# دراسة مقارنة لعملية إدغام مخارج الحروف في اللغتين الإنجليزية والعربية

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**الملخص**

تبحث الدراسة الحالية في عملية إدغام مخارج الحروف (Place Assimilation) باللغتين العربية السورية والإنجليزية في إطار Optimiality Theory التي اقترحها برنس و سمولنسكي (1993). في البداية ، سيتم التركيز على ثلاث نقاط مهمة تتعلق بهذه العملية ؛ آليات إدغام مخارج الحروف والمحفزات (triggers) والأهداف المحتملة لهذه العملية (targets) ، والاتجاه الذي تتخذه هذه العملية عادة. يبدو أن عملية الإدغام في كلتا اللغتين تستهدف الحروف الساكنة السنخية /n, t, d/ داخل الكلمات و بين كلمتين . ستظهر الدراسة أن تصنيف قوانين التوافق (agreement constraints ) فوق قوانين الالتزام بالأصل (faithfulness constraints) سيضمن بالتأكيد توافق اثنين من الحروف الساكنة المتجاورة من حيث مخارج الحروف. فيما يتعلق بالإدغام، سيظهر أن الأصوات الحلقية /k/ في اللغة العربية السورية لها تأثير أكبر على الأصوات السنخية /n, t, d/ من الأصوات الشفوية /b/. لكي نكون أكثر تحديدًا ، تؤدي الأصوات الحلقية إلى إدغام كل من الصوت الأنفي /n/ والصوت الإنفجاري السنخي /t,d/ . من ناحية أخرى ، تؤدي الأصوات الشفوية /b/ إلى إدغام الصوت الأنفي /n/ فقط. في اللغة الإنجليزية ، على الرغم من ذلك ، فإن كلا من الأصوات الحلقية /k,g/ والأصوات الشفوية /p,b/ لها تأثير على الأصوات السنخية /n, t, d/. سيُقال إن الأصوات الإحتكاكية /s,ʃ/ في كلتا اللغتين أقل احتمالًا لأن يتم إدغامها مقارنة مع الحروف الساكنة الأخرى. تم توثيق حالتين باللغتين العربية السورية والإنجليزية و هي إدغام /s/ و /z/ إلى /ʃ/ و /ʧ/على التوالي.

**الكلمات المفتاحية**: Optimality Theory , الإدغام، ترتيب القوانين ، الخيار الثابت ، الخيار الأفضل ، الأصوات الحلقية ، الأصوات الشفوية ، الأصوات السنخية.

# Place Assimilation: A Contrastive Study of English and Arabic

**Abstract**

The present study investigates the process of place assimilation in Syrian Arabic and English in the framework of Optimality Theory proposed by Prince and Smolensky (1993). Initially, three important points related to this process will be investigated; the mechanisms of place assimilation, the potential triggers and targets of this process, and the direction this process usually takes. The process of place assimilation in both languages seems to target alveolar consonants within words and across word boundaries. It will be shown that ranking markedness constraints above faithfulness constraints will certainly ensure that two neighbouring consonants agree in terms of place of articulation.

In terms of place assimilation, it will be shown that dorsals in Syrian Arabic have greater influence on coronals than labials do. To be more specific, dorsals trigger place assimilation of both coronal nasals and coronal stops. Labials, on the other hand, trigger place assimilation of coronal nasals only. In English, however, both dorsals and labials have influence on coronals (nasals and stops).

It will be argued that fricatives in both languages are even less likely to be assimilated in place of articulation to other consonants. Two cases are attested in Syrian Arabic and English: /s/ and /z/ assimilate in place of articulation to /Σ/ and /**Z**/, respectively.

**Key words:** Optimality theory, place assimilation, constraints ranking, faithful candidate, the winning candidate, dorsal, labial, coronal.

## 1 Introduction

Assimilation is one of the most prominent phenomena attested in connected speech. This process has been recorded to take place in many languages of the world such as English (Lass 1984, Hawkins 1984 and Roca and Johnson 1999, among others), German (Kohler 1998 and Boase-Beier and Lodge 2003), Spanish (Hualde 2005 and Pin◌ͫeros 2006), and Arabic (Cowell 1964, Abu-Salim 1988, Qafisheh 1977, Teifour 1997 and Watson 2002, among others). To get started, let us discuss some points associated with this process.

