Representing Disharmonic Turkish Roots in Autosegmental and OT

Hannah Stortz

Stony Brook University, December 2024

Abstract

Vowel harmony is a well-documented phenomenon in the Turkish language, of which there are two types: backness harmony and roundness harmony. Although these processes apply regularly from roots to suffixes, there are a number of disharmonic roots that present difficulties to claims that Turkish vowel harmony applies across the entire phonological word. Different theories have attempted to account for this fact. This paper will discuss the approach of feature specification in Autosegmental phonology, as well as the Optimality Theory proposal that Turkish vowels should be further categorized according to markedness. While both proposals have advantages and disadvantages, I argue that the Autosegmental approach is a better formalization due to its formal simplicity and its applicability to a broad range of exceptions.

---

1. Background

1.1. Turkish Vowel Harmony

Turkish is an agglutinative language with a rich inventory of suffixes. The Turkish language has two well-documented types of harmony – consonant harmony and vowel harmony, the latter of which is the focus of this paper. Within Turkish Vowel Harmony (henceforth TVH)

there exist two separate processes: backness harmony and roundness harmony.[1] The Turkish vowel inventory is a symmetrical set of 8 vowels, with 1 vowel for every combination of high/low, front/back, and round/unrounded.

(1) *Turkish vowel inventory (Kabak 2832)*[2]

	front		back	
	unround	round	unround	round
high	i	y	ɯ	u
low	e	ø	ɑ	o

TVH is typically defined as a rightward feature-spreading process that occurs across a phonological word (exceptions will be discussed in section 3.2). A vowel's ±back and ±round features are defined by the immediately preceding vowel, with alternation occurring between vowels of the same height. While backness harmony applies to all vowels, roundness harmony applies only to high vowels (Kabak 2834). For example, the plural suffix /-lEr/ contains a low[3] vowel, but whether it surfaces as a front vowel (as in [-ler]) or as a back vowel (as in [-lɑr]) depends on whether the previous vowel is front or back. The same principle applies to roundness harmony.

The following examples illustrate regular affix alternations caused by backness and roundness harmony.

(2) *Root-suffix harmony (Kabak 2833)*

a. /dɑl-lEr-In/ [dɑl-lɑr-ɯn] "of branches"

b. /jer-lEr-In/ [jer-ler-in] "of places"

[1] These are sometimes referred to as palatal and labial harmony, respectively.
[2] Some authors opt to use the Turkish alphabet rather than IPA as Turkish is generally spelled phonetically.
[3] Following convention, unspecified low vowels will be represented as "E", and unspecified high vowels will be represented as "I" in the underlying representations.

c. /jol-In/ [jol-un] “of a/the road”

d. /søz-In/ [søz-yn] “of a/the word”

In examples (2a) and (2b), the suffix vowels alternate according to the features of the preceding vowel. The low vowel of the plural suffix /lEr/ surfaces as front or back depending on whether the previous root vowel is front or back. This then influences the surface form of the high vowel in the genitive suffix. Because the first vowel is unrounded, there is no spreading of +round in the high vowels. In (2c) and (2d), the backness of the suffix vowel is similarly determined by the preceding vowel. However, because the first vowel is rounded, the subsequent high vowels must also match in roundness.

1.2. Disharmonic Roots

Although the process of root-suffix harmony is fairly regular, issues arise when considering the application of harmony root-internally. While most native Turkish roots are harmonic, a number of disharmonic roots exist in the language (Dow & Lamontagne 4; henceforth D&L). One commonplace example is the word [kitɑp] “book”, which contains a front vowel followed by a back vowel, resulting in a disharmonic sequence.

In their seminal work on Turkish disharmony, Clements and Sezer (henceforth C&S) claim that “many, though not all disharmonic roots are historical borrowings” (C&S 226). Further research additionally suggests that these disharmonic roots constitute a small subset of the Turkish lexicon and are typically early borrowings of Persian and Arabic origin (D&L 4, 6). Nevertheless, the set of disharmonic roots is large enough to present an issue to any account of TVH that defines the process as applying left-to-right across the entire phonological word, without exception. For this reason, formalizations such as Linear/SPE style rules are inadequate as their fully automatic application is unable to account for cases of disharmony (Kabak 2838).

