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# The Medial and Final (CCC) Consonant Clusters in the Loanwords of Turkish: Is It an Illusion?

## *Türkçedeki Alıntı Sözcüklerde Ortadaki ve Sondaki Üçlü (CCC) Ünsüz Kümeleri: Bu Bir Yanılsama mı?*

**Semra Baturay Meral**[1*]

*** Sorumlu yazar**
**Corresponding author**

[1] Dr. Öğr. Üyesi, Yıldız Teknik Üniversitesi, Türkiye
Assist. Prof. Dr., Yıldız Technical University, Turkey
semrabaturay@gmail.com
**ORCID ID** https://orcid.org/0000-0002-2231-361X0

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**ÖZ**

Bu çalışma, Türkçeye geçen yabancı sözcüklerdeki ünsüz (CCC) kümelerinin ortaya çıkışını dilin uyarlama yöntemleri açısından incelemeyi amaçlamaktadır. Sesdizimsel kısıtlamalarına titizlikle uyan ve istisnalara karşı düşük tolerans gösteren bir dil olarak bilinen Türkçe, sesdizimsel açıdan uygun olmayan yabancı sözcükleri dile aktarırken kendi kısıtlamalarına uygun hale getirmek adına bu sözcükleri çeşitli sesbilimsel işlemlerden geçirmektedir. Türkçe bu kısıtlamalardan biri olarak, sesbilimsel dizide biçimbilimsel anlamda eklemenin varlığını işaret ettiği için basit yapılı biçimlerde üç ünsüzün bitişikliğine (CCC) izin vermemektedir. Ancak, *bandrol*, *semptom*, *portföy* ve *kuvartz* gibi Türkçeye alınmış, orta ve son CCC kümelerine sahip bir dizi yabancı sözcük hala dilde mevcuttur. Çalışmanın amacı, bu ve benzeri örneklerden yola çıkarak, yabancı dillerden Türkçeye alınan sözcüklerdeki CCC kümelerinin yapısını incelemektir. Çalışmamızda, basit yapılı sözcüklerdeki CCC'nin sadece bir yanılsama olduğu ve sesdizimsel kısıtlamaların ihlal edilmediği iddia edilmektedir. Bu doğrultuda, Türkçenin yabancı sözcükleri dile uyarlarken CCC'den kaçınmak için üç temel strateji geliştirdiği savunulmaktadır. İlk strateji olarak Türkçe /bandɯrol/ sözcüğünde olduğu gibi ilk CC'den sonra bir ünlünün sesletimini önermektedir (i). Türkçenin uyguladığı ikinci strateji ise CCC kümesine sahip bir sözcüğü /semtom/ ve /kuvarz/'da olduğu gibi sadece CC ile Türkçeye uyarlamaktır (ii). Üçüncü seçenek ise CCC içeren bazı alıntı sözcüklerin zihinsel sözlükte karmaşık bir biçimbilimsel yapıya sahipmiş gibi kaydedilmesidir: *port-föy* (iii). Çalışmada bu stratejiler yönetim, izin verme ve kurucu yapı analizleri ışığında açıklanacaktır.

**Anahtar kelimeler**
Türkçede ünsüz kümeleri, sesbilimsel ve sesletimsel kısıtlamalar, alıntı sözcük uyarlamaları.

**ABSTRACT**

The present study aims to investigate the appearance of CCC clusters in the foreign words borrowed by Turkish in terms of the adaptation strategies used in the process. Known as a language which strictly follows its phonotactic constraints showing low tolerance for the exceptions, Turkish employs a variety of phonological processes in the adaptation process of the foreign words into the language so as to make the phonologically improper loan words obey with the phonotactic and phonological constraints of the language. As one of these constraints, Turkish forbids the adjacency of three consonants (CCC) in the simplex forms given that CCC implies morphological complexity on the phonological string. However, there are still a number of foreign words with medial and final CCC clusters adapted to Turkish such as *bandrol* 'banderol', *semptom* 'symptom', *portföy* 'portfolio' and *kuvartz* 'quartz'. Based on these observations, the aim of the present study is to investigate the occurrence of CCC clusters in Turkish words, which are adapted to Turkish from foreign languages. In this regard, we claim that CCC in simplex words are only an illusion and there is no violation of phonotactic constraints. Accordingly, we argue that Turkish has three basic strategies in order to avoid CCC clusters while adapting the foreign words. As the first strategy, Turkish prefers the realization of a vowel following the initial CC as in /bandɯrol/ (i). The second strategy Turkish applies is to adapt the word which has a CCC cluster with only CC: e.g. /semtom/ and /kuvarz/ (ii). As the third option, certain adapted words with CCC clusters are stored in the mental lexicon as if they had a complex morphological structure *port-föy* (iii). We will give an account for these strategies in the light of government, licensing and constituent structure analyses.

**Keywords**
Consonant clusters in Turkish, phonological and phonotactic constraints, loan word adaptation.

## 1. INTRODUCTION

Turkish is a language which is known for the strict adherence to its phonotactic constraints: i.e. the word initial CCs are not allowed in Turkish different from many languages such as English, French, Polish etc. For this reason, the foreign words with a word-initial consonant cluster seem to be adapted into the language with a vowel that breaks up this cluster in accordance with certain phonological conditions (Yavaş, 1980; Clements & Sezer, 1982; Balcı, 2006; Göksel & Kerslake, 2011; Kornfilt, 2013). This is exemplified in (1a-d) below.

(1) a. plan → /pi̲lan/ 'plan'
b. krem → /ku̲rem/ 'cream'
c. spiker → /si̲piker/ 'announcer'
d. tren → /ti̲ren/ 'train'

Adapted from Yavaş (1978, p. 36)

Given in (1a-d), the words with the initial consonant clusters in French origin are borrowed into Turkish with a vowel, the source of which is accounted in different terms depending on the phonological theory adapted: feature spreading from the environment (Clements & Sezer, 1980), epenthetic vowel insertion (Yavaş, 1980), element spreading to the empty nucleus (Balcı, 2006; Baturay, 2012) etc.

Turkish also has certain restrictions regarding the non-initial consonant clusters. CC clusters are allowed word finally as long as their sequencing follows the sonority scale of Clements (1990) (2a-b) and word internally (2c-d). However, the occurrence of CCC clusters (2e-f) implies a morphologically complex structure compared to a simplex word (Balcı, 2006).



(2) a. ka**mp** 'camp' e. ke**ntl**er (kent-ler) city+Pl 'cities'
b. se**rt** 'hard' f. de**nkl**ik (denk-lik) equivalent+Der. 'equivalance'
c. ka**rd**eş 'sibling'
d. a**mpü**l 'lamb'

Given in (2a-d), the word final (-mp and -rt) and word medial (-rd- and -mp-) consonant clusters (CC) are in line with the sonority sequencing (from more sonorous to less sonorous) (Hooper, 1972; Clements, 1990; Kaye, Lowenstamm & Vergnaud, 1990; Harris, 1990; Kenstowicz, 1994; Cyran, 2003, 2008). Accordingly, CC clusters are allowed in Turkish simplex words depending on their order and sonority sequencing. In (2e-f), on the other hand, three consonants appear adjacently (-rtl-) and (-nkl-) respectively, and this implies morphological complexity in Turkish (Balcı, 2006).[1] This means that there is no simplex word on the phonological string with the existence of a CCC. Nevertheless, we still observe a number of examples in Turkish that appear to contradict with this constraint (3a-h).