A clear and precise definition of assimilation comes from Hawkins (1984: 184) who argues that "assimilation takes place when one sound changes its character in order to become more like a neighboring sound". This may occur within words, e.g. *include* → [◌̼**ŋ**.**k**lu:d] or across word boundaries, e.g. *ten balls* → [te**m** **b**O:lz]. In terms of direction, assimilation can be regressive (anticipatory) in which a phoneme changes under the influence of the following phoneme; i.e., right to left, as in the above-mentioned examples. It can also be progressive (perseverative) where a phoneme is affected by a preceding phoneme; i.e. left to right as in [b◌̪g] + *-s* → [b◌̪gz]. There is still one case in which assimilation works in both directions at the same time. This is usually referred to as coalescent or fusional assimilation[1] e.g. did you → [d◌̼**dZ**u]. Furthermore, linguists refer to two other types of assimilation - complete and partial. Complete assimilation results in an identical geminate consonant cluster, e.g. *fat cat* → [f◌̪**k** **k**◌̪t]. Partial assimilation, on the other hand, produces consonant sequences which are not identical, e.g. *that boy* → [Δ{**p** **b**O◌̼].

Languages manifest a wide range of place assimilation, in which a phoneme becomes more like its neighbour in terms of place of articulation (henceforth, POA assimilation), e.g. *right back* → [raI**p** **b**{k]. If the influence is in the manner these phonemes are produced, we have assimilation in manner of articulation (henceforth, MOA assimilation), e.g. read this → [ri:Δ Δ◌̼s]. The final type of assimilation concerns voicing, e.g. *dog+-s (plural)* → [dΘ**gz**] (voicing) or five towns → [faI**f** **t**a◌̟nz] (devoicing).

## 2 The Mechanism of POA Assimilation

[1] Sometimes, it is called reciprocal assimilation, as indicated by Collins and Mees (2003).

POA◌ assimilation occurs when a segment adopts the place of articulation of an adjacent segment. The outcome of this process is either a homorganic (but not identical) consonant cluster as in ('in[2]+ possible' being realized as [✋mp⑨s✋bl] 'impossible'), or identical segments as in (in + mature being realized as [✋m≅tΣu≅] 'immature').[3] Given this mechanism, it can be argued that the coronal nasal /n/ in the two cases loses its place feature [coronal] to adopt that of the following segment, [labial]. Consequently, it is realised as the labial nasal [m]. POA assimilation minimizes the differences between two adjacent consonants in a way that makes them partially or totally similar in point of articulation.

## 3 Triggers and Targets of POA Assimilation

Consonants are generally classified into four groups in terms of place of articulation: *Labials* (bilabials and labio-dentals), *Coronals* (dentals, inter-dentals, alveolars and alveo-palatals), *Dorsals* (velars and uvulars), and *Gutturals*[4] (pharyngeals and glottals). In terms of manner of articulation, consonants are divided into *Continuants* (laterals, rhotics, and fricatives), *Stops* and *Nasals*. The behaviour of these consonants will be addressed with reference to their perceptual salience.

According to the Production Hypothesis introduced in Kohler (1991), Byrd (1994), and Jun (1995), among others, "Speakers make more effort to preserve the articulation of speech sounds with relatively more powerful acoustic cues" (Jun 1995: 122). In other words, speech sounds with more salient acoustic cues are more likely to surface intact. Other speech sounds with less salient acoustic cues, however, are more anticipated to undergo a phonological change.

According to Jun (1995), the acoustic cues of consonants fall into two types: internal and transitional. Internal cues can be detected during the acoustic interval associated with the consonantal constriction. Transitional cues, on the other hand, are usually detected during the time

[2] *In-* is believed to be the underlying form for this negation prefix since it surfaces as *in-* before vowel-initial words as in [✋n≅p□≅Yp□✋≅t] 'inappropriate' or [✋n{d✋kw≅t] 'inadequate'.

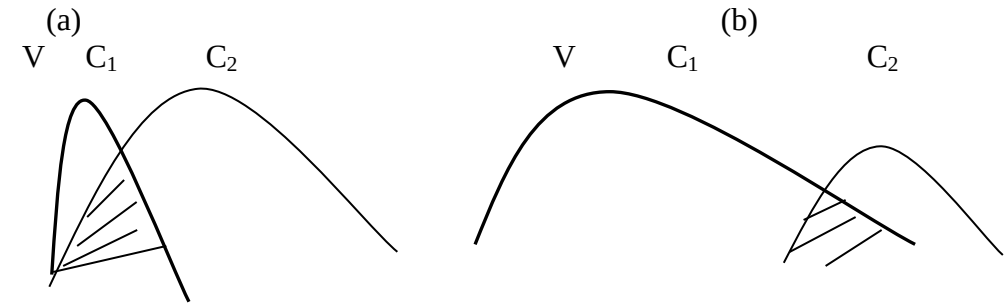
[3] The first case is known as partial assimilation where the two consonants only agree in the place feature, whereas the second is total (or categorical) assimilation in which the two segments share all place, manner and voice features. In the second case, total assimilation is followed by a process of degemination.