Several other proposals have attempted to address the disparity in the behavior of TVH within roots versus across suffixes through formalizations couched in a variety of theoretical frameworks. Being two of the most popular phonological theories, the focus of this paper will be on Autosegmental and Optimality Theory (OT) explanations of disharmonic Turkish roots. It will become apparent that while neither analysis is flawless, the Autosegmental approach to disharmony is preferable due to its simplicity and broad applicability.

2. Proposed Formalisms

2.1. Autosegmental Analysis

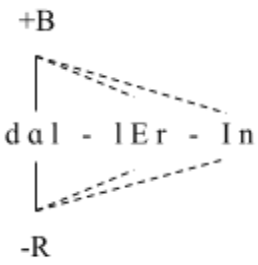
The primary claim of the Autosegmental approach to disharmony is that vowel harmony is not an active process in Turkish roots. According to C&S, "The standard approach to disharmonic roots has been to treat them as exceptions to the otherwise general rules of vowel harmony… Yet our results suggest that the burden of proof is on the linguist who wishes to demonstrate that roots are governed by vowel harmony at all" (C&S 226). Their claim is that disharmonic roots are not exempt from TVH simply because they are usually borrowings, since borrowed words tend to undergo other nativization processes such as final k-deletion and final obstruent devoicing (C&S 226). As a result, there is no reason to believe that vowel harmony is not applied to borrowed roots if it is normally active when other phonological rules do apply.

The solution is to claim that root vowels are "opaque" to TVH. C&S define opaque segments as "nonundergoers," "blockers," and "spreaders," meaning that they license harmony in subsequent vowels but do not themselves undergo harmony processes (C&S 221). In Autosegmental terms, this means that root vowel features are prespecified in the underlying representation (UR), and features spread rightwards through the insertion of association lines from the rightmost specified vowel to all subsequent vowels. This formalization simultaneously

accounts for regular root-suffix harmony and disharmonic roots, as seen in the following examples adapted from Kabak & Vogel (henceforth K&V).

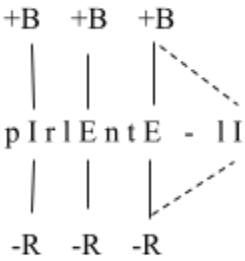
(3) *Autosegmental formalizations of TVH (adapted from K&V 22)*

a.



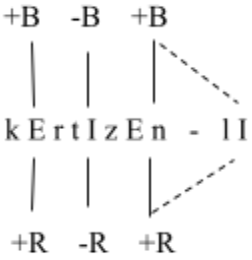
[dɑl-lɑr-ɯn] "of branches"

b.



[pɯrlɑntɑ-lɯ] "with brilliants"

c.



[kortizon-lu] "with cortisone"

As seen in all three of these examples, ±back and ±round features are underlyingly associated in all root vowels, while suffix vowels are unspecified. In (3a), features spread harmonically from the root to the suffix vowels, all the way to the end of the word. In (3b) and

(3c), features only spread from the rightmost vowel of a multi-syllabic root. Because root vowels are opaque and association lines cannot cross, spreading cannot occur from non-final root vowels. However since the vowels following the root do not yet have associated features, features can spread freely to them and across all subsequent suffix vowels.

While the root in (3b) is harmonic, if we are to accept C&S's claim that TVH is not active in roots, then the features must be specified regardless. On the other hand, (3c) has a disharmonic root, but because root vowels do not undergo harmony and the disharmonic features are prespecified in the UR, there is no true violation of harmony as a process.

With this formalization, the definition of TVH must be slightly modified to state that it is a rightward feature spreading process whereby vowels can spread features to any immediately following unspecified vowel. Any apparent harmony within roots is accidental, while seemingly disharmonic roots can be easily represented without any associated cost to the overall description of TVH. The prespecification of root vowels is also consistent with the observation that root vowels do not alternate, which suggests that they are not undergoing harmonic processes.