[1] See also van der Hulst & van de Weijer (1991), Kaye (1989, 1995) with the similar observations on the occurrence of CCC clusters in Turkish and other languages.

| | | | | | | |
|---|---|---|---|---|---|---|
| (3) | a. ba**ndr**ol | -ndr- | 'banderol' | e. ka**rst** | -rst- | 'karst' |
| | b. u**ltr**a | -ltr- | 'ultra' | f. kuva**rtz** | -rtz- | 'quartz' |
| | c. sü**rpr**iz | -rpr- | 'surprise' | g. po**rtf**öy | -rtf- | 'portfolio' |
| | d. se**mpt**om | -mpt- | 'symptom' | h. apa**rtm**an | -rtm- | 'apartment' |

Given in (3a-h), there are certain foreign words adapted to Turkish with medial (3a-d), (3g-h) and final (3e-f) CCC clusters. Note that some of these words seem to be spelled and pronounced (*e.g.* 3b Fr. *ultra* /yltʀa/; 3c Fr. *surprise* /syʀpʀiz/) or only pronounced (*e.g.* 3e Ger. *kars*/kɑɪst /) with CCC in the original language.

In the light of the data above, the aim of the present study is to investigate the appearance of those CCC clusters in Turkish words, which are adapted from foreign languages. In this regard, we begin with questioning the existence of such CCCs: are there really adjacent CCC in those forms or is it just an illusion? Do we really pronounce the three adjacent consonants appearing in orthography?

Turkish employs a variety of phonological strategies in order to make the *phonologically improper* words comply with its own phonological standards in the adaptation process of these forms. Consider certain examples of the strategies of Turkish to keep its phonological and phonotactic constraints away from violation (4a-d).

| | | | | | |
|---|---|---|---|---|---|
| (4) | a. Devoicing | kita**b** (Ar.) | → | kita**p** | 'book' |
| | b. Vowel-Zero Alternation | a**kl** (Ar.) | → | ak**ı**l | 'mind' |
| | c. Vowel shortening | zam**a:**n(Ar.) | → | zam**a**n | 'time' |
| | d. Degemination | hi**ss** (Ar.) | → | hi**s** | 'sense' |



(i) Let us begin with the (4a) case where devoicing is at work. The original voiced obstruents /b, c, d, g/ are devoiced word finally in Turkish since they are not allowed in this position (Underhill, 1976; Kopkallı, 1993; Inkelas & Orgun, 1994; Demir & Yılmaz, 2011). (ii) Certain word final consonants which are sequenced against the sonority scale undergo vowel-zero alternation in Turkish in that vowel appears between two final consonants (4b) (Clements & Sezer, 1982; van de Weijer, 1991; Özsoy, 2004; İskender, 2008; Göksel & Kerslake, 2011). (iii) The long vowels are shortened in Turkish if there is no vowel following them (4c) (vowel shortening) (Sezer, 1986; Kaye, 1990; van der Hulst & van de Weijer, 1991; Denwood, 2002; Scheer, 2004; Nuhbalaoğlu, 2010; Göksel & Kerslake, 2011; Erguvanlı-Taylan, 2013). Also, (iv) consonant degemination applies to the word final long consonants, which is against the phonotactic constraint of Turkish (Lees, 1961; Lewis, 1967; van der Hulst & van de Weijer, 1991; Göksel and Kerslake, 2011; Kornfilt, 2013). As seen, Turkish strictly follows its phonotactic constraints showing low tolerance for the exceptions. Then, the question is if Turkish keeps its phonotactic constraints on CCC consonant clusters in a more flexible way while following the other ones so strictly? Are the exceptions to the word-internal *CCC constraint welcome?

As an answer for these questions, we claim that CCC clusters are only illusion in Turkish in that there are no three adjacent CCCs in simplex words even in the adapted ones. CCCs in simplex words only appear orthographically and they can be pronounced by excessively

careful reading in most of the cases (3a-f). Otherwise, it implies morphological complexity or lexical storage as a complex form (3g-h). Accordingly, we argue that Turkish has three basic strategies given in (5a-c) for the sake of avoiding CCC clusters while adapting the foreign words into the language.

(5) a. Vowel appearance after CC: ba**ndr**ol → /ba**ndɯr**ol/

b. Reducing the consonants: se**mpt**om → /se**mt**om/

c. Lexical storage as a complex form: po**rtf**öy → po**rt-f**öy

When we check the native speaker judgements of Modern Standard Turkish and the pronunciation guide provided by the online Turkish dictionary of *Türk Dil Kurumu* (Turkish Language Association) (*TDK*) (https://sozluk.gov.tr/), we observe that CCCs are hardly ever heard adjacently in the examples such as *bandrol* and *semptom*. How can Turkish avoid these CCCs? As the first strategy, Turkish prefers the realization of a vowel following the initial CC as in the case of /band**ɯ**rol/ (5a). The second strategy Turkish applies is to adapt the words which have a CCC cluster with only two Cs (CC) into Turkish /se**mt**om/ (5b). As the third option, certain adapted words with a CCC are stored in the lexicon as if they had a complex morphological structure *port-föy* (5c): the sequence *-rtf-* appears on the same phonological string but these consonants can be considered as belonging to different morphemes akin to a complex structure.

The structure of the article is as follows: Section 2 will present a discussion on why CCCs are impossible on the simplex structures in Turkish by means of the constituent structure account, government and licensing mechanisms we adapt in the present study (Kaye & Lowenstamm, 1981; Kaye, 1987, 1989, 1990; Charette, 1991; Harris, 1994; Polgárdi, 1998). The strategies of Turkish to avoid CCCs on the same constituent structure will be given in section 3. The conclusion part will summarize the study.



## 2. WHY THERE IS NO CCC IN TURKISH SIMPLEX WORDS: A THEORETICAL ACCOUNT

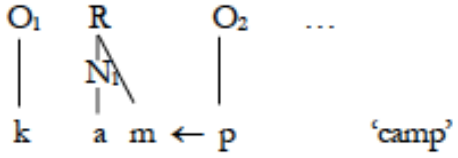
Given in Kaye & Lowenstamm (1981), Kaye (1989) and Harris (1994), languages have different types of consonant clusters such as branching rhymes and branching onsets depending on their parametric setting. See (6a-b) for Branching Rhyme and Branching Onset Parameters, respectively.

(6) a. Branching Rhyme Parameter Rhymes may branch. [ON/OFF] (RT Clusters)

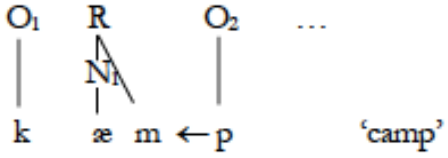
b. Branching Onset Parameter Onsets may branch. [ON/OFF] (TR Clusters)

Given in (6a), if a language fixes the Branching Rhyme Parameter ON, the coda-onset clusters (RT clusters) are possible as in the case of Turkish (7a) and English (7b).

(7) a. RT Clusters in Turkish




b. RT Clusters in English

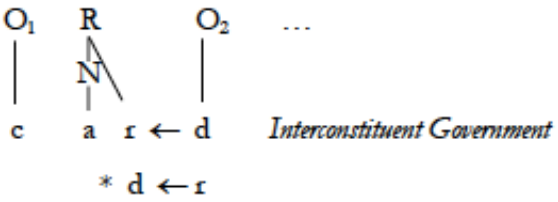


Similarly, if the Branching Onset Parameter is ON in a language, branching onsets (TR clusters) can appear as in the case of English (9b), Polish, French, Spanish and Dutch, etc. If it is OFF, TR clusters do not occur as in the case of Turkish. RT and TR clusters are distinguished from each other in terms of sonority and constituent structure. See Clements' (1990) sonority scale in (8a-e).

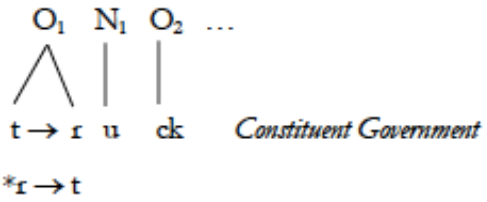
(8) a. vowels (V) 5 (the most sonorous)
b. glides (G) 4
c. liquids (L) 3
d. nasals (N) 2
e. obstruents (O) 1 (the least sonorous )

Based on the sonority scale and Sonority Dispersion Principle (SDP) that is claimed to be a basis for the classification of the syllable types according to relative complexity, Clements (1990, 1992) argues that sonority rises from the onset to the nucleus but falls from nucleus to coda. Accordingly, the coda (R) is not less sonorous than the onset (T) in (RT) clusters.