[4] Guttural sounds are believed to have the place feature [pharyngeal] as indicated by McCarthy (1994).

of coarticulation between the given consonant and the adjacent segments (CV, VC).[5]

As far as place features are concerned, Jun (1995) argues that unreleased dorsals and labials (in a pre-consonantal position) have more salient perceptual cues than those of unreleased coronals. According to Jun, the explanation for this tendency comes from the fact that the tongue-tip gestures associated with the production of coronal sounds are rapid. This, in fact, results in rapid transitional cues. On the other hand, the lip gestures, as well as the tongue dorsum gestures associated with the production of labials and dorsals respectively, are slow. This yields long transitional cues. To see the influence of rapid and slow gestures on the articulatory overlap, let us have a look at the following.

(1) -




Rapid $C_1$ gesture Slow $C_1$ gesture

As can been seen, the rapid gesture of $C_1$ in (a) triggers a bigger articulatory overlap with $C_2$. Accordingly, the $VC_1$ transitional cue will be affected not only by $C_1$ but also $C_2$, as is the case with coronal sounds whose short gestures are concealed. In (b), however, the slow gesture of $C_1$ only allows a smaller articulatory overlap with $C_2$. That is to say, the $VC_1$ transitional cue is mainly influenced by $C_1$, as is the case with dorsal and labial sounds whose long gestures are more distinguishable. In brief, consonants with long gestures (like labials and dorsals) are less likely to be affected by other consonants in a phonological process like POA assimilation. Consonants with short gestures (like coronals), however, are the optimal targets of this process.

Related to this discussion is the distinction made between dorsals and labials in terms of their perceptual salience. It has been argued that

[5]In a pre-consonantal position, consonants lack their salient transitional cues, namely (CV). Thus, they are left with the relatively weak transitional cues (VC).

dorsal sounds benefit from an additional strong cue for place of articulation resulting from the convergence of F2 and F3 of the neighbouring vowels, as indicated by Stevens (1989).[6] These formants, Stevens argues, may yield prominence in the midfrequency range which serves as a salient acoustic cue for place of articulation. Accordingly, dorsal sounds are more salient than labials. To summarise, dorsal sounds are more salient than labial sounds, which are in turn more salient than coronal sounds.

## 4 The Direction of POA Assimilation

According to Fujimura et al. (1978), Ohala (1990, 1992) and Jun (1995), most assimilation processes are regressive on the basis of perceptual salience. In a consonant cluster $C_1C_2$, $C_2$ (in pre-vocalic position) is more salient than $C_1$ (in pre-consonantal position) since it has better acoustic cues. This means that $C_2$ shows more resistance to any change caused by a phonological process. $C_1$, on the other hand, is liable to change. Related to this point is the fact that that a consonant in the onset position is more likely to resist any phonological change. The segment in the coda position, however, is more liable to be altered. Scholz (2003: 166) argues that "Onset constituents are more stable and less susceptible for alternations like assimilation to take place than coda constituents".[7] With this fact, the analysis for regressive place assimilation has been further supported.

## 5 Optimality Theory Framework

Optimality Theory (henceforth, OT) is a constraint-based theory proposed by Prince and Smolensky (1993). This linguistic model postulates that Universal Grammar incorporates a set of universal constraints on the well-formedness of phonological structures. In other words, the criteria which govern representational well-formedness are the same cross-linguistically. What distinguishes a language from another is the way these criteria are prioritized, that is, how these universal constraints are ranked with respect to each other.

In OT, every phonological structure has two forms (representations): an *input* (underlying) form and an *output* (surface) form. OT operates on these forms through two major functions: the

[6] F3 is associated with the degree of lip rounding.

[7] McCarthy (2007) accounts for the different behaviour of the onset and the coda regarding assimilation and deletion. He believes that a consonant should lose its place features by debuccalization before it can assimilate or delete. This, he argues, only takes place in the coda position. Consequently, the consonants in the coda are more anticipated to undergo POA assimilation than those in the onset.

GENERATOR (Gen) produces an indefinite number of potential candidates (outputs) and the EVALUATOR (Eval) evaluates these candidates via a set of ranked constraints so as to eventually recognize the optimal candidate. This is shown in the following flowchart as proposed by McCarthy (2002).