2.2. Criticism of the Autosegmental Approach

Despite its seeming ability to handle root-suffix harmony as well as dis/harmony within roots, there are some disadvantages to the Autosegmental analysis of TVH. The first issue is its "lack of representational economy" (K&V 22). While necessary to represent disharmonic roots, specifying all root vowels adds a lot of clutter, particularly in the case of harmonic roots. However, if in harmonic words such as (3b) only the first root vowel is prespecified, there would have to be association lines spreading features to root vowels; this would imply that root vowels can, in fact, undergo harmony, which negates the claim made by C&S that harmony does not apply to roots. Thus in order to maintain a consistent formalization, the less minimal route of

specifying all root vowels is necessary.

Perhaps more problematic is the fact that prespecifying all root vowels results in disharmonic roots being treated as unexceptional (Kiparsky 1). As previously mentioned, disharmonic roots represent an incredibly small percentage of the Turkish lexicon, a fact which is not reflected in the Autosegmental approach. It is difficult to believe that all apparent harmony within roots is entirely accidental, but there is no formal difference between how a harmonic versus a disharmonic root is represented within a maximal-specification framework.

Thus while the Autosegmental analysis is able to represent both harmonic and disharmonic roots with ease while also accounting for regular root-suffix harmony, it steamrolls over the fact that disharmony is an irregularity, and it is perhaps not the cleanest representation.

2.3. OT Analysis

OT analyses of TVH typically rely on the idea of markedness, combined with constraints aimed at limiting disharmony overall. C&S observed that vowels from the set /a, e, i, o, u/ seem to combine freely within roots, even when resulting in violations of harmony, while /y, ø, ɯ/ do not occur in disharmonic roots (C&S 223). Furthermore, roots that would include /y, ø, ɯ/ disharmonically are highly unstable and tend to be regularized, as in komünizim ~ kominizim "communism" (C&S 223).[4] Proponents of OT models therefore argue that the set of /y, ø, ɯ/ is "marked," and that the processes of TVH have the twofold goal of reducing disharmony and reducing the presence of these marked vowels.

In her 2006 paper on vowel harmony, Krisztina Polgárdi includes a robust analysis of Turkish harmony from an OT perspective, which is outlined here in abbreviated form. Rather

[4] Note that C&S distinguish this regularization process from harmony, which they claim is not active in roots. This is because regularization of this type does not always result in a harmonic sequence; rather, the marked vowel is replaced with an unmarked vowel.

than the features shown in (1), Polgárdi uses the elements I, U, and A to refer to frontness, roundness, and lowness, respectively (9). *MULT(I/U/A) constraints prohibit feature spreading, with *MULT(A) ranked highest since height harmony does not apply in Turkish. A HARMONY constraint restricts violations of frontness and roundness harmony, and must therefore be ranked above *MULT(I/U). Additionally, LICENSE(A, U) ensures that roundness harmony only applies to high vowels by only allowing low round vowels in word-initial positions (i.e. low vowels in non-initial positions cannot become round through feature spreading). The resulting tableau accounts for regular root-suffix harmony, where (non-height) feature spreading is optimal if it prevents a violation of HARMONY.

(4) *Regular root-suffix harmony constraints (Polgárdi 118)*[5]

k V y + V n **A** **v** **I** **v** **U** **v**	*MULT(**A**)	HARMONY	*MULT(**I**)	*MULT(**U**)
a. k V y + V n **A** **v** **I** >>> • **U** >>>• ☞ *köyün*		*	*	*
b. k V y + V n **A** **v** **I** >>> • **U** **v** *köyin*		**!	*	
c. k V y + V n **A** **v** **I** **v** **U** >>>• *köyun*		**!		*
d. k V y + V n **A** **v** **I** **v** **U** **v** *köyın*		**!*		
e. k V y + V n **A** >>>• **I** >>>• **U** >>>• *köyön*	*!		*	*

[5] Polgárdi does not use IPA. ɪ = ɯ, ö = ø, and ü = y.