(9) a. RT Clusters




b. TR Clusters






Sonority sequencing of consonants in the clusters given in (9a) and (9b) is crucial in terms of government and licensing relations. According to Kaye (1990, 1992), phonology is parallel to syntax in terms of government and licensing relations: i.e. as in syntax, government in phonology is an asymmetrical relation between two skeletal points defined as maximally binary in light of the Binarity Theorem (Kaye, 1990). As an instance of government in phonology, (9b) represents the constituent government within the same constituent ($O_1$) which is used for the licensing of the consonant clusters (TR) (Charette, 1991): the obstruent /t/ licenses the liquid/r/ which sits in the right branch of the branching onset, but it is not allowed in the other way around since it would violate the sonority sequencing (/r/ cannot license /t/). In (9a), on the other hand, we have coda-licensing as an instance of the interconstituent government. Accordingly, /d/ ($O_2$) coda-licenses /r/ following the Coda Licensing Principle given in (10).[2]

(10) The Coda Licensing Principle

Post-nuclear rhymal positions must be licensed by the following onset.

(Kaye, 1990, p.311)

[2] Another type of clusters is the bogus one, in which consonants have neither constituent nor interconstiuent relation with each other (two successive onset consonants separated by an empty nucleus) (Harris, 1994; Scheer, 2004) as in the case of *atlas* in that there is an empty nucleus between [t] and [l]: a[tØl]as.

Given in (10), the coda licensing is possible if there is no violation of the sonority sequencing: i.e. /r/ cannot coda-license /d/. As for Turkish, the Branching Onset Parameter is set OFF while the Branching Rhyme Parameter is fixed ON. Accordingly, Turkish have RT clusters word finally (11a-b) and word medially (11c-d) but not TR clusters (11e-f).

(11) a. ka**mp** 'camp' e. *a**kl** → akıl 'mind'

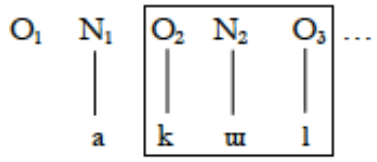
b. se**rt** 'hard' f. *sa**br** → sabır 'patience'

c. a**mp**ül 'lamb'

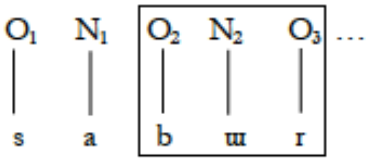
d. ka**rd**eş 'sibling'

As seen in (11e-f), the final *kl* and *br* clusters are not possible in Turkish since they cannot be in a coda-onset licensing relation due to the sonority hierarchy. They cannot be under the same constituent either, since there is no branching onset in Turkish (Winnick, 1972; Clements & Sezer, 1982; van der Hulst & van de Weijer, 1991; Kopkallı, 1993) (Branching Onset Parameter-OFF). Accordingly, Turkish adapts these Arabic words given in (11e-f) into Turkish by breaking the clusters with an empty nucleus as shown in (12a-b) respectively.

(12) a. *akl → akıl




b. *sabr → sabır






$N_2$s in both (12a-b) must be interpreted since there is no proper governor for them. In order for Proper government to hold, a governor must be phonetically realized and no governing domain intervenes between the governor and the governee, as argued in Kaye (1987).

(13) Proper Government

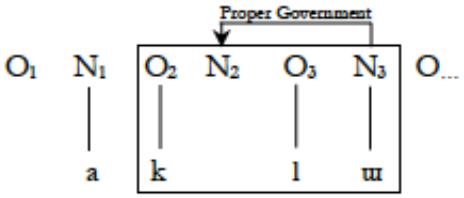
A properly governs B if

1. A and B are adjacent on the relevant projection,
2. A is not itself licensed, and
3. Neither A nor B are government licensers.

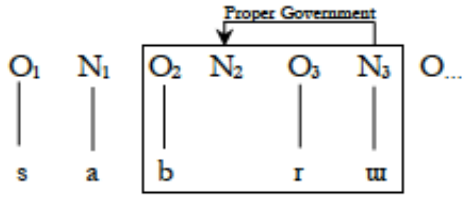
Kaye (1987)

Given in (13), Proper Government is responsible for the vowel-zero alternation in languages such as Turkish, Arabic, Polish, German among the others. The vowel in the empty nucleus is not realized if the following nucleus is realized.

(14) a. *akl → akØlɯ 'mind+Poss'



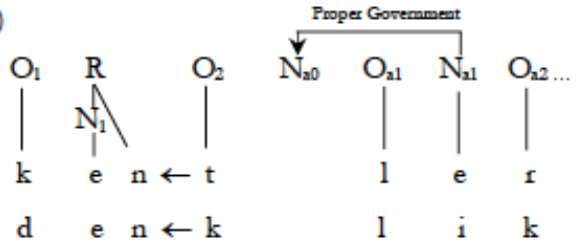

b. *sabr → sabØrɯ 'patience+Poss'



As given in (14a-b), $N_3$, which has a full vowel, properly governs $N_2$ and hence no vowel is interpreted under it. (12a-b) and (14a-b) are instances of vowel-zero alternation in Turkish in the absence and in the presence of proper government, respectively.

Going back to the coda-onset clusters given in (11a-d), RT clusters are possible word-finally in Turkish even if they are not followed by a vowel as in the case of *ka[mp]* 'camp' (11a) and *se[rt]* 'tough' (11b). However, these clusters can occur word-medially only when followed by a vowel as in *a[mp]ül* 'lamb' (11c) and *ka[rd]eş* 'sibling' (11d). Otherwise, three consonants would occur adjacently implying the morphological complexity as in the case of ke*nt-l*er 'city+Pl' (2e) and de*nk-l*ik 'equivalent+Der' (2f). The constituent structure of these forms is represented in (15).

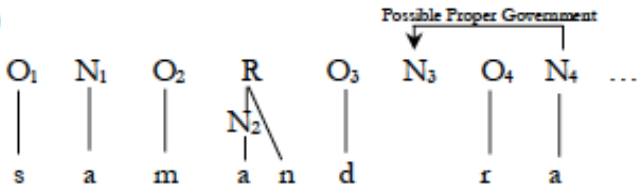
(15)




Given in (15), we argue that the CCC is broken by the nucleus ($N_{a0}$), which belongs to the suffix not to the base. Following Baturay-Meral (2020), we assume that the bases, prefixes and suffixes (productive ones) are stored in the lexicon with their unique templates, which are recognizable in phonology. The absence of CCC clusters in the simplex words would provide evidence for the distinction between an affix and a base in phonology. Accordingly, phonology can distinguish the base nucleus from the suffixal one: the former must be realized after the initial CC in CCC clusters but the latter one does not need to be interpreted. Let us now analyze the constituent structure of the simplex word *Samandıra* (16), the name of a neighborhood in İstanbul, in order to understand why the base vowel following the initial CC in CCC clusters must be interpreted.

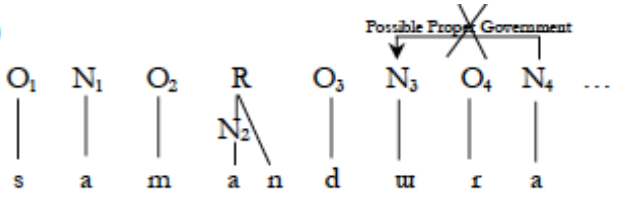


(16)




Given in (16), $N_3$ cannot be silent */samandra/ although $N_4$ has a potential to properly govern $N_3$. The proper government is blocked in such cases where the empty nucleus follows the RT clusters in Turkish simplex words. Instead, $N_3$ is realized as in (17).

