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Phonological Derivation by Phase: Evidence from Basque

Phonological Derivation by Phase: Evidence from Basque

Bridget Samuels*

1 Phonological Derivation by Phase

Throughout the generative era, several cyclic models of phonology have been proposed. The first of these was Chomsky et al. (1956), which introduced the phonological cycle, a crucial component of Chomsky and Halle (1968), and adopted in syntax by Chomsky (1965). In phonology, this concept was later implemented as the ‘strict cycle’ of Kean (1974) and Mascaró (1976). The tradition of Lexical Phonology (& Morphology) begun by Kiparsky (1982) and Mohanan (1982) developed the idea of cyclicity further, building on Pesetsky (1979).¹

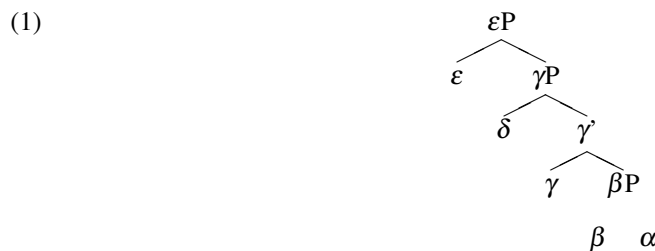
Recently, a new movement in phonological theory has emerged, attempting to combine the insights of Lexical Phonology with Distributed Morphology (Halle and Marantz, 1993) and the phase-based theory of narrow syntax and the syntactic interfaces developed in Chomsky (2001, 2008:; derivation by phase or DbP). The theory presented here and in Samuels (2009), which I call phonological derivation by phase (PDbP), falls under this umbrella. It takes as a starting point the conceptual argument laid out in the foundational work by Marvin (2002:74): “If we think of levels in the lexicon as levels of syntactic attachment of affixes, we can actually say that Lexical Phonology suggests that phonological rules are limited by syntactic domains, possibly phases.”

From a Minimalist standpoint, a model of grammar with synchronous cycles across the various modules is highly desirable. Indeed, this is the “best-case scenario” for computational efficiency according to Chomsky (2004:107). There is also a growing body of literature which argues that phases are required to regulate syntax’s interfaces with the semantic and phonological components; see, for instance, Boeckx (2008) on how phases facilitate ‘wild-type’ or ‘free’ Merge and a conjunctivist semantics of the type proposed by Pietroski (2005: et seq.).

Moreover, PDbP also allows us to recognize the important contributions of cyclic models of phonology. For instance, all attempts to account for phonological opacity effects in a monostratal theory suffer from serious empirical or technical problems (see Vaux, 2008:and references therein for discussion). Since the model proposed here relies on a cycle that is not proprietary to phonology, it is insulated from one family of recurring criticisms of Lexical Phonology, namely that its levels were poorly motivated and allowed to proliferate in an unconstrained manner (e.g., Itô and Mester, 2003). In PDbP, by contrast, we expect evidence for the cycle to come from syntax and semantics in addition to (morpho)phonology. And there can be no *ad hoc* stipulation of cycles/levels if a phonological analysis must be responsible to, and grounded in, such external evidence; conversely, phonological phenomena should be able to provide evidence which is helpful for syntactic analysis.

1.1 Phases and Spell-Out

Before going any further, we should clarify how the basic phase architecture works. Consider a syntactic tree like the one below.



*I am grateful to Cedric Boeckx, Aritz Irurtzun, Gorka Elordieta, and audiences at NAPhC5 and PLC33 for their helpful comments. All faults of course remain my own.

¹For a proper introduction to Lexical Phonology, see the works cited above, the papers in Kaisse and Hargus (1993), and McMahon (2000).

At certain points during the construction of this structure, the derivation is punctuated by the introduction of a phase head. What is crucial for present purposes is that phase heads initiate Transfer or Spell-Out, sending a chunk of the completed derivation to the semantic and phonological systems. Specifically, the complement of a phase head is the chunk that gets transferred, at the point when another phase head enters the derivation. Upon transfer, the ‘spell-out domain’ (transferred chunk) is rendered opaque to further syntactic operations. This is formalized in the Phase Impenetrability Condition:

(2) PHASE IMPENETRABILITY CONDITION (Chomsky, 2001)

For [ZP Z ... [HP α [H YP]]]: The domain of H is not accessible to operations at ZP, but only H and its edge.

