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Antepenultimate rhyme in Spanish and Greek as a window to metrically weak positions

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Meter and rhyme in poetry have often been used as diagnostics for phonological structure. In this contribution, we investigate how rhyme can provide insights into prosodic foot constituency. In particular, we show that rhyme patterns involving words with antepenultimate stress in Spanish and Greek poetry constitute evidence for internally layered ternary feet, based on an asymmetry that arises between unstressed post-tonic medial vs. unstressed word-final syllables: the former can be ignored in antepenultimate-stressed word rhyming, while the latter play a prominent role in rhyme. With a layered foot, this can be attributed to the fact that the post-tonic medial syllable is *weaker* because it has a double foot-dependent status, while the final syllable is dominated by only one foot projection. We support our claim with new empirical data from both languages by combining quantitative (for Spanish poetry) and qualitative (for Greek poetry) approaches. This article adds to the body of research discussing internally layered ternary feet in Spanish; additionally, by proposing the presence of this structure in Greek, we are able to provide a unified account of independent phenomena occurring in the language.

1 Introduction

Meter and rhyme in poetry—the "pairing of two or more words [...] which end in a similar way but usually begin differently" (Fabb 2022: 155)—have often been used as diagnostics for phonological structure. Poetic form heavily draws on linguistic structure and, hence, can provide independent evidence for prosodic constituents (Halle & Keyser 1971; Kiparsky 1973; Nespor & Vogel 1986; Hayes 1989; Golston & Riad 1999; Holtman 1996; De Sisto 2020; among others). For instance, in standard rhyme between monosyllables, rhyme targets the syllable rime (e.g. *God* ~ *rod*, *things* ~*springs* ~ *wings*, Holtman 1996: 121). In this sense, poetic rhyme provides additional support for specific prosodic constituents, which are also the target of linguistic processes (Kiparsky 1973: 242).

In this article we investigate the rhyming patterns that involve words with antepenultimate (**APU**) stress at the end of the line in two Indo-European languages, Spanish (1) and Modern Greek (2)—henceforth Greek—and demonstrate that the patterns arising, along with additional linguistic evidence (e.g. the stress window, the size of hypocoristics, etc.) provide support for models that incorporate Internally Layered Ternary (ILT) feet in metrical representations (see below and Section 2 for discussion).[1]

(1) Spanish stanza with APU rhyme in the first and fourth lines

Buscar un crítico en**fá**tico	A
que alabe mi obra, no **quié**ro,	B
que tan bien como el pri**mé**ro	B
puedo ser yo cate**drá**tico.	A

To find an *emphatic* critic
Who praises my work, I do not *want*,
For as well as the *first one*
I can be a *professor* myself.

José Zorrilla, *A mi amigo D. Juan Eugenio de Hartzenbusch* (1840)[2]

(2) Greek stanza with APU rhyme in the first and second line

Μ' αστροφεγγιές ολόβαθες, τριανταφυλλιά χα**ρά**ματα [xa**rá**mata]		A
με φεγγαροµα**λά**ματα [fegaroma**lá**mata]		A
κι όταν σιγά κι α**γά**λι [a**ɣá**li]		B
βρέχει ουρανός σε µια µεριά κι' ηλιοφωτάει στην **ά**λλη [**á**li]		B

[1] Notations used: in the original orthographic forms, stressed syllables appear in boldface with an acute accent, and the underlining indicates the segments that rhyme. For Greek, we have also transcribed the rhyming material in IPA; words in a rhyming configuration are marked with italics in the translated verses. Capital letters at the end of the line indicate the pairing of words in a rhyming schema.

[2] The source of all Spanish lines is http://www.poesi.as. This and all other external sources/links mentioned in the paper have been accessed in the period between November 2023 and October 2024.

With starry moons deep, rose *dawns*,
with *moonshine*
and when slowly and *caringly*
the sky is raining on one side and the sun is shining on the *other*.

Kostas Varnalis, *To aidoni* (1921)

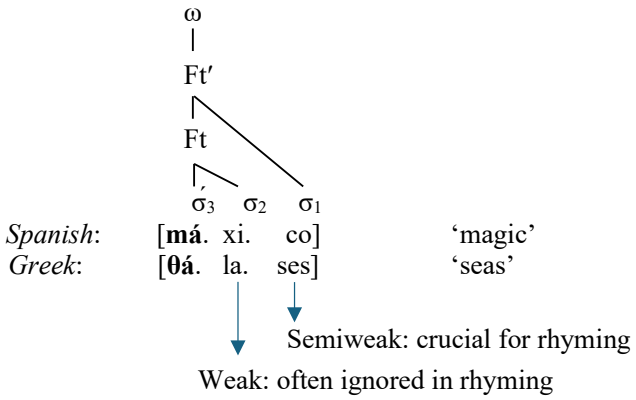
The Spanish examples *en**fá**tico* ~ *cate**drá**tico* in (1) and the Greek *χα**ρά**ματα* [xa**rá**mata] ~ *φεγγαρομα**λά**ματα* [fegaroma**lá**mata] in (2) form perfect rhymes: all the material from the stressed vowel up to the end of the prosodic word is identical. However, beyond perfect rhyme, Spanish and Greek words with APU stress participate in more complex rhyming schemes in which not every segment following the stressed vowel is identical. In the present study, we describe the range of rhyming patterns in Spanish and Greek involving APU-stressed words and demonstrate that, despite significant differences between the two languages, both exhibit interesting asymmetries in the behavior of their unstressed syllables, described in detail in §3 and §4. Essentially, the role of final syllables (σ_1) proves more important in rhyming than that of post-tonic penults (σ_2). In Spanish, whereas word-final unstressed syllables in words with APU stress are crucial in rhyme (σ_1 in (3)), post-tonic unstressed syllables are often ignored for rhyming purposes (σ_2 in (3)). We interpret this dual patterning of unstressed syllables as a prominence asymmetry and propose that the immediately post-tonic unstressed syllables are *weaker* than the word-final unstressed syllables (see (3)). In Greek, there is a specific pattern of APU rhyme which singles out the word-final syllable over the two preceding syllables in words with APU stress, offering independent support for the relative greater strength of this syllable.[3]

(3) Dual patterning of post-tonic syllables in Spanish and Greek rhyme
[... $\acute{\sigma}_3$ $\sigma_{2\text{-Weak}}$ $\sigma_{1\text{-Semiweak}}]_{\omega}$

We further argue that this asymmetry is best accounted for in a representational model that allows Internally Layered Ternary (ILT) feet in prosodic representations. An ILT foot arises by minimal adjunction of an unstressed syllable to a binary foot, giving rise to a structure in which a foot is stacked on top of another foot (4) (Davis and Cho 2003; van der Hulst 2010; Bennett 2012; 2013; Kager 2012; Martínez-Paricio 2013; Martínez-Paricio & Kager 2015; 2021; Breteler 2018; among others). Our claim is that APU-stressed words in Spanish and Greek contain an ILT foot aligned to the right edge of the prosodic word. In this representation, the *weaker* nature of the post-tonic unstressed syllable arises from its double foot-dependent status in the ILT foot, as opposed to the syllable in the adjunct position, which is just dominated by one foot projection and is, therefore, slightly stronger.

[3] See van Oostendorp (1995), who originally discussed the contrast between *weak* and *semiweak* syllables in other languages like Dutch.

(4) ILT feet in Spanish and Greek words with APU stress



In a nutshell, the general thesis of this article is that poetic language and the structure of verse—namely, the specific rhyming patterns involving words with APU stress—can provide independent support for phonological constituency. This is especially significant for Spanish, since previous research has already posited ternary feet in this language, but evidence for their internally layered structure has been lacking. The data presented stand out as such evidence. The paper's contribution on the metrical structure of Greek is even bolder, given that, to our knowledge, ILT feet have not been proposed for this language to date. Yet, we will show that their admission offers valuable insights on other phenomena too, beyond rhyme.

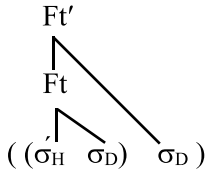
The organization of the paper is as follows. In §2 we provide a brief theoretical background on a metrical model that incorporates ILT feet in metrical representations and present specific linguistic evidence for this prosodic structure in various languages. Then, in §3–§5 we turn to the poetic evidence for this representation. First, in §3 and §4 we describe the most important generalizations regarding the rhyming of words with APU in Spanish and Greek. In §5 we propose that this can be interpreted as evidence for layering and develop an ILT-foot-based representational analysis of the data. In §6 we dismiss alternative analyses framed in more traditional metrical models and non-structural stress-based accounts. Finally, §7 concludes.

2 Theoretical background: the ILT foot

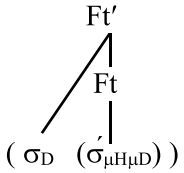
In roughly the last decade, several studies have investigated the hypothesis that feet can be maximally trisyllabic, as long as they arise via minimal adjunction of a weak syllable to an adjacent bimoraic or disyllabic foot (Martínez-Paricio 2013; Martínez-Paricio & Kager 2015; 2021 and references therein, based on pioneering work by Selkirk 1980; Prince 1980). Examples of such feet, dubbed Internally Layered Ternary (ILT) feet, appear in (5) (the innermost foot in these structures is a trochee, but similar structures are possible with iambs; in these diagrams and the rest of the paper, foot heads are indicated with vertical lines and an H subscript, foot dependents with diagonal lines and a D subscript).

(5) Maximally trisyllabic feet and foot layering: examples of ILT feet

a. Bisyllabic foot with a right adjunct



b. Bimoraic foot with a left adjunct



Evidence in favor of this prosodic structure comes from a wide array of linguistic phenomena, including (i) the particular distribution of suprasegments like stress (Kager 2012; Martínez-Paricio & Kager 2015) and tone (Iosad 2016; Breteler 2018; Breteler & Kager 2022), (ii) several segmental weakening and strengthening processes (Davis & Cho 2003; Davis 2005; Bennett 2012; 2013; Martínez-Paricio 2013; Martínez-Paricio & Kager 2021; Kager & Martínez-Paricio 2018; among others), and (iii) various kinds of morphophonological phenomena, which either need to refer to a ternary domain to account for the size of truncation patterns (Krämer 2018; Martínez-Paricio & Torres-Tamarit 2019; Cabré et al. 2021) or regulate the distribution and emergence of certain affixes in specific contexts (McCarthy 1982; Lampitelli et al. 2022; Mascaró 2024). Likewise, the hypothesis that feet can be ternary allows for a straightforward motivation of the ternary word-minimality requirement reported in a few languages (for Gilbertese, see Blevins & Harrison 1999, and for Imere, see van Urk 2024).

Even though traditional works on poetic meter have referred to ternary feet to explain rhythmic alternations—and such feet were sometimes claimed to display binary branching internal structure (e.g. Kiparsky 1977: 228; Prince 1989: 55, 58)—, rhyming has not previously been used to diagnose the internal binary structure of ternary feet.[4] The novelty of our study lies precisely in using rhyme to provide independent support for foot layering in the two languages under study, Spanish and Greek. But before proceeding to explore this evidence, let us briefly

[4] Traditionally, the evidence for ternary feet with internal binary branching structure in verse comes solely from the distribution of stresses in meter. Furthermore, some of those ternary feet displayed two stresses—two strong (S) positions—as, for example, in ((SW)S) or (S(SW)), something that is not possible in contemporary Internally Layered Ternary (ILT) foot models, since ternary feet always arise via adjunction of a weak syllable to an existing foot. In other words, ILT feet contain only one foot head and, at most, one stress (see Martínez-Paricio 2013: 59 for details on the Head Uniqueness Principle). Therefore, as correctly pointed out by an anonymous reviewer, traditional ternary feet with binary branching structure and a strong adjunct would be probably reanalyzed in modern terms as "containing two feet comprising a metron".

consider the concept of layering and the already available empirical evidence in support of it. A key representational prediction of the ILT foot model is that, once a language allows ILT feet, it may exploit the structural difference between *types* of foot heads and foot dependents, as well as their position within the foot (initial *vs.* non-initial). Such distinctions go beyond the traditional strong (foot head) *vs.* weak (foot dependent) dichotomy in standard metrical theory. We will illustrate this point about foot layering with two concrete language examples, as the layered structure is crucial to our understanding of the APU rhyme patterns explored in this article.

