Roots, Heads, or Both? Categorizing Turkish Derivational Affixes*

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ABSTRACT: The categorization of derivational affixes has received well-deserved attention in Distributed Morphology. In addition to single-categorization views that classify derivational affixes as either roots or heads, a recent proposal argues that such units can be both roots and heads. While this categorization has been shown to explain Dutch and English data, whether it applies to different languages has not been extensively investigated. In order to investigate the applicability of this recent proposal to the Turkish language, this study examined Turkish derivational suffixes in terms of their stress, flexibility, selection, and ordering patterns. The results showed that the proposal cannot account for the patterns of derivational suffixes in Turkish.

Keywords: derivational affixes, categorization, roots, heads

Türkçe Yapım Eklerini Sınıflandırmak

ÖZ: Yapım eklerinin sınıflandırılması Dağıtılmış Biçimbilim kuramında oldukça ilgi çekmiştir. Yapım eklerini kök ya da baş olarak tek bir sınıfta gören sınıflandırmaların yanında, son zamanlarda ortaya atılan bir görüş bu eklerin hem baş hem de kök olabileceğini savunmuştur. Söz konusu bu görüş İngilizce ve Felemenkçe dillerindeki örüntüleri açıklasa da başka dillerdeki yapım eklerinin örüntülerini açıklayıp açıklayamayacağı detaylı olarak

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incelenmemiştir. Bu sınıflandırmanın Türkçe diline uygulanabilirliğini incelemek için mevcut çalışma Türkçe yapım eklerini vurgu, esneklik, seçilme ve sıralama örüntüleri açısından incelemiştir. Sonuçlar ortaya koyulan sınıflandırmanın Türkçe dilindeki yapım eklerinin davranışlarını açıklamada yetersiz kaldığını göstermiştir.

Anahtar sözcükler: yapım ekleri, sınıflandırma, kök, baş

1 Introduction

The derivation of complex words has been a main interest in linguistics for decades. Particularly, the characteristics of derivational affixes have remained a controversial topic in Distributed Morphology due to contrasting arguments. One popular view argues that such affixes are functional heads, initializing phases and determining the word category of roots (Marvin, 2002), while another defines derivational affixes as roots with uninterpreted categorical features (De Belder, 2011). In a more recent argument, Creemers et al. (2018) take a middle ground and propose that some derivational affixes are functional heads while others are roots. This paper investigates whether this latter categorization of derivational morphemes in English and Dutch can also account for Turkish. The observations present convincing evidence that, although the categorization of Creemers et al. (2018) can mostly apply to Turkish derivational affixes, affix ordering behaviors prevent it from being generalized to Turkish.

2 Literature Review

Distributed Morphology is heavily influenced by the Principles and Parameters theory of syntax (Chomsky & Lasnik, 1993). Referring to operations of head movement and adjunction, Halle and Marantz (1993) argued that word derivation could also be a result of syntactic operations rather than a process in the lexicon. Although Distributed Morphology has evolved over time in line with the changes in the Minimalist Program (Chomsky, 1995), the central premises are still the same; it sees a morpheme as "the atom of morphosyntactic representation" and a vocabulary item as "a relation between a phonological string or 'piece' and information about where that piece may be inserted" (Harley & Noyer, 1999).

The definition of affixes in Distributed Morphology differs substantially from the traditional view. Traditionally, affixes are seen as special bound morphemes that attach to stems and cannot stand on their own despite the meaning they denote (Carstairs-McCarthy, 2017, pp. 20-21). This view relies on the separation of morphemes in a word as meaningful units, namely, roots and affixes. Derivational affixes can change the meaning and the grammatical category of words, creating unique meanings; therefore, such units are thought to create new

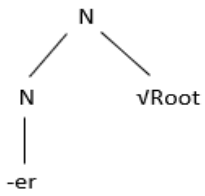
word entries, thereby expanding the size of the lexicon (e.g., Baurer, 2003, pp.92-93; Booij, 2000). Inflectional affixes, on the other hand, use word bases to create complex words that do not differ much from their regular meaning (Baurer, 2003, p. 96). This difference between derivational and inflectional affixes is known to affect morphological processing, along with additional factors such as affix productivity (Bertram et al., 2000).

In Distributed Morphology, there are varying views regarding the status of affixes. One popular view proposes a syntactic view of word derivation; complex words are created through syntactic processes (Embick & Noyer, 2007; Halle & Marantz, 1993), and affixes are distributed phenomena realized at the interface of syntax and phonology (Halle & Marantz, 1993). There have been other arguments as well regarding the status of affixes in Distributed Morphology (e.g., Bobaljik, 2002; Saab & Lipták, 2016; Wunderlich & Fabri, 1995). More specifically, one recent debate concerns the status of derivational affixes in particular, namely, whether such affixes are functional heads (Marvin, 2002), roots (De Belder, 2011), or both (Creemers et al., 2018). Sub-sections below present each of these proposals.

2.1 All derivational affixes are functional heads

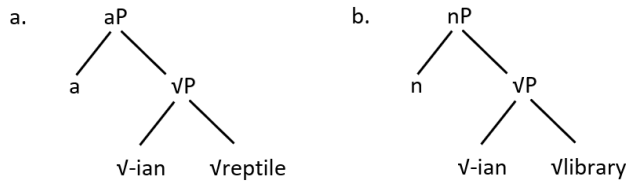
The first proposal takes derivational affixes as functional heads (Marantz, 1997; Marvin, 2002). These heads also set word categories; therefore, uncategorized roots become categorized by merging with functional heads. In Figure 1, the English derivational suffix -er attaches to a root, and since this derivational suffix is a functional head, the derived word becomes a noun under a categorical head. This categorical head is also a phase boundary in word formation. Marantz (2001) further argues that derivational affixes initiate phase cycles, similar to phase theory in syntax (Chomsky, 2001). This phase-based nature of complex words is in line with the cyclic phonological effects documented in the Sound Pattern of English (Chomsky & Halle 1968); cyclic phonological effects could be attributed to phase processes.

