider the quadri-consonantal broken plurals. The prosodic structure of these forms is CCVVCVC, so their vocalic melody VIs are always in the form {v:,v}. In the data set of attested broken plurals, the first vowel in the melody is either /a:/ or /ie/, and the second vowel in the melody is either /a/ or /e/. Therefore, four possible vocalic melodies are attested for the quadri-consonantal broken plurals: {a:,e}, {ie,e}, {a:,a}, and {ie,a}. With 194 quadri-consonantal broken plurals sharing just four vocalic melodies, perhaps it is possible to generalize and predict which vocalic melodies surface with which consonants.

For example, the vowel /a/ nearly always surfaces when adjacent to the guttural consonants /ħ/, /q/, and /għ/. This generalization holds whether the guttural consonant is the second, third, or fourth radical of the root. The first consonant is ignored because the quadri-consonantal forms always have a word-initial cluster.

Root	**Singular**	**Plural**	**Vocalic melody**	**gloss**
(a) $\sqrt{\text{MQDF}}$	*moqdief*	*mqadef*	{a:,e}	‘oar/s’
(b) $\sqrt{\text{BQN}}$	*baqqun*	*bqaqen*	{a:,e}	‘pickaxe/s’
(c) $\sqrt{\text{TLQ}}$	*tellieqa*	*tlielaq*	{ie,a}	‘race/s’
(d) $\sqrt{\dot{\text{Z}}\text{RGħ}}$	*żerriegħa*	*żrieragħ*	{ie,a}	‘seed/s’
(e) $\sqrt{\text{SNDQ}}$	*senduq*	*sniedaq*	{ie,a}	‘chest/s’
(f) $\sqrt{\dot{\text{G}}\text{WNH}}$	*ġewnaħ*	*ġwienaħ*	{ie,a}	‘wing/s’

Table 5.8: The vowel [a] surfaces when adjacent to guttural consonants.

There is only one contradictory form in the data set (*qażquż* → *qżieqeż* ‘pig/s’),

so the phonological constraint that dictates which vowel can surface with guttural consonants is quite rigid. However, this generalization doesn't hold with the triconsonantal forms. When a guttural consonant is the second radical of a triconsonantal form, /a/ is inserted 60% of the time, and when a guttural consonant is the third radical of a triconsonantal form, /a/ is inserted 29% of the time. This may suggest that there are different phonological constraints for tri- and quadri-consonantal roots.

After just a brief scan of the data set, other consonants and natural classes that may have the potential to affect the surfacing of the adjacent vowel are /r/, liquids, nasals, and sonorants in general. If one were able to uncover more trends in the vocalic melody data similar to the surfacing of /a/ in the quadri-consonantal forms, perhaps some broader generalizations could be made both within the broken plural data and within Maltese phonology more broadly.

5.3 Summary

This Chapter has sought to address three particular phenomena that pertain to the plural system of Maltese, and how they can be analyzed within the framework described in the present study. In particular, these phenomena involve broken plurals that surface in different broken plural types, nouns that take both sound and broken plurals, and nouns that are expected to be pluralized internally but are instead pluralized externally. These phenomena have been dealt with through notions of allomorphy. This Chapter has also proposed directions for future research on Maltese within a late-insertionist framework. It has proposed studies both within and beyond the nominal domain, and has proposed the possibility of the phonological determination of vocalic melodies. Studies on Maltese morphology have been largely lexicalist, so the introduction of a study using a decompositional, late-insertionist framework marks a new direction in the analysis of word formation in Maltese.

Chapter 6

Conclusion

The aim of this study was to explore the Maltese broken plural and to develop a theory of broken plural derivation that derives the surface form from a consonantal root that fits within a decompositional, late-insertionist framework. Further, this study has sought to describe a theory of phonological derivation that is able to account for the variation in the broken plural prosodic structures that are attested in Maltese. Lastly, the present study operated under the assumption that, contrary to popular literature, the 'template morph' is an epiphenomenon of the derivation. In doing so, this study has proposed a unified morphophonological derivation of concatenative and non-concatenative morphology of Maltese.

6.1 Framework synopsis

This study utilizes a modified version of the Distributed Morphology framework. The morphosyntactic branch of the derivation operates on the principles of late-insertion, phasal spell-out, and competition, as is typical of DM analyses. The phonological branch of the derivation strays from the mainstream DM framework in that it is structured around the Optimality Theory framework. Vocabulary Items (VIs) inserted in the morphosyntax are fed into the input of OT tableaux, and interacting constraints assign violations to candidates until the optimal candidate is selected for insertion.

It was argued that in the morphosyntax, two types of morphs can spell-out an Abstract Item: a stem morph or a root morph. The insertion of either a stem morph or a root morph governs which head projects the [+plural] feature. If a root morph is inserted, the [+plural] feature is expressed in the n head and is spelled-out

by allomorphic vocalic melody VIs. This structure generates a broken plural. If a stem morph is inserted, the [+plural] feature is expressed in the Num head and is spelled-out by allomorphic suffixal VIs. This structure generates a sound plural.

The phonological branch continues the derivation of the plural. The consonantal root morph and the vocalic melody morph serve as the input for an OT derivation. Several constraints were defined, but perhaps the most important constraint is Contiguity, which is ranked low to allow for the interleaving of the two morphs. Constraints on syllable well-formedness interact with the vocalic melody and the root consonants to ensure that the correct vowel(s) surface(s) in the appropriate position(s) between the root consonants. Thus, the variation in the prosodic structures of the broken plural in Maltese can be traced to the constraint ranking, not to a template morph.

6.2 Limitations and shortcomings

Unfortunately, every study comes with its own set of limitations and shortcomings, and the present study is no exception. The first and perhaps most impactful limitation of the present study is the relative age of the data set. The list of broken plurals compiled for this study was collected and tested against Maltese speakers in 2006, nearly twenty years ago. To the dismay of the author (who has limited working knowledge of Maltese), many of these broken plurals are considered now-obsolete by the current population of Maltese speakers. Perhaps a future study can utilize the methodology of Schembri (2006) to conduct a follow-up study to the status of the broken plurals in Maltese. A broken plural database containing all of the features outlined in Chapter 3 (and perhaps more) would be an asset to future studies on the broken plural. With a more accurate and up-to-date data set, the framework outlined above can be tailored more to the present linguistic situation in Malta and abroad.

A shortcoming of this study is the failure to fully incorporate the sound plurals into the derivation. Although this study is primarily concerned with the broken plurals, the sound plurals nonetheless exist in the grammar and should be accounted for. This study was able to account for the sound plurals in the morphosyntax, but

the sound plurals were abandoned in the phonological branch for reasons discussed in section 5.2.1. (the incompatibility with the low ranking of Contiguity, for one). A goal of the study was to unite concatenative and non-concatenative morphology under a single analysis, and a complete phonological derivation of the sound plurals would have strengthened this attempt.

6.3 Future research

In the current literature, there are no studies of Maltese morphology that take a decompositional, late-insertionist approach to the derivation of word forms. Therefore, the path is wide open to tackle other aspects of Maltese morphology within this framework. Additionally, few studies within the realm of Semitic morphology adopt the template-as-epiphenomenon approach, although the number is growing. A deeper analysis into the morphology of Maltese could add extra support to this approach to Semitic morphology.

As a final note, the integration of both the Semitic and non-Semitic aspects of Maltese morphology into a single analysis serves as impetus for further study of the morphosyntax of languages with heavy contact influence and/or borrowing, such as mixed languages and creole languages. The unique positioning of Maltese as a language that exists within the blurred line between Indo-European languages and Afro-Asiatic languages warrants further in-depth analyses of its intriguing linguistic phenomena.

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Appendix 1

The data set

This is the list of the broken plurals that were used in this study. This list includes type 1v23v broken plurals and type v123v broken plurals, as well as adjectives. The broken plurals are sorted according to prosodic structure type. Both triconsonantal and quadri-consonantal forms are listed here.

Triconsonantal forms

Root	Singular	Plural	Gloss	Prosodic type
bjr	bir	bjar	well/s	12vv3
bjt	bejt	bjut	roof/s	12vv3
blt	belt	bliet	city/ies	12vv3
bnt	bint	bniet	daughter/s	12vv3
brġ	borġ	braġ	heap/s	12vv3
bwt	but	bwiet	pocket/s	12vv3
bwz	buz	bwiez	pair/s of boots	12vv3
ċff	ċoff	ċfuf	bow/s	12vv3
ċns	ċens	ċnus	lease/s	12vv3
ċnt	ċint	ċnut	parapet wall/s	12vv3
ċrm	ċorma	ċrum	large number/s	12vv3
ċrv	ċerva	ċriev	deer/pl.	12vv3
ċwċ	ċuċ	ċwieċ	idiot/s	12vv3
djn	dejn	djun	debt/s	12vv3
djr	dar	djar	house/s	12vv3
dmm	demm	dmiem	blood/pl.	12vv3

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Root	Singular	Plural	Gloss	Prosodic type
dnb	denb	dnub	tail/s	12vv3
drs	darsa	dras	molar/s	12vv3
dwl	dawl	dwal	light/s	12vv3
fnk	fenek	fniek	rabbit/s	12vv3
fqr	fqir	fqar	poor/pl.	12vv3
frn	forn	fran	oven/s	12vv3
frq	ferq	fruq	gap/s	12vv3
ġdr	ġidra	ġdur	turnip/s	12vv3
għdd	għodda	għodod	tool/s	12vv3
għjn	għajn	għejun	fountain/s	12vv3
għnq	għonq	għenuq	neck/s	12vv3
għqd	għoqda	għoqod	knot/s	12vv3
għrb	għarbi	għarab	Arab/s	12vv3
għrf	għaref	għorrief	wise man/men	12vv3
għrq	għerq	għeruq	root/s	12vv3
għss	għassa	għases	police station/s	12vv3
għxx	għoxx	għoxux	vagina/s	12vv3
għżż	għażiż	għeżież	beloved/pl.	12vv3
ġld	ġilda	ġlud	leather/pl.	12vv3
ġnb	ġenb	ġnub	side/s	12vv3
ġns	ġens	ġnus	ethnic group/s	12vv3
ġwf	ġuf	ġwief	womb/s	12vv3
gzz	gozz	gzuz	heap/s	12vv3
ħbb	ħabib	ħbieb	friend/s	12vv3
ħbb	ħabba	ħbub	very small coin/s	12vv3

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Root	Singular	Plural	Gloss	Prosodic type
ħbl	ħobla	ħbiel	pregnant/pl.	12vv3
ħdd	ħadd	ħdud	Sunday/s	12vv3
ħdn	ħodon	ħdan	an armful/pl.	12vv3
ħff	ħafif	ħfief	light/pl.	12vv3
ħjt	ħajt	ħjut	thread/s	12vv3
ħlq	ħalq	ħluq	mouth/s	12vv3
ħmr	ħmar	ħmir	donkey/s	12vv3
ħnk	ħanek	ħniek	gum/pl.	12vv3
ħrf	ħaruf	ħrief	lamb/s	12vv3
kbr	kbir	kbar	big/pl.	12vv3
kff	keffa	kfief	hem/s	12vv3
klb	kelb	klieb	dog/s	12vv3
klm	kelma	kliem	word/s	12vv3
kmm	komma	kmiem	sleeve/s	12vv3
lbs	libsa	lbies	dress/es	12vv3
lp	lupu	lpup	wolf/ves	12vv3
lwn	lewn	lwien	colour/s	12vv3
mħħ	moħħ	mħuħ	mind/s	12vv3
mlħ	melħ	mluħ	salt/pl.	12vv3
mwl	mula	mwiel	landlord/s	12vv3
mws	mus	mwies	pocket knife/ves	12vv3
mwt	mewt	mwiet	death/s	12vv3
ndf	nadif	ndaf	clean/pl.	12vv3
nwl	newl	nwiel	loom/s	12vv3
nżl	niżla	nżul	slope/s	12vv3