In Dutch, Kager & Martínez-Paricio (2018) have argued that at least three phonological processes—vowel reduction, glottal stop /ʔ/ insertion and /h/ licensing/deletion—differentiate between two types of unstressed syllables. In particular, a subset of the unstressed syllables has been shown to be more resistant to vowel reduction, more prone to retain a coda /h/ and more eager to display insertion of a glottal stop than others. The duality of unstressed syllables in Dutch is partially illustrated in (6), which exemplifies the vowel reduction patterns in words with identical vowels in different unstressed syllables like ***lò**comotíef* 'locomotive'. According to Kager & Martínez-Paricio (2018: 83–84), the default foot in Dutch is trochaic, with an optional initial adjunct. Following previous research on Dutch stress (e.g. Gussenhoven 1993), it is also assumed that the trochaic foot can be bimoraic word-finally as in (lò.ko).(mo.(tíf)). In formal registers, the quality of the two underlying unstressed vowels is retained (6a); by contrast, in informal registers, both are reduced (6c). Interestingly, in semiformal registers, the vowel of the second syllable reduces, whereas the third one retains its original vowel quality (6b). The pattern with reduction of the third vowel but not of the second (6d) is, crucially, unattested. This has been used to support the idea that the third unstressed syllable is *stronger* than the second syllable. Following previous scholars who have demonstrated that foot-initial position is a prominent position in phonology (see Kiparsky 1979; Davis & Cho 2003; and especially Bennett's 2013 account of foot-initial strengthening effects in iambic systems, where segments in the weak branch of a foot are shown to undergo strengthening effects, precisely due to its location in a prosodically prominent initial position), Kager & Martínez-Paricio (2018) propose that the asymmetry between unstressed weak *vs.* semiweak syllables in Dutch can be accounted for in a model with ILT feet: whereas the second syllable lies in the weak branch of a (traditional) foot, the third syllable is located in the adjunct of an ILT foot, and foot-initially, a potential locus of strengthening effects.

(6) Weak and semiweak syllables in Dutch vowel reduction

a.	Formal register	(**lò**.ko).(mo.(**tíf**))
b.	Semiformal register	(**lò**.kə).(mo. (**tíf**))
c.	Informal register	(**lò**.kə).(mə. (**tíf**))
d.	Unattested	*(**lò**.ko).(mə. (**tíf**))

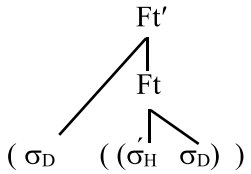
Even though standard metrical theory could potentially account for similar dual asymmetries in unstressed syllables by referring to a parallel contrast between unstressed syllables located in the weak branch of a foot *vs.* unfooted syllables (i.e. directly linked to the prosodic word), such alternative accounts would need to stipulate the motivation for the greater strength of the latter. In a model with ILT feet, assuming the foot-initial position is a prominent position, this comes for free (for similar analyses of other strengthening effects, see Kiparsky 1979; Davis 2005 on English; Bennett 2012, 2013 on coda epenthesis in Huariapano; and Martínez-Paricio 2013 on high tone in Gilbertese).

Likewise, the fact that a subset of the unstressed syllables in languages with ILT feet have a double foot-dependent status (e.g. the second syllable in ((σ́ σ)$_{Ft}$ σ)$_{Ft'}$) while others do not (i.e. the third syllable in ((σ́ σ)$_{Ft}$ σ)$_{Ft'}$) allows us to potentially account for the greater weakness of the syllable in the double foot-dependent position. In this article we will argue that Spanish and Greek APU rhyme patterns provide this type of evidence too: a subset of the unstressed syllables are *weaker* than others.

The ILT foot model further allows for comparable subtle contrasts among strong syllables. Even though these are not directly relevant to our understanding of the APU rhyme patterns, for the sake of completeness, we summarize why this is a desired prediction. To wit, imagine a language that allows both (7a) and (7b). In this language, it should be possible for a particular phonological strengthening phenomenon to exclusively target stressed syllables in an ILT foot (i.e. the foot head in (7a)), due to its double foot-headed status.

(7) Beyond the weak vs. strong dichotomy in standard metrical theory

a. Example of an ILT foot



b. Example of a traditional foot

This specific prediction has been argued to be borne out in Wargamay, an Australian language reported to have a particular lengthening process which only affects peninitial syllables in odd-parity forms (see Martínez-Paricio 2013 for details). In even-parity forms, there is no trigger for lengthening, since there are no ILT feet, but just regular feet (e.g. (όσ)(ὸσ)(ὸσ)). In odd-parity

forms, on the contrary, an ILT foot arises word-initially as a last resort device to foot an otherwise left-over syllable (e.g. (σ(σ́σ))(σ̀σ)(σ̀σ)). Consequently, the peninitial syllable is structurally different from other stressed syllables and becomes the target for lengthening. Alternative accounts that refer instead to the greater prominence of syllables in the head of the main foot (as opposed to foot heads of secondary feet) are unsatisfactory, since the language has cases of initial primary stress (e.g. σ́σσ), in which there is no peninitial lengthening. Beyond Wargamay, languages like Brazilian Portuguese (Nevins & Costa 2019), Chugach Alutiiq (Martínez-Paricio & Kager 2021) and Yidiny (Martínez-Paricio 2013) have been claimed to display instances of strengthening effects in the heads of ILT feet, the only syllables with a double foot-headed status.

After this overview of the main evidence for ILT feet, we turn to the description of the APU rhyme patterns in Spanish (§3) and Greek (§4).

3. Spanish APU rhyme

To start, a general note regarding rhyme terminology in Spanish poetry is in order. The language distinguishes two types of rhyme depending on the degree of identity between the segments of the words involved in the rhyme pattern: *rima consonante*, which presents complete identity of all segments from the stressed vowel onwards, as in *prima**vé**ra* ‘spring’ rhyming with *pra**dé**ra* ‘meadow’, and *rima asonante,* in which only the vowels coincide, while consonants differ, as in *ma**rí**do* ‘husband’ rhyming with ***gr**íllo* ‘cricket’ (Bello 1955). The former is commonly referred to as ‘perfect rhyme’ in Western traditions. The latter is a particular instantiation of ‘imperfect rhyme’ and is sometimes referred to as *assonance* in the literature.

Perfect and imperfect rhyme in Spanish poetry can involve words with antepenultimate (APU), penultimate (PU) and final (U) stress; namely, all stress patterns allowed by the three-syllable window characterizing the language can be employed as rhyming material. Their frequency in rhyme, however, reflects their frequency in the Spanish lexicon. In fact, given that most words in Spanish have stress on the penult (Nuñez-Cedeño & Morales-Front 1999; Piñeros 2016 and references therein), the most attested rhyme pattern consists of two words with penultimate stress rhyming with each other (Bello 1955; Navarro Tomás 1972; Quilis 1984; Domínguez Caparrós 2014a). Rhyming between two finally stressed words is less common but widely attested as well. Both patterns are shown in (8) (from here on, we use the symbol ~ to indicate that two or more words are rhyming).

(8) Spanish lines with PU rhyme in the first and third lines (*te**só**ro* ~ ***ll**ó**ro*)* and U rhyme in the second and fourth lines (*vol**vér*** ~ *que**rér***)

Juventud, divino te**só**ro,	A
¡ya te vas para no vol**vér**!	B
Cuando quiero llorar, no **ll**ó**ro**	A
y a veces lloro sin que**rér**	B

Youth, divine *treasure*
You're leaving and never *coming back*!
When I want to cry, I don't *cry*.
and sometimes I cry without *wanting to*

Rubén Darío, *Canción de otoño a primavera* (1905)

Only a small percentage of words present stress on the antepenultimate syllable (less than 9% according to Nuñez-Cedeño & Morales-Front 1999). It is not surprising then that rhyme patterns involving words with APU stress appear to be even less common.

Besides the general distinction between perfect and imperfect rhyme, APU rhymes can be of two types: (i) two words with APU stress can rhyme with each other (APU-APU), as in (9), or (ii) one word with APU stress can rhyme with a word with PU stress (APU-PU rhyme), as in (10).

(9) Spanish lines displaying perfect APU-APU rhyme (***trágico*** ~ ***mágico***)

escogí entre un asunto grotesco y otro **trá**gico A
llamé a todos los ritmos con un conjuro **má**gico A

I chose between a grotesque and a *tragic* matter
I invoked all the rhythms with a *magic* spell

José Asunción Silva, *Un Poema* (1923)

(10) Spanish lines with APU-PU rhyme (imperfect rhyme in *áa*: ***helá**da* ~ ***trá**gicas*)

Ven, tú, el que imprimes un solemne ritmo
Al parpadeo de la tumba hel**á**da; A
El que dictas los lúgubres acentos
Del decir hondo de las sombras **trá**gicas, A

Come, you, the one who imposes a solemn rhythm
To the blinking of the *freezing* thumb;
The one who dictates the somber accents
Of the deep saying of *tragic* shadows.

Delmira Augustini, *Misterio: Ven* (1907)

This second rhyme type, APU-PU, has been originally reported in metrical treatises and papers on metrics (see, among others, Bello 1955; Quilis 1984; Domínguez Caparrós 2014a). Generally, only very few examples are provided in these studies, which do not allow us to clearly define the breadth of the phenomenon, nor establish whether it is associated with specific vowels in the post-tonic medial position. For instance, several of the reported cases of APU-PU rhyme include the weak vowel [i] in that position, as in (10) *helá**da*** ~ ***trá**gicas*.

To achieve a more accurate description of the possible rhyming patterns involving APU-stressed words in Spanish, in this contribution, we provide new quantitative evidence of this rhyme pattern, which supports generalizations found in previous treatises; additionally, as it will be discussed in detail in sections 3.1 and 3.2, our data show that (i) the phenomenon is less marginal than previously thought and (ii) post-tonic vowel quality does not affect its occurrence, meaning that any vowel can occur in the post-tonic medial position.

3.1 Corpus and methodology

The original source of our data is the publicly available website poesi.as, which collects 20,899 poems by 4,935 Spanish and Latin American poets from the 13th through the 21st century.[5] We retrieved all poems containing lines ending with words with APU stress with a Python script. We identified 20,759 such lines in the whole poesi.as corpus. Even though APU-stressed words can rhyme line-internally (at the end of a hemistich), this has not been studied in our analysis.

Out of the 20,759 instances identified with a word with APU stress at the end of the line, we manually analyzed a random sample of 12,305 cases of lines ending with APU-stressed words across 3,303 poems. Our manual analysis consisted of first checking whether these words with APU stress occurred in a rhyme pattern. Secondly, we classified the rhyme pattern (i.e. APU-APU or APU-PU rhymes) and described the type of rhyme (i.e. perfect or imperfect rhyme), annotating the specific vowels and positions involved in the rhymes.

Most of the 12,305 line-final words with APU stress that we analyzed were not found in a rhyme pattern, as opposed to just 519 (roughly almost 5%) which were used as rhyming material. Additionally, we incorporated in our corpus 50 APU rhymes manually identified in research papers and treatises, as well as in our own readings of poetry. Our annotated data is publicly available in an OSF repository.[6] In the following subsection, we focus on the analysis of the 569 APU rhymes collected. In the paper, V_1 is used to refer to the vowel in the word-final syllable, V_2 to the vowel in the penult syllable and V_3 in the antepenult syllable.