### 5.1 Richness of the Base

This hypothesis has been used to describe the status of the lexicon as being unrestricted. This 'unrestricted' nature of the lexicon is summarized in McCarthy (2002: 70) as follows: "[Richness of the base] says that there are no language-particular restrictions on the input, no linguistically significant generalizations about the lexicon, no principled lexical gaps, no lexical redundancy rules, morpheme structure constraints, or similar devices". Given this, the input level is immune to constraints. However, it is at the output level that constraints become active.

Constraints in OT fall into two main categories: markedness and faithfulness constraints. The constraints in each category may conflict with one another as well as with those in the other category. Let us illustrate these categories in turn.

### 5.2 Markedness Constraints

Markedness constraints evaluate the well-formedness of outputs. They ensure that marked structures (whether segmental, syllabic or metrical) are avoided in the surface forms. Accordingly, a violation of a markedness constraint yields a less natural structure in the output. Here are some examples of these constraints.[8]

- *** [☠**

No word-initial velar nasal.

- **ONSET**

Syllables must have onsets

- ***$\alpha_{\mu\mu\mu}$**

Trimoraic syllables are barred

- *** CLASH**

[8]These constraints can be said positively (as ONSET) or negatively (as *[☠ and *CLASH...etc.)

Adjacent stressed syllables are prohibited.

### 5.3 Faithfulness Constraints

Unlike markedness constraints, these constraints check the discrepancy between the input and the output. They penalize overparsing and underparsing as argued by Prince and Smolensky (1993).[9]

- **FILL**

Syllable positions must be filled with underlying segments.

- **PARSE**

Underlying segments must be parsed into syllable structure.

Let us now consider the way OT represents this conflict between markedness and faithfulness constraints. Typically, the language specific ranking of constraints and the way in which the optimal candidate is chosen are depicted by the following tableau:

| Input | CONS 1 | CONS 2 | CONS 3 |
|---|---|---|---|
| Candidate A | *! | | * |
| Candidate B | | *! | |
| ☞ Candidate C | | | * |

To understand this tableau, we need to refer to some important points to be considered carefully. Constraints are ranked left to right. Candidates, however, are listed in the leftmost column. Here are some notational conventions used in OT:

- The winning (optimal) candidate is given the sign {☞}
- Constraint violation is referred to as {*}
- Fatal constraint violation is represented as {*!}[10]
- The lines between constraints are:

1. **Solid** if the ranking between these constraints is valid.[11]
2. **Dotted** if the ranking is insignificant.[12]

[9] These two terms will be soon explained when we discuss the notion of 'containment' in Prince and Smolensky (1993).

[10] Constraint violation is fatal when it makes a candidate lose out.

[11] Valid ranking entails that one constraint outranks the other.

[12] In such a case, the constraints are equally ranked.

The candidate with the fewest serious violations will be selected as the winner.

Let us now move to study vowel elision in English and Syrian Arabic and see how constraint ranking can account for this process in both languages.

## 6 POA Assimilation in Syrian Arabic

Dorsals and labials differ in terms of their effects on coronals. It has been found that dorsals in Syrian Arabic have greater influence on coronals than labials do. To be more specific, dorsals trigger POA assimilation of both coronal nasals and coronal stops. Labials, on the other hand, trigger POA assimilation of coronal nasals only. This is shown in the following:

(1)- Nasal Assimilation

a) - /ho:**n # b**e:tu/ → [ho:**m b**e:tu] "here is his house"
b) - /sa:ke**n** # fo:θ/ → [sa:ke**Φ f**o:ʔ] "he is living upstairs"
c) - /sam.ʕa:**n # k**a.la:.mak/→ [sam.ʕa:**N k**a.la:.mak] "I hear your speech"

(2) - Stop assimilation [13]
a) - /l≅bse**t # k**an.zi/ → [l≅bse**k k**an.zi] "she wore a sweater"
b) - /ʔaΞa**d** # **g**o:l/ → [ʔaΞa**g g**o:l] "he scored a goal"
c) - /sa:ʕe**d** # **b**a:na/ → [sa:ʕe**d b**a:na] "help Baana!"
d) - /hasa**d** # **b**a:sem/ → [hasa**d b**a:sem] "he envied Baasem"

(3) – Fricative assimilation
a) - /ʕa.ru:**s** # **Σ**a:.mij.je/ → [ʕa.ru:**Σ Σ**a:.mij.je] "a bride from Damascus"
b) - /Ξa:.me**s** # **Σ**a:.hed/ → [Ξa:me**Σ Σ**a:hed] "the fifth witness"
c) - /rak.ka**z** # **Z**≅h.du/ → [rak.ka**Z Z**≅h.du] "he focussed his effort"
d) - /ʕak.ka:**z** # **Z**≅d.de/ → [ʕak.ka:**Z Z**≅d.de] "my grandfather's walking stick"

In the examples (1) a-b, the coronal nasal /n/ assimilates in POA to the following labial consonants (bilabial /b/, labio-dental /f/, respectively). In

[13] The voiced dorsal stop /g/ is underlyingly absent in SyrA. It only occurs in words borrowed from other Arabic dialects or from English as is the case for word [go:l] "goal"

the example (c), /n/ assimilates in POA to the following dorsal consonant (velar /k/) These examples reflect the idea that the less salient segments (coronal) assimilate in POA to the more salient segments (labial and dorsal).