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Root	Singular	Plural	Gloss	Prosodic type
qff	qoffa	qfief	basket/s	12vv3
qħb	qaħba	qħab	prostitute/s	12vv3
qlb	qalb	qlub	heart/s	12vv3
qll	qalil	qliel	fierce/pl.	12vv3
qmħ	qamħ	qmuħ	corn/pl.	12vv3
qrq	qorq	qrieq	sandal/s	12vv3
qwl	qawl	qwiel	proverb/s	12vv3
qws	qaws	qwies	bow/s	12vv3
qxr	qoxra	qxur	crust/s	12vv3
rġl	raġel	rġiel	man/men	12vv3
rħs	rħis	rħas	cheap/pl.	12vv3
rjs	ras	rjus	head/s	12vv3
rqq	rqieq	rqaq	thin/pl.	12vv3
rwħ	ruħ	rwieħ	soul/s	12vv3
sbħ	sabiħ	sbieħ	beautiful/pl.	12vv3
sħb	sieħba	sħab	friend/s	12vv3
sħħ	sħiħ	sħaħ	whole/pl.	12vv3
sħn	sħun	sħan	hot/pl.	12vv3
sjf	sajf	sjuf	summer/s	12vv3
sjf	sejf	sjuf	sword/s	12vv3
sn	sena	snin	year/s	12vv3
snd	sined	snied	stretch/es of barren land	12vv3
snn	sinna	snien	tooth/teeth	12vv3
srġ	sarġ	sruġ	serge/s	12vv3
srm	sorm	srum	buttocks/pl.	12vv3

Continued on next page

Root	Singular	Plural	Gloss	Prosodic type
srp	serp	sriep	snake/s	12vv3
swq	suq	swieq	market/s	12vv3
swr	sur	swar	bastion/s	12vv3
swt	sawt	swat	lash/es	12vv3
tfl	tifel	tfal	boy/s	12vv3
tjn	tajn	tjun	mud/pl.	12vv3
tjr	tajra	tjur	fowl/pl.	12vv3
tmn	tomna	tmien	measure of corn/pl.	12vv3
tql	tqil	tqal	heavy/pl.	12vv3
trf	tarf	truf	lock/s of hair	12vv3
twl	twil	twal	tall/pl.	12vv3
vrs	vers	vrus	verse/s	12vv3
wċċ	wiċċ	uċuħ	face/s	12vv3
wħd	waħda	uħud	one/pl.	12vv3
xbk	xibka	xbiek	fishing net/s	12vv3
xfr	xifer	xfar	edge/s	12vv3
xħħ	xħiħ	xħaħ	greedy/pl.	12vv3
xhr	xahar	xhur	month/s	12vv3
xjħ	xieħ	xjuħ	old person/people	12vv3
xmx	xemx	xmux	sun/s	12vv3
xqq	xaqq	xquq	crack/s	12vv3
xtt	xatt	xtut	shore/s	12vv3
xwk	xewka	xwiek	thorn/s	12vv3
żbb	żobb	żbub	penis/es	12vv3
żgħr	żgħir	żgħar	small/pl.	12vv3

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Root	Singular	Plural	Gloss	Prosodic type
żjt	żejt	żjut	oil/pl.	12vv3
zkk	zokk	zkuk	trunk/s	12vv3
zpp	zopp	zpup	lame person/people	12vv3
bdw	bidwi	bdiewa	farmer/s	12vv3v
bnd	banda	bnadi	side/s	12vv3v
btħ	bitħa	btieħi	yard/s	12vv3v
bwq	bieqja	bwieqi	small bowl/s	12vv3v
ċmn	ċumnija	ċmieni	chimney/s	12vv3v
drb	darba	drabi	one time/pl.	12vv3v
fsq	fisqija	fsieqi	swaddling clothes/pl.	12vv3v
għġb	għaġeb	għoġġieba	fussy person/people	12vv3v
għlq	għalqa	għelieqi	field/s	12vv3v
ġml	ġemel	ġmula	camel/s	12vv3v
ġrw	ġeru	ġriewi	puppy/ies	12vv3v
ħbl	ħobla	ħbieli	pregnant/pl.	12vv3v
ħbl	ħabel	ħbula	rope/s	12vv3v
ħnk	ħanek	ħnieki	gum/pl.	12vv3v
ħżn	ħażin	ħżiena	bad/pl.	12vv3v
ktl	kitla	ktieli	kettle/s	12vv3v
ljl	lejl	ljieli	night/s	12vv3v
lsr	lsir	lsiera	slave/s	12vv3v
ltm	ltim	ltiema	orphan/s	12vv3v
nsr	nisrani	nsara	Christian/s	12vv3v
qbr	qabar	qbura	grave/s	12vv3v
qmr	qamar	qmura	moon/s	12vv3v

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Root	Singular	Plural	Gloss	Prosodic type
qrb	qariba	qraba	kindred/pl.	12vv3v
qrm	qormi	qriema	person/people from Qormi	12vv3v
qrt	qorti	qrati	lawcourt/s	12vv3v
qsr	qasrija	qsari	flower pot/s	12vv3v
rħl	raħal	rħula	village/s	12vv3v
sdr	sidrija	sdieri	waistcoat/s	12vv3v
swl	sala	swali	hall/s	12vv3v
trb	tarbija	trabi	baby/ies	12vv3v
trħ	terħa	trieħi	sash/es	12vv3v
twq	tieqa	twieqi	window/s	12vv3v
xbk	xibka	xbieki	fishing net/s	12vv3v
xtb	xatba	xtabi	gate/s	12vv3v
xtw	xitwa	xtiewi	winter/s	12vv3v
xwn	xini	xwieni	galley/s	12vv3v
zlz	zalza	zlazi	sauce/s	12vv3v
bċċ	biċċa	bċejjeċ	piece/s	12vjjv3
bhm	bhima	bhejjem	beast/s	12vjjv3
btl	btala	btajjel	holiday/s	12vjjv3
bxr	bxara	bxajjar	announcement/s of an event	12vjjv3
dgħs	dgħajsa	dgħajjes	boat/s	12vjjv3
fls	flus	flejjes	money/pl.	12vjjv3
frġ	froġa	frejjeġ	omelette/s	12vjjv3
ftr	ftira	ftajjar	type of bread/pl.	12vjjv3
fwħ	fwieħa	fwejjaħ	perfume/s	12vjjv3
għdr	għadira	għadajjar	pool/s	12vjjv3

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Root	Singular	Plural	Gloss	Prosodic type
għġn	għaġin	għaġajjen	dough/s	12vjjv3
għmr	għamara	għamajjar	furniture/s	12vjjv3
għrs	għarus	għarajjes	engaged man/men	12vjjv3
vt	ingravata	ingravajjet	tie/s	12vjjv3
gżr	gżira	gżejjer	island/s	12vjjv3
ħbż	ħobż	ħbejjeż	bread/s	12vjjv3
ħġġ	ħuġġieġa	ħġejjeġ	bonfire/s	12vjjv3
ħlq	ħlieqa	ħlejjaq	creature/s	12vjjv3
ħrf	ħrafa	ħrejjef	fable/s	12vjjv3
ħss	ħoss	ħsejjes	sound/s	12vjjv3
ħxx	ħaxix	ħxejjex	grass/pl.	12vjjv3
kċn	kċina	kċejjen	kitchen/s	12vjjv3
kns	knisja	knejjes	church/es	12vjjv3
ktn	katina	ktajjen	chain/s	12vjjv3
lt	ċikkulata	ċikkulajjet	chocolate/s	12vjjv3
mjd	mejda	mwejjed	table/s	12vjjv3
nbd	nbid	nbejjed	wine/pl.	12vjjv3
ntn	ntiena	ntejjen	stink/pl.	12vjjv3
rġn	reġina	rġejjen	queen/s	12vjjv3
rjħ	rieħa	rwejjaħ	smell/s	12vjjv3
rkn	rokna	rkejjen	comer/s	12vjjv3
rn	ġiżirana	ġiżirajjen	necklace/s	12vjjv3
rt	inċirata	inċirajjet	raincoat/s	12vjjv3
skl	skola	skejjel	school/s	12vjjv3
skl	skuna	skejjen	schooner/s	12vjjv3