Typically (or perhaps even necessarily; see Richards to appear), phase heads and non phase heads alternate with one another, so the chunks being transferred are larger than a single terminal. For (1) above, let us assume that only γ and ε are phase heads. The derivation proceeds as follows:

- (3) a. Merge (β, α): α accessible to β .
 b. Merge ($\gamma, \beta P$): β, α accessible to γ .
 c. Merge (δ, γ'): γ accessible to δ .
 d. Merge ($\varepsilon, \gamma P$): δ, γ accessible to ε . βP transferred.

In the discussion to follow, I assume that Uriagereka’s (1999) conception of Multiple Spell-Out (i.e., complex specifiers and adjuncts are spelled out alone) and Chomsky’s phase framework can be simultaneously entertained. One means for accomplishing this is suggested by recent proposals such as Narita 2009 and Boeckx 2008, which argue that only simplex syntactic objects can undergo Merge: complex objects introduced on a left branch must therefore be reduced to simplex objects before they can be integrated with the main derivational spine. This is achieved by the transfer of all but the head of the mergee. That is to say, complex specifiers and adjuncts must be headed by phase heads.²

One important clarification is necessary in order to enable us to make broader use of the Phase Impenetrability Condition. In narrow syntax, ‘accessible to operations’ essentially means eligible for movement (i.e., Internal Merge or Re-Merge), and able to participate in Agree. For present purposes, I will move forward under the assumption that an ‘accessible’ string of phonology is available for phonological rules/operations.³ Now let us assume, then, that phase impenetrability holds in phonology, so each phonological string becomes inaccessible subsequent to the transfer of another string to the phonological component. By preventing ‘reaching back too far’ into the derivation, the Phase Impenetrability Condition derives the effects previously attributed to the erasure of morpheme boundaries (‘brackets’) at the end of every cycle (Siegel, 1974; Mohanan, 1982), rendering the result of earlier cycles opaque. In other words, a rule can only affect something on its own cycle and/or the previous one, nothing more. The solution adopted here is similar in spirit to Pesetsky (1979) and the Lexical Phonology tradition following it: word-building operations and phonological rules interleave, and the Phase Impenetrability Condition prevents modifying previous cycles after they are built.

Another idea which is crucial to PDbP is that phasal domains are identifiable not just at the clausal level (i.e., v, C , etc.) but also within words. Parallel to v , Marantz (2001) establishes $\{n,$

²Naturally, if we are going to pursue this type of theory, we must identify what is a phase head, and therefore what is a spell-out domain. Chomsky (2001: et seq.) takes C and transitive v to be phase heads; Legate (2003), Marvin (2002), Marantz (2008), and others argue that v must be a phase head in unaccusative and passive constructions as well. Crucially, T is not a phase head. Svenonius (2004), Bošković (2005), and Ott (2008), among others, argue for D as a phase head, and I will follow them here; I also follow Bošković (2005) in claiming that D need not be present in all languages or for all arguments. Other questions remain open, such as whether P is also a phase head (see Abels, 2003). It is my hope that investigation of PF properties will open the door for phonological effects to shed some light on these unresolved matters.

³See Samuels (2009), Ch. 4 for my conception of rules as combinations of primitive operations SEARCH, COPY and DELETE.

a} as phase heads. Following Marantz (1997), these elements are the categorial heads to which acategorial roots must merge, and this includes derivational affixes. Marvin (2002) and Di Sciullo (2004, 2005) argue on multiple independent grounds that the Phase Impenetrability Condition holds for these ‘morphological phases.’ I argue in §5.2 of Samuels (2009) that lexical rules are responsible to the Phase Impenetrability Condition on this smaller scale (a lexical rule has as its domain two adjacent morpheme-level Spell-Out domains) while post-lexical rules are responsible to the Phase Impenetrability Condition at the clausal level.