Figure 1. Derivational affixes as functional heads



This proposal, however, has two problems (Lowenstamm, 2015). First, certain affixes can create multiple types of word categories. Figure 2 shows how the affix *-ian* creates a noun and an adjective by getting attached to different roots. If all derivational affixes are functional heads, as described in Marantz (2001), then the *-ian* affixes in these two instances should be regarded as different forms, given that derivational affixes determine the category of the complex word. This solution treats the similarities between affixes with the same forms as purely coincidental and implies that *-ian* in the word *reptilian* and *-ian* in the word *librarian* are two different affixes. For the languages that possess too many homophonous affixes, such coincidental occurrences would be unbelievable as they get higher in number.

Figure 2. Lowenstamm's proposal of derivational affixes as roots.



The second problem has a phonological basis. Lexical Phonology defines two types of derivational affixes: level-1 and level-2 (Kiparsky, 1982). Level-2 affixes follow level-1 affixes and make no changes in the stress pattern of a word. If we are to take every derivational affix as a functional head and accept that it initiates a new phase, it would be difficult to explain the phonological outcomes of stress-shifting and stress-neutral affixes. As a new phase starts with the fusion of each derivational affix and cyclic phonological effects depend on phases, structures with stress-shifting affixes would seem identical to ones with stress-neutral affixes in terms of morphology (Lowenstamm, 2015).

2.2 All derivational affixes are roots

The second proposal, in which derivational affixes are seen as roots, offers two solutions to the aforementioned problems. As mentioned above, the first proposal assumes that homophonous affixes have different forms and that their similarities are purely coincidental. In languages with a large number of homophonous affixes, labelling all of these affixes as having coincidental similarities sounds counterintuitive. As a solution to this problem of treating categorically-flexible affixes as different forms, De Belder (2011) argues against the necessity of lexical categories, including root features. This view of roots without any features takes the functional structure as the interpreter of roots; therefore, different syntactic structures can lead to different interpretations of the same root.

This would eliminate the necessity of treating homophonous affixes as different forms and rather allow labelling them as a single affix with categorical flexibility. Lowenstamm (2015) similarly underlines that derivational affixes in English are flexible, as they can result in either noun categorization or adjective categorization. Since taking all derivational affixes as roots would leave no differences between affixes and bound roots, Lowenstamm (2015) proposes that what we call derivational affixes are bound roots with uninterpretable category features. These features are valued at the phrase level by merging with the category head (Figure 2).

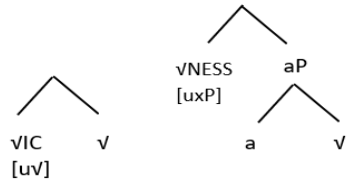
Lowenstamm (2015) rejects the idea that each derivational root introduces a phase; as mentioned above, the proposal of every affix starting a new phase would make it impossible to differentiate stress-shifting and stress-neutral morphemes in terms of morphology if cyclic phonological effects emerge with the initiation of new phases. In this proposal, cyclicity is defined as:

i. Phonological rules apply in the domains of roots.
ii. Rule application starts at the deepest root level and then iteratively proceeds to higher domains.

According to Lowenstamm (2015), all roots are the same (e.g., atom, -ic, -ness, -ment) in terms of cyclic rule application, and whether a bound root can be involved in cyclic processes depends on its structural position. This position is strongly related to a root's selectional properties. While bound roots that are local to other roots are involved in cyclic phonology, bound roots that are not local to other roots are not. Locally bound roots always have u√ features that can be checked by any root, while non-local roots have uxP features that must be checked by a phrase head (Figure 3).

In Figure 3, the affix -ic is local to the other root, resulting in stress-shifting behavior. The stress in the second syllable in the word ***eco****nomy*, for example, shifts to the third syllable after merging with the -ic affix (eco**no**mic). However, the -ness affix in Figure 3 is not local to the other root, leaving the stress pattern the same after the merge. The stress in the first syllable of the word **hap**py stays in the same position after the derivation (**hap**piness).

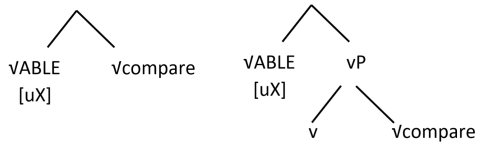
Figure 3. Local and non-local derivational affixes (based on Lowenstamm, 2015)



In order to solve the second problem, Lowenstamm (2015) proposes a third type of affix (a bound root with uninterpretable features in their terminology) that attaches to both roots and words, in addition to level-1 and level-2 affixes. This third type of root can be in both local and non-local positions; therefore, it can be both stress-shifting and stress-neutral. These roots possess a uX feature that can either be checked by a root or a phase head, depending on the structural position (Figure 4). Therefore, the problem of differentiating stress-shifting affixes from stress-neutral ones is solved, even for the affixes that can sometimes change stress patterns.

In Figure 4, the suffix -able is local to another root, thus changing the stress pattern. For example, the word *com**pare*** has stress on its second syllable, but the stress on this syllable shifts to the first syllable in the derived word ***com**parable***.** However, the word can also be pronounced as *com**par**able* without a stress shift, which can be explained by the second tree in Figure 4; since the structural position of the suffix -able is not local to the root, the stress stays the same.