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Root	Singular	Plural	Gloss	Prosodic type
skrn	skrun	skrejjen	screw/s	12vjjv3
sngħ	sengħa	snajja'	craft/s	12vjjv3
spż	spiża	spejjeż	expense/s	12vjjv3
str	storja	stejjer	story/ies	12vjjv3
tbgħ	tebgħa	tbajja'	stain/s	12vjjv3
xkr	xkora	xkejjer	sack/s	12vjjv3
xmr	xmara	xmajjar	river/s	12vjjv3
żwr	żjara	żjajjar	visit/s	12vjjv3
fqr	fqir	foqra	poor/pl.	1v23v
ġdd	ġdid	ġodda	new/pl.	1v23v
għmj	għama	għomja	blind person/people	1v23v
għnj	għani	għonja	rich/pl.	1v23v
ġnn	ġnien	ġonna	garden/s	1v23v
ktb	ktieb	kotba	book/s	1v23v
mrd	marid	morda	sick person/people	1v23v
ndf	nadif	nodfa	clean/pl.	1v23v
qdm	qadim	qodma	old/pl.	1v23v
qsr	qasir	qosra	short/pl.	1v23v
sqf	saqaf	soqfa	roof/s	1v23v
tbb	tabib	tobba	doctor/s	1v23v
bċċ	boċċa	boċoċ	marble/s	1v2v3
bjd	abjad	bojod	white/pl.	1v2v3
blh	belha	boloħ	idiot/s	1v2v3
blkk	blokka	blokok	block/s	1v2v3
bll	balla	balal	bundle/s	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
bll	bolla	bolol	stamp/s	1v2v3
blq	iblaq	boloq	dusky/pl.	1v2v3
bnd	banda	baned	band/s	1v2v3
bnk	bank	banek	bank/s	1v2v3
bqr	baqra	baqar	cow/s	1v2v3
brġ	berġa	bereġ	auberge/s	1v2v3
brk	borka	borok	wild duck/s	1v2v3
brll	pożambrella	pożambrelel	umbrella stand/s	1v2v3
brll	umbrella	umbrelel	umbrella/s	1v2v3
brm	borma	borom	pot/s	1v2v3
brr	birra	birer	beer/s	1v2v3
brż	borża	boroż	paper bag/s	1v2v3
bsl	basla	basal	onion/s	1v2v3
bzz	bozza	bozoz	bulb/s	1v2v3
ċll	ċella	ċelel	cell/s	1v2v3
ċng	ċanga	ċaneg	beef/pl.	1v2v3
ċng	ċinga	ċineg	leash/es	1v2v3
ċnt	ċinta	ċinet	sharp edge/s of a roof	1v2v3
ċpp	ċappa	ċapap	lump/s of fruit	1v2v3
ċqq	ċoqqa	ċoqoq	monk's hood/s	1v2v3
ċrm	ċorma	ċorom	large number/s	1v2v3
ċrn	ċerna	ċeren	grouper/s	1v2v3
ċrr	ċarru	ċarar	plot/s of land	1v2v3
dċċ	doċċa	doċoċ	shower/s	1v2v3
djq	dejjaq	dojoq	narrow/pl.	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
dml	demla	demel	abscess/es	1v2v3
fdd	fidda	fided	silver/pl.	1v2v3
fll	folla	folol	crowd/s	1v2v3
fltt	flotta	flotot	fleet/s	1v2v3
flxkn	flixkun	fliexken	bottle/s	1v2v3
flz	falz	foloz	false/pl.	1v2v3
frġ	forġa	foroġ	forge/s	1v2v3
frk	forka	forok	gallows/pl.	1v2v3
frm	firma	firem	signature/s	1v2v3
frm	forma	forom	shape/s	1v2v3
frr	inforra	inforor	lining/s of a dress	1v2v3
frs	farsa	fares	farce/s	1v2v3
frx	farxa	farax	wooden shelf/ves	1v2v3
fss	fossa	fosos	cesspit/s	1v2v3
fxx	faxxa	faxex	bandage/s	1v2v3
fxx	fixxa	fixex	imitation coin/s	1v2v3
ġbl	ġebla	ġebel	stone/s	1v2v3
gdb	gidba	gideb	lie/s	1v2v3
gff	gaffa	gafef	fork/s for catching sea urchins	1v2v3
gġġ	gaġġa	gaġeġ	cage/s	1v2v3
gmm	gomma	gomom	rubber/pl.	1v2v3
ġmr	ġamra	ġamar	live coal/s	1v2v3
ġnt	ġonta	ġonot	extra piece/s	1v2v3
grn	girna	giren	small room/s in a field	1v2v3
ġrr	ġarra	ġarar	jar/s	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
grss	grossa	grosos	twelve dozen/pl.	1v2v3
grtt	grotta	grotot	grotto/s	1v2v3
gss	ingassa	ingases	noose/s	1v2v3
gvrt	gverta	gvieret	blanket/s	1v2v3
gwrr	gwerra	gwerer	war/s	1v2v3
ħdr	aħdar	ħodor	green/pl.	1v2v3
ħfr	ħofra	ħofor	hole/s	1v2v3
ħll	ħalla	ħalel	swell/s of the sea	1v2v3
ħlq	ħolqa	ħoloq	metal link/s	1v2v3
ħmr	aħmar	ħomor	red/pl.	1v2v3
ħrx	aħrax	ħorox	harsh/pl.	1v2v3
ħtb	ħotba	ħotob	matchmaker/s	1v2v3
kbb	kobba	kobob	ball/s of thread	1v2v3
kħl	ikħal	koħol	blue/pl.	1v2v3
klkk	klikka	klikek	clique/s	1v2v3
knk	konka	konok	trench/es	1v2v3
knn	kanna	kanen	pipe/s	1v2v3
kpp	kappa	kapep	cape/s	1v2v3
krh	ikrah	koroh	ugly/pl.	1v2v3
kxx	kaxxa	kaxex	box/es	1v2v3
kxx	koxxa	koxox	thigh/s	1v2v3
lbr	labra	labar	needle/s	1v2v3
lġġ	loġġa	loġoġ	arch/es	1v2v3
lnċ	lanċa	laneċ	ferry boat/s	1v2v3
lnd	landa	laned	tin/s	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
lnf	linfa	linef	chandelier/s	1v2v3
lnz	lanza	lanez	fishing line/s	1v2v3
lnz	lenza	lenez	fishing line/s	1v2v3
lqm	loqma	loqom	morsel/s	1v2v3
lżr	liżar	lożor	sheet/s	1v2v3
mċċ	miċċa	miċeċ	fuse/s	1v2v3
mff	moffa	mofof	mould/pl.	1v2v3
mll	molla	molal	spring/s	1v2v3
mnk	manka	manek	hose/s	1v2v3
mpp	mappa	mapep	map/s	1v2v3
mrs	morsa	moros	vice/s	1v2v3
mss	massa	mases	mass/es	1v2v3
mzz	mazza	mazez	mace/pl.	1v2v3
mzz	mezza	mezez	wicker basket/s for fruit	1v2v3
nċċ	niċċa	niċeċ	niche/s	1v2v3
nkt	nikta	niket	dot/s	1v2v3
nml	nemla	nemel	ant/s	1v2v3
nss	nassa	nases	trap/s	1v2v3
pjzz	pjazza	pjazez	square/s	1v2v3
plkk	plakka	plakek	plaque/s	1v2v3
pll	palla	palel	pall/s	1v2v3
plz	polza	poloz	voucher/s	1v2v3
pnn	pinna	pinen	pen/s	1v2v3
pnt	pinta	pinet	pint/s	1v2v3
pnt	ponta	ponot	pimple/s	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
prċ	perċa	pereċ	washing line/s	1v2v3
prg	porga	porog	laxative/s	1v2v3
pzz	pezza	pezez	piece/s of cloth	1v2v3
pzz	pizza	pizez	pizza/s	1v2v3
qll	qolla	qolol	type of jar/pl.	1v2v3
qml	qamla	qamel	nit/s	1v2v3
qms	qmis	qomos	shirt/s	1v2v3
qtn	qotna	qoton	cotton pod/s	1v2v3
qtt	qatta	qatet	shear/pl.	1v2v3
rml	armel	romol	widower/s	1v2v3
rss	rassa	rases	crowd/s	1v2v3
rtb	artab	rotob	soft/pl.	1v2v3
rtt	rotta	rotot	course/s	1v2v3
rzz	razza	razez	ethnic group/s	1v2v3
sdd	sodda	sodod	bed/s	1v2v3
sfnġ	sfinġa	sfineġ	fritter/s	1v2v3
sfr	isfar	sofor	yellow/pl.	1v2v3
sġr	siġra	siġar	tree/s	1v2v3
skk	sikka	sikek	plough/s	1v2v3
smm	somma	somom	sum/s	1v2v3
smr	ismar	somor	suntanned/pl.	1v2v3
spll	spalla	spalel	shoulder/s	1v2v3
spnż	sponża	sponoż	sponge/s	1v2v3
spp	soppa	sopop	soup/s	1v2v3
srr	serra	serer	hothouse/s	1v2v3

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Root	Singular	Plural	Gloss	Prosodic type
srr	sorra	soror	flank/s	1v2v3
stff	staffa	stafef	stirrup/s	1v2v3
stkk	stikka	stikek	cue/s	1v2v3
stll	stalla	stalel	stable/s	1v2v3
stll	stilla	stilel	straw/s	1v2v3
stng	stanga	staneg	bolt/s	1v2v3
stt	setta	setet	sect/s	1v2v3
swd	iswed	suwed	black/pl.	1v2v3
tbn	tibna	tiben	straw/s	1v2v3
tkk	takka	takek	blot/s	1v2v3
tkk	tikka	tikek	dot/s	1v2v3
tkk	tokka	tokok	pen holder/s	1v2v3
tnd	tinda	tined	tent/s	1v2v3
tqb	toqba	toqob	hole/s	1v2v3
trġ	tarġa	taraġ	stair/s	1v2v3
trk	tork	torok	Turk/s	1v2v3
trnk	trinka	trinek	trench/es	1v2v3
trq	triq	toroq	street/s	1v2v3
trr	terra	terer	powder/s	1v2v3
trt	torta	torot	pie/s	1v2v3
trx	trux	torox	deaf/pl.	1v2v3
txx	taxxa	taxex	tax/es	1v2v3
tzz	tazza	tazez	glass/es	1v2v3
vlġġ	vleġġa	vleġeġ	arrow/s	1v2v3
vll	villa	vilel	villa/s	1v2v3

Continued on next page

Root	Singular	Plural	Gloss	Prosodic type
vrg	virga	vireg	can/s	1v2v3
wlġ	wilġa	wileġ	large area/s of fields	1v2v3
wrċ	werċ	wereċ	cross-eyed person/people	1v2v3
wrq	werqa	weraq	leaf/ves	1v2v3
xff	xoffa	xofof	lip/s	1v2v3
xkff	xkaffa	xkafef	shelf/ves	1v2v3
xll	xall	xalel	shawl/s	1v2v3
xlp	xilpa	xilep	salp/s	1v2v3
xrk	xriek	xorok	stone slab/s	1v2v3
żbġ	żibġa	żibeġ	bead/s	1v2v3
zpp	zopp	zopop	lame person/people	1v2v3
żrq	iżraq	żoroq	azure/pl.	1v2v3
bħr	baħar	ibħra	sea/s	v123v
ġfn	ġifen	iġfna	vessel/s	v123v
ġml	ġemel	iġmla	camel/s	v123v
ġsm	ġisem	iġsma	body/ies	v123v
lħn	leħen	ilħna	voice/s	v123v
lsn	lsien	ilsna	tongue/s	v123v
qbr	qabar	oqbra	grave/s	v123v
qsm	qasam	oqsma	agricultural estate/s	v123v
sdr	sider	isdra	chest/s	v123v
sqr	seqer	isqra	falcon/s	v123v
xbr	xiber	ixbra	span/s	v123v
xdq	xedaq	ixdqa	jaw/s	v123v

Quadri-consonantal forms

Root	Singular	Plural	Gloss	Prosodic type
bċn	beċċun	bċieċen	pigeon/s	12vv2v3
bkm	bekkum	bkiekem	spidershell/s	12vv2v3
bln	ballun	blalen	ball/s	12vv2v3
bqn	baqqun	bqaqen	pickaxe/s	12vv2v3
brt	beritta	brieret	cap/s	12vv2v3
bzl	buzzell	bziezel	block/s with one or more pulleys	12vv2v3
bżl	beżżul	bżieżel	breast/s	12vv2v3
bzn	bezzun	bziezen	bread roll/s	12vv2v3
bżq	bużżieqa	bżieżaq	balloon/s	12vv2v3
ċpl	ċappella	ċpapel	round stone/s	12vv2v3
ċpt	ċappetta	ċpiepet	hinge/s of a door	12vv2v3
ċrt	ċarruta	ċrieret	piece/s of cloth	12vv2v3
dbn	dubbiena	dbieben	fly/ies	12vv2v3
dbr	dabra	dbabar	ulcer/s	12vv2v3
dbs	debbus	dbiebes	mace/pl.	12vv2v3
dħn	duħħan	dħaħan	smoke/pl.	12vv2v3
dkn	dokkiena	dkaken	large bench/es	12vv2v3
dwr	dawra	dwawar	stroll/s	12vv2v3
fls	fellus	flieles	chick/s	12vv2v3
fwr	fawra	fwawar	sensation/s of hotness	12vv2v3
gdm	geddum	gdiedem	lower jaw/s	12vv2v3
ġkt	ġakketta	ġkieket	jacket/s	12vv2v3
gln	gallun	glalen	gallon/s	12vv2v3
ġmn	ġummiena	ġmiemen	tassell/s	12vv2v3
kmr	kamra	kmamar	room/s	12vv2v3

Continued on next page

Root	Singular	Plural	Gloss	Prosodic type
kmr	anti-kamra	anti-kmamar	antechamber/s	12vv2v3
kpl	kappell	kpiepel	hat/s	12vv2v3
kpn	kappun	kpapan	hood/s worn by babies	12vv2v3
kxn	kexxun	kxaxen	drawer/s	12vv2v3
kzl	kazzola	kzazel	saucepan/s	12vv2v3
nfr	nuffara	nfafar	scarecrow/s	12vv2v3
pxn	pexxun	pxaxen	calf/s	12vv2v3
qlt	qallut	qlalet	feces/pl.	12vv2v3
qts	qattus	qtates	cat/s	12vv2v3
rdn	raddiena	rdieden	spinning wheel/s	12vv2v3
rkl	rukkell	rkiekel	bobbin/s	12vv2v3
rst	russett	rsieset	heron/s	12vv2v3
rzt	razzett	rziezet	farm/s	12vv2v3
sfr	suffara	sfafar	whistle/s	12vv2v3
sħr	saħħar	sħaħar	wizard/s	12vv2v3
skn	sikkina	skieken	knife/ves	12vv2v3
slb	salib	slaleb	crucifix/es	12vv2v3
slm	sellum	slielem	ladder/s	12vv2v3
snr	sunnara	snanar	fishing hook/s	12vv2v3
srq	serrieq	srieraq	saw/s	12vv2v3
tkn	takkuna	tkaken	heel/s	12vv2v3
tlq	tellieqa	tlielaq	race/s	12vv2v3
xfr	xafra	xfafar	blade/s	12vv2v3
xrq	xerqa	xrieraq	cough/s	12vv2v3
żlm	żelluma	żlielem	blunder/s	12vv2v3