(17)




Different from the case given in (16-17), proper government is possible for the suffixal nucleus ($N_{a0}$) in (15), which follows the RT cluster in the same way with $N_3$ in a simplex from given in (16). As noted above, phonology seems to distinguish the base nucleus from the suffixal one (Baturay-Meral, 2020).

Similar to Turkish, Charette (1991:134) observes that the word-internal empty nucleus following a consonant cluster must be realized in French. This is given in (18c-d).

(18) French

| | | | | | |
|---|---|---|---|---|---|
| a. forge | /fɔʀʒ/ | 'forge!' | c. orgelet | /ɔʀʒəlɛ/ | 'sty' |
| b. calme | /kalm/ | 'calm' | d. percevoir | /pɛʀsəvwaʀ/ | 'to perceive' |

Adapted from Charette (1991:29)

Given in (18a-b) and (18c-d), there is a difference between the word final and word medial clusters in French similar to Turkish. The CC can occur word finally in the absence of a following vowel (18a-b) while the word internal CCs must be followed by a vowel as in (18c-d). Charette (1991) explains this difference via Government Licensing given in (19).

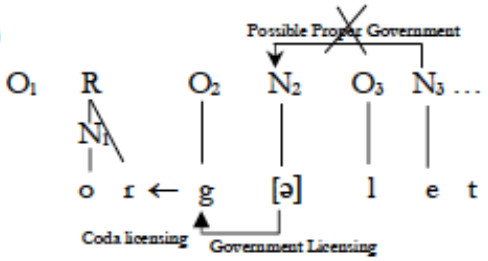
(19) Government Licensing

For a governing relation to hold between a non-nuclear head $\alpha$ and its complement, $\alpha$ must be government-licensed by its nucleus $\beta$.

Charette (1991)

The government-licenser of a word internal onset is a nucleus which is not properly governed in French and Turkish. Accordingly, this nucleus must be interpreted in both languages.[3] Consider the constituent structure of (18c) in (20) to see the parallelism between French and Turkish in terms of word final and word internal clusters.

(20)




$N_2$ would be properly governed by $N_3$ in (20) but it is not since it is a government licensor which gives license to $O_2$ for coda-licensing of the right branch of the rhyme. Accordingly, French chooses to preserve government licensing but not proper government of an empty nucleus (org[ə]let) (Charette, 1991). The empty nucleus $N_2$ receives phonetic interpretation in order to government license the preceding onset ($O_2$) in order for it to govern its complement (the right branch of the rhyme). In this respect, Turkish behaves similar to French as given in (17). The potential question may be why there is no need for such a government licensor word finally either in French (21a) or Turkish (21b).

(21) a. French: /kalm/ 'calm'

b. Turkish: /ke***nt***/ 'city'

A potential answer for this question might be that the existence of CC clusters which are not followed by a vowel is a sign of the word final position: it implies the right word boundary

[3] Note that the word internal government licensor may be a properly governed one in other dialects of French and other languages as a parametric variation (Charette, 1991). Polish provides many examples of this sort: [plastØra] 'plaster' and [ubrØdac] 'imagine' (Polgárdi, 1998, p.3)

both in French (21a) and Turkish (21b). On the other hand, the word internal coda-onset cluster must be government licensed by a full nucleus: i.e. **Samandra* is out (16). However, the word-final coda onset cluster may be followed by a properly governed nucleus since it does not need any government licensing as a mark of the word boundary in Turkish: i.e. *kent-ler* is allowed in (15).[4] Following the government licensing idea of Charette (1991), we claim that phonology can distinguish the base nucleus from the suffixal one in that the suffixal one is properly governed if there is a potential governor but the base nucleus cannot be done so.

Up to this point, we have explained why the word internal CCC is forbidden in Turkish by means of the proper government, coda-licensing and government licensing: the coda-licensing is only possible by means of a realized government licensor, not a properly governed one for the word internal CCC cases. In section 3, we will discuss which strategies Turkish applies in loanword adaptation to avoid CCC in the same phonological string.

## 3. STRATEGIES OF TURKISH TO AVOID THE WORD INTERNAL CCC

As noted in sections 1 and 2, we observe that CCCs in simplex words as in (3a-h) repeated here as (22a-h) are adjacent only orthographically and these three consonants may only be pronounced by excessively careful pronunciation in most of the cases.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (22) | a. ba**ndr**ol | -ndr- | 'banderol' | e. ka**rst** | -rst- | 'karst' |
| | b. u**ltr**a | -ltr- | 'ultra' | f. kuva**rtz** | -rtz- | 'quartz' |
| | c. sü**rpr**iz | -rpr- | 'surprise' | g. po**rtf**öy | -rtf- | 'portfolio' |
| | d. se**mpt**om | -mpt- | 'symptom' | h. apa**rtm**an | -rtm- | 'apartment' |



According to the native speaker judgements of Modern Standard Turkish speakers and the pronunciation guide given in *Çevrimiçi Büyük Sözlük* (Online Comprehensive Dictionary) of *Türk Dil Kurumu* (Turkish Language Association) (*TDK*) (https://sozluk.gov.tr/), CCCs are hardly ever heard adjacently in the examples such as *ultra, bandrol, sürpriz, semptom, karst, kuvartz* given in (22a-f), respectively. Instead, only two Cs are heard in the examples (22c-f): /r/ is not pronounced in casual speech in *sü~~r~~priz* 'surprize' (22c); and also /p/ in *sem~~p~~tom* 'symptom' (22d). Similarly, *karst* is pronounced without /r/ (22e) and /t/ is omitted from *kuvartz* in (22f). When the consonant is not omitted, Turkish prefers to realize a vowel in the empty nucleus position as in /bandɯrol/ (22a) although it might be silent due to the proper government. Note that this is also the case in *ultra* /ultura/ (22b).

In some other cases, on the other hand, certain adapted words with CCCs are stored in the lexicon as if they have a complex morphological structure: e.g. *port-föy* 'portfolio' (22g) and *apart-man* 'apartment' (22h). *-rtf-* and *-rtm-* in these examples appear on the same phonological string but actually the three consonants seem to be belonging to different morphemes in phonology. Then, we argue that the examples in (22g-h) have a different constituent structure from those in (22a-f). Accordingly, we propose that Turkish has three basic strategies given in

[4] Note that Turkish and French do not behave in the same way regarding the realization of the government licensor in the suffixed examples. In Turkish, the suffixal nucleus does not need to be realized and it can be properly governed as in *denk-lik* 'equivalent-DER' (15). However, French prefers the suffixal nucleus to be realized as well as the word internal one if it is the government licensor: *lent-**e**ment* [ə] *[Ø] 'slowly' (Charette, 1991).

(23a-c) for the sake of avoiding CCC on the same simplex string while adapting the foreign words into the language.

(23) a. Vowel appearance after CC: ba**ndr**ol → /ba**ndɯr**ol/

b. Reducing the consonants: se**mpt**om → /se**mt**om/

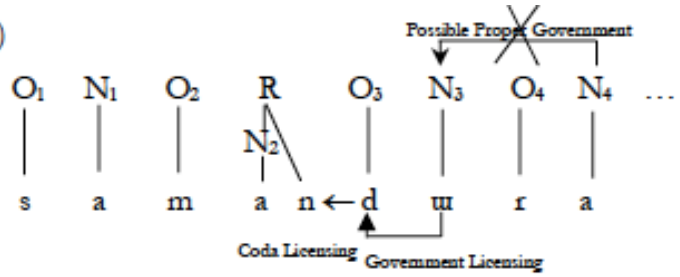
c. Lexical storage as a complex form: po**rtf**öy → po**rt-f**öy

We are going to present each strategy in (23a-c) in detail in section 3.1, 3.2 and 3.3, respectively.