Figure 4. The bound root with uninterpretable features (based on Lowenstamm, 2015)

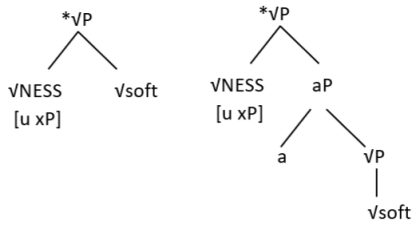


2.3 Some derivational affixes are roots, others are heads

In the third proposal, Creemers et al. (2018) oppose the proposal that all affixes are roots. Categorically flexible derivational affixes constitute a relatively small percentage in Dutch (20%, according to De Belder, 2011), and unlike De Belder (2011), who takes categorical flexibility as a coincidence, Creemers et al. (2018) see it as a grammatical feature differentiating derivational affixes: some derivational affixes are roots and others are functional heads.

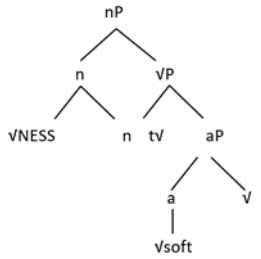
In the proposal of Lowenstamm (2015), stress-neutral affixes have [u xP] features, which can only be checked by categorized materials. It is also assumed that categories head roots and not the other way around. Figure 5 (based on Creemers et al., 2018) shows how this proposal makes certain derivations illicit. In the first example (left), -ness affix merges with an uncategorized root, but the [u xP] feature requires a categorized structure to be checked. In the second example (right), although the *aP* can check the uninterpretable feature of the affix, the final structure is uncategorized, which violates the proposal that categories head roots.

Figure 5. The uninterpretable features of level-2 affixes in Lowenstamm (2015)



As a solution, Lowenstamm (2015) argues that the structures like in Figure 5 (right) attach to categorical heads, and the head of the affix (-ness in the example) moves to this new branch, making itself sister to the √P. This allows aP not to be headed by a root and thus explains stress-shifting and stress-neutral affixes without violating the principles offered (Figure 6; also see examples 34, 35, and 36 in Lowenstamm, 2015, p.245; and 36 in Creemers et al. 2018, p. 65).

Figure 6. The solution of Lowenstamm (2015) for level-2 affixes



By referring to categorially rigid affixes as functional heads, Creemers et al. (2018) offer a more straightforward and simpler solution for differentiating

stress-neutral and stress-shifting affixes: Derivational affixes with categorical flexibility are roots, and they do not start phase cycles, while single category creating affixes are functional heads and initiate phase cycles (for an alternative explanation of categorical flexibility, see Atlamaz & Dikmen, 2024). The structure in Figure 5 (right) would be grammatical in this proposal; the level-2 affix, -ness, is a functional head and can categorize the structure.

Adopting Lowenstamm's stress-shifting and stress-neutral affix types, Creemers et al. (2018) propose three derivational affix types in Dutch to differentiate derivational roots and derivational function heads:

(i) Level-1a affixes: These affixes are stress-shifting affixes, and they can attach to bound stems. The reason why level-1 affixes are divided into two subcategories is categorical flexibility. Categorically flexible level-1 affixes (i.e., level-1a) are placed in a closer position to stems compared to level-1b affixes and level-2 affixes.
(ii) Level-1b affixes: Although these affixes are similar to level-1a affixes in their stress-shifting and bound stem attaching features, they are not categorically flexible. These affixes never appear outside of level-2 affixes.
(iii) Level-2 affixes: These affixes cannot attach to bound stems and cannot alter the stress pattern of a word. They lack categorical flexibility, like level-1b affixes.

Creemers et al. (2018) created the terms l-affixes and f-affixes based on the definitions of l-morphemes and f-morphemes by Harley and Noyer (1999). L(exical)-affixes are roots, and f(unctional)-affixes are the spell-out points of functional heads. Similar to how l-morphemes are more flexible compared to f-morphemes, only l-affixes show categorical flexibility. F-affixes, on the other hand, are categorically rigid; they cannot spell out *different* categorical heads. Table 1 presents these affixes and their uninterpretable feature types.

Table 1. Affix types and their uninterpretable features (based on Creemers et al. 2018)

Phases	First phase		Later phases
Affix Types	Level-1a = l-affixes	Level-1b = f-affixes	Level-2= f-affixes
	[u √P]	[u √P] or [u x]	[u xP]

L(exical)-affixes are level-1a affixes, while f(unctional)-affixes are level-1b and level-2 affixes. Level-1a affixes, or l-affixes, combine with uncategorized roots due to their uninterpretable root feature [u √P]. Level-1b affixes, a type of f-affixes, either attach to uncategorized roots to check their uninterpretable category feature [u √P] or have a [u x] feature that can be both checked by

attaching to a root or a category (see Figure 4); therefore, level-1b affixes with the [u √P] feature can only combine with uncategorized roots. The level-1b affixes with the [u x] feature, on the other hand, will show stress-shifting behavior when they attach to uncategorized roots but leave the stress untouched when combining with categorized materials. What differentiates an l-affix from an f-affix having a [u √P] is the spell-out initiated by f-affixes; while an f-affix with a [u √P] feature can follow an l-affix (which does not initiate a spell out), l-affixes cannot follow any kind of f-affixes, as the lexical spell-out leads to categorization. F-affixes change the stress when combined with roots, but not when combined with words (categorized constituents). Other f-affixes, which are level-2 affixes, attach to words in later phases (remember that level-2 affixes occur in the final positions, and they cannot attach to bound stems). They have a [u xP] feature that can only be checked by merging with a category. Table 2 summarizes how features limit the type of element that affixes can merge with.