In the examples (2) a-b, the coronal stops /t, d/ assimilate in POA to the following dorsal consonants (velar /k, g/) These examples reflect the idea that the less salient segments (coronal) assimilate in POA to the more salient segments (dorsal). However, the coronal stop fails to assimilate in POA to a following labial as shown in the examples (2) c-d.

In the examples (3) a-d, all the fricatives associated with POA assimilation are coronals. The difference between them lies in the value of the dependent place feature, namely [anterior]. Explicitly, /s/ and /z/ are [0anterior], whereas /Σ/ and /**Z**/ are [-anterior].[14] With this in mind, we may say that the less marked coronal fricatives characterised with [0anterior] are more likely to assimilate in POA to the more marked coronal fricatives holding the feature [-anterior].[15]

## 7 POA Assimilation in English

In English, both dorsals and labials target coronals in POA assimilation as expected. Specifically, /n/ assimilates in POA to a following bilabial consonant /b/ as in (4)-a, to a following labio-dental consonant /f/ as in (4)-b, and to a following dorsal consonant /k/ as in (4)-c.

(4)- Nasal Assimilation

| Input | | Output | Glossary |
|---|---|---|---|
| a) - /te**n # b**ks/ | → | [te**m b**ks] | "ten books" |
| b) - /**n** # fkt/ | → | [**Φ f**kt] | "in fact" |
| c) - /pe**n # k**es/ | → | [peNkes] | "pen case" |

Unlike in Syrian Arabic, coronal stops {t, d} assimilate in POA to a following labial or dorsal as in (5) a-d.

(5) - Stop assimilation [16]

a) - /f**t # k**d/ → [f**k k**d] "fat kid"

[14] In their model of contrastive specification, Avery and Rice (1988) argue that coronals are usually unmarked. That is to say, [coronal] is absent underlyingly. However, a coronal gets a specified coronal articulator when it is contrasted minimally with another coronal such as {s and Σ} & {z and **Z**}.

[15] This also predicts that /s/ and /z/ cannot target /Σ/ and /**Z**/, respectively, in POA assimilation simply because they do not have a place feature to spread.

[16] The voiced dorsal stop /g/ is underlyingly absent in SyrA. It only occurs in words borrowed from other Arabic dialects or from English as is the case for word [go:l] "goal"

b) - /he**d** # **g**o:l/ → [he**g** **g**o:l] "head goal"
c) - /f✞t**b**👐:l/ → [f✞p**b**👐:l] "football"
d) - /red # b✞l / → [rebb✞l] "red bull"

In (6) a-b, the coronal fricatives {s, z} assimilate in POA to {♠, ☪} in a way similar to the data in Syrian Arabic.

(6) – Fricative assimilation
a) - /👎✋**s** # **Σ**u:/ → [👎✋**Σ** **Σ**u:] "this shoe"
b) - /👎★✞z # j✋★z/ → [👎★✞☪ j✋★z] "the fifth witness"
Roach (1998:125)

## 8 Optimality Theoretic Account of POA Assimilation

It has been argued that speech production is attained by reconciling two needs: the need to have easy articulation by the speaker on the one hand, and the need to have easy perception by the listener, on the other hand (Lass 1984, Hura et al. 1992, Mohanan 1993, Jun 1995 and Scholz 2003, among others). To start with, "ease of articulation" entails that the speaker assimilates or deletes in his/her speech in a way that minimizes the exerted effort while pronouncing. This articulatory need is achieved by making two consonants in a consonant cluster more similar in terms of POA. The best constraint to play that role is that of agreement as follows.

**AGREE (place)**

Adjacent output consonants must agree in place features.

On the other hand, the idea of ease of perception is met by keeping the contrast between the two consonants. To put it differently, adjacent consonants are expected to remain faithful to the underlying form in terms of POA. On this basis, the best constraint to satisfy this requirement belongs to the faithfulness family of constraints proposed by McCarthy and Prince (1995) as follows.

**IDENT-IO (place)**

An output consonant and its input correspondent must have identical place features.