The strongest claim made by the PDbP approach is that spell-out domains are the *only* domains that phonology needs. In other words, both the levels of Lexical Phonology and the constituents of the prosodic hierarchy come for free when we assume Distributed Morphology and a phasal syntax: phonological domains are directly imposed by morphosyntactic structure, and phonology need not erect any boundaries. It has been recognized for at least forty years (i.e., at least back to Chomsky and Halle, 1968) that phonological domains correspond in some fashion to morphosyntactic ones. If the correspondence is not one of exact congruence, then phonology must construct (or adjust) boundaries. But if the correspondence *is* exact, then phonology can simply ‘read’ the structures it is given. Theories that assume exact correspondence subscribe to the ‘direct reference’ conception of the syntax/phonology interface; see Kaisse (1985), Odden (1990), and Cinque (1993). In recent literature, it is common to read that direct reference cannot be correct because there are apparent mismatches between syntactic and phonological domains. This is the position held by proponents of ‘indirect reference’ theories such as Selkirk (1984); Nespor and Vogel (1986); Truckenbrodt (1995); Seidl (2001), and many others. If PDbP is correct, there is no need to abandon direct reference for an indirect theory. In fact, the situation is even better: phonology doesn’t have to ‘read’ syntactic boundaries, it just applies to each chunk as it is received. PDbP can thus lead us to an understanding of phrase-level phonology that involves no boundary construction and eliminates the prosodic hierarchy.

In the remainder of the present work, we will consider vowel alternations in Lekeitio Basque, which will provide a case study of how lexical rule application works in PDbP. In Samuels (2009), Ch. 5, I provide further examples, and contrast lexical rules with post-lexical ones such as obstruent voicing in Korean.

2 Lekeitio Basque

Lekeitio Basque has two vowel assimilation rules which apply in the same contexts (data is from Hualde and Elordieta 1992, Elordieta 1997, 1999, 2007, p.c.):

- (4) a. VOWEL RAISING (obligatory)
 $V[-HI] \rightarrow [+HI] / _ _ V$
 b. VOWEL ASSIMILATION (optional; fed by raising)
 $V[-RD] \rightarrow V_1 / V_1 _ _$

Hualde and Elordieta (1992), focusing on the assimilation rule, note that it behaves in many respects like a lexical rule, yet it can apply across (some) word boundaries and appears sensitive to morphosyntactic information. Subsequently, Elordieta (1997: et seq.) has argued that the relevant environment for both of these rules is within a feature-checking chain: (C, T), (T, *v*), (T, D), (*v*, D), or (D, N). Of particular relevance to vowel assimilation are the T-*v* and D-N relationships. I will present an alternative that takes the correlation with feature chains, which I show to be imperfect, as coincidental;⁴ in my analysis, these rules are both lexical, and as such, their application is restricted to two adjacent morpheme-level spell-out domains. Since lexical rules are carried on individual lexical entries, it is trivial to restrict these rules to items that are involved in feature chains, which

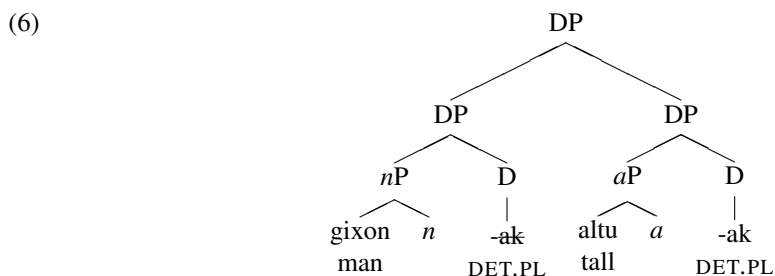
⁴However, given that feature-checking relationships are themselves subject to the Phase Impenetrability Condition, there is likely to be some degree of correlation. Indeed, depending on what one believes about the nature of phases, feature-checking may in fact underlie the phase cycle. But whatever the relationship between features and phases may be, note that my analysis, but not Elordieta’s, can account for the cases in which two assimilating items are not part of the same feature chain.

should yield a perfect match with Elordieta’s predictions. However, as we will see, there are in fact a few examples of assimilation in which there is no feature-checking involved. Moving forward, then, I will assume that the rules are carried on all lexical items, except for certain lexical exceptions, of which there must be some in anyone’s analysis, and let the Phase Impenetrability Condition take care of the rest.

I will now demonstrate the environments in which assimilation (and raising, if applicable) applies, and those in which it does not. One context in which these rules apply is between a noun and an inflectional affix, which in this case signifies both definiteness and case. I give two examples below.