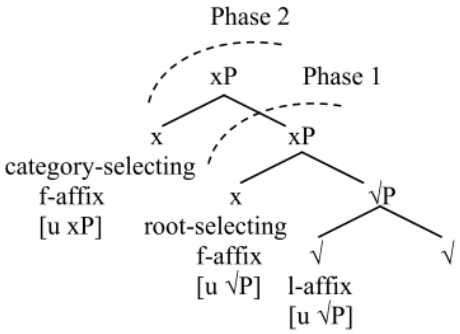
Table 2. Features of different affix (based on Creemers et al. 2018)

[u √P]	[u xP]	[u x]
Can only merge with roots. Stress-shifting	Can only merge with phrase heads. Stress-neutral.	Can merge with roots and phrase heads. Changes the stress when merging with roots.

In summary, an l-affix (categorically flexible and stress-shifting) takes an uncategorized root and returns an uncategorized stem due to its [u √P] feature. If the word derivation ends with this affix, a null category defining head categorizes the word. Some level-1b affixes (the first type of f-affixes) can take only uncategorized roots, similar to l-affixes, but due to them being functional heads, they categorize the root after merging with it. Other level-1b affixes can take both uncategorized roots and categorized stems, and they spell out their own categorical head in either situation. Finally, level 2 affixes (the second type of f-affixes) can only merge with categorized stems and categorize them according to their own categorical head.

Figure 7 shows the phases in a complex word derivation involving all three types of derivational morphemes. An l-morpheme merges with an uncategorized root and does not initiate a spell-out since the new item is also a root. The structure is still uncategorized, so an f-morpheme with a root feature [u √P] merges. This affix also determines the category; thus, the structure becomes categorized. At the same time, a spell-out occurs. Now, only an affix with either a [u xP] or [u x] feature can attach to the structure since it is no longer a root. An f-affix with a [u xP] feature (a level-2 affix) merges with the structure and initiates another spell-out.

Figure 7. Different types of affixes merging with a root (based on Creemers et al. 2018)



No study so far has investigated whether Turkish derivational affixes also reflect the features proposed by Creemers et al. (2018). The aim of this study is to see if the pattern summarized above is applicable to Turkish.

3 Turkish Data

This section presents a subset of categorically-flexible and categorically-rigid Turkish derivational [1]affixes and investigates whether they comply with the categorization of Creemers et al. (2018) in terms of categorical flexibility, stress changing behaviors, selectional requirements, and ordering. The reason for not examining all affixes was the abundance of Turkish affixes. If the initial examination successfully confirms Creemers et al.'s (2018) pattern, then the investigation can be extended to all derivational affixes in Turkish.

3.1 Categorical Flexibility

Categorically flexible and categorically rigid derivational affixes in Turkish [2]investigated in this section are further defined as either stress-shifting or stress-neutral. If the derivational affix categorization of Creemers et al. (2018) is valid

[1] Note that inflectional affixes are not investigated, and I simply consider them as different forms even if they have identical forms with some derivational affixes (e.g., -DI as the derivational suffix and -DI as the inflectional suffix in Turkish).

[2] Turkish affixes can appear in different forms (allomorphs) depending on the sound patterns of the word/root they are attached to, a phenomenon known as vowel harmony (check Göksel & Kerslake, 2004 for more information). Capital letters in affixes indicate vowels and consonants that undergo phonologically induced changes.

for Turkish, we should observe stress-shifting behavior for categorically flexible affixes.

First, categorically flexible affixes and their stress features will be investigated (Göksel & Kerslake, 2004; Kornfilt, 1997; Lewis, 1970):

-GIn is a stressable [3]suffix that can attach to verbs[4]. It creates (a) nouns and (b) adjectives.

(1) a.	-GIn]$_{N}$		b.	-GIn]$_{ADJ}$
	bas-kın			dur-gun
	push$_{V}$-Gin			stop$_{V_}$GIn
	‘raid’			‘calm’

-(I)K is another stressable suffix that attaches to verbs. It creates (a) nouns and (b) adjectives.

(2) a.	-(I)K]$_{N}$		b.	-(I)K] $_{ADJ}$
	kay-ık			sol-uk
	slide$_{V}$-(I)K			fade$_{V_}$(I)K
	‘boat’			‘faded’

-lI suffix merges with nouns, adjectives, and adjective phrases to create nouns and adjectives. The derived word can possess, reflect the characterization, or be enhanced by the quality of its stem (e.g., sevgili ‘lover’, hızlı ‘fast’). This surface form[5] can also refer to the -lI suffix that creates nouns and pronouns denoting a person belonging to a place (e.g., köylü ‘villager’, buralı ‘local/individual from here’). The -lI suffix is stressable.

(3) a.	-lI]$_{N}$		b.	-lI]$_{ADJ}$
	Köy-lü			hız-lı
	village$_{N}$-lI			speed$_{N_}$lI
	‘villager’			‘fast’

The stressable suffix -CA decreases the power of meaning denoted by adjectives-like in *hızlıca* ‘quite fast’ (Göksel & Kerslake, 2004). The form can also denote the -CA suffix that creates nouns by attaching to a limited number of verbal

[3] Throughout the paper, I use the term ‘stressable’ to indicate that the affix *can* carry stress. The instances in which such affixes are not stressed are beyond the scope of this paper but briefly mentioned in the discussion.

[4] Descriptively speaking, I refer to these constituents as they are categorized in a traditional sense. According to the categorization of Creemers et al. (2018), any constituent merging with level-1a affixes are roots, some of which are identical to word forms.

[5] Depending on the adopted definition of an affix, it is possible to assume that some surface forms can denote different morphemes.

nouns ending in -me (suffix), like in *bulmaca* ‘puzzle’ (Lewis, 1970). This suffix is different from unstressable -CA (see the end of this section) in that while this stressable -CA can be followed by the suffix -Cık (*bulmacacık* ‘little puzzle’), unstressable -CA cannot be.