Basically, ranking AGREE (place) above IDENT-IO (place) ensures that place assimilation occurs. To reflect the regressive nature of assimilation, we can use the faithfulness constraint that preserves the second consonant in a consonant cluster between the input and output as follows.

**C2-IDENT-IO**

The output of the second consonant in a consonant cluster and its input correspondent must have identical features.[17]

Importantly, the constraint C2-IDENT-IO does not conflict with the agreement constraint. Consequently, they are equally ranked.

**8.1 An OT account of nasal assimilation**

In this section, nasal assimilation to a following labial or dorsal will be addressed in both languages using these constraints. Take, for instance, (1)-a:

The underlying form is /ho:**n # b**e:tu/ **,** and we follow the same ranking.

AGREE (place), C2-IDENT-IO >> IDENT-IO (place)

The following tableau demonstrates this.

(1) -

| /ho:**n** # **be:t**on/ | AGREE (place) | C2-IDENT-IO | IDENT-IO (place) |
|---|---|---|---|
| a- ho:**n be:t**on | *! | | |
| b- ☞ ho:**m be:t**on | | | * |
| c- ho:**n ne:t**on | | *! | * |

Candidate (b) is chosen as the winner because it incurs a minor violation of a low ranked constraint, IDENT-IO (place). Candidates (a) and (c) lose out due to their fatal violations of the high ranked constraints; AGREE (place) and C2-IDENT-IO, respectively.

With a similar line of analysis, we can account for /n/ assimilation to a following dorsal in (4)-c.

The underlying form is /pe**n # k**e✋s/ and we follow the same ranking.

[17] This constraint will be used with all cases of assimilation (place, manner, and voice) and pharyngealization to capture the regressive nature of these processes, as attested in SyrA and JA.

AGREE (place), C2-IDENT-IO >> IDENT-IO (place)

The following tableau demonstrates this.

(2) -

| /pe**n** # **ke✋s**/ | AGREE (place) | C2-IDENT-IO | IDENT-IO (place) |
|---|---|---|---|
| a- pe**n** **ke**✋s | *! | | |
| b- ☞ peN **ke**✋s | | | * |
| c- pe**k** **ke**✋s | | *! | * |

The faithful candidate (a) fails as it incurs a violation of a top ranked constraint. Candidate (c) is also ruled out due to its fatal violation of the constraint C2-IDENT-IO. Candidate (b) wins with a minor violation of a low ranking constraint, namely IDENT-IO (place).

### 8.2 An OT account of stop assimilation

The data in Syrian Arabic show that a coronal stop fails to assimilate to a following labial stop like /b/, that is, it only assimilates to dorsal stops. In this case, we need to introduce two constraints which ensure that /t/ and /d/ retain their coronality before non-coronal sounds.[18] One might argue that this scenario alludes to the salient status of the coronal stop since it resists a phonological process. However, this proves to be wrong if we think of the inability of the coronal stop to trigger place assimilation in sequences like /k.t/ or /b.t/. Let us consider the following constraints:

**IDENT-IO $C_{[cor]}$ $C_{[dor]}$**

The coronal stop is preserved before a dorsal stop.

**IDENT-IO $C_{[cor]}$ $C_{[lab]}$**

The coronal stop is preserved before a labial stop.

[18] Such constraints are considered to be ad hoc, as it is unusual for coronals (which are less slient) to show this kind of resistance to phonological changes caused by dorsals or labials (which are more salient).

These constraints are violated if the relevant coronal stop (/t/ or /d/) assimilates in POA to the following dorsal or labial stop. Let us see how these constraints will account for the diversity between the two languages.

In Syrian Arabic, ranking IDENT-IO $C_{[cor]}$ $C_{[lab]}$ above the agreement constraint reflects the idea that the coronal stop retains its coronality before the labial stop. Ranking IDENT-IO $C_{[cor]}$ $C_{[dor]}$ below the agreement constraint suggests that the coronal stop in this dialect is more likely to assimilate in POA to a following dorsal stop. This is evident in the following ranking.

IDENT-IO $C_{[cor]}$ $C_{[lab]}$ >>AGREE (place), C2-IDENT-IO >> IDENT-IO $C_{[cor]}$ $C_{[dor]}$ >> IDENT-IO (place)

Let us consider the example in (2)-b. The underlying form is /ʔaΞa**d** # **g**o:l / and we have the following tableau.