- (5) a. *ume-en* → *umiin*
 child-GEN.PL ‘of the children’
- b. *gixon altú-ak* → *gixon altúuk*
 man tall-DET.PL ‘the tall men’

Following Etxeberria’s (2007) arguments from semantics, I posit a structure in which D is twice present, but only once pronounced. Such a structure accounts for multiple agreement, which is common cross-linguistically and present in some dialects of Basque. It is also supported by the conclusions of Compton and Pittman (2007), who argue that some adjectives in Inuktitut, which act much like those in Basque, are actually DPs in apposition; I adopt their labeling here. For this and all subsequent structures in Basque and Korean, I assume head-finality. Note that in a structure like the *nP* and *aP* in the examples below, the complement and specifier are indistinguishable; the root is accessible to D. I also omit representing Spec,DP unless it is relevant to the example being discussed.



For the case at hand, the relevant property of this structure is that *altu* is accessible to *-ak*: the former is spelled out in the complement of D, and the latter in its edge, so assimilation can apply. Because the roots remain trapped in the complement domain of D, nouns are highly restricted in triggering the rules we are discussing. The following two examples demonstrate that a noun and an adjective cannot interact, as suggested by the structure posited above. This is true regardless of whether there is compounding involved; the only difference is that with a compound, there will be an additional *aP* layer on top of the DP, serving to lexicalize it.

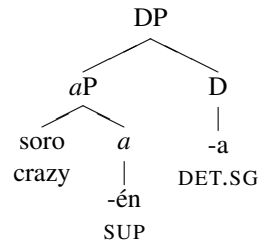
- (7) a. *ortu estu-a* → *ortu estuu*
 field narrow-DET.SG ‘narrow field’
- b. *buru-ánda*
 head-big ‘big-headed’

In these examples, the relation between the two roots is at issue, and assimilation is blocked because the roots are in the complement domains of two different determiners.

Assimilation can, however, occur between an adjective and a derivational affix. This case provides some of the best evidence that feature chains are not involved. Note that there are very few vowel-initial derivational suffixes in Basque, and the superlative is in fact the only one that triggers assimilation; the comparative and excessive, which I assume involve the same syntactic configuration, trigger raising of the root-final vowel but are exceptions to assimilation (see Elordieta,

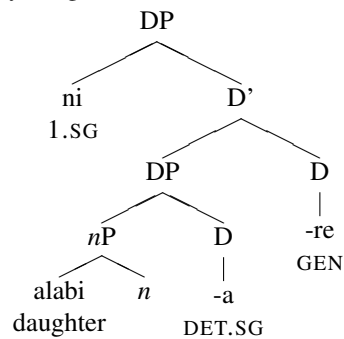
1997:ch. 2, ft. vii for discussion).⁵ Again, as above, the root is accessible to *a*. Assimilation can therefore apply on the cycle at which they are both spelled out.

- (8) soro-én-a → soruúna
 crazy-SUP-DET.SG ‘the craziest’



There are a few other circumstances in the nominal domain in which elements that are linearly adjacent to one another do not undergo assimilation. As I have already mentioned, this is largely due to nominals being rendered inaccessible by D. This is the case with the possessive shown below:

- (9) nire alabi-a → nire alabii
 my daughter-DET.SG ‘my daughter’

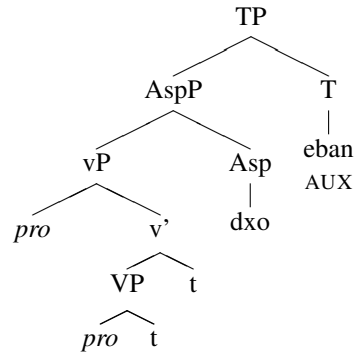


Here, *alabi* is blocked from interacting with the genitival *-re* by the D (*-a*) in the lower DP. (There could also be more functional projections between the lower and higher DPs, but this is irrelevant.) Note that assimilation does occur between *alabi* and this lower D, as we have already seen for *umiin* ‘child.GEN.PL’ and *altuuk* ‘tall.DET.PL’.

Outside of DP, there is only one context in which assimilation occurs: between a verb and an auxiliary. Following Laka (1990) and many subsequent works on Basque syntax, I show the main verb moving to AspP, with the auxiliary heading TP. This is not crucial to the analysis presented here; movement only to *v* (as in Irurtzun 2007) or all the way to T (as in Elordieta 1997, et. seq.) will produce the same results. The verb and auxiliary are spelled out together in the complement of C regardless, so assimilation is free to apply to the auxiliary.