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Root	Singular	Plural	Gloss	Prosodic type
żlq	żellieqa	żlielaq	slippery place/s	12vv2v3
żmr	żummara	żmamar	fife/s	12vv2v3
żnr	żunnara	żnanar	animal/s with multicolored fur	12vv2v3
zpn	zappun	zpapen	mattock/s	12vv2v3
żrgħ	żerriegħa	żrieragħ	seed/s	12vv2v3
żrq	żurrieqi	żrieraq	person from Żurrieq/pl.	12vv2v3
bdbd	bodbod	bdabad	he-goat/s	12vv3v4
bħnn	baħnan	bħaħen	fool/s	12vv3v4
blbl	belbul	bliebel	little bird/s	12vv3v4
bndr	bandiera	bnadar	flag/s	12vv3v4
brbn	barbun	braban	flounder/s	12vv3v4
brdl	burdell	briedel	brothel/s	12vv3v4
brkn	barkun	braken	pontoon/s	12vv3v4
brmċ	bermuċ	briemeċ	sth. rolled between one's fingers/pl.	12vv3v4
brml	barmil	bramel	bucket/s	12vv3v4
brqm	borqom	brieqam	caul/s	12vv3v4
brqx	burqax	braqax	painted comber/s	12vv3v4
bstn	bastun	bsaten	walking stick/s	12vv3v4
btbt	betbut	btiebet	reed pipe/s	12vv3v4
bxkl	bixkilla	bxiekel	wicker basket/s	12vv3v4
bxrn	bixrun	bxieren	place/s where grapes are squeezed	12vv3v4
bżbż	bażbuż	bżiebeż	sickly person/people	12vv3v4
ċnċl	ċenċiela	ċnieċel	little bell/s	12vv3v4
ċngn	ċangun	ċnagan	large stone slab/s	12vv3v4
ċnpl	ċenpula	ċniepel	dowdy woman/en	12vv3v4

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Root	Singular	Plural	Gloss	Prosodic type
ċrċr	ċerċur	ċrieċer	person/people of vulgar habits	12vv3v4
ċrkt	ċurkett	ċrieket	ring/s	12vv3v4
dblt	dublett	dbielet	skirt/s	12vv3v4
dnfl	denfil	dniefel	dolphin/s	12vv3v4
drbs	dorbies	drabes	lion/s	12vv3v4
fkrn	fekruna	fkieren	tortoise/s	12vv3v4
frdl	fardal	fradal	apron/s	12vv3v4
frft	farfett	friefet	butterfly/ies	12vv3v4
frfx	ferfux	friefex	rash person/people	12vv3v4
frkt	furketta	frieket	fork/s	12vv3v4
frts	fartas	frietes	bald man/men	12vv3v4
għfrd	għafrid	għefiered	devil/s	12vv3v4
għnqd	għanqud	għenieqed	bunch/es of fruit	12vv3v4
għsfr	għasfur	għasafar	bird/s	12vv3v4
għxrn	għaxra	għexieren	ten/s	12vv3v4
glgl	gelgul	gliegel	large spring/s of water	12vv3v4
ġlġl	ġolġol	ġlieġel	small tinkling bell/s	12vv3v4
gnds	gendus	gniedes	bull/s	12vv3v4
grbġ	gorboġ	griebeġ	sty/es	12vv3v4
grbl	gurbell	griebel	type of fish /pl.	12vv3v4
grdl	gardell	griedel	goldfinch/s	12vv3v4
ġrdn	ġurdien	ġrieden	mouse/pl.	12vv3v4
grfx	gerfux	griefex	careless work/pl.	12vv3v4
ġrnt	ġurnata	ġranet	day/s	12vv3v4
grżm	gerżuma	grieżem	throat/s	12vv3v4

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Root	Singular	Plural	Gloss	Prosodic type
ġwlq	ġewlaq	ġwielaq	wicker basket/s	12vv3v4
ġwnħ	ġewnaħ	ġwienaħ	wing/s	12vv3v4
ħnżr	ħanżir	ħnieżer	pig/s	12vv3v4
ħrbx	ħarbux	ħriebex	very small fish/pl.	12vv3v4
ħrpn	ħarpun	ħrapen	harpoon/s	12vv3v4
kntn	kantun	knatan	building stone/s	12vv3v4
krfs	karfusa	krafes	celery/pl.	12vv3v4
krkr	karkur	krakar	slipper/s	12vv3v4
krkt	kurkett	krieket	hook/s	12vv3v4
krpt	kurpett	kriepet	corset/s	12vv3v4
krtċ	kartoċċ	kratać	paper bag/s	12vv3v4
krtl	kartell	kratel	small barrel/s	12vv3v4
kwkb	kewkba	kwiekeb	star/s	12vv3v4
mftħ	muftieħ	mfietaħ	key/s	12vv3v4
mgħrf	mgħarfa	mgħaref	spoon/s	12vv3v4
mġnn	miġnun	mġienen	madman/madmen	12vv3v4
mġss	mġassa	mġases	noose/s	12vv3v4
mħdd	mħadda	mħaded	pillow/s	12vv3v4
mħġr	maħġar	mħaġar	heap/s of stones	12vv3v4
mħrt	moħriet	mħaret	plough/s	12vv3v4
mħżn	maħżen	mħażen	storing place/s	12vv3v4
mktr	maktur	mkatar	handkerchief/s	12vv3v4
mnsb	mansab	mnasab	bird catching net/s	12vv3v4
mntn	muntun	mtaten	ram/s	12vv3v4
mqdf	moqdief	mqadef	oar/s	12vv3v4

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Root	Singular	Plural	Gloss	Prosodic type
mqds	maqdes	mqades	holy place/s	12vv3v4
mqrt	maqrut	mqaret	pastry filled with dates/pl.	12vv3v4
mrtl	martell	mrietel	hammer/s	12vv3v4
msbħ	musbieħ	msiebaħ	lamp/s	12vv3v4
msġr	masġar	msaġar	wood/pl.	12vv3v4
mskn	miskin	msieken	pitiable person/people	12vv3v4
mslt	misluta	msielet	earring/s	12vv3v4
msmr	musmar	msiemer	nail/s	12vv3v4
msrħ	misraħ	msieraħ	open square/s	12vv3v4
msrn	musrana	msaren	bowel/s	12vv3v4
pċlq	peċluq	pċielaq	blabbermouth/s	12vv3v4
pċpċ	peċpuċa	pċapaċ	worthless object/s	12vv3v4
pntr	pantor	pnatar	flounce/s	12vv3v4
pnzl	pinzell	pniezel	brush/es	12vv3v4
prpr	perpura	prapar	scarecrow/s	12vv3v4
psps	pespus	psiepes	fledgling bird/s	12vv3v4
pstż	pastaż	psataż	rude person/people	12vv3v4
pxpx	pexpux	pxiepex	naughty child/ren	12vv3v4
qndl	qandul	qnadel	wattle/s	12vv3v4
qnfd	qanfud	qniefed	hedgehog/s	12vv3v4
qnpn	qanpiena	qniepel	bell/s	12vv3v4
qntr	qantar	qnatar	heavy load/s	12vv3v4
qnżħ	qanżħa	qnieżaħ	fussy person/people	12vv3v4
qrtl	qartalla	qratal	large wicker basket/s	12vv3v4
qrts	qartas	qratas	rolled piece/s of paper for groceries	12vv3v4

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Root	Singular	Plural	Gloss	Prosodic type
qżqż	qażquż	qżieqeż	pig/s	12vv3v4
skrpl	skarpell	skrapel	chisel/s	12vv3v4
skrpn	skarpan	skrapan	shoemaker/s	12vv3v4
skrtċ	skartoċċ	skratać	cartridge/s	12vv3v4
skwrr	skwerra	skwerer	set square/s	12vv3v4
sltn	sultan	slaten	king/s	12vv3v4
slvġ	salvaġġ	slavaġ	savage/s	12vv3v4
sndq	senduq	sniedaq	chest/s	12vv3v4
sntr	senter	snieter	shotgun/s	12vv3v4
srbt	serbut	sriebat	row/s	12vv3v4
srdq	serduq	sriedaq	cock/s	12vv3v4
srkn	serkin	srieken	sulky/pl.	12vv3v4
srvt	sarvetta	srievet	napkin/s	12vv3v4
tnbr	tanbur	tnabar	drum/s	12vv3v4
tntf	tentufa	tnietef	trifle/s	12vv3v4
tntx	tentuxa	tnietex	frayed thread/s	12vv3v4
trtn	tartana	tratan	tartan fishing boat/s	12vv3v4
trtq	tertuqa	trietaq	membrane/s	12vv3v4
vrdn	verdun	vrieden	greenfinch/es	12vv3v4
wrżq	werżieq	wrieżaq	cricket/s	12vv3v4
xfjk	xifajk	xjafek	troublemaker/s	12vv3v4
xjtn	xitan	xjatan	devil/s	12vv3v4
xnxl	xenxul	xniexel	newly formed bunch/es of grapes	12vv3v4
żjtn	żejtuni	żwieten	person/people from Żejtun	12vv3v4
żnbl	żenbil	żniebel	large basket/s made of broom	12vv3v4

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Root	Singular	Plural	Gloss	Prosodic type
żnġl	żinġla	żnieġel	large copper basin/s	12vv3v4
zntr	zuntier	znatar	churchyard/s	12vv3v4
żnżn	żunżan	żnażan	wasp/s	12vv3v4
żrbn	żarbun	żraben	shoe/s	12vv3v4
żrġn	żarġun	żragan	vine shoot/s	12vv3v4
żrmġ	żarmuġ	żrameġ	small rabbit/s	12vv3v4
żrżq	żurżieqa	żrieżaq	slide/s	12vv3v4
żrżr	żarżur	żrieżer	tiger moth/s	12vv3v4
ċvt	ċavetta	ċwievet	key/s	1wvv2v3
dfr	difer	dwiefer	nail/s	1wvv2v3
ħnt	ħanut	ħwienet	shop/s	1wvv2v3
rfn	riefnu	rwiefen	gale/s	1wvv2v3
tbt	tebut	twiebet	coffin/s	1wvv2v3
tġn	taġen	twaġen	frying pan/s	1wvv2v3
tpt	tapit	twapet	carpet/s	1wvv2v3
tvl	tavla	twavel	plank/s	1wvv2v3
xbl	xabla	xwabel	sabre/s	1wvv2v3
żml	żiemel	żwiemel	horse/s	1wvv2v3

Appendix 2

Root analysis

The following table is a recreation of the root analysis outlined in Section 3.5. For the sake of space, only the root analysis of the triliteral roots will be displayed here. Some columns of the table have been omitted for conciseness, namely the 'sequence' columns. Cluster-initial roots have likewise been omitted.