(3) -

| /ʔaΞa**d** # **g**o:l / | IDENT-IO $C_{[cor]}$ $C_{[lab]}$ | AGREE (place) | C2-IDENT-IO | IDENT-IO $C_{[cor]}$ $C_{[dor]}$ | IDENT-IO (place) |
|---|---|---|---|---|---|
| a- /ʔaΞa**d g**o:l / | | *! | | | |
| b-☞ /ʔaΞa**g g**o:l / | | | | * | * |
| c- /ʔaΞa**d d**o:l / | | | *! | | * |

Note that the constraint IDENT-IO $C_{[cor]}$ $C_{[lab]}$ is vacuously satisfied by the three candidates. Candidates (a) and (c) violate the high ranked constraints AGREE (place) and C2-IDENT-IO, respectively. Consequently, they lose out to candidate (b) which violates a lower ranked constraint, namely IDENT-IO $C_{[cor]}$ $C_{[dor]}$.

Let us now turn to account for the failure of coronal assimilation to a labial stop in (2)-c. The input is /sa:ʕe**d** # **b**a:na/ and we follow the same ranking of constraints.

(4) -

| /sa:ʕe**d** # **b**a:na / | IDENT-IO $C_{[cor]}$ $C_{[lab]}$ | AGREE (place) | C2-IDENT-IO | IDENT-IO $C_{[cor]}$ $C_{[dor]}$ | IDENT-IO (place) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| a- ☞/sa:ʕe**d** **b**a:na / | | * | | | |
| b- /sa:ʕe**b** **b**a:na / | *! | | | | * |
| c- / sa:ʕe**d** **d**a:na / | | | * | | *! |

In the same way, the constraint IDENT-IO $C_{[cor]}$ $C_{[dor]}$ is vacuously satisfied by the three possible candidates. Candidate (b) is ruled out due to its fatal violation of the constraint IDENT-IO $C_{[cor]}$ $C_{[lab]}$, which is highly ranked in Syrian Arabic. Candidates (a) and (c) violate the constraints AGREE (place) and C2-IDENT-IO, respectively. Candidate (c) loses out to candidate (a) because it incurs an additional violation of the constraint IDENT-IO (place).

To reflect the fact that the coronal stops in English assimilate to both labial and dorsal stops, the constraints IDENT-IO $C_{[cor]}$ $C_{[dor]}$ and IDENT-IO $C_{[cor]}$ $C_{[lab]}$ are ranked below the constraint AGREE (place). Let us examine the example in (5) a, d.

The underlying forms are /f**ʧ # k**✋d/ and /red # b✞l / which surface [fʧkk✋d] and [rebb✞l] ,respectively. The constraints are as follows:

AGREE (place), C2-IDENT-IO >> IDENT-IO $C_{[cor]}$ $C_{[lab]}$ ,IDENT-IO $C_{[cor]}$ $C_{[dor]}$ >> IDENT-IO (place)

(5) -

| /fʧt# k✋d / | AGREE (place) | C2-IDENT-IO | IDENT-IO $C_{[cor]}$ $C_{[lab]}$ | IDENT-IO $C_{[cor]}$ $C_{[dor]}$ | IDENT-IO (place) |
|---|---|---|---|---|---|
| a- /fʧt k✋d/ | *! | | | | |
| b- ☞ /fʧk k✋d / | | | | * | * |
| c- /fʧt t✋d/ | | *! | | | * |

The three candidates vacuously satisfy the constraint IDENT-IO $C_{[cor]}$ $C_{[lab]}$. Candidates (a) and (c) lose out as they violate the high ranked constraints, AGREE (place) and C2-IDENT-IO respectively. Candidate (b) is the winner as it incurs a violation of a low ranked constraint.

(6) -

| /red # b✞l / | AGREE (place) | C2-IDENT-IO | IDENT-IO $C_{[cor]}$ $C_{[lab]}$ | IDENT-IO $C_{[cor]}$ $C_{[dor]}$ | IDENT-IO (place) |
|---|---|---|---|---|---|
| a- /red b✞l/ | *! | | | | |
| b- ☞ /reb b✞l / | | | * | | * |
| c- /red d✞l/ | | *! | | | * |

Candidate (b) wins with a minor violation of a low ranked constraint. Candidates (a) and (c) are ruled out due to their fatal violations of top ranked constraints, AGREE (place) and C2-IDENT-IO , respectively.

**8.3 An OT account of fricative assimilation**

As indicated earlier in section (6), both consonants involved in POA assimilation are coronals. Accordingly, we need to modify our constraints so that they capture the change in the value of the dependent place feature [anterior] as follows.

**AGREE [anterior]**

Adjacent output coronals must have the same value for the feature [anterior].