**3.1. Vowel Appearance: C1C2C3 → C1C2-V-C3**

Recall from section 2 that the presence of a CCC implies the existence of a word boundary in Turkish: i.e. CCC= Complex Structure (*dert-ler* 'problem+pl'). Then, the word internal C1C2 clusters can occur if they are licensed by a full nucleus (not a properly governed one) as in (17) repeated in (24).

(24)




As seen in (24), $N_3$ is realized so as to government license the complement of the rhyme although it may be properly governed by $N_4$. Then, we have /sama**ndɯr**a/ not */sama**ndr**a/. Turkish adapts certain foreign words with a CCC according to this constituent structure type. See (25a-d) for the instances of those foreign words and their adaptation into Turkish.

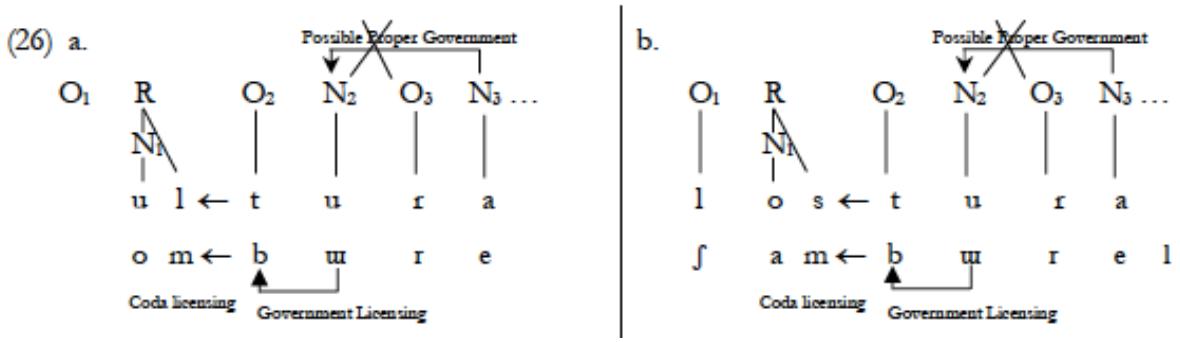


(25) C1C2C3 → C1C2-V-C3 [5]

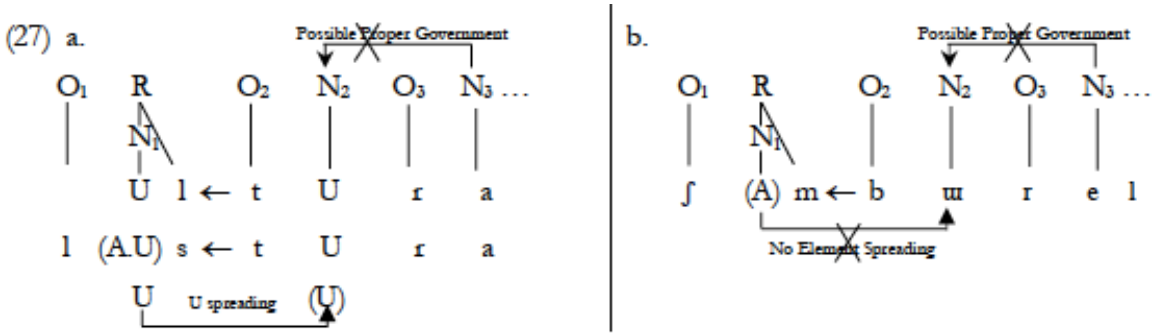
| | | | | |
|---|---|---|---|---|
| a. ultra | → | /ult**u**ra/ | 'ultra' | Ø → u |
| b. lostra | → | /lost**u**ra/ | 'shoeshine' | Ø → u |
| c. şambrel | → | /ʃamb**ɯ**rel/ | 'chambray' | Ø → ɯ |
| d. ombre | → | /omb**ɯ**re/ | 'ombre' | Ø → ɯ |

Given in (25a-d), the vowel is realized following C1C2 and preceding C3 as opposed to the orthography: i.e. three consonants appear adjacent in the orthography but they are not adjacent in phonology (26a-b).

[5] The data is not limited to the ones given in (25a-d). The number of such examples can be increased: e.g. *implant* (Fr.) /impilant/ 'implant', *pankreas* (Fr.) /pankɯreas/ 'pancreas', *banrdol* (Fr.) /bandɯrol/ 'banderol', *sendrom* (Fr.) /sendɯrom/ 'syndrome', *andropoz* (Fr.) /andɯropoz/ 'andropause' etc., some of which may be formed with the combination of more than one morpheme in the original language. However, the present study assumes that phonology cannot see morphology and the internal structure of these words in the adaptation process but there might be certain cases where phonology analogizes them to a complex structure due to the weird consonant clusters as we will discuss in section 3.3.




As represented in (26a-b), although it may be properly governed by $N_3$, $N_2$ is realized so as to government license $O_2$, which coda-licenses the complement of the rhyme, /l/, /m/ and /s/, /m/ in (26a-b) respectively. Accordingly, we have /ultura/ not /ultra/; /ombɯre/ not /ombre/ (26a); and the output is /lostura/ not /lostra/; /ʃambɯrel/ not /ʃambrel/ in (26b). Following Charette & Göksel (1996), we assume that $N_2$ is realized via element spreading if there is any available source and target complying with the licensing constraints: (i) Operators must be licensed; (ii) A is not a licenser; (iii) U must be head (Charette & Göksel, 1996). Compare (27a) and (27b) for the realization of N2 in /ultura/, /lostura/ and /ʃambɯrel/.




Given in (27a) for /ultura/ and /lostura/, the initial vowel under $N_1$ has an U element that spreads into $N_2$, which is not properly governed since it is a government licensor in both cases. Note that the element U spreads from $N_1$ to $N_2$ in accordance with the licensing constraint *U must be head*. For (27b), on the other hand, we observe a slightly different situation. Since A is not a licenser in Turkish, it cannot spread into $N_2$ in /ʃambɯrel/. Accordingly, the $N_2$ position is filled with /ɯ/, which is the realization of an empty nucleus position in the absence of element spreading (Charette & Göksel, 1996).[6, 7]

[6] Note that there is another case where the U element in $N_1$ does not spread into $N_2$ /ombɯre/. The initial nucleus ($N_1$) of /ombɯre/ has the vowel /o/, which is a combination of (A.U) elements (Charette & Göksel, 1996). The element U under $N_1$ is expected to spread to $N_2$ position in accordance with the licensing constraint *U must be head,* but it is not. The reason for this is that Turkish seems to adapt the French word *ombre* into Turkish with the nucleus ($N_2$) which has a lexical vowel /ɯ/ so as to be the government licensor different from *şambrel*, $N_2$ of which is empty and realized as the default vowel in the absence of proper government. To be more precise, /ɯ/ is a lexical vowel assigned to $N_2$ by Turkish when the word *ombre* is borrowed the from French while /ɯ/ in /ʃambɯrel/ seems to be the realization of an empty nucleus in the absence of proper government. Nevertheless, Turkish makes the government licensor be realized in both cases though in different ways.

[7] There may also be a second hypothesis about the realization of the empty nucleus ($N_2$) for /ʃambɯrel/: /ɯ/may be lexically assigned to $N_2$ similar to /ɯ/ in /ombɯre/ as noted in the previous footnote. This second

Given in the present section, Turkish applies the realization of the nucleus following C1C2 in C1C2C3 as one of its strategies to avoid C1C2C3 in simplex structures: C1C2-V-C3. Section 3.2 will discuss another strategy of Turkish to prevent CCC: reducing the consonants in CCCs in the adaptation process.