(4) a.	-CA]$_{N}$		b.	-CA] $_{ADJ}$
	bul-ma-ca			hızlı-ca
	find$_{V}$-MA-CA			fast$_{ADJ}$-ca
	‘puzzle’			‘quite fast’

-CI is a very productive suffix that attaches to nouns to derive nouns and adjectives. It is stressable.

(5) a.	-CI]$_{N}$	b.	-CI]$_{N/ADJ}$	c.	-CI]$_{N/ADJ}$
	çiçek-çi		yalan-cı		yağ-cı
	flower$_{N}$-CI		lie$_{N}$-CI		oil$_{N}$-CI
	‘florist’		‘liar’ or ‘lying’		‘oilseller’ or ‘obsequious’

-lIK is another productive and stressable suffix that creates nouns and adjectives from nouns, adjectives, or adverbs.

(6) a.	-lIK]$_{N}$	b.	-lIK]$_{ADJ}$
	kitap-lık		gün-lük
	book$_{N}$-LIK		day$_{N}$-LIK
	‘bookshelf’		‘daily’

The suffix -I selects verbs to create nouns and adjectives. It is also stressable.

(7) a.	-I]$_{N}$	b.	-I]$_{ADJ}$
	doğ-u		dol-u
	rise$_{V}$-I		fill$_{V}$-U
	‘east’		‘full’

-(A/I)cIK is the most common diminutive suffix (Ketrez, 2012; Kornfilt, 1997), which indicates smallness (Göksel & Kerslake, 2004). The suffix can create both nouns and adjectives; thus, it is a categorically-flexible suffix (also see Atlamaz & Dikmen, 2024). The suffix can carry stress (Göksel & Kerslake, 2011; Özçelik, 2023).

(8) a.	-(A/I)cIK]	b.	-CIK]
	ince-cik		kedi-cik
	thin$_{ADJ}$-(A/I)cIK		cat$_{N}$-CIK
	‘very thin’		‘the poor/dear little cat’

Categorically flexible derivational affixes investigated so far are all stressable, thus stress-shifting affixes. The categorically rigid and stressable derivational affixes to be investigated in this paper are the following (Göksel & Kerslake, 2004; Kornfilt, 1997; Lewis, 1970):

-GI is a stressable suffix. It attaches to verbs and creates nouns.

(9) -GI]$_N$
sil-gi
erase$_V$-GI
'eraser'

-DI is another stressable suffix that attaches to verbs to create nouns.

(10) -DI]$_N$
çık-tı
exit-DI
'printout'

The suffix –(A)m creates nouns from verbs. It is stressable.

(11) -(A)m]$_N$
kur-am
establish-(A)m
'theory'

-(s)Al derives adjectives from nouns (*bilimsel* 'scientific') and is a productive and stressable suffix (Kornfilt, 1997). Although Göksel and Kerslake (2004) argue that the suffix can also derive nouns on rare occasions (e.g., *kumsal* 'beach'), there are no further examples, and this usage does not seem productive anymore; thus, I categorize this suffix as categorically-rigid.

(12) -(s)AL]$_{ADJ}$
söz-sel
statement$_N$-(s)AL
'verbal'

The stressable suffix -(A)v merges with verbs to create nouns.

(13) -(A)v]$_N$
sına-av
test$_V$-AV
'exam'

-(I)msI is a productive suffix that selects nouns and adjectives to create adjectives. It is stressable.

(14) -(I)msI]$_{ADJ}$
sarı-(I)msı
yellow$_{ADJ}$-(I)msI
'yellowish'

There are also categorically rigid derivational affixes in Turkish that are unstressable (Göksel & Kerslake, 2004); they cannot change the stress of a word. All unstressable derivational affixes in Turkish are categorically rigid and are given below:

Unstressable -CA creates adverbials from nouns with different meanings, such as (i) adverbials showing manner (*çocuk-ca* 'childishly'), (ii) agentive adverbs (*dekanlık-ça* 'by the Dean's office), (iii) numerical expressions indicating ongoing time periods like in *aylar-ca* 'for months' (Kornfilt, 1997). The form can also refer to the -CA suffix that is added to demonstratives (iv) to add a meaning of 'therefore' or 'thus' like in *böyle-ce tamamlandı*, 'thus the job was done' (Lewis, 1970)**.** This suffix is a different suffix from the stressable -CA.

(15) -CA]$_{ADV}$
çocuk-ca
child$_{N}$-CA
'childish'

The fifth function regarding this form is controversial in terms of the categorization of derived words. Göksel and Kerslake (2004) argue that the suffix creates adjectives, adverbs, and nouns referring to languages by merging with the nouns denoting nations.

(16) -CA]$_{N}$
Türk-çe
Turk$_{N}$-CA
'Turkish'

Lewis (1970), on the other hand, argues that the suffix creates adverbs denoting languages, and these adverbs are then used as adjectives and nouns. I adopt this later view in this paper and label the suffix as categorically-rigid.

-CAsInA is an unstressable suffix that merges with adjectives to create adverbs of manner (mostly used with negative implications).

(17) -CAsInA]$_{ADV}$
aptal- casına
stupid$_{ADJ}$- CAsInA
'stupidly'

-en is an Arabic originated and unstressable suffix. It creates adverbs by merging with nouns.

(18) -en]$_{ADV}$
hakikat-en
truth$_{N}$-en
'really'

The suffix -(y)In attaches to season words to create adverbials. It is unstressable.

(19) -(y)In]$_{ADV}$
yaz-ın
summer$_{N}$-(y)In
'in summer'

Words regarding the times of a day take the unstressable suffix -leyin to become adverbials.