The optimal candidate in this case incurs feature-spreading violations, as well as a harmony violation due to the non-application of height harmony. However, the violations of frontness and roundness spreading are ranked lower than harmony violations, making their cost lower if harmony is applied as a result.

In order to account for disharmonic roots, Polgárdi proposes a DERIVED ENVIRONMENT CONSTRAINT (DEC), which essentially states that harmony is not active in roots.[6] DEC must be ranked above HARMONY in order for disharmony within roots to not incur a fatal violation. A consequence of the DEC >> HARMONY ranking is that the vowels in harmonic roots must have their shared features underlyingly associated, as these features cannot become shared through spreading (Polgárdi 121).

(5) *Optimal disharmonic roots (Polgárdi 121)*

h **A** s **A** p **I** **v** **v** **v**	DEC	HARMONY	*MULTIPLE (**I**)
a. h **A** s **A** p **I** **v** **v** **v** ☞ *hesap*		*	
b. h **A** s **A** p **I**>>• **v** **v** *hesep*	*!		*

In this case, a disharmonic root is preferable to a harmonic root if the disharmony is closer to the UR as proposed according to the principle of richness of the base.

Three more constraints – *ELEMENTS, LIC(I, U), and FILL – are added to restrict the appearance of marked vowels in disharmonic roots.[7] Polgárdi makes the un/marked vowel division more specific by claiming that /ɯ/ does not occur disharmonically and /y, ø/ do not

[6] The exact wording is: "No changes are allowed within a single analytic domain." (Polgárdi 120)
[7] For a detailed explanation of these constraints, see Polgárdi 2006, pg. 122.

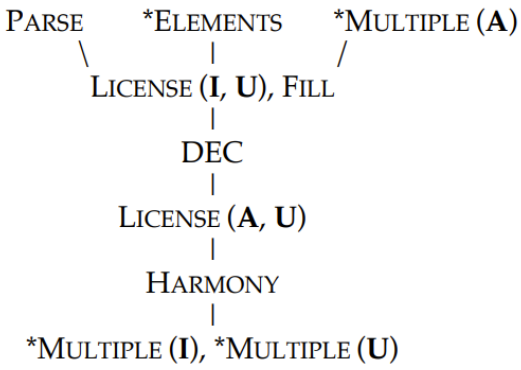
occur with back vowels (Polgárdi 122). The three new constraints account for these observations, and LIC(I, U) furthermore represents the generalization that backness harmony is in some way stronger than roundness harmony (Polgárdi 122).

(6) *Further constraints on disharmony (Polgárdi 123)*

v ... v **I v** **U v**		*ELEMENTS	LIC(**I, U**)	FILL	DEC	HARMONY	*MULT(**I**/**U**)
a.	**v ... v** **I>>>•** **U>>>•** *ü ... ü*	**			**!		**
b.	**v ... v** **I>>>•** **U v** ☞ *ü ... i*	**			*	*	*
c.	**v ... v** **I v** **U>>>•** *ü ... u*	**	*!		*	*	*
d.	**v ... v** **I v** **U v** *ü ... ɪ*	**	*!	*!		**	
e.	**v ... A** **I v** **U v** *ü ... a*	***!	*		*	***	

Taken together, Polgárdi's constraints and rankings result in a system that allows the spreading of backness and roundness if the result would be a decrease in the number of violations of harmony. In general, however, feature spreading is dispreferred, and it frequently results in a fatal violation within roots. There are also restrictions on where the "marked" vowels /y, ø, ɯ/ can appear, with their use being mostly relegated to harmonic roots. The full list of proposed constraints and orderings can be seen below.