[5] For our corpus study, which focuses on well-recognized authors, we excluded the 21st century poet section from poesi.as. This is because that section is open to any submission, including works by both established authors and also amateur poets or anyone uploading content. Additionally, contemporary poetry has a strong tendency to lack rhyme. As we explain later in this paper, we added some 21st century poets during our manual analysis of treatises, research papers and our own poetry readings.

[6] https://osf.io/wsjnb/. It should be noted that not all analyzed lines could be published due to copyright issues; for those cases, only rhyming words are displayed, together with rhyme description and metadata (complete poems can be retrieved from poesi.as).

3.2 New evidence for APU rhyme patterns in Spanish

Our results are presented in **Figure 1**. As the focus is on comparing the frequency of APU-APU with APU-PU rhymes, there is no differentiation between instances of perfect and imperfect rhyme within the two types.

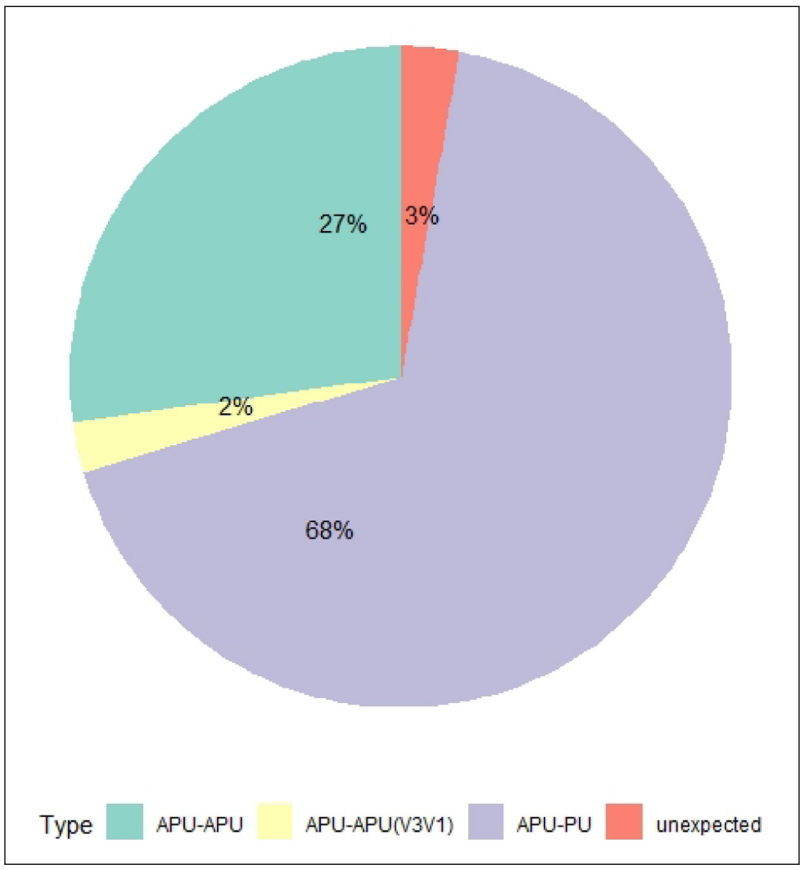


Figure 1: Types of APU rhyme patterns.

Of the 569 APU rhymes in our data, 29% of them constitute the APU-APU rhyme pattern. 27% thereof consists of APU-APU rhymes in which all vowels coincide (cf. ***trágico*** ~ ***mágico*** in (9)). The remaining 2% (called APU-APU (V3-V1) in **Figure 1**) contains cases where the segments of the post-tonic unstressed syllable do not match, but those in the antepenult (V3) and the final one (V1) do, as illustrated in ***pálido*** ~ *escándalo* (11), hence highlighting the possibility of two words rhyming despite the segments in their post-tonic syllables not being identical.[7]

[7] In our data we did not find any case of APU-APU rhymes in which the final vowels mismatched.

(11) Spanish stanza with rhyme between two APU-stressed words with different post-tonic vowels in the second and fourth line (imperfect rhyme in *áo*: ***pálido*** ~ ***escándalo***)

Sin dar a nadie respuesta,
Confuso, atónito, **pá**lido, A
Al ver ya fuera del púlpito[8]
A quien movió tal es**cán**dalo, A

Without giving an answer to anyone,
Confused, stunned, *pale*,
Seeing already out of the pulpit
The one who caused such a *scandal*,

Juan de Dios Peza, *La caja milagrosa* (1873–1900)

Most of the rhyme patterns identified (68%) constitute APU-PU rhymes of the type exemplified in (12), where material of the post-tonic syllable in the APU-stressed word is ignored in rhyme.[9] These results show that, even though words with APU stress are not very often exploited as rhyme material, the APU-PU rhyme type is rather common, and is the most common type in rhymes involving APU-stressed words.

In addition, given the vast time span covered by our data (from roughly the 13th until the end of the 21st century) and the geographic distribution of the authors included (Spain and Latin America), it is safe to reject the idea that the APU-PU rhyme type belongs to a specific poetic form, meter, author or writing style. The examples in (12)–(14) show its attestation in poems from different centuries, poetic forms and countries.

(12) APU-PU rhyme in a *romance* (*comedia de capa y espada*) in the second, fourth and sixth lines (17th century, Spain) (imperfect rhyme in *óa*: ***cólera*** ~ *incor**póra*** ~ *dis**pónga***)

Tenéis toda la región
Del hígado, por la **có**lera, A
Lesa, que con la pituita
Quemándola se incor**pó**ra. A
Ahora bien, señora mía,
Vuesiría se dis**pó**nga A

[8] One might observe that *púlpito* could be part of the rhyme pattern too; however, only even lines rhyme in this poem, while odd lines do not.

[9] Three of these cases also presented a final vowel mismatch consisting of [u] rhyming with [o]. Note, however that this is not a real mismatch in Spanish verse, since posterior vowels [u~o] are considered to rhyme in final unstressed position in a special pattern of assonance (Caparrós 2014a: 105). Still, under suggestion of an anonymous reviewer we tested the significance of those cases by performing a chi-square goodness of fit test. However, given that the cases of final vowel mismatch are less than 5 instances, the provided statistical results need to be taken with caution. The resulting p-value < 2.2e-16 may suggest the final vowel mismatch to be significantly not commonly distributed.

You have the whole region
Of the liver, by the *cholera*,
Injured, that with the mucous secretions
Burning it *gets mixed* to them.
Now well, my lady
You would *prepare* yourself

Tirso de Molina, *El amor médico,* Act II, vv. 1689–1692 (1635)

(13) APU-PU rhyme in a stanza of *versos de arte mayor* (19th century, Spain) (imperfect rhyme in *áa*: *esc**á**rch**a*** ~ *so**n**á**m**bul**a*** ~ *a**p**á**g**a*** ~ ***á**l**m**as*)

Hay canas en mi cabeza, hay en los prados es**cá**rch**a**, A
Más yo prosigo soñando, pobre, incurable so**n**á**m**bul**a**, A
Con la eterna primavera de la vida que se a**p**á**g**a A
Y la perenne frescura de los campos y las **á**l**m**a**s**, A

There's grey hair on my head, there's *frost* in the meadows,
Yet, I keep dreaming, poor, incurable *sleepwalker*,
With the eternal spring of life that *goes out*
And the constant freshness of the fields and *souls*,

Rosalía de Castro, *Dicen que no hablan las plantas, ni las fuentes ni los pájaros* (1884)

(14) APU-PU rhyme in a quatrain with even-line rhymes (20th century, Puerto Rico) (imperfect rhyme in *éa*: *tri**gué**ña* ~ *A**mé**rica*)

Ay ay ay, que mi negra raza huye
Y con la blanca corre a ser tri**gué**ña; A
¡A ser la del futuro,
Fraternidad de A**mé**rica! A

Ay ay ay, my black race flees
And runs with the white one to become *golden skin*;
To be the one of the future,
Fraternity of *America*!

Julia de Burgos, *Ay, ay, ay de la grifa negra* (1938)

Note, however, that, in accordance with claims in metrical studies (see, for instance Domínguez Caparrós 2014b and references therein), our data show that the APU-PU rhyme pattern became more common from the second half of the 18th century onwards, while it was less attested in previous centuries.

Crucially, for our purposes, most of the APU-PU rhymes are clearly imperfect rhymes in which only the quality of the vowels of the stressed syllables and of the word-final syllables

coincide. The segments in the post-tonic medial syllable of the APU-stressed word are completely disregarded and play no role in the rhyme. Consequently, the post-tonic syllable is deemed *weaker* than the final one.

Regarding post-tonic-vowel quality, all five vowels of the Spanish inventory are attested, hence excluding the hypothesis that this rhyme pattern might be possible only with some post-tonic vowels. However, as **Figure 2** indicates, the most common rhyme patterns in APU-stressed words involve a post-tonic [i]. Its higher frequency, nonetheless, appears to be a strong preference only line-finally. An analysis comparing the unique occurrences of APU-stressed words in our whole corpus line-finally (in rhyming and non-rhyming patterns) and line-internally has shown that 42% of line-final APU-stressed words have a post-tonic [i]. Line-internally, the percentage of APU-stressed words with post-tonic [i] is much lower (i.e. 26.5%), and only slightly higher than that of those with post-tonic [a] (i.e. 26.3%). These frequencies (even if only very slightly) do not square with those we find when considering the Spanish language in general: we analyzed a Spanish lexicon[10] extracted from the Spanish language dictionary of the Royal Spanish Academy[11] (Real Academia Española), and the results indicate that most APU-stressed words have a post-tonic [a] (59.4 %), while post-tonic [i] characterizes only 8% of them. We could hypothesize that the extensive presence of post-tonic [i] in rhyme is due to its brevity and perceptual weakness, though future research is needed to confirm this.

Lastly, the analysis of the rhyme patterns highlighted sixteen cases (3% in the corpus) which do not fall in the previously identified rhyme patterns (indicated as 'unexpected cases' in **Figure 1**). Of these, thirteen involve the word ***océ**ano* with a hiatus (in different authors), which rhymes with PU-stressed words such as ***má**no*. In these types of rhymes, the stressed vowel in *o**cé**ano* seems to be disregarded for rhyming. However, this conclusion is questionable, since the sequence [ea] in *o**cé**ano* can be pronounced as a diphthong in Spanish poetry, which would render *o.c[e̯á].no* a word with PU stress rather than APU stress. Another unexpected case is represented by the rhyme pattern *de**mó**crata* ~ ***plá**ta*, where the stressed syllable in *de**mó**crata* is ignored, generating an *aa* rhyme rather than the expected *oa*. Similarly, in the rhyme *ecle**si**ástica* ~ *do**mé**stica*, the quality of the stressed vowels is dissimilar. Finally, ***Áms**terdam* ~ *sole**dád*** shows a rhyme between an APU-stressed word and a U-stressed one, a pattern not attested elsewhere in our corpus; our hypothesis is that the poet might have been exploiting some kind of secondary stress on the final syllable to accommodate to the final stress in other lines in the poem (in §4.2 we will see a comparable systematic pattern in Greek). Importantly, none of these cases contradicts our observation regarding the post-tonic medial syllable being weaker, or more dismissible, than the final unstressed syllable; rather, what they show is that the stressed

[10] https://github.com/JorgeDuenasLerin/diccionario-espanol-txt.
[11] https://dle.rae.es/.

syllable of APU words is somehow being occasionally disregarded. However, this is an extremely infrequent pattern.