(20) -leyin]$_{ADV}$
sabah-leyin
morning$_{N}$-leyin
'in the morning'

- rA is an unstressable suffix that creates locative pronouns by merging with demonstrative pronouns and ne 'what'.

(21) -rA]$_{PRO}$
bu-ra
this$_{PRO}$-rA
'here'

There is a controversy regarding the status of the unstressable suffix -lA. Göksel and Kerslake (2004) define it as a suffix that attaches to nouns; it denotes a place that is related to the root's meaning (*tuz* 'salt', *tuzla* 'salt mine'). The authors argue that this suffix is different from stressable -lA suffix, which creates verbs from nouns, adjectives, onomatopoeic stems, and interjections. Kornfilt (1997) and Lewis (1970) do not consider it a suffix and thus imply that the word *yayla* is a simple word. The word *tuzla* (salt mine) is not used anymore in modern Turkish; therefore, the latter view is more accurate due to the difficulty of defining a string of sounds as a suffix by referring to a single word. I will then not categorize it as an unstressable suffix.

(22) -lA]$_{N}$
tuz-la
salt$_{N}$-lA
'salt mine'

(Göksel & Kerslake, 2004)

The summary of the observations so far is represented in Table 4.

Table 4. Turkish affixes and their features[6]

Suffix	Categorically Flexible	Stress-shifting
-GIn	Yes	Yes
-(I)K	Yes	Yes
-lI	Yes	Yes
-CA (stressable)	Yes	Yes
-Cı	Yes	Yes
-LIK	Yes	Yes
-I	Yes	Yes
-CIK	Yes	Yes
-GI	No	Yes
-Dı	No	Yes
-(A)m	No	Yes
-(s)Al	No*	Yes
-(A)v	No	Yes
-(I)msI	No	Yes
-CA (unstressable)	No*	No
-CAsInA	No	No
-en	No	No
-(y)In	No	No
-rA	No	No
-leyin	No	No

The observations have revealed a pattern in Turkish derivational affixes that is similar to the pattern of Creemers et al. (2018) in Dutch: Categorically flexible Turkish derivational affixes are always stress-shifting while some categorically rigid derivational affixes can be stress-neutral (Level-2 affixes in Creemers et al., 2018).

3.2 Stress

Turkish roots carry stress on their last syllable most of the time. Göksel and Kerslake (2004) call these roots 'regular roots' while labeling any Turkish roots violating this pattern as 'irregular roots'. Irregular roots in Turkish include most adverbs (**ya**rın 'tomorrow'), nouns borrowed from other languages (lo**kan**ta 'restaurant'), place names with the exception of place names ending in -istan (**An**kara, Hindis**tan** 'India'), some question words (**han**gi 'which'), stems

[6] Only the suffixes having stressable homophones are marked as 'unstressable' beside their names. All non-stress-shifting affixes in the table are unstressable.

carrying reduplicative affixes (**kıp**kısa 'really short'), and stems including unstressable suffixes (bold syllables are the syllables carrying stress).

As for affixes, most Turkish derivational affixes can carry stress. When new suffixes are added to stems, there are a few rules regarding where stress should be assigned (Göksel & Kerslake, 2004):

(i) Adding a stressable suffix to a root having a stressed final syllable will move the stress on that suffix, which is now the final syllable.

(23) bar**dak** 'glass'
bardak-l**ar** 'glass-PL=glassses'

(ii) If a stressable suffix combines with a root having an unstressed final syllable, the stress position of the word does not change.

(24) **pen**cere 'window'
pencere-ler 'window-PL=windows'

Some suffixes and clitics in Turkish are unstressable. Some derivational affixes are also among these unstressable bound morphemes. Adding these suffixes to regular roots and irregular roots generally does not change the stress of a word (Göksel & Kerslake, 2004).

(25) ço**cuk**ça child-adverbial affix=childishly'

Turkish is an agglutinative language, allowing many suffixes to combine within a single word. In almost all multiple affix combinations, stress is placed on the last syllable before the first unstressable suffix or clitic. Even if a stressable suffix follows an unstressable suffix, the stress position does not change. In the example below (taken from Göksel & Kerslake, 2004), -lAr is a stressable affix, following the unstressable affix -(y)mIş, but the stress of the word does not change.

(26) okul**da** 'at school' okul**da**-ymış-lar 'apparently they are/were at school

There are two exceptions in the stress behavior of unstressable suffixes or clitics. The first one concerns the clitics -dA, ki and ya, which move the stress to the preceding syllable, even when it is unstressable (Göksel & Kerslake, 2004).

(27) an**lı**yorum 'I understand'
(28) anlıyo**rum** da 'although I understand'
(29) anlamıyo**rum** ki 'I just can't understand'
(30) anlıyo**rum** ya 'I UNDERSTAND it'

Although clitics show similar behaviors to affixes in most cases, their unique independent-word-like features earned them a specific status (e.g., Torner, 2005; Zingler, 2022). Therefore, the exception given here does not disprove the pattern proposed for derivational affixes in Creemers et al. (2018).

(31) İs**tan**bullulaş ‘become like a native of Istanbul’
(32) İstanbullu**laş**-ma ‘don’t become like a native of İstanbul’

However, this morpheme should not be regarded as a derivational suffix; it changes the grammatical meaning of the word without creating a new one, in line with the definition of inflectional affixes (Baurer, 2003, p. 96).

All in all, unstressable derivational [7] suffixes do not change the stress position in a word, even when they cluster or combine with a following stressable affix. This fits in well with the categorization of Creemers et al. (2018), in which stress-neutral affixes are categorically rigid and cannot change stress patterns.