Heading Legend			
C1	Root consonant 1	**1P**	Place of articulation of consonant 1
C2	Root consonant 2	**2P**	Place of articulation of consonant 2
C3	Root consonant 3	**3P**	Place of articulation of consonant 3
1V	Voicing of consonant 1	**1C**	Continuancy of consonant 1
2V	Voicing of consonant 2	**2C**	Continuancy of consonant 2
3V	Voicing of consonant 3	**3C**	Continuancy of consonant 3
1S	Sonorancy of consonant 1	**1#**	Sonority score of consonant 1
2S	Sonorancy of consonant 2	**2#**	Sonority score of consonant 2
3S	Sonorancy of consonant 3	**3#**	Sonority score of consonant 3
1M	Manner of articulation of consonant 1		
2M	Manner of articulation of consonant 2		
3M	Manner of articulation of consonant 3		

Data Legend			
V	Voiced	**A**	Place: Alveolar
L	Voiceless	**F**	Place: F(Ph)aryngeal
S	Sonorant	**G**	Place: Glottal
O	Obstruent	**L**	Place: Labial
A	Manner: Affricate	**P**	Place: Palatal
F	Manner: Fricative	**V**	Place: Velar
G	Manner: Glide	**C**	Continuant
L	Manner: Liquid	**O**	Occlusive
N	Manner: Nasal		
S	Manner: Stop		

Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
bċċ	boċoċ	b	ċ	ċ	V	L	L	O	O	O	S	A	A	L	P	P	O	O	O	4	2	2
bċn	bċieċen	b	ċ	n	V	L	V	O	O	S	S	A	N	L	P	A	O	O	O	4	2	7
bdw	bdiewa	b	d	w	V	V	V	O	O	S	S	S	G	L	A	V	O	O	C	4	4	9
bħr	ibħra	b	ħ	r	V	L	V	O	O	S	S	F	L	L	F	A	O	C	C	4	3	8
bjd	bojod	b	j	d	V	V	V	O	S	O	S	G	S	L	P	A	O	C	O	4	9	4
bjr	bjar	b	j	r	V	V	V	O	S	S	S	G	L	L	P	A	O	C	C	4	9	8
bjt	bjut	b	j	t	V	V	L	O	S	O	S	G	S	L	P	A	O	C	O	4	9	1
bkm	bkiekem	b	k	m	V	L	V	O	O	S	S	S	N	L	V	L	O	O	O	4	1	7
blh	boloh	b	l	h	V	V	L	O	S	O	S	L	F	L	A	F	O	C	C	4	8	3
bll	bolol	b	l	l	V	V	V	O	S	S	S	L	L	L	A	A	O	C	C	4	8	8
bln	blalen	b	l	n	V	V	V	O	S	S	S	L	N	L	A	A	O	C	O	4	8	7
blq	boloq	b	l	q	V	V	L	O	S	O	S	L	S	L	A	G	O	C	O	4	8	1
blt	bliet	b	l	t	V	V	L	O	S	O	S	L	S	L	A	A	O	C	O	4	8	1
bnd	bnadi	b	n	d	V	V	V	O	S	O	S	N	S	L	A	A	O	O	O	4	7	4
bnk	banek	b	n	k	V	V	L	O	S	O	S	N	S	L	A	V	O	O	O	4	7	1
bnt	bniet	b	n	t	V	V	L	O	S	O	S	N	S	L	A	A	O	O	O	4	7	1
bqn	bqaqen	b	q	n	V	L	V	O	O	S	S	S	N	L	G	A	O	O	O	4	1	7
bqr	baqar	b	q	r	V	L	V	O	O	S	S	S	L	L	G	A	O	O	C	4	1	8
brġ	braġ	b	r	ġ	V	V	V	O	S	O	S	L	A	L	A	P	O	C	O	4	8	5
brk	borok	b	r	k	V	V	L	O	S	O	S	L	S	L	A	V	O	C	O	4	8	1
brm	borom	b	r	m	V	V	V	O	S	S	S	L	N	L	A	L	O	C	O	4	8	7
brr	birer	b	r	r	V	V	V	O	S	S	S	L	L	L	A	A	O	C	C	4	8	8
brt	brieret	b	r	t	V	V	L	O	S	O	S	L	S	L	A	A	O	C	O	4	8	1
brż	boroż	b	r	ż	V	V	V	O	S	O	S	L	F	L	A	A	O	C	C	4	8	6
bsl	basal	b	s	l	V	L	V	O	O	S	S	F	L	L	A	A	O	C	C	4	3	8
btħ	btieħi	b	t	ħ	V	L	L	O	O	O	S	S	F	L	A	F	O	O	C	4	1	3

Continued on next page

Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
btl	btajjel	b	t	l	V	L	V	O	O	S	S	S	L	L	A	A	O	O	C	4	1	8
bwq	bwieqi	b	w	q	V	V	L	O	S	O	S	G	S	L	V	G	O	C	O	4	9	1
bwt	bwiet	b	w	t	V	V	L	O	S	O	S	G	S	L	V	A	O	C	O	4	9	1
bwz	bwiez	b	w	z	V	V	L	O	S	O	S	G	A	L	V	A	O	C	O	4	9	2
bxr	bxajjar	b	x	r	V	L	V	O	O	S	S	F	L	L	P	A	O	C	C	4	3	8
bzl	bziezel	b	z	l	V	L	V	O	O	S	S	A	L	L	A	A	O	O	C	4	2	8
bżl	bżieżel	b	ż	l	V	V	V	O	O	S	S	F	L	L	A	A	O	C	C	4	6	8
bzn	bziezen	b	z	n	V	L	V	O	O	S	S	A	N	L	A	A	O	O	O	4	2	7
bżq	bżieżaq	b	ż	q	V	V	L	O	O	O	S	F	S	L	A	G	O	C	O	4	6	1
bzz	bozoz	b	z	z	V	L	L	O	O	O	S	A	A	L	A	A	O	O	O	4	2	2
ċff	ċfuf	ċ	f	f	L	L	L	O	O	O	A	F	F	P	L	L	O	C	C	2	3	3
ċll	ċelel	ċ	l	l	L	V	V	O	S	S	A	L	L	P	A	A	O	C	C	2	8	8
ċmn	ċmieni	ċ	m	n	L	V	V	O	S	S	A	N	N	P	L	A	O	O	O	2	7	7
ċng	ċineg	ċ	n	g	L	V	V	O	S	O	A	N	S	P	A	V	O	O	O	2	7	4
ċns	ċnus	ċ	n	s	L	V	L	O	S	O	A	N	F	P	A	A	O	O	C	2	7	3
ċnt	ċinet	ċ	n	t	L	V	L	O	S	O	A	N	S	P	A	A	O	O	O	2	7	1
ċpl	ċpapel	ċ	p	l	L	L	V	O	O	S	A	S	L	P	L	A	O	O	C	2	1	8
ċpp	ċapap	ċ	p	p	L	L	L	O	O	O	A	S	S	P	L	L	O	O	O	2	1	1
ċpt	ċpiepet	ċ	p	t	L	L	L	O	O	O	A	S	S	P	L	A	O	O	O	2	1	1
ċqq	ċoqoq	ċ	q	q	L	L	L	O	O	O	A	S	S	P	G	G	O	O	O	2	1	1
ċrm	ċrum	ċ	r	m	L	V	V	O	S	S	A	L	N	P	A	L	O	C	O	2	8	7
ċrn	ċeren	ċ	r	n	L	V	V	O	S	S	A	L	N	P	A	A	O	C	O	2	8	7
ċrr	ċarar	ċ	r	r	L	V	V	O	S	S	A	L	L	P	A	A	O	C	C	2	8	8
ċrt	ċrieret	ċ	r	t	L	V	L	O	S	O	A	L	S	P	A	A	O	C	O	2	8	1
ċrv	ċriev	ċ	r	v	L	V	V	O	S	O	A	L	F	P	A	L	O	C	C	2	8	6

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Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
ċvt	ċwievet	ċ	v	t	L	V	L	O	O	O	A	F	S	P	L	A	O	C	O	2	6	1
ċwċ	ċwieċ	ċ	w	ċ	L	V	L	O	S	O	A	G	A	P	V	P	O	C	O	2	9	2
dbn	dbieben	d	b	n	V	V	V	O	O	S	S	S	N	A	L	A	O	O	O	4	4	7
dbr	dbabar	d	b	r	V	V	V	O	O	S	S	S	L	A	L	A	O	O	C	4	4	8
dbs	dbiebes	d	b	s	V	V	L	O	O	O	S	S	F	A	L	A	O	O	C	4	4	3
dċċ	doċoċ	d	ċ	ċ	V	L	L	O	O	O	S	A	A	A	P	P	O	O	O	4	2	2
dfr	dwiefer	d	f	r	V	L	V	O	O	S	S	F	L	A	L	A	O	C	C	4	3	8
dħn	dħaħan	d	ħ	n	V	L	V	O	O	S	S	F	N	A	F	A	O	C	O	4	3	7
djn	djun	d	j	n	V	V	V	O	S	S	S	G	N	A	P	A	O	C	O	4	9	7
djq	dojoq	d	j	q	V	V	L	O	S	O	S	G	S	A	P	G	O	C	O	4	9	1
djr	djar	d	j	r	V	V	V	O	S	S	S	G	L	A	P	A	O	C	C	4	9	8
dkn	dkaken	d	k	n	V	L	V	O	O	S	S	S	N	A	V	A	O	O	O	4	1	7
dml	demel	d	m	l	V	V	V	O	S	S	S	N	L	A	L	A	O	O	C	4	7	8
dmm	dmiem	d	m	m	V	V	V	O	S	S	S	N	N	A	L	L	O	O	O	4	7	7
dnb	dnub	d	n	b	V	V	V	O	S	O	S	N	S	A	A	L	O	O	O	4	7	4
drb	drabi	d	r	b	V	V	V	O	S	O	S	L	S	A	A	L	O	C	O	4	8	4
drs	dras	d	r	s	V	V	L	O	S	O	S	L	F	A	A	A	O	C	C	4	8	3
dwl	dwal	d	w	l	V	V	V	O	S	S	S	G	L	A	V	A	O	C	C	4	9	8
dwr	dwawar	d	w	r	V	V	V	O	S	S	S	G	L	A	V	A	O	C	C	4	9	8
fdd	fided	f	d	d	L	V	V	O	O	O	F	S	S	L	A	A	C	O	O	3	4	4
fll	folol	f	l	l	L	V	V	O	S	S	F	L	L	L	A	A	C	C	C	3	8	8
fls	flejjes	f	l	s	L	V	L	O	S	O	F	L	F	L	A	A	C	C	C	3	8	3
flz	foloz	f	l	z	L	V	L	O	S	O	F	L	A	L	A	A	C	C	O	3	8	2
fnk	fniek	f	n	k	L	V	L	O	S	O	F	N	S	L	A	V	C	O	O	3	7	1
fqr	foqra	f	q	r	L	L	V	O	O	S	F	S	L	L	G	A	C	O	C	3	1	8