**3.2. Reducing the Consonants: CCC – C = CC**

As noted above, Turkish applies certain strategies while borrowing the words with internal and final CCC clusters. The realization of the empty nucleus despite proper government is one of the strategies as presented in 3.1. As another strategy, Turkish chooses to adapt the word with the internal CCC with only CC: i.e. one of the consonants is removed in the adaptation process. See the examples given in (28a-d).

(28) CCC → CC

| | | | | |
|---|---|---|---|---|
| a. sem[p]tom | → | /semtom/ | 'symptom' | p → Ø |
| b. sü[r]priz | → | /sypriz/ | 'surprise' | r → Ø |
| c. şam[b]rel | → | /ʃamrel/ | 'chambray' | b → Ø |
| d. om[b]re | → | /omre/ | 'ombre' | b → Ø |

Let us begin with (28c-d), which are the examples we discussed in section 3.1. For *şambrel* and *ombre*, we argued that the nucleus which follows C1C2 is realized in order to government license the coda-licensor on the structure although it can be properly governed by the following nucleus. Here, we notice that Turkish can apply two different strategies for the same words in order to prevent CCC clusters. Compare (29a-b) with (30a-b).



| (29) CCC → CC-V-C | | vs. | (30) CCC → CC | | |
|---|---|---|---|---|---|
| a. /ʃambɯrel/ | Ø → ɯ | | a. /ʃamrel/ | b → Ø | *şambrel* |
| b. /ombɯre/ | Ø → ɯ | | b. /omre/ | b → Ø | *ombre* |

Regarding (29a-b) and (30a-b), what we observe is that examples in (29a-b) are in free variation with those in (30a-b) though (30a-b) may be preferred in quick and casual speech.

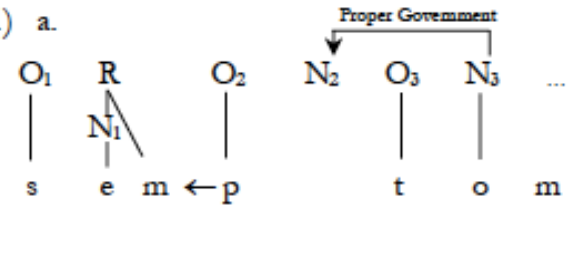
Going back to the examples of consonant reducing strategy of Turkish, in (28a-d), the medial consonant seems to be out (28a, c, d) in the process of adaptation. In these three examples, the excluded consonant is labial (having U element). In (28b), on the other hand, the left-out consonant is the first member in C1C2C3: /r/. With very careful and extremely slow pronunciation, it may be possible to produce these excluded sounds, but they are not heard in everyday speech. Let us now see the constituent structure change of (28a) in the adaptation process in (31a-b).

hypothesis could be supported by the alternative pronunciations of *ultra* and *lostra* given in (ia-b).

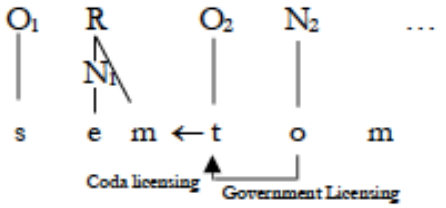
(i) a. /ultɯra/ b. /lostɯra/

Turkish native speakers can pronounce the words *ultra* and *lostra* with /ɯ/ under $N_2$ (ia-b) as an alternative way to /u/. It seems that Turkish may adapt the foreign words with C1C2C3 with a lexical vowel under the nucleus following C1C2. That is to say, there may be alternative ways of realization of the nucleus following C1C2 in C1C2C3. The important point, however, is that Turkish never picks up the words containing CCCs as they are.

(31) a.

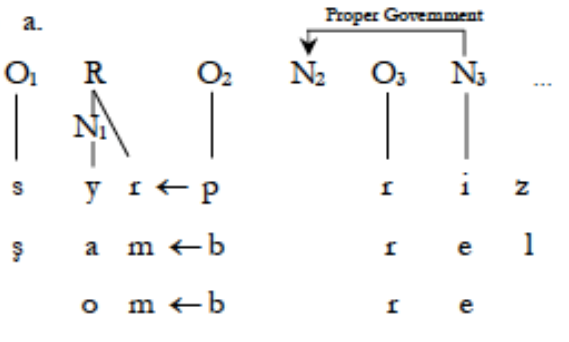



b.

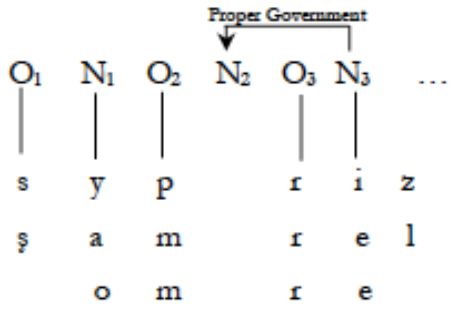



Turkish cannot adapt *semptom* as it is in (31a) since $N_2$, which is properly governed by $N_3$, cannot government license $O_2$. Recall that properly governed nuclei cannot be a government licensor in Turkish. Accordingly, O2 cannot coda-license the complement of the rhyme. Then, Turkish borrows the word with the constituent structure given in (31b), according to which $O_2$ $N_2$ pair in (31a) is extracted. As a result, the constraint which bans the CCC cluster in simplex words is not violated. Let us now see the constituent structure of (28b-d) in (32a-b).

(32) a.




b.



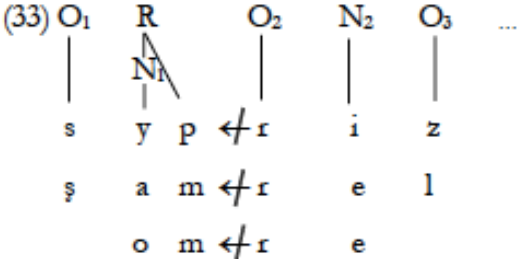



One possible constituent structure representation of *sürpriz*, *şambrel* and *ombre* for Turkish could be as represented in (32a) in which there is a coda-onset cluster. However, this option does not work since the properly governed silent nucleus cannot be the government licensor in Turkish.[8] Then, Turkish adapts the relevant words without a coda-onset cluster as given in (31b), which have bogus clusters instead. Note that bogus clusters consist of two consecutive onset consonants different from both onset and coda clusters (Kaye, Lowenstamm & Vergnaud, 1990; Charette, 1991; Harris, 1994) as in $O_2$ and $O_3$ in (32b) which are broken by an empty nucleus ($N_2$). The members of the bogus cluster cannot have a coda-onset licensing relation since /r/ cannot coda-license /p/ or /m/ in (33) due to sonority hierarchy:[9] /r/ is more sonorous than /p/ or /m/.

[8] -pr- and -br- clusters are in fact branching onsets (TR clusters) in French. However, Turkish does not have branching onsets since it sets the Branching Onset Parameter OFF given in (6b). Then, there is no possibility for a branching onset on the constituent structure of Turkish. Instead coda-onset (-rp-, -mb-) and bogus clusters (-pr-, -mr-) are only possible ones.

[9] Determined by the number of elements that a segment is made of, complexity is claimed to play a crucial role the hierarchical sequencing of clusters among the languages (Harris, 1990; Backley, 2011).

(33)




Then, we adapt the *sürpriz*, *şambrel* and *ombre* from French to Turkish via the constituent structure given in (32b). Beyond that, it would actually be quite interesting to examine phonologically which of these sounds are left out and how it is determined, but we will not go into the detail for the time being as the present study aims to present the general strategies of Turkish to prevent CCCs in the simplex words. As a future project, it would be interesting to analyze the mathematics of language in reducing the consonant in CCC: e.g. In C1C2C3 (3)- Cx (1)= CC (2) cases, what should be the Cx?