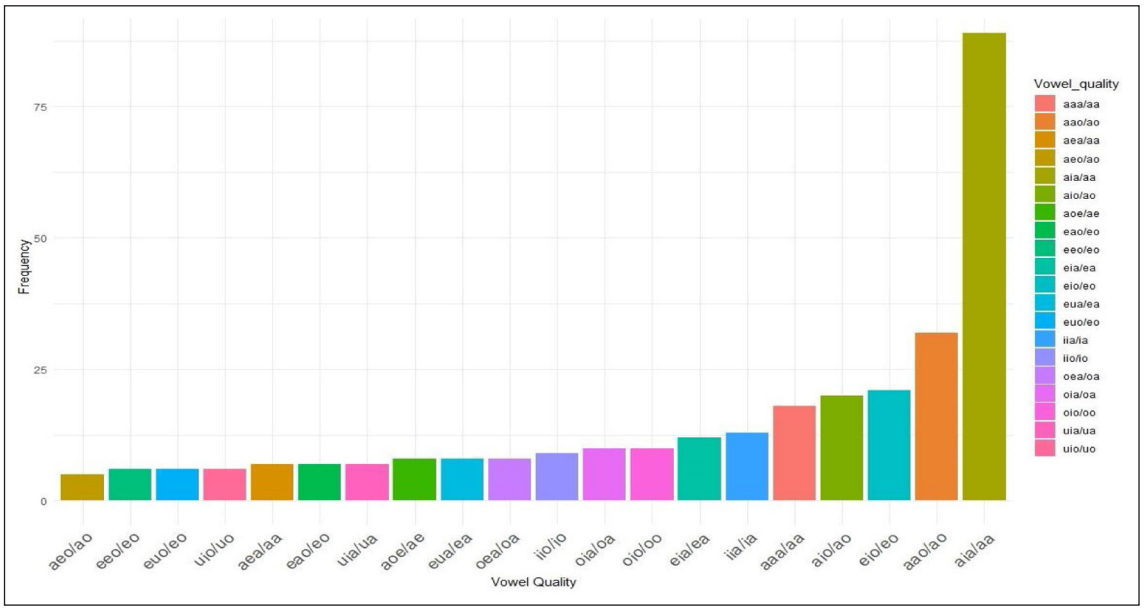


Figure 2: 20 most frequent vowel patterns in APU-PU rhymes in our corpus.

4. Greek rhymes: an overview

Like Spanish, Greek also possesses a trisyllabic stress window at the right edge of the word, admitting APU, PU and U stresses. Its stress is (largely) lexical, primarily due to the existence of several minimal pairs only differentiated in terms of stress, such as *ούρα* [úra] 'urine' vs. *ουρά* [urá] 'tail' or *φύλλο* [fílo] 'leaf' vs. *φιλώ* [filó] 'I kiss', and the presence of stress shifts bound to the combination of specific roots and affixes (Revithiadou 1999). Most of the work on Greek stress relies on findings from nominal stress (not verbal stress or other parts of speech), which presents the largest diversity. According to Revithiadou (1999), APU stress is the default, whereas Apostolouda (2018) argues in favor of a PU default. Other studies suggest that there may be different defaults depending on different inflectional classes (Revithiadou & Lengeris 2016) or certain phonological properties; for instance, in existing and novel acronyms, U stress is preferred, especially when the word ends in a coda (Topintzi & Kainada 2012). Corpus data demonstrate this diversity too; GreekLex2 (Kyparissiadis et al. 2017), a recent lexical database tagged for stress and part of speech information and other properties, reports the following stress distribution in the token analysis of the polysyllabic lemmas it includes.

(15) Stress distribution in GreekLex2 (type and token frequency) (Table 2 in Kyparissiadis et al. 2017)

	Types		Tokens	
Stress position	**Counts**	**Percentage**	**Counts per million**	**Percentage**
Monosyllables	276	0.8	225192	53.2
Final	9951	28.2	61558	14.6
Pre-final	13569	38.4	88817	21
Antepenultimate	11508	32.6	47368	11.2

Note. Monosyllables are presented separately in the analysis as they can only be stressed on their sole syllable.

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The patterns' distribution is also dependent on the parts of speech involved. For instance, although PU stress is the most common pattern in nouns (where it is closely followed by APU stress) and verbs, it is the least common in adjectives, where U stress is predominant, followed by APU stress (Kyparissiadis et al. 2017). Regardless of the specifics and various complications, it is evident that APU stress is quite common, and definitely more common than APU stress in Spanish.

Turning now to rhymes, this phenomenon is also rather understudied in Greek, including from a literary point of view. The only book-length (albeit short) study exclusively devoted to it is Kokolis (1993). Reference to rhyme is made in several other works on Greek poetic metrics or versification, such as Voutieridis (1929), Spatalas (1997), and Stavrou (1974), but is often brief and perfunctory. Interesting insights can be found scattered in articles usually on specific poets, such as Psalti (2017), to which we soon return. To our knowledge, the only source that offers preliminary quantitative information on Greek rhymes is *Greek Rhyme* (http://greek-rhyme.web.auth.gr/index.php/en/; henceforth *GrRh*) a pilot database (Topintzi et al. 2019) containing works by various poets (from the early 19th century to the present) and a series of original algorithms for automatic rhyme detection. At the moment of writing, the database contains 11,259 rhymes, distributed as follows:

(16) Rhyme type distribution in *GrRh* (corpus of 11,259 rhymes as of 15/09/2024)

Rhyme type	Raw Number	Percentage
APU	261	2.32%
PU	7276	64.62%
U	3722	33.06%

APU rhymes are undoubtedly rare; the extent of their rarity, though, remains to be determined. This is because *GrRh* mostly contains works by acclaimed poets, who often conform to genres and poetic forms that delimit the structure of the verse. For instance, almost all poems by Lorenzos Mavilis (1860–1912) contained in the database exhibit a particular version of an Italian sonnet—

consisting of 14 lines in rhyme organized in iambic hendecasyllables: 2 quatrains followed by 2 tercets—thus bound to present PU rhyme. In contrast, Lina Nikolakopoulou (born 1957), a contemporary poet who often writes lyrics for songs, is fond of U rhymes (72.21%), but otherwise alternates between APU and PU rhymes, roughly equally, namely, by 13.60% and 14.20%, respectively.

Greek rhyme patterns virtually always involve rhyme pairs where both members share the same stress pattern, i.e. APU-APU, PU-PU and U-U. Some examples follow. Example (17) lists the first stanza of the poem *Gala*. The first and third lines illustrate U-U rhymes, while the second and fourth lines illustrate PU-PU rhymes.

(17) Greek stanzas with alternating PU-PU and U-U rhymes

Μαυροντυμένοι απόψε, φίλοι ω**χροί**,	[o**xrí**]	A
ελάτε στο δικό μου περι**βό**λι,	[peri**vó**li]	B
μ' έναν παλμό το βράδυ το βα**ρύ**	[va**rí**]	A
για ναν το ζήσουμ' **ό**λοι.	[**ó**li]	B

Dressed in black tonight, *pale* friends,
come to my *orchard*
with a pulse in the *heavy* evening
for *all* of us to experience it.

Kostas Karyotakis, *Gala* (1919)

The next example showcases APU-APU rhymes across the verse. Note that the form *μου* is a clitic adjoined to the preceding word and has no stress marking of its own. Thus, *μόνη μου* makes for a single APU-stressed unit.

(18) Greek stanza with APU-APU rhymes throughout

Στ' άρμα του χρόνου του **γό**νιμου	[**ɣó**nimu]	A
Πέρα απ' τη μοίρα και **μό**νη μου	[**mó**ni mu]	A
Μού 'διωχνε ο κάμπος τη **σκό**νη μου	[**skó**ni mu]	A
Στα σύνορα του α**νώ**νυμου	[a**nó**nimu]	A

In the chariot of the *fertile* time
Beyond fate and *alone*
The plain was blowing away *my dust*
On the border of *anonymity*

Lina Nikolakopoulou, *I patrida* (1992)

While perfect rhymes are generally preferred, a range of rhyme variants is attested, especially rich rhymes, where the onset consonant(s) preceding the stressed vowel are also matched, e.g. *πλα**τάνι*** 'plane tree' ~ *βο**τάνι*** 'herb' [pla**táni** ~ vo**táni**] or *χα**ρά*** 'joy' ~ *κυ**ρά*** 'lady' [xa**rá** ~ ci**rá**] in *Agrampeli* (1872) by Aristotelis Valaoritis. Imperfect rhymes are also identified but are less common.[12] When found, they typically involve consonant rather than vowel mismatches. Thus, in *Sterna* (1932) by Giorgos Seferis, we read ***στέρ**να* 'cistern' ~ *α**στέρ**ια* 'stars' ~ ***μέρα*** 'day' [**st**é**rn**a ~ a**st**é**rj**a ~ **m**é**r**a] and then *ρι**πί**δι* 'fan' ~ ***δεί**λι* 'dusk' ~ ***σφύ**ζει* 'pulsates' [ri**pí**ði ~ **ð**íli ~ **sf**ízi], with the target consonants highlighted in grey. Vowel mismatches are rarer. In fact, Kokolis (1993) does not mention them at all. We must look into Psalti (2017) for them, e.g. *λου**λού**δια* 'flowers' ~ *κε**ντί**δια* 'embroidered decorations' [lu**lú**ða ~ ke**dí**ða] from *Ruth* by Romos Filyras. Psalti (2017) provides additional comparable examples involving APU-APU rhymes to which we turn in section 4.2, alongside a deeper exploration of APU rhyme.

4.1 Methodology and data

In contrast to Spanish, there is currently no publicly available large collection of Greek poetry. A valuable resource is *Anemoskala*,[13] which contains information about more than a dozen prominent poets and their poems. However, due to intellectual property rights, only a limited subset of the actual texts is made available—much of which is already contained in *GrRh*. This means that for Greek we have been unable to conduct a quantitative survey of the APU rhyme patterns. *GrRh*, as mentioned, allows for some quantitative results, but its automatic rhyme detection algorithms fall short in the cases under consideration. As we will soon see, Greek possesses an APU-U rhyme pattern. This is entirely missed in *GrRh*, whose algorithms can identify rhyme among words stressed on the same syllable, e.g. APU-APU rhymes, but not APU-PU or APU-U rhymes. Thus, while we are confident about the validity of the generalizations that follow—also, because, on the one hand, most are reported elsewhere too and, on the other, they conform to the third author's native speaker intuitions—we are not in a position to comment on how widespread they are in Greek poetry and rhyme as a whole. With this in mind, our data are largely based on three poets: Nasos Vagenas (as explored in Psalti 2017), a selection of poems by Manousos Fassis and the poem *O ilios o iliatoras* (*The Sovereign Sun*; 1971) by Odysseas Elytis (manually analyzed by the third author of the paper).

4.2 Greek APU rhymes

Recall that for antepenultimately stressed words, APU-APU perfect rhymes are the norm in Greek (e.g. ***γό**νιμου* ~ *α**νώ**νυμου*). The APU-PU rhyme pattern we encountered in Spanish (cf. (12–14))

[12] Automatic detection of imperfect rhymes in *GrRh* often overgenerates. For instance, it will classify as imperfect U-U rhymes any case where the final stressed vowels in the lines differ. Manual analysis usually reveals that there is no rhyme present at all in these cases. For this reason, generalizations here are only of qualitative nature.