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Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
frġ	foroġ	f	r	ġ	L	V	V	O	S	O	F	L	A	L	A	P	C	C	O	3	8	5
frk	forok	f	r	k	L	V	L	O	S	O	F	L	S	L	A	V	C	C	O	3	8	1
frm	forom	f	r	m	L	V	V	O	S	S	F	L	N	L	A	L	C	C	O	3	8	7
frn	fran	f	r	n	L	V	V	O	S	S	F	L	N	L	A	A	C	C	O	3	8	7
frq	fruq	f	r	q	L	V	L	O	S	O	F	L	S	L	A	G	C	C	O	3	8	1
frr	inforor	f	r	r	L	V	V	O	S	S	F	L	L	L	A	A	C	C	C	3	8	8
frs	fares	f	r	s	L	V	L	O	S	O	F	L	F	L	A	A	C	C	C	3	8	3
frx	farax	f	r	x	L	V	L	O	S	O	F	L	F	L	A	P	C	C	C	3	8	3
fsq	fsieqi	f	s	q	L	L	L	O	O	O	F	F	S	L	A	G	C	C	O	3	3	1
fss	fosos	f	s	s	L	L	L	O	O	O	F	F	F	L	A	A	C	C	C	3	3	3
ftr	ftajjar	f	t	r	L	L	V	O	O	S	F	S	L	L	A	A	C	O	C	3	1	8
fwħ	fwejjaħ	f	w	ħ	L	V	L	O	S	O	F	G	F	L	V	F	C	C	C	3	9	3
fwr	fwawar	f	w	r	L	V	V	O	S	S	F	G	L	L	V	A	C	C	C	3	9	8
fxx	fixex	f	x	x	L	L	L	O	O	O	F	F	F	L	P	P	C	C	C	3	3	3
ġbl	ġebel	ġ	b	l	V	V	V	O	O	S	A	S	L	P	L	A	O	O	C	5	4	8
gdb	gideb	g	d	b	V	V	V	O	O	O	S	S	S	V	A	L	O	O	O	4	4	4
ġdd	ġodda	ġ	d	d	V	V	V	O	O	O	A	S	S	P	A	A	O	O	O	5	4	4
gdm	gdiedem	g	d	m	V	V	V	O	O	S	S	S	N	V	A	L	O	O	O	4	4	7
ġdr	ġdur	ġ	d	r	V	V	V	O	O	S	A	S	L	P	A	A	O	O	C	5	4	8
gff	gafef	g	f	f	V	L	L	O	O	O	S	F	F	V	L	L	O	C	C	4	3	3
ġfn	iġfna	ġ	f	n	V	L	V	O	O	S	A	F	N	P	L	A	O	C	O	5	3	7
gġġ	gaġeġ	g	ġ	ġ	V	V	V	O	O	O	S	A	A	V	P	P	O	O	O	4	5	5
ġkt	ġkieket	ġ	k	t	V	L	L	O	O	O	A	S	S	P	V	A	O	O	O	5	1	1
ġld	ġlud	ġ	l	d	V	V	V	O	S	O	A	L	S	P	A	A	O	C	O	5	8	4
gln	glalen	g	l	n	V	V	V	O	S	S	S	L	N	V	A	A	O	C	O	4	8	7

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Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
ġml	ġmula	ġ	m	l	V	V	V	O	S	S	A	N	L	P	L	A	O	O	C	5	7	8
gmm	gomom	g	m	m	V	V	V	O	S	S	S	N	N	V	L	L	O	O	O	4	7	7
ġmn	ġmiemen	ġ	m	n	V	V	V	O	S	S	A	N	N	P	L	A	O	O	O	5	7	7
ġmr	ġamar	ġ	m	r	V	V	V	O	S	S	A	N	L	P	L	A	O	O	C	5	7	8
ġnb	ġnub	ġ	n	b	V	V	V	O	S	O	A	N	S	P	A	L	O	O	O	5	7	4
ġnn	ġonna	ġ	n	n	V	V	V	O	S	S	A	N	N	P	A	A	O	O	O	5	7	7
ġns	ġnus	ġ	n	s	V	V	L	O	S	O	A	N	F	P	A	A	O	O	C	5	7	3
ġnt	ġonot	ġ	n	t	V	V	L	O	S	O	A	N	S	P	A	A	O	O	O	5	7	1
grn	giren	g	r	n	V	V	V	O	S	S	S	L	N	V	A	A	O	C	O	4	8	7
ġrr	ġarar	ġ	r	r	V	V	V	O	S	S	A	L	L	P	A	A	O	C	C	5	8	8
ġrw	ġriewi	ġ	r	w	V	V	V	O	S	S	A	L	G	P	A	V	O	C	C	5	8	9
ġsm	iġsma	ġ	s	m	V	L	V	O	O	S	A	F	N	P	A	L	O	C	O	5	3	7
gss	ingases	g	s	s	V	L	L	O	O	O	S	F	F	V	A	A	O	C	C	4	3	3
ġwf	ġwief	ġ	w	f	V	V	L	O	S	O	A	G	F	P	V	L	O	C	C	5	9	3
gzz	gzuz	g	z	z	V	L	L	O	O	O	S	A	A	V	A	A	O	O	O	4	2	2
ħbb	ħbieb	ħ	b	b	L	V	V	O	O	O	F	S	S	F	L	L	C	O	O	3	4	4
ħbl	ħbieli	ħ	b	l	L	V	V	O	O	S	F	S	L	F	L	A	C	O	C	3	4	8
ħbż	ħbejjeż	ħ	b	ż	L	V	V	O	O	O	F	S	F	F	L	A	C	O	C	3	4	6
ħdd	ħdud	ħ	d	d	L	V	V	O	O	O	F	S	S	F	A	A	C	O	O	3	4	4
ħdn	ħdan	ħ	d	n	L	V	V	O	O	S	F	S	N	F	A	A	C	O	O	3	4	7
ħdr	ħodor	ħ	d	r	L	V	V	O	O	S	F	S	L	F	A	A	C	O	C	3	4	8
ħff	ħfief	ħ	f	f	L	L	L	O	O	O	F	F	F	F	L	L	C	C	C	3	3	3
ħfr	ħofor	ħ	f	r	L	L	V	O	O	S	F	F	L	F	L	A	C	C	C	3	3	8
ħġġ	ħġejjeġ	ħ	ġ	ġ	L	V	V	O	O	O	F	A	A	F	P	P	C	O	O	3	5	5
ħjt	ħjut	ħ	j	t	L	V	L	O	S	O	F	G	S	F	P	A	C	C	O	3	9	1

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Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
ħll	ħalel	ħ	l	l	L	V	V	O	S	S	F	L	L	F	A	A	C	C	C	3	8	8
ħlq	ħoloq	ħ	l	q	L	V	L	O	S	O	F	L	S	F	A	G	C	C	O	3	8	1
ħmr	ħmir	ħ	m	r	L	V	V	O	S	S	F	N	L	F	L	A	C	O	C	3	7	8
ħnk	ħnieki	ħ	n	k	L	V	L	O	S	O	F	N	S	F	A	V	C	O	O	3	7	1
ħnt	ħwienet	ħ	n	t	L	V	L	O	S	O	F	N	S	F	A	A	C	O	O	3	7	1
ħrf	ħrejjef	ħ	r	f	L	V	L	O	S	O	F	L	F	F	A	L	C	C	C	3	8	3
ħrx	ħorox	ħ	r	x	L	V	L	O	S	O	F	L	F	F	A	P	C	C	C	3	8	3
ħss	ħsejjes	ħ	s	s	L	L	L	O	O	O	F	F	F	F	A	A	C	C	C	3	3	3
ħtb	ħotob	ħ	t	b	L	L	V	O	O	O	F	S	S	F	A	L	C	O	O	3	1	4
ħxx	ħxejjex	ħ	x	x	L	L	L	O	O	O	F	F	F	F	P	P	C	C	C	3	3	3
ħżn	ħżiena	ħ	ż	n	L	V	V	O	O	S	F	F	N	F	A	A	C	C	O	3	6	7
kbb	kobob	k	b	b	L	V	V	O	O	O	S	S	S	V	L	L	O	O	O	1	4	4
kbr	kbar	k	b	r	L	V	V	O	O	S	S	S	L	V	L	A	O	O	C	1	4	8
kċn	kċejjen	k	ċ	n	L	L	V	O	O	S	S	A	N	V	P	A	O	O	O	1	2	7
kff	kfief	k	f	f	L	L	L	O	O	O	S	F	F	V	L	L	O	C	C	1	3	3
kħl	koħol	k	ħ	l	L	L	V	O	O	S	S	F	L	V	F	A	O	C	C	1	3	8
klb	klieb	k	l	b	L	V	V	O	S	O	S	L	S	V	A	L	O	C	O	1	8	4
klm	kliem	k	l	m	L	V	V	O	S	S	S	L	N	V	A	L	O	C	O	1	8	7
kmm	kmiem	k	m	m	L	V	V	O	S	S	S	N	N	V	L	L	O	O	O	1	7	7
kmr	kmamar	k	m	r	L	V	V	O	S	S	S	N	L	V	L	A	O	O	C	1	7	8
knk	konok	k	n	k	L	V	L	O	S	O	S	N	S	V	A	V	O	O	O	1	7	1
knn	kanen	k	n	n	L	V	V	O	S	S	S	N	N	V	A	A	O	O	O	1	7	7
kpl	kpiepel	k	p	l	L	L	V	O	O	S	S	S	L	V	L	A	O	O	C	1	1	8
kpn	kpapan	k	p	n	L	L	V	O	O	S	S	S	N	V	L	A	O	O	O	1	1	7
kpp	kapep	k	p	p	L	L	L	O	O	O	S	S	S	V	L	L	O	O	O	1	1	1

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Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
krh	koroħ	k	r	h	L	V	L	O	S	O	S	L	F	V	A	F	O	C	C	1	8	3
ktb	kotba	k	t	b	L	L	V	O	O	O	S	S	S	V	A	L	O	O	O	1	1	4
ktl	ktieli	k	t	l	L	L	V	O	O	S	S	S	L	V	A	A	O	O	C	1	1	8
ktn	ktajjen	k	t	n	L	L	V	O	O	S	S	S	N	V	A	A	O	O	O	1	1	7
kxn	kxaxen	k	x	n	L	L	V	O	O	S	S	F	N	V	P	A	O	C	O	1	3	7
kxx	koxox	k	x	x	L	L	L	O	O	O	S	F	F	V	P	P	O	C	C	1	3	3
kzl	kzazel	k	z	l	L	L	V	O	O	S	S	A	L	V	A	A	O	O	C	1	2	8
lbr	labar	l	b	r	V	V	V	S	O	S	L	S	L	A	L	A	C	O	C	8	4	8
lbs	lbies	l	b	s	V	V	L	S	O	O	L	S	F	A	L	A	C	O	C	8	4	3
lġġ	loġoġ	l	ġ	ġ	V	V	V	S	O	O	L	A	A	A	P	P	C	O	O	8	5	5
lħn	ilħna	l	ħ	n	V	L	V	S	O	S	L	F	N	A	F	A	C	C	O	8	3	7
ljl	ljieli	l	j	l	V	V	V	S	S	S	L	G	L	A	P	A	C	C	C	8	9	8
lnċ	laneċ	l	n	ċ	V	V	L	S	S	O	L	N	A	A	A	P	C	O	O	8	7	2
lnd	laned	l	n	d	V	V	V	S	S	O	L	N	S	A	A	A	C	O	O	8	7	4
lnf	linef	l	n	f	V	V	L	S	S	O	L	N	F	A	A	L	C	O	C	8	7	3
lnz	lenez	l	n	z	V	V	L	S	S	O	L	N	A	A	A	A	C	O	O	8	7	2
lp	lpup	l	p		V	L		S	O		L	S		A	L		C	O		8	1	
lqm	loqom	l	q	m	V	L	V	S	O	S	L	S	N	A	G	L	C	O	O	8	1	7
lsn	ilsna	l	s	n	V	L	V	S	O	S	L	F	N	A	A	A	C	C	O	8	3	7
lsr	lsiera	l	s	r	V	L	V	S	O	S	L	F	L	A	A	A	C	C	C	8	3	8
lt	ċikkulajjet	l	t		V	L		S	O		L	S		A	A		C	O		8	1	
ltm	ltiema	l	t	m	V	L	V	S	O	S	L	S	N	A	A	L	C	O	O	8	1	7
lwn	lwien	l	w	n	V	V	V	S	S	S	L	G	N	A	V	A	C	C	O	8	9	7
lżr	lożor	l	ż	r	V	V	V	S	O	S	L	F	L	A	A	A	C	C	C	8	6	8
mċċ	miċeċ	m	ċ	ċ	V	L	L	S	O	O	N	A	A	L	P	P	O	O	O	7	2	2