3.3 Selectional Requirements

Creemers et al.’s (2018) categorization proposes that level-1a and level-1b affixes (both stress-shifting affixes) can attach to bound morphemes, while level-2 affixes (stress-neutral affixes that are categorically rigid) cannot. Some Turkish categorically flexible and stress-shifting derivational suffixes can attach to bound stems:

(33) a.	-(I)K]$_A$	b.	-I]$_N$	c.	-GIn]$_N$
	cɪv-ɪk		tɪn-ɪ		çɪl-gɪn
	cɪv?-(I)K		tɪn?-I		çɪl?-GIn
	‘juicy’		‘tone’		‘crazy’

Similarly, some Turkish categorically rigid and stress-shifting derivational affixes can occur with bound stems:

(34) a.	-(A)m]$_N$	b.	-(s)AL]$_A$	c.	-GI]$_N$
	yord-am		ero-sal		sɪy-gɪ
	yort?-(A)m		ero?-(s)AL		sɪy?-GI
	‘procedure’		‘erotic’		‘volume’

Although some Turkish categorically flexible (and stress-shifting) derivational affixes attach to bound stems, all those affixes attach to words as well (35 and 36); in fact, only on rare occasions do they choose bound stems. Creemers et al. (2018) argue that although some word-like items (e.g., ‘diplomaat’ in Dutch)

[7] How some clitics and the negative suffix -ma shift stress to even unstressable affixes within the process of word derivation is beyond the scope of this study.

seem to take level-1 affixes, they are actually the root versions of these words with an identical form and meaning. However, the abundance of words to which level-1 affixes attach in Turkish suggests that such a proposal would necessitate too many identical forms of words and roots.

(35) a.	-(I)K]$_A$	b.	-I]$_N$	c.	-GIn]$_N$
	yan-ık		an-ı		kız-gın
	burn**V**-(I)K		moment**N**-I		resent**V**-GIn
	‘burnt’		‘memory’		‘resentful’

(36) a.	-(A)m]$_N$	b.	-(s)AL]$_A$	c.	-GI]$_N$
	uza-m		mantık-sal		sar-gı
	extend**V**-(A)m		logic**N**-(s)AL		wrap**V**-GI
	‘extension’		‘logical’		‘bandage’

As far as my investigations have gone, no categorically rigid and stress-neutral Turkish derivational suffix attaches to bound morphemes. Some words, however, only seem to possess these affixes. *Tomurcuk* ‘bud’ and *cücük* ‘chick’, for example, have endings identical to the suffix -(A/I)CIK. Therefore, the following argument can be put forward:

(37) a.	-(A/I)cIK]$_A$	b.	-(A/I)cIK]$_A$
	tomur-cuk		cü-cük
	tomur?-(A/I)cIK		cü?-(A/I)cIK
	‘bud’		‘chick’

The first word, *tomurcuk* ‘bud’, is actually derived from a less common verb, *tomur*- ‘cutting a tree’; therefore, it does not attach to a bound stem there. The second word, cücük ‘chick’, is likely to be borrowed from Persian as a simple word (the Persian word ‘cūcak’ has the same meaning). This confirms the pattern that level-2 Turkish derivational affixes, which are categorically rigid and stress-neutral, do not attach to bound morphemes.

In summary, the categorization of Creemers et al. (2018) can account for the selectional requirements of Turkish derivational affixes. The final criterion is the ordering of derivational suffixes.

3.4 Ordering

Göksel and Kerslake (2004) state that the ordering of Turkish derivational suffixes cannot be reduced to definite patterns. Although unproductive suffixes usually do not co-occur with productive suffixes and do not precede them when they do, these behaviors are not applicable to all cases. If the ordering in Creemers et al.’s (2018) proposal is also true for Turkish, we should not observe a pattern in which categorically flexible affixes follow categorically rigid ones.

My analysis will start with categorically flexible stress-shifting suffixes. An initial comparison suggests a pattern in which categorically flexible suffixes tend to precede categorically rigid and stress-neutral suffixes.

(38) a. bil-gin-ce]$_{A}$ b. çıl-gın-casına]$_{ADV}$
know$_{V}$-GIn-CE çıl?-GIn-CAsInA
'eruditely' 'crazily'

(39) a. *bil-ce-gin]$_{N}$ b. *çıl-casına-GIn]$_{N}$
know$_{V}$-CE-GIn çıl?-CasInA-GIn

The next step involves comparing two types of categorically rigid suffixes: stress-shifting and stress-neutral. Stress-neutral suffixes again tend to appear in final positions within words with multiple derivational suffixes.

(40) a. kur-(A)m-ca]$_{ADV}$
establish$_{V}$-(A)m-CA
'by the theory'

(41) a. *kur-ca-(A)m]$_{ADV}$
establish$_{V}$-CA-(A)m

The observations so far suggest that categorically rigid and stress-neutral suffixes appear in final positions when multiple derivational suffixes merge. It is unclear, however, whether a similar pattern exists between two stress-shifting suffixes: categorically flexible and categorically rigid.

(42) a. belir-gin-imsi]$_{A}$ b. tat-lı-msı]$_{A}$ c. bat-ı-sal]$_{A}$
appear$_{V}$-GIn-(I)msI taste$_{V}$-lI-(I)msI sink$_{V}$-I-(s)Al
'rather apparent' 'rather sweet' 'western'

Although the words in (42) point to a pattern in which categorically rigid stress-shifting suffixes precede categorically flexible stress-shifting suffixes, also consider the following words:

(43) a. gör-ev-li]$_{N}$ b. gör-sel-lik]$_{N}$ c. uy-du-lu]$_{A}$
see$_{V}$-(A)v-lI see$_{V}$-(s)Al-lIk fit$_{V}$-Dı-lI
'attendant' 'visuality' 'one with a receiver'

As can be observed in the examples above, while categorically rigid stress-shifting affixes can come before categorically flexible stress-shifting affixes (42) in Turkish, the opposite pattern is also possible (43). Therefore, a definite pattern does not exist in the Turkish language between the ordering of categorically flexible and categorically rigid suffixes. The findings will be discussed in the next section.