[13] https://www.greek-language.gr/Resources/literature/tools/concordance/index.html.

is not reported in traditional surveys such as Kokolis (1993). It is mentioned though by Psalti (2017) for Nasos Vagenas. Examples include: *αγαλμα.**τί**.δι.α* 'statuettes' ~ ***ί**.δια* 'identical' [a.ɣal.ma.**t**ί.ði.a ~ **í**.ðja] or ***χρό**.νια* 'years' ~ *σαρ.**δό**.νι.α* 'sardonic' [**xr**ó.na ~ sar.**ð**ó.ni.a] in Vagenas' *Kykladikon* (2001), among a few more in other poems by the same author.[14] All eight cases—with one exception—that Psalti reports, however, display a systematic configuration: the existence of a hiatus context where the final vowel in the word (V_1) is preceded by the vowel [i]. It is well known that this vowel can often cause palatalization of the previous consonant or glide formation undergoing glide strengthening (see Topintzi & Baltazani 2016, for details), often leading to variation. Thus for some speakers, the word *άδεια* 'permission' is trisyllabic [á.ði.a] and for others disyllabic [á.ðja]. It is reasonable that the poet taps into exactly this possibility in his poetry; thus what looks like an APU-PU rhyme may in fact be a regular PU-PU[15] or APU-APU rhyme, depending on what process applies, e.g. both APU in [a.ɣal.ma.**t**ί.ði.a ~ **í**.ði.a] vs. both PU in [a.ɣal.ma.**t**ί.ðja ~ **í**.ðja]. But, even if one insists on retaining the APU-PU pattern, the generalization seems to be the same as in Spanish: what can be ignored is the post-tonic syllable in the APU word, namely the one that contains the vowel [i].

Going back to the APU-APU rhyme pattern, one wonders whether Greek admits the (rare) Spanish pattern that skips the post-tonic penultimate syllable and only matches the vowels of the antepenultimate and final syllables (cf. *pálido* ~ *escándalo* in (11)). Some examples of this type are found in (19a). Nonetheless, the other vowels within the APU domain can also be ignored: the final (19b), the antepenultimate (19c), or a combination of the penultimate and final (19d). Pattern (19b) is ungrammatical in Spanish, while (19c) is very marginally attested. Rhyming vowels in the transcription appear in grey shading, alternating ones in *italics*. Since the rhyme domain involves the APU vowel and everything that follows it, the usual notation of boldface and underlining has been omitted here to avoid further visual clutter.[16]

(19) Vowel mismatches in Greek APU-APU rhymes

a. V_3-V_1 rhyme, posttonic V_2 is ignored

ερήμωση ~ θύμηση	er*í*m*o*s*i* ~ θ*í*m*i*s*i*	'desolation' – 'memory'
εβάρυνες ~ εμάρανες	ev*á*r*i*n*e*s ~ em*á*r*a*n*e*s	'you're burdened' – 'you withered'
έρωτα ~ τέρατα	*é*rot*a* ~ t*é*r*a*t*a*	'love' – 'monsters'

[14] Syllabification boundaries have been added here for the reader's convenience to highlight the vowel-glide alternation discussed in the text right afterwards.

[15] Conceptually, this resyllabification is similar to the Spanish *o**cé**a**n**o* ~ ***m**á**n**o* case, which, however, involves diphthongization.

[16] All the examples in (19) are from Elytis' *O ilios o iliatoras*, except for: *έρωτα ~ τέρατα* (from Vagenas, *Simeia kai terata*), *δαφνόφυλλα ~ όφειλε ~ ερπετόφιλοι* (from Vagenas, *Dhon Kichotis*), *γύρισε ~ επούλησε* (from Seferis, *Agianapa B'* in *Logbook III*) and *έρωτα ~ αόρατα* (from Vagenas, *Mille Fiori*).

b. V_3-V_2 rhyme, V_1 is ignored[17]

άνοιξε ~ άνοιξη	ánikse ~ ániksi	‘opened’ – ‘spring (the season)’
δαφνόφυλλα ~ όφειλε	ðafnófila ~ ófile	‘bay leaves’ – ‘owed’
~ ερπετόφιλοι	~ erpetófili	– ‘reptile lovers’

c. V_2-V_1 rhyme, V_3 is ignored[18]

γύρισε ~ επούλησε	ɟírise ~ epúlise	‘(s/he) returned’ – ‘(s/he) sold’

d. Double mismatch: Only the finals rhyme

παράθυρα ~ φοινικόκλαρα	paráθira ~ finikóklara	‘windows’ – ‘palm fronds’
έρωτα ~ αόρατα	érota ~ aórata	‘love’ – ‘invisible’

In the absence of quantitative data regarding the frequency of the above patterns, no firm conclusion can be drawn from (19). Pattern (19a), which—impressionistically speaking according to the third author—is perceived as more natural than the others, may indeed be more frequent, in which case, Greek would be comparable to Spanish. At present, we simply cannot tell. Thus, it is safer to conclude that Greek vowel quality patterns within APU rhymes offer no evidence for the post-tonic syllable being deemed *weaker* than the final one.

However, we suggest that Greek possesses another APU rhyme pattern that offers evidence to the complementary statement, namely that the final syllable is *stronger* than the weak post-tonic one. This evidence derives from an APU-U rhyme pattern reported in much previous philological literature (e.g. Peri 1989), including Stavrou’s book on metrics (1974: 105), which only devotes six pages to rhyme, and Kokolis (1993: 27), which discards many other rhyme patterns as deviant ones. We first illustrate with the celebrated example that Peri (1989) also uses:

(20) First four lines from Elytis’ *O ilios o iliatoras* and APU-U rhyme

Ο Ηλιος ο Η**λιά**τορας	[iʎátoras]	A
ο πετροπαιχνι**διά**τορας	[petropexni**ðjá**toras]	A
από την άκρη των α**κρώ**	[a**kró**]	B
κατηφοράει στο **Ταί**ναρο	[téna**ro**]	B

The *sovereign* Sun
the *stone player*
from the edge of *edges*
descends to *Tainaro*[19]

[17] Regarding the vowel quality alternations, Psalti (2017: 5) mentions that changes from high to low vowels and vice versa are avoided. An exception involves the penultimate vowels in: *paráθira ~ finikóklara*; the triplet of final vowels in: *ðafnófila ~ ófile ~ erpetófili* is a superficial exception. The words appear in this linear order, so the middle one with mid /e/ can be argued to mediate between low /a/ (first in sequence) and high /i/ (last in sequence).

[18] One can raise objections as to whether this case indeed exhibits rhyme. Given that all other verses in the poem present rhyme, excluding this pair seems unprincipled and unjustified—especially by Seferis, a Nobel prize-winning poet. It is true, however, that examples of this sort are harder to come by.

Our focus is on lines 3–4. Here, the finally stressed word *akró* rhymes with the antepenultimately stressed *ténaro* (APU-U rhyme pattern). As Peri observes, this becomes possible because a secondary final stress is assumed to be added to the primarily stressed APU word. Note that no secondary stress of this sort arises in the regular language; it is only added for rhyme purposes. Kokolis (1993: 28) considers this pattern "relatively rare"; impressively enough, though, in *O ilios o iliatoras*, it is attested in 34 out of the 110 rhymes of the poem (about 31%). (21a) presents some additional examples in the same work, while (21b–c) offer examples from other poets. Secondary stresses in the IPA transcription have been added for convenience.

It is consequently more accurate to describe this pattern as APU/U-U rhyme, among different levels of stress. Going back to our example from (20), rhyme effectively emerges between the final syllables in ***akró*** and *ténar**ò*** (the dotted underlining indicates the domain where the APU rhyme would have begun, but does not; in subsequent rhymes of this type, only the underlining among the final syllables is marked). Note that in this specific pair, one could argue that the rhyme domain starts even earlier, given that the pretonic vowels also match. This is coincidental; there are several cases in the poem without identity of the PU vowel, such as *θάlᴀ**sès*** ~ ***ᴇʌés*** or *pᴏ**té*** ~ *orcízᴇ**tè*** (relevant vowels are shown in small capitals). The latter example illustrates another, more common feature: full identity between the final syllables in the rhyme pair. This can be detected in *pole**mán*** ~ *epíra**màn*** and *misofégar**ò*** ~ *xar**ó***, among others in Elytis, or *tra**nós*** ~ *proistáme**nòs*** in Fassis. Vagenas opts to extend this identity even further to the left. Finally, both possible orders of words within this rhyme type are attested, namely APU-U, as in *óli*^{m}***bò*** ~ *koli*^{m}***bó***, and U-APU, as in *vu**ná*** ~ *pleúme**nà***.

(21) a. From Odysseas Elytis' *O ilios o iliatoras*

Rhyme pair (Greek spelling)	***Rhyme pair (IPA)***	***Gloss***
ακρώ ~ Ταίναρο	a**kró** ~ ténar**ò**	'edges' – 'Tainaro'
θάλασσες ~ ελιές	θάλas**sès** ~ e**ʌés**	'seas' – 'olive trees'
πολεμάν ~ επήραμαν	pole**mán** ~ epíra**màn**	'fight.3PL' – 'took.1PL'
κρυφά ~ ανάθρεφα	kri**fá** ~ anáθre**fà**	'secretly' – 'raised.1SG'
βουνά ~ πλεούμενα	vu**ná** ~ pleúme**nà**	'mountains' – 'floating'
ποτέ ~ ορκίζεται	po**té** ~ orcíze**tè**	'never' – 'swears.3SG'
μισοφέγγαρο ~ χαρώ	misofégar**ò** ~ xar**ó**	'half moon' – 'enjoy.1SG'
απερπάτητοι ~ πατεί	aperpátit**ì** ~ pat**í**	'untrodden' – 'step.3SG'
ωκεανούς ~ τύραννους	ocea**nús** ~ tíra**nùs**	'oceans.ACC' – 'tyrants.ACC'
κρασί ~ ξεμανίκωτοι	kras**í** ~ ksemaníkot**ì**	'wine' – 'sleeveless.M.NOM.PL'

[19] Cape Tainaro is the southernmost point of mainland Greece.

b. From Manoussos Fassis

Rhyme pair (Greek spelling)	***Rhyme pair (IPA)***	***Gloss***
τρανός ~ προϊστάμενος	tra**nós** ~ proistáme**nòs**	‘famous’ – ‘boss’
(ω λα) λα ~ κοτόπουλα	(o la) **lá** ~ kotópu**là**	‘oh la la’ – ‘chickens’
απελέκητο ~ κοιτώ	apelécit**ò** ~ cit**ó**	‘uncut, ignorant’ – ‘look.1SG’

c. From Nasos Vagenas

Rhyme pair (Greek spelling)	***Rhyme pair (IPA)***	***Gloss***
Όλυμπο ~ κολυμπώ	óli^{m}**bò** ~ koli^{m}**bó**	‘Olympus’ – ‘swim.1SG’
λοιπά ~ κατάλοιπα	li**pá** ~ katáli**pà**	‘(and the) rest’ – ‘residue’
ρωτά ~ αξημέρωτα	rot**á** ~ aksimérot**à**	‘ask.3SG’ – ‘before dawn’

Adopting the idea that the APU/U-U pattern is due to the emergence of a secondary metrical stress on the final syllable of the antepenultimately stressed word suggests that the final syllable in that domain is inherently stronger than the penultimate post-tonic syllable.

It is worthwhile mentioning that Köhnlein & van Oostendorp (2014) reach a similar conclusion through their exploration of Dutch APU-APU and PU-PU rhymes, reporting that not all unstressed syllables behave in the same way for rhyme purposes. Specifically, they observe that certain unstressed syllables may participate in the creation of imperfect rhymes, if they are (potential) carriers of secondary stress. Köhnlein & van Oostendorp attribute these differences among unstressed syllables to metrical structure, without, however, being explicit about its specifics. We likewise consider this effect a result of metrical structure but take this issue one step further; in the next section we offer a specific formal account about the asymmetry between the two unstressed syllables in an *APU* word.