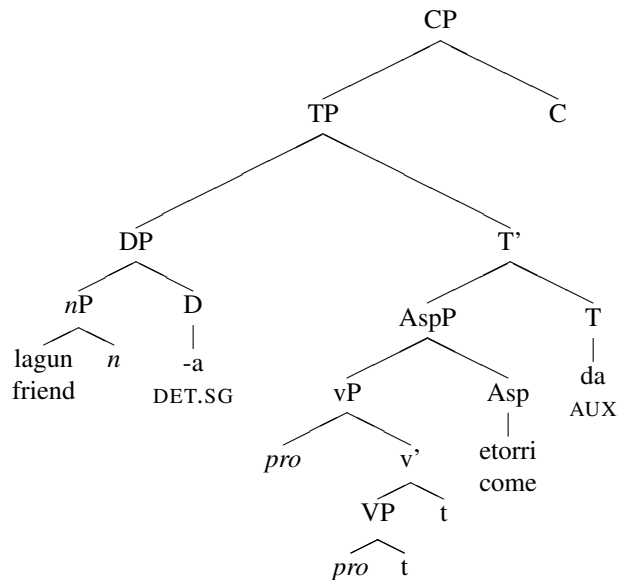
- (10) dxo e-ba-n → dxo oban
 hit 3ERG-NONPRES-PAST ‘(s)he hit it’

⁵There is also at least one derivational affix which does not trigger raising or undergo assimilation, *-árr*, as in *donostiárra* ‘from Donosti.’



Assimilation cannot occur between (the D head of) a subject and a verb, but a syntactic reason for this is not readily apparent. As should be evident from the tree given below, the D in question will be spelled out by C, along with both the main and auxiliary verbs.

- (11) lagun-a etorri da
 friend-DET.SG come AUX ‘the friend has come’

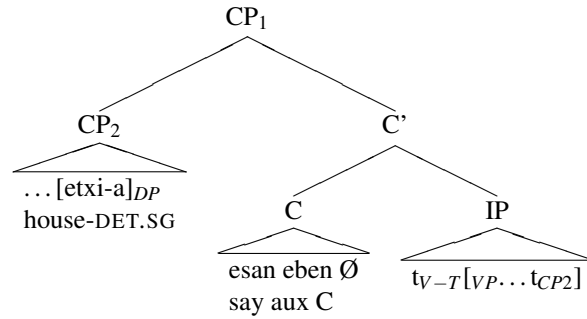


If feature-checking triggered the assimilation rule, this would also be unexpected, since the subject agrees in ϕ -features with the verbal complex. Since there are no cases in which a verb either triggers raising or undergoes assimilation (witness the object-verb and causative examples below, in which there is no assimilation) we may simply say that these rules are simply not triggered by verbs.

- (12) a. arrañ-a erosi dau
 fish-DET buy AUX ‘(s)he has bought fish’
 b. paga eraiñ neutzan
 pay make AUX ‘I made him/her pay’

This also rules out assimilation between the verb and object in the example below, even though it would otherwise be permitted. Following Irurtzun (2007), pied-piping of the embedded CP₂ triggers V-I-C movement of the main verb and auxiliary.

- (13) [barristu egingo dabela plasan dagoen etxi-a]_{CP} esan eben
 renovate do AUX.C square is.REL house-DET.SG say AUX
 ‘They said they would renovate the house that is on the square.’



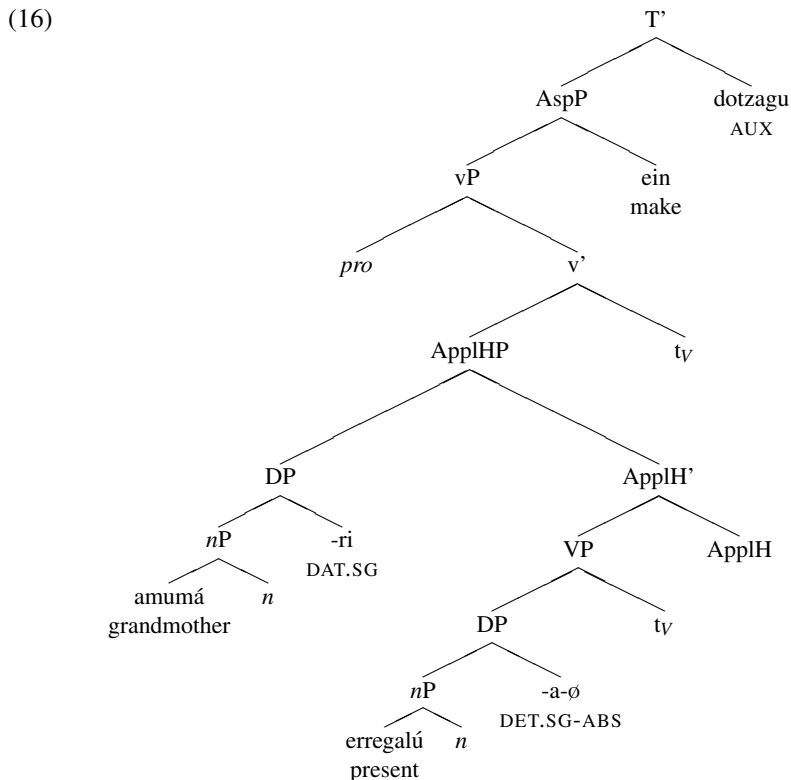
There is also no interaction between a topicalized/focalized argument or an adverb and a verb, as in the following examples. Assimilation of the verb to the topic would be ruled out even if verbs could trigger assimilation because two phase heads, D and C, separate the topic from the verb.