4 Discussion

Recall that the aim of this paper is to examine the accuracy of categorizing some Turkish derivational affixes as roots and others as functional heads, in line with the categorization of Creemers et al. (2008). I examined the flexibility, stress, selectional requirements, and ordering of Turkish derivational affixes and checked whether they comply with the criteria of the categorization given in Creemers et al. (2008). The observations, which were based on the patterns of dozens of Turkish derivational affixes, present compelling evidence that such categorization is not applicable for the Turkish language.

Although Turkish derivational affixes mostly show similar features to Creemers et al. (2018) derivational affix categorization, affix ordering behaviors in Turkish are different; therefore, we need to alter the categorization for Turkish affixes (Table 5).

Table 5. The comparison of the categorization in Creemers et al. (2018) and the patterns of Turkish derivational affixes

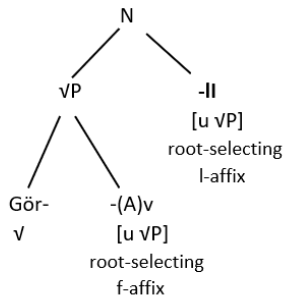
The Categorization in Creemers et al. (2018)				Derivational Affixes in Turkish		
Properties	Level-1		Level-2	Level-1		Level-2
	a	b		a	b	
Stress	Sensitive	Sensitive	Neutral	Sensitive	Sensitive	Neutral
Flexibility	Flexible	Rigid	Rigid	Flexible	Rigid	Rigid
Selec. Req.	Bound stems	Bound stems	Words	Bound stems	Bound stems	Words
Order	First	Second	Third	First or second	First or second	Final

This diversity might seem unimportant initially, but it is most certainly not. Remember that level-1b affixes in Creemers et al. (2018) proposal are functional heads and categorize the roots in word derivation. For this reason, a level-1a suffix cannot follow a level-1b suffix, as they can only attach to 'uncategorized' bound stems. In an attempt to explain word derivations like diplomat-ek in Dutch ('diplomatic') in which a level-1a affix seems to merge with a categorized item (diplomat), Creemers et al. (2018) suggest that lexical items like *diplomat* in Dutch are also roots, and they have "the same form as an independent word". Since Turkish level-1a derivational suffixes attach to a large number of words (categorized items), this proposal would require many identical roots and categorized word forms, which does not seem economical.

Even if we accept the extreme proposal of having identical root forms for words, the ordering of the derivational affixes in Turkish shows that this solution would not be applicable to Turkish. Creemers et al. (2018) argue that l-affixes (or level-1a affixes), which are categorically flexible and stress-shifting, can only attach to uncategorized roots, and once the root is categorized, only f-affixes (level-1b and level-2 affixes) can be used in the derivation process. However, l-

affixes and f-affixes in Turkish can follow each other in many word derivations, as shown in (42) and (43). The word *görevli* 'attendant' in (43a), for example, has the root *gör* 'to see'. Let us assume this is an uncategorized root that can merge with l-affixes. Unlike the words in (40), in which l-affixes merge with the roots immediately before other affixes, the first affix to merge with the root in (43a) is (A)v, which is an f-affix, or level-1b affix (categorically-rigid and stress-shifting). According to Creemers et al. (2018), this should categorize the root and not allow any level-1a affixes to be involved in word derivation after this point, as the latter type of affixes can only merge with uncategorized roots. Contrary to this prediction, level-1a affix -lI merges with the categorized root *görev* 'duty' in (43a) to create the final word form *görevli* 'attendant' (Figure 8).

Figure 8. An example of how l-affixes can follow f-affixes in Turkish



The findings outlined in this paper also present a problem for the claim that a phase is completed after the vocabulary item is categorized and stress-shifting only occurs in the first phase (for an alternative account of cyclic spell out domains, see Embick 2010, pp. 8-13). When level-1b affixes attach to roots, including level-1a affixes (they are still counted as roots even when they attach to other roots), they change the stress pattern and complete a phase. Turkish level-1b affixes can precede level-1a affixes; in such instances, stress should not change with the addition of more suffixes since the first phase is already completed. However, even some stressable inflectional suffixes can attract stress to the very end of Turkish complex words (44).

(44) görevliler**imiz**

see - (A)v	-lI	-ler	- imiz
V - level 1b	- level 1a	- plural	kü-1st person plural possessive

All in all, the observations in the current study show that the proposal of Creemers et al. (2018) cannot be generalized to other languages, like Turkish. At first glance, one may suggest revising the categorization of Creemers et al. (2018) according to the derivational affix ordering patterns in Turkish. However, the

central promise of this proposal was based on the unnecessity of long tree formations offered in Lowenstamm (2015); instead, the idea was put forth that f-affixes categorize roots without the need for additional phase heads. Without this feature, the proposal is almost identical to the view of Lowenstamm (2015), in which derivational affixes are seen as roots. Since this latter view categorizing all derivational affixes as roots allows more flexibility in defining stress-changing behavior and ordering, further studies should investigate whether such an account can explain the ordering flexibility of Turkish derivational affixes. Alternatively, researchers can investigate whether Turkish derivational affixes comply with the recent proposal, which argues that some derivation affixes are heads while others are phrases (Atlamaz & Dikmen, 2024; Gouskova & Bobaljik, 2022).

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