5. An ILT-foot-based analysis of the weak vs. semiweak contrast

In this section, we propose that an ILT foot can account for the greater relevance—and strength—of some unstressed syllables over others in Spanish and Greek rhyme, and further restrict the domain of rhyming. Importantly, ILT feet receive additional independent support from other linguistic phenomena in both languages. In Spanish, previous studies have already referred to ILT feet to explain the maximal size of the stress window and the maximal size of hypocoristics and acronyms. These are briefly summarized below, with references. However, all these linguistic phenomena provide support for a ternary foot, but not specifically for its layered structure. Hence, the study of verse and APU rhyme stands out as crucial, since it allows us to provide evidence for foot layering. This holds true for Greek, too. Admission of ILT feet in Greek, though, has an even stronger impact, as such feet have not been proposed in the literature on Greek before. We

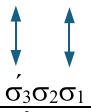
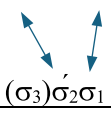
contend that their introduction provides a better understanding of prosodic phenomena similar to those in Spanish, which we explore later in the section.

Let us begin by summarizing the main generalizations regarding APU rhymes in support of ILT feet (22). In Spanish, when two words with APU stress *imperfectly* rhyme (APU-APU), the vowel of the post-tonic syllable can be ignored for rhyming purposes, but the final one cannot. Hence, a pair of words like ***bóveda*** 'vault' and ***rótula*** 'kneecap' rhyme in assonance *oa* (22a.i) but **bóveda* and **cógelo* 'take-IMPER-3SG-ACC' do not rhyme, even if their two first vowels match each other (*oe*). More importantly, we have seen that Spanish words with APU stress most commonly rhyme in assonance with words with penultimate stress (APU-PU), disregarding the quality of the post-tonic vowel (22a.ii). This entailed that a word like ***bóveda*** rhymes in *oa* with a word like ***remóta*** 'remote-FEM', but not in *oe* with a word like *pose* 'pose'. In sum, for rhyming, identity of the vowel in the stressed syllable and the word-final syllable is crucial, but the quality of the post-tonic medial unstressed syllable is not. In Spanish, words with APU stress cannot rhyme with words with U stress.

In Greek, by contrast, a word with APU stress may rhyme with one with U stress (22b), e.g. ***poté*** 'never' ~ *orcízete* 's/he vows', ignoring the penultimate syllable, which in the case of the former word is the medial post-tonic syllable, and the antepenultimate syllable. The APU-U rhyme pattern becomes possible under the assumption that the final syllable of the APU-stressed word receives secondary stress for metrical purposes.

(22) APU rhyme generalizations relevant for ILT feet (rhyming material in bold; arrows indicate rhyme correspondence and brackets indicate optional syllables)

(a) Spanish APU imperfect rhymes

i.	APU-APU	(partial) identity between APU and U	$\acute{\sigma}_3\sigma_2\sigma_1$ ~  $\acute{\sigma}_3\sigma_2\sigma_1$	cf. (11)
ii.	APU-PU	(partial) identity between two specific syllables	$\acute{\sigma}_3\ \sigma_2\ \sigma_1$ ~  $(\sigma_3)\acute{\sigma}_2\sigma_1$	cf. (12) –(14)

(b) Greek APU/U-U rhymes

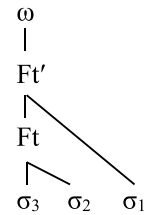
	APU/U-U	(partial) identity between U-stressed and *assumed* U-stressed syllables (mediated by APU domain)	$\acute{\sigma}_3\ \ \sigma_2\ \grave{\sigma}_1$ ~  $(\sigma_3)(\sigma_2)\mathbf{\acute{\sigma}_1}$	cf. (21)

To capture the greater relative prominence of final unstressed syllables (σ_1) over medial unstressed syllables (σ_2), we propose that words with APU stress in Spanish and Greek contain a right-aligned ILT foot (23). This representation allows us to structurally distinguish between the two types of unstressed syllables and provides a motivation for their asymmetrical behavior in rhyme, in which a subset of the unstressed syllables can be characterized as weaker than the others. In Spanish, the post-tonic syllable in words with APU stress can be invisible for purposes of rhyme and thus proves *weaker* than the final one which is never ignored ($\sigma_2 < \sigma_1$). Greek furnishes the complementary effect; in words with APU stress, the final syllable can be rendered stressed for purposes of rhyme, and thus proves stronger than the penultimate one ($\sigma_1 > \sigma_2$). In (23) these two unstressed syllables are in a weak branch of an ILT foot. Yet, the post-tonic syllable is dominated by two-foot projections, whereas the final one is dominated by only one foot projection. The double foot-dependent status of the post-tonic syllable contributes, hence, to its greater weakness, just as in other languages the double foot-headed status of certain stressed syllables has been shown to contribute to their greater strength (§2).

In Spanish, such an account explains why the post-tonic syllable in an APU-stressed word is systematically ignored when rhyming with a PU-stressed word; it also accounts for rhymes involving two words with APU stress, in which vowels in the post-tonic syllable occasionally do not match. Finally, it directly explains why in Spanish there are no PU-PU rhymes (e.g. (óσ) ~ (óσ)) in which the weak syllables are ignored. These syllables are not extra-weak, but just weak and, hence, they rhyme.[20]

Conversely, in Greek, this structure assigns a more prominent status to the final syllable *ses* of *θálases* (21a) than to the post-tonic one, and enables it to be reconstructed to become a foot head itself, i.e. from ILT $[((\theta\acute{a}la)_{Ft}\, ses)_{Ft'}]_{\omega}$, we get a sequence of a binary followed by a unary foot, as in $[(\theta\acute{a}la)_{Ft}(s\grave{e}s)_{Ft}]_{\omega}$, which in turn allows for rhyme with a finally stressed word, such as [eʎés]. Importantly, the ILT foot present in an APU-stressed word licenses this foot reconstruction.

(23) Greater strength of the final unstressed syllable over the post-tonic syllable



Spanish:	[**mú**. si. ka]	'music'	***mú**sica* ~ ***tú**mba* Rhyme in *ua*
Greek:	[**θá**. la. ses]	'seas'	*θálas**es*** ~ *eʎ**és*** Rhyme in *e*

[20] We gratefully acknowledge an anonymous reviewer for this observation, which also constitutes an advantage of our analysis, in comparison to alternative layered foot-free analyses, discussed in Section 6.

Note that the proposed reconstruction is reminiscent of the so-called *enclitic stress* that occurs regularly in the language (see Arvaniti 2007, for discussion). This stress arises in a host + enclitic string, provided the host is APU-stressed. Consider, for instance, the imperative form [cítakse] 'look!' and the enclitic [tin] 'her-ACC'. The combined phrase 'look at her' is *κοίταξέ την* [cìtaksé tin]. Enclitic stress emerges as primary stress on the penultimate syllable within the phrase, while the original stress of the host becomes secondary (Arvaniti 2007 and references therein). Presumably, the host features an ILT foot of the type in (23), namely [((*cíta*)$_{Ft}$ *kse*)$_{Ft}$], which with the addition of the clitic is restructured into two binary feet, i.e. [(*cìta*)$_{Ft}$(*ksé tin*)$_{Ft}$]. Our claim is that the same kind of restructuring extends to rhymed poetry, the only difference being that it is looser, as the resulting new foot is unary. This fits nicely with Kiparsky's (1973:235) observation that 'the linguistic sames which are potentially relevant in poetry are just those which are potentially relevant in grammar'.

Much of the discussion above centered on syllables and syllable nuclei. But it may have repercussions to onsets too. Specifically, an anonymous reviewer suggests that our ILT account predicts that within the APU rhyme, the PU onset should exhibit more variability compared to the U onset. For Spanish, our results render the PU onset of APU-APU rhymes only slightly more flexible than the U onset: namely, 13% of instances have mismatching consonants of the medial syllable, while 11% have differing onsets of the final syllable. In the case of APU-APU (V3-V1), i.e. those with mismatching post-tonic penultimate syllables, the variability attested in medial position is identical to that attested in final position (i.e. 85% of the cases). The Greek data draw a more solid picture, at least in Elytis' *O ilios o iliatoras*, summarized in (24) below.

(24) *Onset (mis)matches in the APU/U-U rhymes of Elytis* (for each rhyme pair, onsets are marked as D(iffering) vs. S(ame); (mis)matching onsets listed within brackets)

	Rhyme pair (IPA)	**Pattern**		**Gloss**
		PU-Ons	**U-Ons**	
a.	potḛ ~ orcízetḛ	D (*p* vs. *z*)	S (*t*)	'never' – 'swears.3SG'
b.	óniro ~ poniró	S (*n*)	S (*r*)	'dream' – 'cunning'
c.	peðemús ~ melúmenus	D (*ð* vs. *m*)	D (*m* vs. *n*)	'sufferings' – 'future-M.ACC.PL'
d.	kratí '~ θeórati	? (*kr* vs. *r*)	S (*t*)	'holds.3SG' – 'enormous'
e.	akró ~ ténaro	D (∅ vs. *n*)	? (*kr* vs. *r*)	'edges' – 'Tainaro'

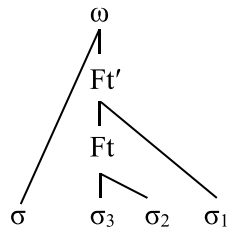
Of the 34 APU/U-U rhymes in the poem, the majority, i.e. 14 (≈41%) exhibit differing onsets in PU position, but matching ones in U syllables across the rhyme pair (24a). 9 rhymes (≈26%) display onset identity (24b), and 8 (≈23.5%) onset variation (24c) for both final syllables. The remaining 3 rhymes (24d-e) seemingly differ but arguably can be subsumed under one

of the patterns above. (24d) concerns 2 rhymes, where the PU onset partly matches (complex vs. singleton onset), while the U onset shows identity across the pair. Depending on how one chooses to view this partial identity of onset (i.e. D or S), this situation can be treated as either pattern (24a) or as (24b). Finally, (24e) is found in the famous *akró* ~ *ténaro* rhyme. If absence vs. presence of an onset in the PU syllable indicates variability, and the U onset is ambiguously interpreted as per (24d), this instance can be subsumed under (24a) or (24c). Focusing on the three primary patterns (24a-c), two points become evident. First, the most common pattern is indeed in accordance with the prediction outlined above. Second, although both PU and U onsets may vary (24c), the fourth logical possibility, whereby the U onset is flexible and the PU one is invariable, never arises, a fact compatible with the idea that σ_1 is stronger than σ_2 in the APU domain.

Turning now to external evidence in favor of ILT feet in each of the two languages, in Spanish, the ILT foot-based account of APU rhyme receives independent support from the domain of word stress and truncation. Previous research has posited the presence of ILT feet in certain words to analyze exceptional antepenultimate stress and restrict the maximal size of the stress window (based on Kager 2012; Martínez-Paricio 2021). It is well-known that stress in Spanish must fall within a three-syllable window from the right edge of the prosodic word, hence, stress may be located in the ultimate, penultimate or antepenultimate position. Yet, antepenultimate stress is the most exceptional and infrequent pattern in the language. Positing that feet can occasionally be expanded with an adjoined syllable, and restricting the location of such layered feet to the right edge of the prosodic word, straightforwardly accounts for the stress window in Spanish, and the impossibility of placing stress further away from the right edge of the prosodic word (*$\acute{\sigma}_4\sigma_3\sigma_2\sigma_1$).[21] As illustrated in (25), a word with four syllables like ***enfá**tico* [*eŋ*.((ˈ*fa.ti*).*ko*)] ‘emphatic’ could never arise with stress in the pre-antepenultimate syllable, because this would entail placing stress outside of the word-final foot. Hence, the ILT foot representation not only allows us to capture subtle strength distinctions among the two post-tonic unstressed syllables but also allows us to representationally differentiate the last three syllables in a word—all dominated by a foot—which can potentially surface with stress, and the pretonic syllables, which are directly linked to the prosodic word and are irrelevant for stress assignment.