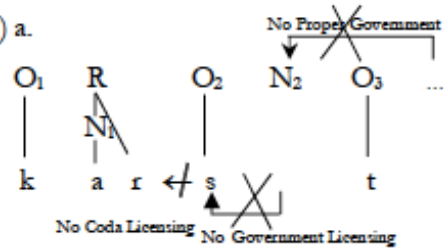
Last but not least, recall the word final CCCs in (22e-f) repeated here as (34a-b).

(34) a. ka**rst** → /kast/ 'karst' r → Ø

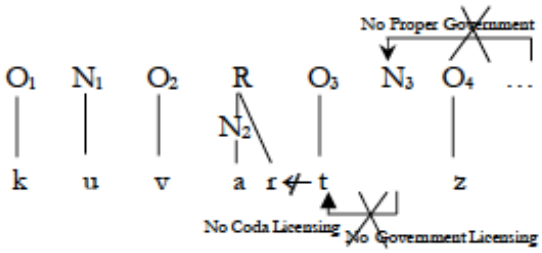
b. kuva**rtz** → /kuvarz/ 'quartz' t → Ø

Given in (34a-b), the final CCC is reduced to CC in the loanword adaptation process of Turkish. In (34a), /r/ is left out while /t/ is dismissed in (34b). Compare (35a-b) with (35c-d) in terms of the adaptation of the words with the final CCC into Turkish.

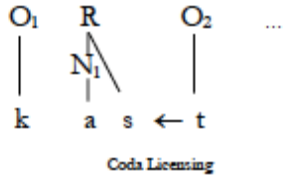
(35) a.



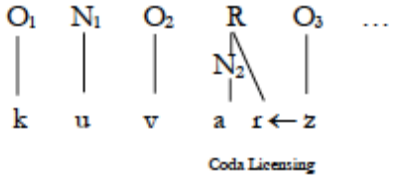

b.




c.




d.




Given in (35a), all three members of the CCC cluster cannot be adapted into Turkish due to government and licensing reasons. First, having no proper governor, $N_2$ must be realized contrary to what is observed: the output should have been /kars*ɯ*t/, which would not be a problem for Turkish since there would not be any *CCC sequence in the form. However, the word is not pronounced with an /ɯ/ in the language. Similarly, (35b) should have been interpreted as /kuvartɯz/ due to the lack of a proper governor for $N_3$, but it is not. The reason why these empty positions remain silent would be an independent research topic for future studies. However, the important point for us now is that these empty nuclei given in (35a-b) cannot be government licensors for $O_2$ and $O_3$, respectively, even if they could have been

properly governed by a full nucleus since the government licensor must be a realized nucleus in Turkish. Without the government licensing, $O_2$ (35a) and $O_3$ (35b) cannot coda-license the right branch of the rhyme. Hence, Turkish prefers to leave one of the consonants out in the adaptation process and have constituent structures in (35c-d) instead of (35a-b): the omission of /r/ which is the right branch of the Rhyme (35a) happens as in (35c) while /t/ is extracted from the structure (35b) given in (35d). As a result, the final CCC is reduced to CC while adapting the words into Turkish.[10]

Having discussed vowel appearance and consonant reducing strategies in section 3.1 and 3.2, respectively, section 3.3 will refer to another adaptation strategy of Turkish: complex storage in the lexicon.

**3.3. Lexical Storage as a Complex Form: Complex Structure for the Simplex Words?**

In sections 3.1 and 3.2, we claimed that Turkish either realizes the empty nucleus following the initial CC (CC-V-C) or leaves one of the consonants out (CC) in the adaptation of a foreign word with a CCC cluster to avoid the illicit sequences of consonants. In this section, we will analyze another group of examples with CCCs, in which neither the nucleus following the initial CC is interpreted nor one of the consonants is omitted in the adaptation process. See (36a-f).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (36) | a. po**rtf**öy | -rtf- | 'portfolio' | d. depa**rtm**an | -rtm- | 'department' |
| | b. po**rtf**olyo | -rtf- | 'portfolio' | e. reko**rtm**en | -rtm- | 'record holder' |
| | c. apa**rtm**an | -rtm- | 'apartment' | f. spo**rtm**en | -rtm- | 'sportsman' |

Given in (36a-f), we observe that three consonants are heard adjacently in the internal position of the borrowed words, a fact which appears to violate the phonotactic constraint of Turkish - no CCC in simplex structures. Similar to (36a-f), there are also some place (37a-b), animal (37c-d) and fruit names (37e) in Turkish that contain an internal CCC.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (37) | a. Bo**rçk**a | -rçk- | A town name in Turkey | d. a**rsl**an | -rsl- | 'lion' |
| | b. A**rtv**in | -rtv- | A city name in Turkey | e. böğü**rtl**en | -rtl- | 'böğürtlen' |
| | c. sı**rtl**an | -rtl- | 'hyena' | | | |

Based on the examples given in (36a-f) and (37a-e), it appears that Turkish may have CCC clusters both in the native and borrowed words as opposed to the claims for no CCC in simplex words presented in the previous sections. Therefore, a set of natural questions arises: Do these examples violate the phonotactic constraints of Turkish regarding to consonant clusters? Are they exceptional? Why does Turkish not apply its nucleus realization or consonant omission strategies to these words?

Given this complicated picture, our proposal is that the words with CCCs in (36a-f) and (37a-e) are stored in the lexicon as if they are not simplex but complex forms which are produced by regular morphology in the light of the analysis developed by Baturay-Meral (2020) for *sırtlan*-type words. Given in (38a-e), there is a certain group of words ending in – *lAn* (stem+lAn) in Turkish.

[10] See the pointed empty nucleus account of Baturay-Meral & van Oostendorp (2023) for the exceptional cases in Turkish and other languages regarding to CCC clusters.

(38) a. a**rs-*l*an** 'lion' c. sı**rt-*l*an** 'hyena' e. böğü**rt-*l*en** 'blackberry'
b. ka**p-*l*an** 'tiger' d. yı-***l*an** 'snake'

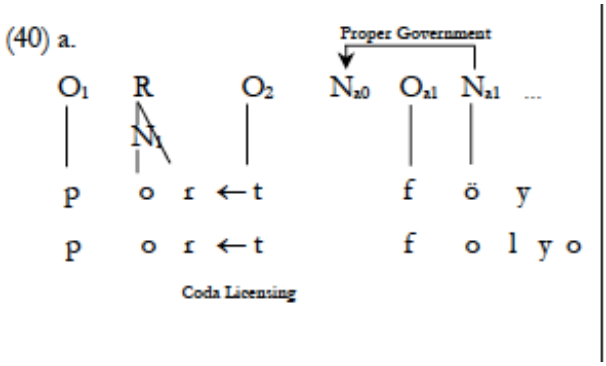
Baturay-Meral (2020, p.182) discusses the *-lAn* form as a harmonic, productive, nominal suffix in Turkish referring to a wild, predatory, big species (Clauson, 1972; Hatipoğlu, 1981; Nişanyan, 2003). Note that this form is no longer productive in the language. Accordingly, *-lAn* seems to be morphologically unanalyzable from the base it attached to at some point in time, but the CCC cluster signals the morphological complexity of the form, nevertheless. Following Pinker and Ullman (2002), Baturay-Meral (2020) claims that the forms in (38a-e) were stored in the lexicon as frozen chunks after the bases were combined with the historical suffix *-lAn* via regular morphology. Accordingly, the assumption is that the base+lAn examples (38a-e) are sent to the lexicon as a single unit after morphology and phonology apply to them. In the present section, we will apply a similar analysis for (36a-f) and (37a-b) repeated in (39a-h), respectively.

