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# Alternations in Contexts of Code-mixing: Allomorphy, Suppletion and Diminutives

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**Abstract**

Arabic broken plural morphology has been given a templatic treatment with a CVCVVCVVC template suprafixed to the skeleton of the singular (McCarthy 1983, McCarthy and Prince 1990). The Prosodic Morphology Hypothesis consistent with the iambic foot and extrametricality applies in the formation of the plural and places strong restrictions on the shapes of Arabic broken plural nouns. This paper presents cases where at a first glance the formation of these stems is not only restricted to its prosodically characterized sub-domain but also inflectional morphology out of it. Within a Distributed Morphology framework, I argue that these can be accounted for with the assumption of a null NUM that conditions the allomorphy on the stem that will be inserted. The consequences of this are that morphosyntactic features in the underlying structure first define the conditions of the *minimal word* followed by mapping of its contents to the iambic foot providing evidence for the syntax-morphology interaction that feeds the phonological component.

# Alternations in Contexts of Code-mixing:
## Allomorphy, Suppletion and Diminutives

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## 1 Introduction

This paper examines data on morphosyntactic code-mixing between Sanna (also known as Cypriot Maronite Arabic; see Karyolemou 2010, Borg 1985, 1997) and Cypriot Greek as spontaneously produced and elicited from native speakers who are competent in both varieties.[1] Code-mixing in the presence of a diminutive appears with both singular and plural stems (known as 'broken plural' in (1)) (McCarthy and Prince 1990) and results in the use of a Cypriot Maronite Arabic stem followed by Cypriot Greek derivational and inflectional suffixes.[2]

(1) a. it -u -i
       hand -DIM -NEU.SG
       'little hand'

   b. *it -u -θkja
       hand -DIM -NEU.PL
       (Int. 'little hands')

   c. *ten -u -i
       hand -DIM -NEU.SG
       (Int. 'little hand')

   d. ten -u -θkja
       hand -DIM -NEU.PL
       'little hands'

An Arabic stem like *it* 'hand' is followed by the Cypriot Greek diminutive *-u* and both are followed by Cypriot Greek inflectional morphology. The puzzle here is that plural inflectional morphology in Cypriot Greek is ungrammatical with a singular stem, like *it* in (1b), but not with a plural suppletive stem, as in (1d). Unlike suppletive stems, non-suppletive Arabic stems (known as 'sound plural') allow for either singular or plural Cypriot Greek suffixes, as in the examples below.

(2) a. xank -ú -i
       mouth -DIM -NEU.SG
       'little mouth'

   b. xank -ú -θkja
       mouth -DIM -NEU.PL
       'little mouths'

This paper discusses the conditions that give (1) vs. (2) contributing to the morphosyntax of Cypriot Arabic nouns and code-mixing phenomena. I first present some basic background on the formation of nouns in Cypriot Greek and Cypriot Arabic and their distribution with the diminutive head. Then, I discuss stem allomorphy conditioned in the code-mixed cases and its relevance to theories of allomorphy.

## 2 Noun Formation and Diminutivization

Nouns in Cypriot Greek mark the singular/plural distinction with a portmanteau morpheme marking number, gender and Case that follows the root. The inflectional morphemes also traditionally act as a morphological indicator for the inflectional class of the noun (a.k.a. noun declension). As Ralli

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[1]Previous work claims that these speakers are bilingual (Newton 1964), a status that requires a more careful examination and comparison with characteristics of bilingual speech. The work here does not aim to provide an examination of data from speakers from an acquisitionist or neurolinguistic perspective that would enable a proper characterization of these speakers as such. For a definition of code-mixing, see Auer 1999 and Muysken 2000, among others.

[2]Coloring of examples here serves to help the reader distinguish between Arabic and Greek morphemes: Red color marks Cypriot Maronite Arabic and blue marks Cypriot Greek.