(7) *Polgárdi's constraints and rankings for TVH (Polgárdi 125)*



Another analysis by Kirchner makes similar claims, though with slightly different constraints. As in Polgárdi's proposal, multiple constraints are dedicated to prohibiting the appearance of marked vowels in disharmonic roots. Feature spreading is also reduced by other constraints when it leads to undesirable optimal candidates. The overall tone of Kirchner's constraints is slightly different than Polgárdi's, however. While feature spreading occurs in Polgárdi's system to reduce violations of HARMONY, under Kirchner's system the function of feature spreading is primarily aimed at lowering the distribution of marked vowels.[8] Furthermore, while Polgárdi is able to account for the observed phenomena with 10 constraints, Kirchner's analysis requires 11 constraints to account for a slightly different feature system that is motivated by the interpretation of [front] and [round] as privative features (Kirchner 4, 14).

In both OT proposals, harmony is always optimal, while disharmony is tolerable as long as it does not involve marked vowels (Kabak 2842). Though the list of necessary constraints for describing TVH is often relatively high, the inclusion of observations about licit disharmonic vowel combinations and the resulting theory of marked vowels leads to greater specificity.

[8] For a complete explanation of these constraints, see Kirchner 1993.

2.4. Criticism of the OT Approach

In the case of OT, the increased specificity of the constraints may have the disadvantage of rendering proposals mostly incorrect. In a footnote, Kirchner admits that many counterexamples to the generalization that /y, ø, ɯ/ do not occur disharmonically have been brought to his attention by native speakers of Turkish, which means that "Much of the analysis in this paper will have to be substantially revised" (Kirchner 2). The examples provided are *müsaade* "permission" and *jüzdan* "wallet," both of which are highly stable and do not undergo regularization. Kabak claims that many other "illicit" vowel combinations are actually attested, and that "Any combination of vowels seems to be legitimate as long as the donor languages permit them" (Kabak 2844). The OT proposals are therefore not flexible enough to deal with these attested but not widely studied exceptions.

Even if there were no counterexamples to the generalization about the appearance of /y, ø, ɯ/ in disharmonic vowels, the idea of markedness itself must be further scrutinized. As previously mentioned, most of the disharmonic roots that have been studied thus far are of Persian and Arabic origin. The vowel distributions in these roots may therefore be a byproduct of the vowel inventories and phonological rules of these languages, and not a result of any constraint within the Turkish language itself (Kabak 2844).

A further concern is put forth by Kabak, who observes that [ɯ], which is treated in OT formalizations as the most marked of all the Turkish vowels, is frequently used to repair illicit consonant clusters, rendering it an active and sometimes preferred tool of the Turkish language rather than a marginally occurring and dispreferred vowel (Kabak 2843). The same can be said for /y, ø/. Examples will be discussed in section 3.2, but for the moment it is sufficient to question whether OT claims about markedness are plausible, particularly if there are counter

examples for what is confidently claimed to be the most marked of the marked vowels.

Finally, the complaint that Autosegmental proposals lack representational economy is not rectified in OT analyses. In fact, both systems rely on the specification of root vowel features in at least some cases. While the Autosegmental approach requires prespecification of all root vowels, OT systems such as Polgárdi's require harmonic roots to have their shared features prespecified. Since harmonic roots represent the vast majority of Turkish roots, the benefit of not having to specify *dis*-harmonic root vowels is minimal, especially when considering the number of constraints needed in OT analyses versus the few rules about spreading and opacity in Autosegmental proposals. And Kirchner ultimately agrees with the Autosegmentalists in concluding that TVH is not active in roots, meaning that the differences between the two approaches differ representationally more so than foundationally (Kirchner 10-11).

3. Discussion

3.1. Evaluating Proposals

While both Autosegmental and OT approaches require some amount of root feature specification, the Autosegmental proposal does so more consistently. Although specifying all root vowels means that harmonic and disharmonic roots are treated equally despite a significant disparity in their distribution, the principles of the Autosegmental proposal are easier to extend to a wider range of possible and attested forms. The OT proposals, on the other hand, correctly underline the exceptional status of disharmonic roots, but they do so by making assumptions about vowel markedness and built-in constraints against combinations of these vowels within the Turkish language. Overall, the Autosegmental version of TVH seems much simpler and straightforward. Native Turkish roots happen to typically be harmonic but with no alternation, and roots of foreign origin are borrowed as "packages" with the root vowel features already

specified, even if they are disharmonic.