**IDENT-IO [anterior]**

An output coronal and its input correspondent must have the same value for the feature [anterior]

Let us consider the input /rak.ka**z # Z**≅h.du/ in (3)-c given the following ranking. [19]

AGREE [anterior], C2-IDENT-IO >> IDENT-IO [anterior]

The following tableau illustrates this.

(7) -

[19] Notice that we can account for similar cases using the same set of constraints , such as /n**Z**/ which surfaces as [n▯Z] and /sΣ/ which surfaces as [ΣΣ], since they only differ in the dependent place feature [anterior]

| /rak.ka**z** # **Z**≅h.du/ | AGREE [anterior] | C2-IDENT-IO | IDENT-IO [anterior] |
|---|---|---|---|
| a- rak.ka**z** **Z**≅h.du | *! | | |
| b- ☞ rak.ka**Z** **Z**≅h.du | | | * |
| c- rak.ka**z** **z**≅h.du | | *! | * |

Candidates (a) and (c) are ruled out because they violate the high ranked constraints, AGREE [anterior] and C2-IDENT-IO, respectively. With a minor violation of a low ranked constraint IDENT-IO [anterior], candidate (b) is the winner.

With a similar line of analysis, we may account for the example in (6)-a taken from Roach (2000).

The underlying form is /👎✋**s** # **Σ**u:/ and we have the same ranking of constraint:

AGREE [anterior], C2-IDENT-IO >> IDENT-IO [anterior]

(8) -

| /👎✋s #♦u:/ | AGREE [anterior] | C2-IDENT-IO | IDENT-IO [anterior] |
|---|---|---|---|
| a- 👎✋s ♦u: | *! | | |
| b- ☞ 👎✋♦ ♦u: | | | * |
| c- 👎✋s su: | | *! | * |

The faithful candidate (a) loses out as it incurs a fatal violation of the constraint AGREE [anterior] which is top ranked. Candidate (c) is also ruled out because it violates the constraint C2-IDENT-IO. Candidate (b) is the winner with a minor violation of a lower ranking constraint, namely IDENT-IO [anterior].

## 9 Conclusion

Throughout this study, I have investigated some important points about the process of POA assimilation in both Syrian Arabic and English. The two languages have shown a considerable similarity in terms of the triggers and targets of these processes. Some instances of diversity are

also attested. This is reflected in the ranking of constraints each language has manifested.

For assimilation to occur, the agreement constraint (AGREE (place) is ranked above the general faithfulness constraint IDENT-IO (place). Together with these constraints, there has been the constraint, C2-IDENT-IO which is meant to account for the regressive nature of assimilation. This is equally ranked with the agreement constraint. Consequently, we have the overall ranking of these constraints for Syrian Arabic and English.

AGREE (place), C2-IDENT-IO >> IDENT-IO (place)

A discrepancy between the two languages has been attested in coronal stop assimilation. Specifically, the coronal stop in Syrian Arabic assimilates in POA to a following dorsal stop, but not to a labial. In English, on the other hand, it assimilates to both labial and dorsal stops. This fact about the two languages is expressed with the help of the two faithfulness constraints IDENT-IO $C_{[cor]}$ $C_{[dor]}$ and IDENT-IO $C_{[cor]}$ $C_{[lab]}$.

Since Syrian Arabic allows assimilation of the coronal stop to the dorsal sound, this means that the constraint IDENT-IO $C_{[cor]}$ $C_{[dor]}$ is ranked lower than the agreement constraint. This is evident in the following ranking for Syrian Arabic data:

IDENT-IO $C_{[cor]}$ $C_{[lab]}$ >>AGREE (place), C2-IDENT-IO >> IDENT-IO $C_{[cor]}$ $C_{[dor]}$ >>IDENT-IO (place)

In English, however, the constraints IDENT-IO $C_{[cor]}$ $C_{[lab]}$ and IDENT-IO $C_{[cor]}$ $C_{[dor]}$ are ranked lower than the agreement constraint to account for the coronal stop assimilation to labial and dorsal stops as shown in the following ranking of constraints:

AGREE (place), C2-IDENT-IO >> IDENT-IO $C_{[cor]}$ $C_{[lab]}$, IDENT-IO $C_{[cor]}$ $C_{[dor]}$ >>IDENT-IO (place)

One point of similarity between Syrian Arabic and English lies in the case of coronal fricative assimilation. In both languages, /s, z/ have been found to assimilate in POA to the following /Σ, **C**/. This process has been straightforwardly accounted for with reference to the constraint AGREE [anterior] to be ranked above the faithfulness constraint. Thus, the optimal ranking for both Syrian Arabic and English is as follows. AGREE [anterior], C2-IDENT-IO >> IDENT-IO [anterior]

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