- (14) a. lagun-ari emon dotzo diru-a
 friend-DAT give AUX money-det.sg
 'To the friend, (s)he has given the money.'
 b. beti amaitxuten dau askanen
 always finish-PROG AUX last
 '(S)he always finishes last.'

Finally, assimilation between two objects is inadmissible, as the following shows:

- (15) amumá-ri erregalú-a-Ø ein dotzagu
 grandmother-DAT present-DET.SG-ABS make AUX
 'We have made a present for grandmother.'

Basque has a high applicative (Arregi and Molina-Azaola, 2004), so the structure posited for the above example is as follows.



As we have already seen, ApplH is a phase head. This means that the dative *-ri* is too many phases away from *erregalú*: the former will be spelled out by *v* and the latter by its own D, with ApplH transferring its own complement in between.

3 Conclusions

All the application and non-application environments of the Lekeitio Basque vowel raising and assimilation rules are compatible with a PDbP analysis. Specifically, we analyze both rules as lexical, and as being carried on all determiners and auxiliaries, plus derivational suffixes (subject to a few exceptions). Although we have seen cases in which the rules might be expected to apply but do not, this is not problematic for the analysis. The more crucial point is that the rules *never* apply when two morpheme-level phase boundaries intervene, which is predicted to be impossible for lexical rules in PDbP. The only elements which we must say cannot trigger this rule are verbs; otherwise we would expect a wider range of application.

I hope to have given ‘proof of concept’ for PDbP: looking closely at syntax allows us to identify language-specific phonological domains, without the need to build up hierarchy in the phonology. At this point, I believe this is the most one can offer given that the syntax upon which a theory of the syntax/phonology interface must depend remains in flux. For this reason, the details of how to implement PDbP may well have to be re-negotiated later. Nevertheless, already there is a quickly-growing list of empirical successes which have been achieved by tying phonological rule application directly to spell-out domains: Seidl (2001) primarily on Bantu & Korean; Marvin (2002) on English & Slovenian; Kahnemuyipour (2004) on Persian, English, and German; Piggott and Newell (2006) and Newell (2008) primarily on Ojibwa; Sato (2006) on Taiwanese, French, Gilyak, Kinyambo, & Welsh; Ishihara (2007) on Japanese; Bachrach and Wagner (2007) on Portuguese; Michaels (2007) on Malayalam; Kamali and Samuels (2008a,b) on Turkish; and more programmatically, Embick (2010) and Scheer (2008). While these approaches all differ from the theory presented here and developed more fully in Samuels (2009) in substantial respects, I hope that the theoretical framework and case study given here will provide a guide for the limited re-analysis that would make these earlier studies compatible with my claims. The phonological literature is rife with obvious candidates for PDbP analyses: for instance, Rizzi and Savoia (1993) note that /u/-propagation in southern Italian dialects occurs between D and an associated noun/adjective, but not between a quantifier and noun/adjective, or between an adjective and noun (in either order). This is highly reminiscent of what we saw for Basque. The ultimate message of this work is that, if we want to understand cross-linguistic variation in phonology, we need to understand cross-linguistic variation in morphosyntax better. This calls for collaboration between phonologists, morphologists, and syntacticians, all working together towards the common goal of describing the range of linguistic structures that are available.

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