It seems entirely possible that while roots do not undergo harmony in Modern Turkish, TVH may have once applied within roots. The fact that the majority of Turkish roots are harmonic may be explained by a historical, though now defunct, harmony process that has left "fossilized" roots. If root vowel alternation ever occurred as a result of harmony, any apparent harmony is now simply a fact of the lexicon (Kiparsky). It may also be that the early Persian and Arabic loan-words which comprise the majority of studied cases of disharmony were borrowed after TVH had already become obsolete within roots. Both of these claims require further study but seem to be consistent with the "fossil" or "package" analysis of specifying all root vowels.

It is worth noting that explanations of TVH from the perspective of Lexical Phonology have also been proposed. The underlying theory of Lexical Phonology is that different phonological processes are assigned to different levels, and that only certain levels apply to certain words. Disharmonic roots would thus be on a level where TVH does not apply. However, it is not always clear how many lexical levels must occur in a phonology, or the motivations for establishing these levels (K&V 5). Furthermore, in order to explain instances of disharmony, roots have to be prespecified for their levels. Recalling again that one complaint of the Autosegmental approach is the lack of minimalism due to underlying prespecification, this system seems no better; the only difference here is that lexical levels are specified as opposed to features. Finally, treating disharmonic roots as exceptions that do not undergo an otherwise regular process of harmony results in a growing class of exceptions as new (sometimes disharmonic) borrowings are constantly being integrated into the language. This is a generally undesirable outcome when proposing theories, particularly when there seems to be an alternative that does not rely on treating certain classes of words as exceptional.

3.2. Other Exceptions to Harmony

Besides the disharmonic root vowel sequences already discussed, there are three other major exceptions to TVH as it has been defined so far: epenthetic vowels, disharmonic suffixes, and consonant-conditioned harmony. A discussion of each will reveal further support for Autosegmental analysis as the winning candidate over OT.

TVH has been described as a rightward feature-spreading process, but the rules which govern the surface features of epenthetic vowels seem to apply regressively, or leftwards. It has been observed that "the phonotactic structure of the Turkish language does not allow initial consonant clusters; therefore, borrowed words that originally have initial consonant clusters undergo resyllabification through epenthesis" (Genç et al. 33). Some examples of epenthesis and its harmonic results can be seen below.

(8) *Regressive harmony of epenthetic vowels (Kabak 2848-2849)*

a. [tɯransfer] "transfer"

b. [siteril] "sterile"

c. [gurup] "group"

In (8a) and (8b), the backness of the epenthetic first vowel is determined by the following vowel, while in (8c) the roundness of the epenthetic vowel is additionally determined regressively.[9]

Although it seems like the same principles as root-suffix harmony apply here, phonologists nearly unanimously agree that regressive harmony operates under different rules than regular TVH, so it is typically treated as an entirely separate process (Kabak 2837, 2849).[10] No revision to the definition or theory of TVH is therefore necessary.

[9] Vowels that trigger regressive +round harmony are typically high (Kabak 2849).

[10] Kabak cites sensitivity to consonant quality within illicit clusters and the involvement of height and frontness features of triggers as justifications for this conclusion, as well as the prevalence of individual speaker variation.

Another set of violations to TVH involves disharmonic suffixes. A disharmonic suffix contains at least one vowel that does not alternate, resulting in disharmony depending on the stem. Two examples are /-Edur/ "verb-forming" and /-istan/ "noun-forming."

(9) *Disharmonic suffixes (C&S 231)*

a. gid-edur-sun "let him keep going"

bak-adur-sun "let him keep looking"

b. arab-istan-ı "Arabia" (acc.)

mool-istan-ı "Mongolia" (acc.)