(39) a. po**rt-f**öy c. apa**rt-m**an e. reko**rt-m**en g. Bo**rçk**a
b. po**rt-f**olyo d. depa**rt-m**an f. spo**rt-m**en[11] h. A**rtv**in

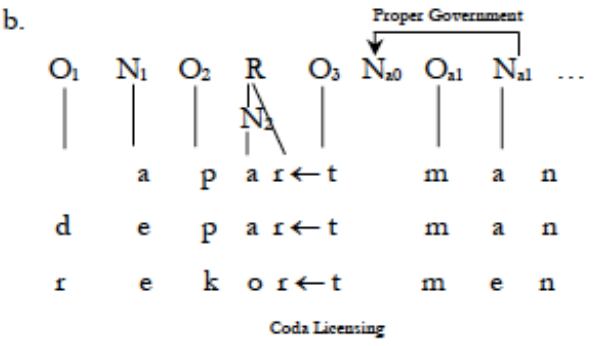
Accordingly, we argue that Turkish is not used to having CCC clusters in the simplex forms and it tends to adapt the forms with CCCs as if they are complex ones although the forms may or may not be morphologically complex in their origin. In other words, the complexity in CCCs implies the morphological complexity for Turkish: the visibility of morphological complexity is limited with the phonological signs such as CCC. For instance, the constituent structures of the forms in (39a-b) and (39c-e) are represented in (40a-b), respectively.



(40) a.




b.

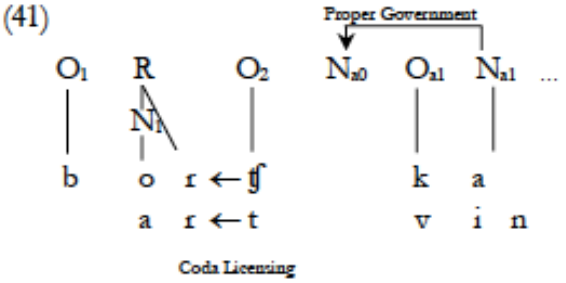



Based on the constituent structures represented in (40a-b), Turkish adapts the words with CCC clusters given in (39a-f) as if C1 and C2 belong to one morpheme ($O_1R_1O_{2...}$) while C3 is the part of another one ($N_{a0}O_{a1}N_{a1}$…). Accordingly, C2 can coda-license the complement of the rhyme as in the complex forms *kent-ler* and *denk-lik* given in (15). Then these adapted forms are sent to lexicon and stored there as unanalyzable units since there is no active morphology in these words.

A similar analysis may be proposed for *Borçka* and *Artvin*, which are originally Georgian loanwords, given in (37a-b). Consider (41) for the representation of (37a-b).

[11] The representation of *sportmen* is similar to the (40b) in terms of coda-onset clusters but the initial consonant cluster is broken with a nucleus in *sportmen* since the branching onset parameter is OFF in Turkish. See Baturay (2012) for the constituent structure of the adapted words with the initial CC.

(41)




As represented in (41), we argue that Turkish does not take *Borçka* and *Artvin* into the language as simplex forms since they also have CCCs inside.

Regarding our study, there is one point that we would like to draw attention to and this point supports our complex structure analysis: we never come across a voiced obstruent in C2 of a CCC cluster when we adapt the words with all three consonants into Turkish. This means that the forms such as **apard-man* are not observed in the language. This fact implies that Turkish takes C2 as if it is a final consonant, which cannot be a voiced non-continuant obstruent according to the devoicing nature of the language.

## 4. CONCLUSION

The present study discussed the so-called CCC clusters in Turkish whose existence implies a morphologically complex structure rather than a simplex one, hence CCC is not permitted in Turkish simplex words. However, there are still several foreign words that appear to be adapted to Turkish with medial (42a-d), (42g-h), and final (42e-f) CCC clusters.



| | | | | | | |
|---|---|---|---|---|---|---|
| (42) | a. bandrol | -ndr- | 'banderol' | e. karst | -rst- | 'karst' |
| | b. ultra | -ltr- | 'ultra' | f. kuvartz | -rtz- | 'quartz' |
| | c. sürpriz | -rpr- | 'surprise' | g. portföy | -rtf- | 'portfolio' |
| | d. semptom | -mpt- | 'symptom' | h. apartman | -rtm- | 'apartment' |

For the examples above, we have provided constituent structure analyses and claimed that CCC clusters are only illusion in Turkish in that there are no three adjacent CCCs in simplex words even in the adapted ones. CCCs in simplex words only appear orthographically and they can be pronounced by excessively careful reading in most of the cases (42a-f). Otherwise, it implies a complex storage (42g-h). Accordingly, we developed the argument that Turkish has three fundamental strategies that are presented in (43a–c) for the purpose of avoiding CCCs while adapting the foreign words into the language.

(43) a. Vowel appearance after CC: ba**ndr**ol → /ba**ndɯr**ol/

b. Reducing the consonants: se**mpt**om → /se**mt**om/

c. Lexical storage as a complex form: po**rtf**öy → po**rt-f**öy

Turkish favors realizing the nucleus immediately following the initial CC as in /bandɯrol/ as the first strategy (43a). The second one employed by Turkish is the conversion of words with the CCC clusters to CC ones as in the case of /semtom/ (43b). The third alternative is the storage of some CCC-adapted words in the lexicon as though they had a complex structure *port-föy* (43c), where the consonants seem to be the parts of different morphemes.

It is also noteworthy to indicate that the absence or presence of proper government in CCC cluster instances present additional implications on the template account developed in Baturay-Meral (2020) for the phonology-morphology interface. According to the author, the bases and productive suffixes are stored in the lexicon with their own unique constituent structure, which are identifiable by phonology. According to our analysis on the adapted words with CCC, the presence of morphological complexity is crucial in terms of phonological licensing relations inside the words. When there is a morphologically complex form, the suffixal nucleus can be properly governed and hence the silence of an internal nuclear position following CC (/denk-lik/ 'equivalance') is possible. In simplex forms such as *Samandıra*, 'a place name', on the other hand, proper government is blocked even if there is a potential proper governor, and hence a vowel must be interpreted in the nucleus after C2 due to government licensing (not */samandra/ but /samandɯra/ 'a place name'). The fact that the government and licensing relations are constructed differently in simplex and complex constructions, which were discussed above regarding the adaptation of foreign words with CCCs into Turkish, supports the claim of Baturay-Meral (2020) that phonology is able to recognize the affix-base distinction and apply government and licensing processes accordingly.

The remaining point of the study which may be exciting to investigate as a future project is about the left-out consonants in the adaptation process as the second strategy. Are the omitted consonants decided according to sonority level, their elemental composition, their position on the constituent structure or the phonological characteristics of the group it forms with other consonants?

Another point that will worth to study in the future is the words with the forms *-man* and *-men* in terms of CCC clusters. Note that the orthographic form of *apartman* was once *apartıman* in Turkish similar to *kompartıman* 'compartment'. There are still some buildings in some regions of İstanbul such as Gümüşuyu, Taksim and Harbiye where the form *apartıman* is used on their signboards: e.g. *Daire Apartımanı* 'Daire Apartment'. The word *apartman* is borrowed from French, which is pronounced with a schwa in the original language after the C2 *appartement* /apaʁtəmɑ̃/. It seems that the word was adapted to Turkish with a realized nucleus in parallel with its French origin, which is also in obedience with the phonotactic constraint of Turkish: no *CCC in simplex forms. However, it developed as *apartman* both in orthography and pronunciation. One possible reason for this change may be the other borrowed words ending with -man such as *departman* 'department', which may lead Turkish to realize *-man* part as a different morpheme. Note that these forms are indeed complex forms (via suffixation as in the case of French -man or compounding as in the case of English -man) in the original language. A similar argument may be valid for the borrowed words ending in *-man*/*-men* such as *sportmen* and *rekortmen*: i.e. statistically, the presence of *-man*/*-men* on some other words may have helped the language to analyze it as an affix *öğret-men* 'teacher', *say-man* 'bookkeeper', *kamera-man* 'cameraman' etc. Nevertheless, all these assumptions need further investigation as an interesting topic of future study.

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