[21] The only apparent exception to the three-syllable window restriction is found in sequences of verbs and enclitics (e.g., ***cóm**praselos* ‘buy them from them’, ***llé**vasela* ‘take it to him/her’). However, if the internal morphological structure of these forms is considered (e.g., $\textit{cómpra}_{V} + \textit{se}_{3PL\ DAT} + \textit{los}_{3PL\ ACC}$) and the domain of stress is restricted to the verbal form, it can be argued that the window restriction is preserved (Hualde 2024). Another alternative, pointed out in Elordieta (2014: 32), is to assume that only the lexical head (i.e., the inflected verbal form) projects its own prosodic word and that enclitics are directly attached to the next level in the prosodic hierarchy, that is, the level of the phonological phrase. If so, there is no longer any violation of the stress window.

(25) Metrical representation of a 4-syllable word



Spanish: [eŋ. (('fa. ti) ko)] 'emphatic'
Greek: [or. (('ci. ze) te)] 's/he vows'

Additional evidence for a ternary foot in Spanish comes from the patterns of truncation in hypocoristics and the creation of acronyms. In Spanish, the most common process of truncation in hypocoristics results in bisyllabic trochees (26a), although monosyllabic moraic trochees (26b) and trisyllabic feet (26c) are also attested (Martínez-Paricio & Torres-Tamarit 2019 and references therein). The assumptions that word-final codas can project a mora in Spanish and that feet can occasionally be maximally trisyllabic support the idea that truncated forms (i.e. minimal words) must correspond to the size of a metrical foot (ibid.). Note, however, that ternary feet in these truncated forms are different from those in words with APU stress: the former consist of a bisyllabic trochee with a left adjunct.

(26) a. *Bisyllabic feet: trochees*
El**ví**ra → (**Él**.vi)
Ma**nuél** → (**Má**.nu)
Valen**tí**na → (**Tí**.na)

b. *Monosyllabic bimoraic trochaic feet*
Fer**nán**do → (Fé$^{\mu}$r$^{\mu}$)
Fran**cís**co → (Frá$^{\mu}$n$^{\mu}$)
Je**sús** → (Chú$^{\mu}$s$^{\mu}$)

c. *Trisyllabic feet*[22]
Estefa**ní**a → (Es(**té**.fi/a))
Bartolo**mé** → (Bar(**tó**.lo))
Ma**nuél** → (Ma(**nó**.lo))

Similarly, the study by Torres-Tamarit & Martínez-Paricio (2024) on the prosodic shape of Spanish acronyms sets at three syllables the upper limit of the size of Spanish acronyms (e.g. **A**sociación

[22] All these examples are amphibrachs, i.e. they contain penultimate stress, the most common stress pattern, but anapests (trisyllabic hypocoristics with final stress) are also attested in some hypocoristics whose source form is a truncation-based compound, as in Mariló, which derives from the truncation-based compound *Mári* + *Lóla*, from the original compound name *María* + *Dolores* (see Martínez-Paricio & Torres-Tamarit 2019 for details).

para la **De**fensa de la **Na**turaleza 'Association for the Defense of Nature' > A**DÉ**NA, Ministerio de Economía, Industria y Competitividad 'Ministry of Economy, Industry and Competitiveness' > MI**NÉ**CO) and argues that the form of acronyms should not exceed that of a metrical foot. Once ILT feet are possible metrical representations, the size of acronyms is limited to three syllables, given that they must consist of one foot and nothing else.

Comparable empirical evidence in favor of ILT feet is available for Greek, too, although feet of this type have not been employed in past research on the language. Like Spanish, these involve the trisyllabic stress window, nickname/hypocoristic formation and acronyms. For the stress window effect, the same argumentation laid out above for Spanish is also applicable to Greek. Regarding Greek nicknames, Topintzi (2003) and Apostolopoulou (2023) show that most of them display one of the following patterns:

(27) a. Main types of Greek nicknames
Bisyllabic with PU stress
aristotélis → áris, télis
aθanasía → násça, nánsi, sísi
elisávet → élsa, véta

b. *Bisyllabic with U stress*
kostadínos → kostís
aθiná → naná
xaríklia → xará

c. *Trisyllabic with PU stress*
aristotélis → arístos
aɟelicí → aɟéla
emanuíl → manólis

For Topintzi (2003), the data in (27a) are strict minimal words in the shape of bisyllabic trochees (óσ), while the other two patterns make for loose minimal words of the type [σ(σ́)] for (27b) and [σ(óσ)] for (27c). If ILT feet, however, are accepted, then all of these forms can have the size of a foot; (27a) would remain a bisyllabic trochee, whereas (27b) could be considered a bisyllabic iamb (σσ́).[23] Finally, as in the Spanish case (26c), the trisyllabic PU-stressed forms of (27c) would be analyzed as ILT feet with a binary trochee preceded by an adjunct.

On this view, then, we can understand the existence of all three nicknames for the same base name as in (28) in a unified fashion: they all consist of a foot. In a standard foot account,

[23] The co-existence of two foot types (trochees and iambs) is less startling than usually thought. To give just two examples, Mascaró (2024) argues for different foot types in Catalan, including dactyls, trochees and iambs for stress. Similarly, Köhnlein (2018) claims that Uspanteko displays both moraic trochees and syllabic iambs in its system.

instead, some nicknames would be feet, and some would be feet plus an extra stray syllable—cf. Topintzi's (2003) loose minimal words.

(28) All main nickname types for base name *Vasilicí*

a. Bisyllabic trochee:	(váso)$_{Ft}$
b. Bisyllabic iamb:	(cicí)$_{Ft}$
c. ILT trochee with left adjunct:	(va(sílo)$_{Ft}$)$_{Ft'}$

Further support for ILT feet can be found in two additional, but rather marginal, nickname formation patterns mentioned in Apostolopoulou (2023). The more common of the two involves anapests, such as [padeleímon] → [padelís] or [kostadínos] → [kostadís]. Less common, and foreign sounding, is the case of a single monosyllable, e.g. [stavrúla] → [stáv] or [stéfanos] → [stéf]. The latter pattern can be analyzed as a single unary foot, i.e. [(*stáv*)], both in this and other, more standard, accounts.[24] The anapest pattern, however, is especially problematic for any of the alternative parsings found in the literature. The option [*pade*(*lís*)]—a possible extension of [σ(σ́)] to trisyllables—requires a unary trochee preceded by two(!) unparsed syllables, a sub-optimal solution. Following Revithiadou (1999: 104), the option [(*pade*)(*lís*)] avoids this issue, but in the absence of secondary stress on the initial syllable (Arvaniti 2007), this seems unlikely too. Finally, [*pa*(*delís*)] would admit iambs—which standard accounts of Greek foot structure (Drachman & Malikouti-Drachman 1999; Revithiadou 1999) do not permit—and an unparsed syllable at the left edge of the word. In contrast, for an account that permits both ILT feet and the co-existence of trochees and iambs, *padelís* is entirely predicted, as it receives the structure [(*pa*(*delís*)$_{Ft}$)$_{Ft'}$], that is, a binary iamb with an adjunct at the left edge. Note that all five patterns—the three main ones and the two marginal ones—of Greek hypocoristics constitute a single foot, according to the foot inventory admitted in ILT theory (cf. Martínez-Paricio & Kager 2015: 466).[25]

Acronym formation displays largely similar patterns. Besides the two most common binary schemas (όσ) and (σό), ternary acronyms are also attested with an amphibrach configuration such as ***Ά****τομα* ***με*** ***Ε****ιδικές* ***Α****νάγκες* 'Persons with Special Needs' > [A.^{l}**ME**.A] or an anapest one, as in ***Ο****ργανισμός* ***Κα****τά των* ***Να****ρκωτικών* 'Organization against Drugs' > [O.KA.^{l}**NA**] (see Topintzi

[24] Greek is considered a quantity-insensitive (QI) language. Yet, monosyllabic CVC nicknames of this type, as well as similarly sized acronyms (Topintzi & Kainada 2012), and the systematic placement of final coda-bearing items appearing in the second position of a binomial (Kikiopoulou & Topintzi 2022) can all be interpreted as cases where final codas contribute to (gradient) syllable weight. While we currently align ourselves with the standard QI-view of Greek, this possibility of bimoraic final CVC syllables remains open.

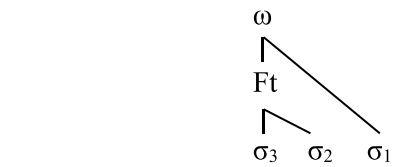
[25] A few (nick)names exceed the single-foot size, namely the four-syllable long and PU-stressed ones, such as [katerína] and [apostólis] from [ekateríni] and [apóstolos], respectively. Apostolopoulou (2023) considers at least the former an instance of a non-truncated nickname, formed due to markedness reduction (avoidance of a stressless and onsetless initial syllable).

& Kainada 2012 for details). Once again, with the introduction of ILT feet, these prosodic shapes become straightforward.

6. Alternative representational analyses

In the present section we consider various alternative analyses and demonstrate the advantages of our account. ILT feet have traditionally been left out from standard foot inventories, hence, we start with a traditional metrical model with (non-layered) maximally disyllabic feet.[26] Maximally disyllabic feet could potentially capture the contrast between *weak* post-tonic unstressed syllables (σ_2) and *semi-weak* final unstressed syllables (σ_1) in words with APU stress by resorting to the structural contrast between (i) unstressed *footed* syllables (i.e, syllables in the weak branch of a foot, σ_2 in (29)) and (ii) unstressed *unfooted* syllables (i.e. syllables directly dominated by the prosodic word, σ_1):

(29) Representational account with maximally disyllabic feet



Such an approach could posit that the post-tonic syllable, located in the weak branch of a foot, is weaker than the final unfooted syllable for various reasons. One is the ample cross-linguistic evidence that syllables in the weak branch of a foot are subject to greater weakening processes than unfooted syllables (e.g. Booij 1977; Gouskova 2003; McCarthy 2008; among others). As for the greater strength of the word-final syllable, this could be attributed to two factors: (i) its prominent position within the word—in Spanish and Greek the right edge of the prosodic word codifies salient grammatical information—and (ii) its prominent position within the line—in Spanish and Greek regulated verse, the end of the line is a metrically prominent position in the sense that it is crucial in rhyming. Under such an approach, it would be reasonable then that the word-final unstressed syllable in APU-stressed words is inherently *stronger* than the post-tonic

[26] More recently, scholars like Golston (2021) have explicitly claimed that no language requires ILT feet based, among others, on the idea that alleged ternary stress systems do not really exhibit ternary stress. Even if we believe this claim is too strong and is not empirically substantiated, it is important to highlight that the reported evidence for ILT feet not only comes from stress systems, but crucially also from specific segmental and tonal metrically conditioned distributions, as well as certain morphophonological patterns (for references and details, see Martínez-Paricio & Kager’s (2021) response to Golston).

syllable, becoming more relevant in rhyming in the two languages. However, such an account faces three important challenges.

First, it cannot provide a unified account of the aforementioned prosodic phenomena: the size of the stress window and the maximal size of hypocoristics and acronyms would have to be stipulated to the size of "a foot + an unfooted syllable".