While the first vowel of /-Edur/ alternates according to the rules of TVH, the second is invariable, as seen in (9a). In (9b), both suffix vowels are invariable. This exception to the normal behavior of suffix vowels is easily handled in the Autosegmental proposal: features of non-alternating vowels are prespecified. This is consistent with the treatment of disharmonic root vowels, as well as the definition of TVH as a rightward feature-spreading process from opaque (prespecified) vowels to transparent (unspecified) vowels, with intermediate opaque vowels acting as blockers which open new harmonic domains. It is not obvious how OT systems would account for these exceptions, other than also relying on prespecification.

Finally, there are instances of apparent disharmony that may be explained by the features of intervening consonants. C&S observe a small number of Turkish words "whose final syllables have back vowels and which govern front vowel harmony, and whose final consonant is [k] word-finally, or before a consonant-initial suffix, and [k^{j}][11] before a vowel-initial suffix" (C&S 239).

[11] The authors use a different symbol for palatal consonants which I am unable to reproduce. It resembles an inverted breve diacritic under the consonant.

(10) *Consonant-conditioned harmony (C&S 239)*

a. "real estate" emlʲak (nom. sg.) emlʲākʲi (acc. sg.)

b. "exhaustion" helʲak (nom. sg.) helʲākʲi (acc. sg.)

The occurrence of [i] after [ɑ] in these examples violates backness harmony, unless the frontness of [i] in the accusative case can be attributed to the preceding palatal velar. If so, then [kʲ] blocks the previous spread of +back and instead spreads -back. In Autosegmental, all that is needed is to make [kʲ] an opaque segment.

(11) *Opaque consonants (C&S 239)*

The opacity of other consonants has also been proposed with varied success to account for further instances of disharmony (see Levi 2002). Assuming this is a valid analysis, the only necessary change to formalizations of TVH is to word the definition in terms of opaque segments rather than vowels.

It has been demonstrated that additional violations of TVH are easily accounted for within an Autosegmental framework by expanding the notion of opacity to include certain suffix vowels and certain consonants. Although OT may be able to make similar adjustments, the preoccupation of proposed analyses with prohibiting marked vowel sequences rather than with feature spreading renders these possible adjustments less intuitive. Additionally, because Autosegmental theory lends itself more readily to concerns over the nature of URs, the necessary adjustments seem more consistent with the theoretical framework as a whole.

3.3. Opportunities for Further Research

Although much research has already been done on the topic of TVH and its irregularities, there is still room for further study, primarily on the topic of borrowings, but also to clarify some of the arguments that have already been discussed.

Looking deeper into why most of the studied disharmonic roots and suffixes are early borrowings from Persian and Arabic, and what percentage of total borrowings from these languages are disharmonic, might reveal further patterns in the data or provide insight into the diachrony of Turkish phonological processes. D&L have done a lot of important statistical analysis on the latter front, but some diachronic explanation is still missing. Particularly because many loanwords undergo other nativization processes, it would be interesting to know why vowel harmony rules seem to be an occasional exception.

As for more recently acquired loan words, a record of the stability of disharmonic forms may tip the balance between Autosegmental and OT proposals. Most recent borrowings come from English, French, and Italian, and as Kabak observed, it seems that many more vowel combinations are allowed in disharmonic roots than was previously believed. If these roots undergo regularization and become harmonic over time, a reconsideration of the idea of markedness may be appropriate. If, however, these forms persist and especially if future borrowings continue to allow unprecedented disharmonic sequences, then Kabak's theory is most likely apt and formalizations for TVH should be able to account for all sorts of possible vowel combinations.

Finally, although a very compelling explanation of many instances of disharmony, the theory of consonant-conditioned vowel harmony must be examined more rigorously. Bellik argues that although the hypothesis of palatal consonants being opaque seems to work well for

some consonants (she makes the argument for /lʲ/), it is difficult to extend this analysis to other consonants (Bellik 19). That is not to say that the theory is entirely ill-conceived, but there are likely more details that have yet to be considered.