Continued on next page

Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
mff	mofof	m	f	f	V	L	L	S	O	O	N	F	F	L	L	L	O	C	C	7	3	3
mħħ	mħuħ	m	ħ	ħ	V	L	L	S	O	O	N	F	F	L	F	F	O	C	C	7	3	3
mjd	mwejjed	m	j	d	V	V	V	S	S	O	N	G	S	L	P	A	O	C	O	7	9	4
mlħ	mluħ	m	l	ħ	V	V	L	S	S	O	N	L	F	L	A	F	O	C	C	7	8	3
mll	molal	m	l	l	V	V	V	S	S	S	N	L	L	L	A	A	O	C	C	7	8	8
mnk	manek	m	n	k	V	V	L	S	S	O	N	N	S	L	A	V	O	O	O	7	7	1
mpp	mapep	m	p	p	V	L	L	S	O	O	N	S	S	L	L	L	O	O	O	7	1	1
mrd	morda	m	r	d	V	V	V	S	S	O	N	L	S	L	A	A	O	C	O	7	8	4
mrj	mirja	m	r	j	V	V	V	S	S	S	N	L	G	L	A	P	O	C	C	7	8	9
mrs	moros	m	r	s	V	V	L	S	S	O	N	L	F	L	A	A	O	C	C	7	8	3
mss	mases	m	s	s	V	L	L	S	O	O	N	F	F	L	A	A	O	C	C	7	3	3
mwl	mwiel	m	w	l	V	V	V	S	S	S	N	G	L	L	V	A	O	C	C	7	9	8
mws	mwies	m	w	s	V	V	L	S	S	O	N	G	F	L	V	A	O	C	C	7	9	3
mwt	mwiet	m	w	t	V	V	L	S	S	O	N	G	S	L	V	A	O	C	O	7	9	1
mzz	mezez	m	z	z	V	L	L	S	O	O	N	A	A	L	A	A	O	O	O	7	2	2
nċċ	niċeċ	n	ċ	ċ	V	L	L	S	O	O	N	A	A	A	P	P	O	O	O	7	2	2
ndf	nodfa	n	d	f	V	V	L	S	O	O	N	S	F	A	A	L	O	O	C	7	4	3
nfr	nfafar	n	f	t	V	L	L	S	O	O	N	F	S	A	L	A	O	C	O	7	3	1
nkt	niket	n	k	t	V	L	L	S	O	O	N	S	S	A	V	A	O	O	O	7	1	1
nml	nemel	n	m	l	V	V	V	S	S	S	N	N	L	A	L	A	O	O	C	7	7	8
nsr	nsara	n	s	r	V	L	V	S	O	S	N	F	L	A	A	A	O	C	C	7	3	8
nss	nases	n	s	s	V	L	L	S	O	O	N	F	F	A	A	A	O	C	C	7	3	3
ntn	ntejjen	n	t	n	V	L	V	S	O	S	N	S	N	A	A	A	O	O	O	7	1	7
nwl	nwiel	n	w	l	V	V	V	S	S	S	N	G	L	A	V	A	O	C	C	7	9	8
nżl	nżul	n	ż	l	V	V	V	S	O	S	N	F	L	A	A	A	O	C	C	7	6	8

Continued on next page

Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
pll	palel	p	l	l	L	V	V	O	S	S	S	L	L	L	A	A	O	C	C	1	8	8
plz	poloz	p	l	z	L	V	L	O	S	O	S	L	A	L	A	A	O	C	O	1	8	2
pnn	pinen	p	n	n	L	V	V	O	S	S	S	N	N	L	A	A	O	O	O	1	7	7
pnt	ponot	p	n	t	L	V	L	O	S	O	S	N	S	L	A	A	O	O	O	1	7	1
prċ	pereċ	p	r	ċ	L	V	L	O	S	O	S	L	A	L	A	P	O	C	O	1	8	2
prg	porog	p	r	g	L	V	V	O	S	O	S	L	S	L	A	V	O	C	O	1	8	4
pxn	pxaxen	p	x	n	L	L	V	O	O	S	S	F	N	L	P	A	O	C	O	1	3	7
pzz	pizez	p	z	z	L	L	L	O	O	O	S	A	A	L	A	A	O	O	O	1	2	2
qbr	qbura	q	b	r	L	V	V	O	O	S	S	S	L	G	L	A	O	O	C	1	4	8
qdm	qodma	q	d	m	L	V	V	O	O	S	S	S	N	G	A	L	O	O	O	1	4	7
qff	qfief	q	f	f	L	L	L	O	O	O	S	F	F	G	L	L	O	C	C	1	3	3
qħb	qħab	q	ħ	b	L	L	V	O	O	O	S	F	S	G	F	L	O	C	O	1	3	4
qlb	qlub	q	l	b	L	V	V	O	S	O	S	L	S	G	A	L	O	C	O	1	8	4
qll	qolol	q	l	l	L	V	V	O	S	S	S	L	L	G	A	A	O	C	C	1	8	8
qlt	qlalet	q	l	t	L	V	L	O	S	O	S	L	S	G	A	A	O	C	O	1	8	1
qmħ	qmuħ	q	m	ħ	L	V	L	O	S	O	S	N	F	G	L	F	O	O	C	1	7	3
qml	qamel	q	m	l	L	V	V	O	S	S	S	N	L	G	L	A	O	O	C	1	7	8
qmr	qmura	q	m	r	L	V	V	O	S	S	S	N	L	G	L	A	O	O	C	1	7	8
qms	qomos	q	m	s	L	V	L	O	S	O	S	N	F	G	L	A	O	O	C	1	7	3
qrb	qraba	q	r	b	L	V	V	O	S	O	S	L	S	G	A	L	O	C	O	1	8	4
qrm	qriema	q	r	m	L	V	V	O	S	S	S	L	N	G	A	L	O	C	O	1	8	7
qrq	qrieq	q	r	q	L	V	L	O	S	O	S	L	S	G	A	G	O	C	O	1	8	1
qrt	qrati	q	r	t	L	V	L	O	S	O	S	L	S	G	A	A	O	C	O	1	8	1
qsm	oqsma	q	s	m	L	L	V	O	O	S	S	F	N	G	A	L	O	C	O	1	3	7
qsr	qsari	q	s	r	L	L	V	O	O	S	S	F	L	G	A	A	O	C	C	1	3	8

Continued on next page

Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
qtn	qoton	q	t	n	L	L	V	O	O	S	S	S	N	G	A	A	O	O	O	1	1	7
qts	qtates	q	t	s	L	L	L	O	O	O	S	S	F	G	A	A	O	O	C	1	1	3
qtt	qatet	q	t	t	L	L	L	O	O	O	S	S	S	G	A	A	O	O	O	1	1	1
qwl	qwiel	q	w	l	L	V	V	O	S	S	S	G	L	G	V	A	O	C	C	1	9	8
qws	qwies	q	w	s	L	V	L	O	S	O	S	G	F	G	V	A	O	C	C	1	9	3
qxr	qxur	q	x	r	L	L	V	O	O	S	S	F	L	G	P	A	O	C	C	1	3	8
rdn	rdieden	r	d	n	V	V	V	S	O	S	L	S	N	A	A	A	C	O	O	8	4	7
rfn	rwiefen	r	f	n	V	L	V	S	O	S	L	F	N	A	L	A	C	C	O	8	3	7
rġl	rġiel	r	ġ	l	V	V	V	S	O	S	L	A	L	A	P	A	C	O	C	8	5	8
rġn	rġejjen	r	ġ	n	V	V	V	S	O	S	L	A	N	A	P	A	C	O	O	8	5	7
rħl	rħula	r	ħ	l	V	L	V	S	O	S	L	F	L	A	F	A	C	C	C	8	3	8
rħs	rħas	r	ħ	s	V	L	L	S	O	O	L	F	F	A	F	A	C	C	C	8	3	3
rjħ	rwejjaħ	r	j	ħ	V	V	L	S	S	O	L	G	F	A	P	F	C	C	C	8	9	3
rjs	rjus	r	j	s	V	V	L	S	S	O	L	G	F	A	P	A	C	C	C	8	9	3
rkl	rkiekel	r	k	l	V	L	V	S	O	S	L	S	L	A	V	A	C	O	C	8	1	8
rkn	rkejjen	r	k	n	V	L	V	S	O	S	L	S	N	A	V	A	C	O	O	8	1	7
rml	romol	r	m	l	V	V	V	S	S	S	L	N	L	A	L	A	C	O	C	8	7	8
rn	ġiżirajjen	r	n		V	V		S	S		L	N		A	A		C	O		8	7	
rqq	rqaq	r	q	q	V	L	L	S	O	O	L	S	S	A	G	G	C	O	O	8	1	1
rss	rases	r	s	s	V	L	L	S	O	O	L	F	F	A	A	A	C	C	C	8	3	3
rst	rsieset	r	s	t	V	L	L	S	O	O	L	F	S	A	A	A	C	C	O	8	3	1
rt	inċirajjet	r	t		V	L		S	O		L	S		A	A		C	O		8	1	
rtb	rotob	r	t	b	V	L	V	S	O	O	L	S	S	A	A	L	C	O	O	8	1	4
rtt	rotot	r	t	t	V	L	L	S	O	O	L	S	S	A	A	A	C	O	O	8	1	1
rwħ	rwieħ	r	w	ħ	V	V	L	S	S	O	L	G	F	A	V	F	C	C	C	8	9	3

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Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
rzt	rziezet	r	z	t	V	L	L	S	O	O	L	A	S	A	A	A	C	O	O	8	2	1
rzz	razez	r	z	z	V	L	L	S	O	O	L	A	A	A	A	A	C	O	O	8	2	2
sbħ	sbieħ	s	b	ħ	L	V	L	O	O	O	F	S	F	A	L	F	C	O	C	3	4	3
sdd	sodod	s	d	d	L	V	V	O	O	O	F	S	S	A	A	A	C	O	O	3	4	4
sdr	sdieri	s	d	r	L	V	V	O	O	S	F	S	L	A	A	A	C	O	C	3	4	8
sfr	sfafar	s	f	r	L	L	V	O	O	S	F	F	L	A	L	A	C	C	C	3	3	8
sġr	siġar	s	ġ	r	L	V	V	O	O	S	F	A	L	A	P	A	C	O	C	3	5	8
sħb	sħab	s	ħ	b	L	L	V	O	O	O	F	F	S	A	F	L	C	C	O	3	3	4
sħħ	sħaħ	s	ħ	ħ	L	L	L	O	O	O	F	F	F	A	F	F	C	C	C	3	3	3
sħn	sħan	s	ħ	n	L	L	V	O	O	S	F	F	N	A	F	A	C	C	O	3	3	7
sħr	sħaħar	s	ħ	r	L	L	V	O	O	S	F	F	L	A	F	A	C	C	C	3	3	8
sjf	sjuf	s	j	f	L	V	L	O	S	O	F	G	F	A	P	L	C	C	C	3	9	3
skk	sikek	s	k	k	L	L	L	O	O	O	F	S	S	A	V	V	C	O	O	3	1	1
skn	skieken	s	k	n	L	L	V	O	O	S	F	S	N	A	V	A	C	O	O	3	1	7
slb	slaleb	s	l	b	L	V	V	O	S	O	F	L	S	A	A	L	C	C	O	3	8	4
slm	slielem	s	l	m	L	V	V	O	S	S	F	L	N	A	A	L	C	C	O	3	8	7
smm	somom	s	m	m	L	V	V	O	S	S	F	N	N	A	L	L	C	O	O	3	7	7
smr	somor	s	m	r	L	V	V	O	S	S	F	N	L	A	L	A	C	O	C	3	7	8
sn	snin	s	n		L	V		O	S		F	N		A	A		C	O		3	7	
snd	snied	s	n	d	L	V	V	O	S	O	F	N	S	A	A	A	C	O	O	3	7	4
sngħ	snajja’	s	n	għ	L	V	?	O	S	?	F	N	?	A	A	?	C	O	?	3	7	?
snn	snien	s	n	n	L	V	V	O	S	S	F	N	N	A	A	A	C	O	O	3	7	7
snr	snanar	s	n	r	L	V	V	O	S	S	F	N	L	A	A	A	C	O	C	3	7	8
spp	sopop	s	p	p	L	L	L	O	O	O	F	S	S	A	L	L	C	O	O	3	1	1
sqf	soqfa	s	q	f	L	L	L	O	O	O	F	S	F	A	G	L	C	O	C	3	1	3