Second, a model without ILT feet falls short when trying to restrict the domain of rhyming in the language, especially in words with APU stress: such words would be parsed with a bisyllabic foot and an unparsed syllable, as in [(*trági*)$_{\text{Ft}}$ *co*]$_{\omega}$ 'tragic'. However, if the domain of rhyme is foot-based—defined as involving identity of all segments (or vowels) in the main foot except the onset—it is not clear why the common pattern of APU perfect rhyme as in [(*trági*)$_{\text{Ft}}$ *co*]$_{\omega}$ 'tragic' ~ [(*mági*)$_{\text{Ft}}$ *co*]$_{\omega}$ 'magic' or [(*ɣóni*)$_{\text{Ft}}$ *mu*]$_{\omega}$ 'fertile' ~ [*a*(*nóni*)$_{\text{Ft}}$ *mu*]$_{\omega}$ 'anonymous' with identity of the final syllable segments should arise in the first place. But more importantly, a traditional foot-based model cannot account for the APU-PU rhyme pattern illustrated by the pair [(*músi*)$_{\text{Ft}}$ *ca*]$_{\omega}$ 'music' ~ [(*túmba*)$_{\text{Ft}}$]$_{\omega}$ 'tomb' rhyming in assonance *ua*, where the medial post-tonic syllable is completely ignored for rhyming, even if it lies within the main foot. For the Greek APU/U-U rhyme pattern, as in [*po*(*té*)$_{\text{Ft}}$]$_{\omega}$ 'never' ~ [*or*(*cíze*)$_{\text{Ft}}$ *te*]$_{\omega}$'s/he vows', the problems are more of a conceptual nature: it is unclear why the final unfooted syllable *te* acquires a special status so that it undergoes prosodic restructuring, and, moreover, it is unclear how that syllable is differentiated from the pretonic *or*, which is representationally comparable. Resorting to the stress window would be a solution, but as we just saw, this effect must also be stipulated in this type of account. Therefore, even if the standard metrical model may capture the dual patterning of unstressed syllables by resorting to the contrast between footed vs. unfooted, it cannot accurately model all the relevant prosodic and rhyming facts explored above and, hence, is dispreferred over our ILT foot-based account.

Third, as already observed in §5, an approach with traditionally maximally disyllabic feet fails to explain why in Spanish there are no PU-PU rhymes (e.g. (όσ)$_{\text{Ft}}$ ~ (όσ)$_{\text{Ft}}$) in which the weak syllables are ignored. Note that if post-tonic syllables—placed in standard metrical models in the weak branch of a foot, e.g. [(όσ)σ)$_{\text{Ft}}$]$_{\omega}$—are ignored for rhyme in words with APU stress, it can be predicted that material in the weak branch of a foot can be ignored in other contexts as well, but this is not reported in PU-PU rhymes.

A different alternative involves a purely non-structural analysis that just relies on the position of stress and not on feet to account for APU rhyme in Spanish and Greek. Pierrehumbert (1994) offers a concrete instantiation of this idea, proposing that "rhymes involve alignment of words or lines, at (prosodic) head position" (1994: 277). She defines such head as the designated terminal element (DTE)—the element exclusively dominated by strong nodes within the metrical tree—along the lines of Liberman and Prince (1977). This proves unsuccessful with regard to the rhyming facts but also fails to provide a unified account of all the other prosodic facts discussed

above (i.e. the stress window, truncation, acronyms). In the case of APU rhyme, without access to feet, such a non-structural account must posit that the rhyming domain extends from the last stressed vowel up to the end of the word. This is not problematic for Pierrehumbert (1994) as her analysis "says nothing about what happens after the head" (p. 277). But, doing so cannot explain the asymmetry seen in Spanish. Specifically, she cannot explain why the post-tonic syllable is ignored in words with APU stress, as in *mú̲sica̲* 'music' ~ *tú̲mba̲* 'tomb', but not elsewhere, as in words with penultimate stress, where the post-tonic syllable is crucial, as in *ní̲do̲* 'nest' ~ *pí̲no̲* 'pine tree'. Likewise, it cannot predict the APU/U-U rhyme pattern of Greek—at least, not without enlisting some *ad hoc* mechanism. If rhymes line up at the DTE position, then the predicted rhyme pair should involve the primarily stressed syllables of **pot**é̲* ~ *orcí̲zete*, which is not the case. Since the final *unstressed* syllable in an APU word is not a DTE, it cannot be singled out to rhyme with the DTE of a finally stressed word.

Lastly, a concern that an anonymous reviewer has rightfully raised must be addressed. We have been reminded that in English, APU/U-U rhymes were (and might still be) quite common, as in Shakespeare's Sonnet 1. However, the consensus is that these APUs were an exception, and the rhyme arising in their final syllable is not due to secondary stress, but because the final syllable coincides with the tenth, metrically strong position in iambic pentameter (cf. Hanson 2009: 284). Rhyme is thus licensed by the meter, allowing for lines as in (30) in which an unstressed syllable gains prominence due to its metrical position.[27]

(30) (Shakespeare, Sonnet I; S = strong position, W = weak)

And	on	ly	he	rald	to	the	gau	dy	spring
W	S	W	S	W	S	W	S	W	S
And	ten	der	churl	mak'st	waste	in	ni	ggar	ding
W	S	W	S	W	S	W	S	W	S

Could conformity to meter then be what underlies APU/U-U rhymes in Greek? While it is true that Elytis' *O ilios o iliatoras* largely presents octasyllabic lines organized in iambs, and therefore, the last syllable in an APU word within an APU/U-U rhyme is metrically strong, the same rhyme schema emerges even in poems that employ free verse. This is the stance that Garantoudis (2023) explicitly takes for Elytis' *Mikri prasini thalassa*, whose free alternation among iambic lines ranging from 10 to 14 syllables, often with anapestic beginnings, and sporadic rhymes "vary rhythm and keep it at a distance from the linear rhythmicity of a strictly verse poem or even a poem of the period of the liberated verse".[28]

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[27] For an alternative analysis and testing of this phenomenon in the English poetry, see De Sisto (2020: 29–58).

[28] The same argument can be made for Nasos Vagenas, and possibly even more robustly, as examination of poems like *Melanxolia Grammatikou*—where APU/U-U rhymes, like *li**pá̲*** ~ *katáli**pa̲*** (21c) appear—reveals complete lack of metrical structure.

(31) First six lines in Elytis' *Mikri prasini Thalassa*; APU/U-U rhymes arise in lines 1-4, 5-6

Μικρή πράσινη θάλασσα δεκατριώ χρο**νώ**	[xro**nó**]	(14σ)
Που θα'θελα να σε υιοθετήσω		(11σ)
Να σε στείλω σχολείο στην Ιωνία		(11σ/anapest)
Να μάθεις μανταρίνι και άψιν**θο**	[ápsin**θo**]	(10σ)
Μικρή πράσινη θάλασσα δεκατριώ χρο**νώ**	[xro**nó**]	(14σ)
Στο πυργάκι του φάρου το καταμεσήμε**ρο**	[katamesíme**ro**]	(14σ/anapest)

Little green sea, thirteen *years* old
I would like to adopt you
Send you to school in Ionia
To learn tangerine and *absinthe*
Little green sea, thirteen *years* old
In the lighthouse tower at *high noon*

The hypothesis that associates the strength of the final syllable in an APU word with its occurrence in a strong position in the metered line is also rejected in Spanish for a number of reasons. Firstly, as noted in 3.2, examples (12–14), the data contain a variety of different stanzas and poetic forms, which follow varied metrical requirements. Secondly, Spanish poetry is not as strict as other metrical traditions with respect to the distribution of its line-internal rhythmic stresses (i.e. the distribution of its weak/strong positions within the line). Although some stanzas favour certain metrical patterns, in other stanzas, regular rhythmic stress alternations are often considered a consequence of an author style's choice, with an expressivity function, rather than a strict requirement of the meter, at least not in all metrical forms (Caparrós 2014a: 84). Instead, what is strongly constrained in Spanish metered poetry is the position of the final stress within the line: crucially, this must always fall on the same syllable, which tends to be the penultimate one, given that penultimate stress is the most common ending in Spanish poetry. This automatically renders most final syllables in Spanish poetry weak.

To better illustrate this point, observe Bermúdez-Otero's *endecasílabo* ('hendecasyllable') in (32), accompanied by listing of the syllable-counting. In *endecasílabos* the tenth syllable is always the stressed one, whether the line ends with a word with penultimate, final or antepenultimate stress. If the line ends in a PU-stressed word, final stress falls on the tenth syllable (the last strong position) and, consequently, the line consists of 11 syllables (hence, the name *endecasílabo*, i.e. verse with eleven syllables; see the first verse in (32)). By contrast, when the *endecasílabo* ends in a U-stressed word, the line has ten syllables, and when it ends in an APU-stressed word, it consists of twelve syllables, as in the second line in (32), but crucially, the last two syllables are weak (or even considered extrametrical, depending on the model—see for instance Duffell 1991).

(32) Spanish hendecasyllable with APU-PU rhyme (imperfect rhyme in úo: oculto ~ húmedo)[29]

en su le cho de‿a re na, don de,‿o **cul** to,	A	11 syllables
1 2 3 4 5 6 7 8 9 **10** X		
ya ce‿un te so ro de co ra les **hú** me dos.	A	12 syllables
1 2 3 4 5 6 7 8 9 **10** X X		

in its bed of sand, where, *hidden,*
lies a treasure of *humid* corals.

(Ricardo Bermúdez-Otero, *Serenata,* 2025)

A different reviewer entertains an alternative idea that can render the final syllable somewhat stronger than the penultimate one in an APU word, namely "final lengthening" or "pre-boundary lengthening" (see Cho 2016 for a review and references therein), the phenomenon whereby syllables before a prosodic boundary are lengthened compared to phrase-internal syllables. This alternative too runs into many of the problems raised above for the other accounts, but it comes along with additional shortcomings. One is that despite being common cross-linguistically, final lengthening is implemented in language-specific ways (Paschen et al. 2022: 13) and is affected by several other factors including presence of contrastive vowel length and syllable structure. Moreover, Kentner et al. (2023), based on German prose texts read aloud, challenge the widely held view that pre-boundary syllable duration increases progressively with boundary strength. What they find instead is that stronger prosodic boundaries, such as clause- or sentence-final boundaries—which often mark verse endings—, display final shortening. Consequently, any prediction about a more prominent final syllable at the end of the line, due to pre-boundary lengthening, is not necessarily valid a priori. Second, Spanish words which are domain final (Phonological Phrase or Intonational Phrase) are significantly longer than those which are not (Rao 2010). However, for final lengthening to be an adequate explanation for the greater prominence of the final syllable in an APU word, this finding should arise more strongly in an APU over a PU word. Yet, it holds true for "comparable numbers of words of different lengths and syllable structures across the data" (Rao 2010: 75).

7. Conclusion

In this article we have proposed that poetic data—in particular, rhyming data—can be used to reinforce the potential of a prosodic structure recently proposed in metrical theory, the ILT foot. Our quantitative investigation of Spanish rhyme and our qualitative study of Greek rhyme have crucially pointed to an asymmetrical behavior of unstressed syllables, which can be effectively

[29] Below each line, we indicate the number of syllables and signal with an X those that appear after the last strong position in the line. Synaloephas are indicated withe the ‿ symbol.

captured in a model with ILT feet. Although alternative representational analyses of the facts may be able to predict a contrast among two types of unstressed syllables, they fail to provide a unified account of at least three additional phenomena in the two languages: the stress window and the size of hypocoristics and acronyms. Furthermore, in the case of Spanish, they fail to restrict the domain of rhyming. In conclusion, our article adds to the body of research on foot-conditioned phenomena, providing new empirical evidence for ILT feet, and highlights the relevance of exploring poetry and verse from a phonological perspective. Importantly, we have shown that research on rhyme facilitates independent and unique support for certain structures (i.e. foot layering), for which purely linguistic evidence was lacking in these languages.

Data availability

The data can be found at https://osf.io/wsjnb/.

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Competing interests

The authors have no competing interests to declare.

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