4. Conclusion

Given that there is overlap in the issues and foundational assumptions of both Autosegmental and OT approaches to TVH, preference should be given to the theory that is simplest and most broadly applicable, as is conventional in the field of phonology. Linguists generally agree that TVH is a rightward feature-spreading process that is not active within roots in Modern Turkish, and that disharmonic roots constitute a noteworthy but relatively small percentage of the Turkish lexicon. Additionally, it seems that some amount of underlying specification is necessary to account for both regular root-suffix harmony as well as disharmonic roots, although there is disagreement as to what information should be prespecified. Though perhaps less minimal than other proposals, the Autosegmental approach of prespecifying all features of root vowels – or rather, of opaque segments – seems most well-suited to handle both the disharmonic roots that have been the focus of this paper, as well as other exceptions that have been mentioned. Extending the definition of opacity to include disharmonic suffix vowels and possibly also consonants is a straightforward fix that does not require reliance on questionable theories such as vowel markedness and lexical levels. And although harmonic and disharmonic roots are treated equally despite significant differences in their frequency, if it is true that TVH used to apply to roots this should come as no surprise; furthermore, if harmony is not currently active in any roots, then both harmonic and disharmonic roots *should* be treated equally. Thus the Autosegmental analysis of TVH, despite the few but valid concerns that have been raised against it, is the better proposal due to its formal simplicity and its flexibility.

References

Bacanlı, Eyüp, et al. “Vowel harmony and other morphological processes in Turkish.” *Proceedings of the Workshop on Turkic and Languages in Contact with Turkic*, vol. 5, no. 1, 29 Dec. 2020, p. 26, https://doi.org/10.3765/ptu.v5i1.4782.

Bellik, Jennifer Ann. “Feature Domains and Covert Harmony in Turkish: The Exceptional Transparency of /A/.” *eScholarship, University of California*, 2 Oct. 2015, escholarship.org/uc/item/36z9d814.

Clements, George N. and Sezer, Engin. "Vowel and Consonant Disharmony in Turkish". *Part 2*, edited by Harry van der Hulst and Norval Smith, Berlin, Boston: De Gruyter, 1982, pp. 213-256. https://doi.org/10.1515/9783112423325-007

Dow, Michael, and Jeffrey Lamontagne. *Different [Back][Round]s: Lexical Origin and Vowel Harmony in Turkish*, mcdowlinguist.github.io/assets/CLA_slides_2019_Dow.pdf.

Genç, Bilal, et al. “Initial consonant cluster epenthesis in Turkish and its implications to EFL.” *International Journal of Educational Spectrum*, vol. 3, no. 1, 21 Feb. 2021, pp. 28–37, https://doi.org/10.47806/ijesacademic.773329.

Göksel, Asl, and Celia Kerslake. *Turkish: A Comprehensive Grammar*. Routledge, 2005.

Inkelas, Sharon, and Cemil Orhan Orgun. “Level ordering and economy in the lexical phonology of Turkish.” *Language*, vol. 71, no. 4, Dec. 1995, p. 763, https://doi.org/10.2307/415744.

Kabak, Barış, and Irene Vogel. “Exceptions to stress and harmony in Turkish: Co-phonologies or prespecification?” *Expecting the Unexpected: Exceptions in Grammar*, 16 Mar. 2011, pp.

59–94, https://doi.org/10.1515/9783110219098.59.

Kabak, Bariş. “Turkish Vowel Harmony.” *The Blackwell Companion to Phonology*, V, John Wiley & Sons, Ltd., 2011.

Kiparsky, Paul. “Domains of Vowel Harmony.” *The Oxford Handbook of Vowel Harmony*, Oxford University Press, 2024.

Kirchner, Robert. *Turkish Vowel Harmony and Disharmony*, 1993, roa.rutgers.edu/files/4-0000/roa-4-kirchner-3.pdf.

Levi, Susannah. *Glides, Laterals, and Turkish Vowel Harmony*. 2000.

Polgárdi, Krisztina. *Vowel Harmony: An Account in Terms of Government and Optimality*. Holland Academic Graphics, 1998.

Walker, Rachel. “Vowel harmony in optimality theory.” *Language and Linguistics Compass*, vol. 6, no. 9, Sept. 2012, pp. 575–592, https://doi.org/10.1002/lnc3.340.