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Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
sqr	isqra	s	q	r	L	L	V	O	O	S	F	S	L	A	G	A	C	O	C	3	1	8
srġ	sruġ	s	r	ġ	L	V	V	O	S	O	F	L	A	A	A	P	C	C	O	3	8	5
srm	srum	s	r	m	L	V	V	O	S	S	F	L	N	A	A	L	C	C	O	3	8	7
srp	sriep	s	r	p	L	V	L	O	S	O	F	L	S	A	A	L	C	C	O	3	8	1
srq	srieraq	s	r	q	L	V	L	O	S	O	F	L	S	A	A	G	C	C	O	3	8	1
srr	soror	s	r	r	L	V	V	O	S	S	F	L	L	A	A	A	C	C	C	3	8	8
stt	setet	s	t	t	L	L	L	O	O	O	F	S	S	A	A	A	C	O	O	3	1	1
swd	suwed	s	w	d	L	V	V	O	S	O	F	G	S	A	V	A	C	C	O	3	9	4
swl	swali	s	w	l	L	V	V	O	S	S	F	G	L	A	V	A	C	C	C	3	9	8
swq	swieq	s	w	q	L	V	L	O	S	O	F	G	S	A	V	G	C	C	O	3	9	1
swr	swar	s	w	r	L	V	V	O	S	S	F	G	L	A	V	A	C	C	C	3	9	8
swt	swat	s	w	t	L	V	L	O	S	O	F	G	S	A	V	A	C	C	O	3	9	1
tbb	tobba	t	b	b	L	V	V	O	O	O	S	S	S	A	L	L	O	O	O	1	4	4
tbgħ	tbajja’	t	b	għ	L	V	?	O	O	?	S	S	?	A	L	?	O	O	?	1	4	?
tbn	tiben	t	b	n	L	V	V	O	O	S	S	S	N	A	L	A	O	O	O	1	4	7
tbt	twiebet	t	b	t	L	V	L	O	O	O	S	S	S	A	L	A	O	O	O	1	4	1
tfl	tfal	t	f	l	L	L	V	O	O	S	S	F	L	A	L	A	O	C	C	1	3	8
tġn	twaġen	t	ġ	n	L	V	V	O	O	S	S	A	N	A	P	A	O	O	O	1	5	7
tjn	tjun	t	j	n	L	V	V	O	S	S	S	G	N	A	P	A	O	C	O	1	9	7
tjr	tjur	t	j	r	L	V	V	O	S	S	S	G	L	A	P	A	O	C	C	1	9	8
tkk	tokok	t	k	k	L	L	L	O	O	O	S	S	S	A	V	V	O	O	O	1	1	1
tkn	tkaken	t	k	n	L	L	V	O	O	S	S	S	N	A	V	A	O	O	O	1	1	7
tlq	tlielaq	t	l	q	L	V	L	O	S	O	S	L	S	A	A	G	O	C	O	1	8	1
tmn	tmien	t	m	n	L	V	V	O	S	S	S	N	N	A	L	A	O	O	O	1	7	7
tnd	tined	t	n	d	L	V	V	O	S	O	S	N	S	A	A	A	O	O	O	1	7	4

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Root	Plural	C1	C2	C3	1V	2V	3V	1S	2S	3S	1M	2M	3M	1P	2P	3P	1C	2C	3C	1#	2#	3#
tpt	twapet	t	p	t	L	L	L	O	O	O	S	S	S	A	L	A	O	O	O	1	1	1
tqb	toqob	t	q	b	L	L	V	O	O	O	S	S	S	A	G	L	O	O	O	1	1	4
tql	tqal	t	q	l	L	L	V	O	O	S	S	S	L	A	G	A	O	O	C	1	1	8
trb	trabi	t	r	b	L	V	V	O	S	O	S	L	S	A	A	L	O	C	O	1	8	4
trf	truf	t	r	f	L	V	L	O	S	O	S	L	F	A	A	L	O	C	C	1	8	3
trġ	taraġ	t	r	ġ	L	V	V	O	S	O	S	L	A	A	A	P	O	C	O	1	8	5
trħ	trieħi	t	r	ħ	L	V	L	O	S	O	S	L	F	A	A	F	O	C	C	1	8	3
trk	torok	t	r	k	L	V	L	O	S	O	S	L	S	A	A	V	O	C	O	1	8	1
trq	toroq	t	r	q	L	V	L	O	S	O	S	L	S	A	A	G	O	C	O	1	8	1
trr	terer	t	r	r	L	V	V	O	S	S	S	L	L	A	A	A	O	C	C	1	8	8
trt	torot	t	r	t	L	V	L	O	S	O	S	L	S	A	A	A	O	C	O	1	8	1
trx	torox	t	r	x	L	V	L	O	S	O	S	L	F	A	A	P	O	C	C	1	8	3
tvl	twavel	t	v	l	L	V	V	O	O	S	S	F	L	A	L	A	O	C	C	1	6	8
twl	twal	t	w	l	L	V	V	O	S	S	S	G	L	A	V	A	O	C	C	1	9	8
twq	twieqi	t	w	q	L	V	L	O	S	O	S	G	S	A	V	G	O	C	O	1	9	1
txx	taxex	t	x	x	L	L	L	O	O	O	S	F	F	A	P	P	O	C	C	1	3	3
tzz	tazez	t	z	z	L	L	L	O	O	O	S	A	A	A	A	A	O	O	O	1	2	2
vll	vilel	v	l	l	V	V	V	O	S	S	F	L	L	L	A	A	C	C	C	6	8	8
vrg	vireg	v	r	g	V	V	V	O	S	O	F	L	S	L	A	V	C	C	O	6	8	4
vrs	vrus	v	r	s	V	V	L	O	S	O	F	L	F	L	A	A	C	C	C	6	8	3
wċċ	uċuħ	w	ċ	ċ	V	L	L	S	O	O	G	A	A	V	P	P	C	O	O	9	2	2
wħd	uħud	w	ħ	d	V	L	V	S	O	O	G	F	S	V	F	A	C	C	O	9	3	4
wlġ	wileġ	w	l	ġ	V	V	V	S	S	O	G	L	A	V	A	P	C	C	O	9	8	5
wrċ	wereċ	w	r	ċ	V	V	L	S	S	O	G	L	A	V	A	P	C	C	O	9	8	2
wrq	weraq	w	r	q	V	V	L	S	S	O	G	L	S	V	A	G	C	C	O	9	8	1

Continued on next page

Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
xbk	xbieki	x	b	k	L	V	L	O	O	O	F	S	S	P	L	V	C	O	O	3	4	1
xbl	xwabel	x	b	l	L	V	V	O	O	S	F	S	L	P	L	A	C	O	C	3	4	8
xbr	ixbra	x	b	r	L	V	V	O	O	S	F	S	L	P	L	A	C	O	C	3	4	8
xdq	ixdqa	x	d	q	L	V	L	O	O	O	F	S	S	P	A	G	C	O	O	3	4	1
xff	xofof	x	f	f	L	L	L	O	O	O	F	F	F	P	L	L	C	C	C	3	3	3
xfr	xfar	x	f	r	L	L	V	O	O	S	F	F	L	P	L	A	C	C	C	3	3	8
xħħ	xħaħ	x	ħ	ħ	L	L	L	O	O	O	F	F	F	P	F	F	C	C	C	3	3	3
xjħ	xjuħ	x	j	ħ	L	V	L	O	S	O	F	G	F	P	P	F	C	C	C	3	9	3
xll	xalel	x	l	l	L	V	V	O	S	S	F	L	L	P	A	A	C	C	C	3	8	8
xlp	xilep	x	l	p	L	V	L	O	S	O	F	L	S	P	A	L	C	C	O	3	8	1
xmx	xmux	x	m	x	L	V	L	O	S	O	F	N	F	P	L	P	C	O	C	3	7	3
xqq	xquq	x	q	q	L	L	L	O	O	O	F	S	S	P	G	G	C	O	O	3	1	1
xrk	xorok	x	r	k	L	V	L	O	S	O	F	L	S	P	A	V	C	C	O	3	8	1
xrq	xrieraq	x	r	q	L	V	L	O	S	O	F	L	S	P	A	G	C	C	O	3	8	1
xtb	xtabi	x	t	b	L	L	V	O	O	O	F	S	S	P	A	L	C	O	O	3	1	4
xtt	xtut	x	t	t	L	L	L	O	O	O	F	S	S	P	A	A	C	O	O	3	1	1
xtw	xtiewi	x	t	w	L	L	V	O	O	S	F	S	G	P	A	V	C	O	C	3	1	9
xwk	xwiek	x	w	k	L	V	L	O	S	O	F	G	S	P	V	V	C	C	O	3	9	1
xwn	xwieni	x	w	n	L	V	V	O	S	S	F	G	N	P	V	A	C	C	O	3	9	7
żbb	żbub	ż	b	b	V	V	V	O	O	O	F	S	S	A	L	L	C	O	O	6	4	4
żbġ	żibeġ	ż	b	ġ	V	V	V	O	O	O	F	S	A	A	L	P	C	O	O	6	4	5
żjt	żjut	ż	j	t	V	V	L	O	S	O	F	G	S	A	P	A	C	C	O	6	9	1
zkk	zkuk	z	k	k	L	L	L	O	O	O	A	S	S	A	V	V	O	O	O	2	1	1
żlm	żlielem	ż	l	m	V	V	V	O	S	S	F	L	N	A	A	L	C	C	O	6	8	7
żlq	żlielaq	ż	l	q	V	V	L	O	S	O	F	L	S	A	A	G	C	C	O	6	8	1

Continued on next page

Root	**Plural**	**C1**	**C2**	**C3**	**1V**	**2V**	**3V**	**1S**	**2S**	**3S**	**1M**	**2M**	**3M**	**1P**	**2P**	**3P**	**1C**	**2C**	**3C**	**1#**	**2#**	**3#**
zlz	zlazi	z	l	z	L	V	L	O	S	O	A	L	A	A	A	A	O	C	O	2	8	2
żml	żwiemel	ż	m	l	V	V	V	O	S	S	F	N	L	A	L	A	C	O	C	6	7	8
żmr	żmamar	ż	m	r	V	V	V	O	S	S	F	N	L	A	L	A	C	O	C	6	7	8
żnr	żnanar	ż	n	r	V	V	V	O	S	S	F	N	L	A	A	A	C	O	C	6	7	8
zpn	zpapen	z	p	n	L	L	V	O	O	S	A	S	N	A	L	A	O	O	O	2	1	7
zpp	zpup	z	p	p	L	L	L	O	O	O	A	S	S	A	L	L	O	O	O	2	1	1
żrgħ	żrieragħ	ż	r	għ	V	V	?	O	S	?	F	L	?	A	A	?	C	C	?	6	8	?
żrq	żrieraq	ż	r	q	V	V	L	O	S	O	F	L	S	A	A	G	C	C	O	6	8	1
żwr	żjajjar	ż	w	r	V	V	V	O	S	S	F	G	L	A	V	A	C	C	C	6	9	8