(2002) points out, even if both gender and inflectional class provide this classification, the two do not coincide, as for example in the nouns *anθropos*.MASC 'human' and *prooðos*.FEM 'progress' that have different gender but belong in the same noun inflectional class. Cypriot Greek, in this case, is an understudied variety of Greek and lacks a formal account of its noun system. Setting aside the need for a detailed analysis of the different noun inflectional classes in Cypriot Greek that is beyond the purposes of this paper, a description of the inflectional suffixes for the declensions is given below.

| CLASS | Nominative.Singular | Nominative.Plural | Meaning |
|---|---|---|---|
| 1.M(asculine) | áppar-os | appár-i | 'horse' |
| 1.F(eminine) | ámm-os | ámm-i | 'sand' |
| 2.M(asculine) | ppará-s | ppará-es | 'money' |
| 2.F(eminine) | tsaéra-∅ | tsaér-es | 'chair' |
| 3.N(euter) | vunó-ń | vun-á | 'mountain' |

Table 1: Cypriot Greek noun declensions

Cypriot Maronite Arabic marks the plural with *-at* for external plurals (Borg 1985) in nouns and with *-in* in adjectives in both masculine and feminine gender, as illustrated in (3). In Standard Arabic, the sound plural is systematically found only with members of proper names, derived nouns or adjectives such as participles, deverbals and diminutives and unassimilated loans (McCarthy and Prince 1990).

(3)  a.  hevan  -at
         animal -PL
         'animals'

     b.  xilv   -in
         sweet -PL
         'sweet'

A more complete description is provided in the table below for the morphology of sound and broken plurals in nouns. Cypriot Arabic marks masculine and feminine in the singular, as *-∅* and *-e,-a* correspondingly. In the plural, the suffix *-at* is used in all genders.

| SG.FEM | | PL.FEM | |
|---|---|---|---|
| korn-**e** | 'chair' | korn-**at** | 'chairs' |
| ʃam-**a** | 'candle' | ʃam-**at** | 'candles' |
| SG.MASC | | PL.MASC | |
| xank | 'mouth' | xank-**at** | 'mouths' |

Table 2: Cypriot Maronite Arabic noun inflection in sound plurals

There is a finite list of nouns that form the *broken plural* in Cypriot Arabic. This shows consonant metathesis and vowel epenthesis characteristics, as in the examples given below.

| SG.FEM | | PL.FEM | |
|---|---|---|---|
| pint | 'girl' | pnat | 'girls' |
| SG.MASC | | PL.MASC | |
| sapi | 'boy' | ʃpap | 'boys' |
| sinn | 'tooth' | snan | 'teeth' |
| it | 'hand' | ten | 'hands' |

Table 3: Cypriot Maronite Arabic broken plurals (Borg 1985)

The context where mixing includes the use of Cypriot Greek inflectional suffixes with a Cypriot Arabic stem is in the presence of the diminutive *-u*. The diminutive *-u* immediately follows the

root and precedes inflectional morphemes, such as the number/Case morpheme. In the presence of the Cypriot Greek diminutive *-u*, all noun inflectional classes can only be followed by the Cypriot Greek inflectional morphemes seen above, *-i* or *-a* in singular and *-θca* and *-es* in plural. The ability to change grammatical features of the surrounding morphemes could suggest different kinds of diminutive heads (see Steriopolo 2013 for relevant discussion).

(4)  a.  kor -u   -a  
         girl -DIM -FEM.SG  
         'girl'

      b.  kor -u   -es  
         girl -DIM -FEM.PL  
         'girls'

      c.  kut -u   -i  
         box -DIM -NEU.SG  
         'box'

      d.  kut -u   -θkja  
         box -DIM -NEU.PL  
         'boxes'

Sanna speakers who are competent in both Cypriot Greek and Cypriot Arabic have access to the derivational diminutive morphology and the inflectional suffixes and use these to form the diminutive forms of Arabic nouns as in (2), repeated below.

(5)  a.  xank -ú   -i  
         mouth -DIM -NEU.SG  
         'little mouth'

      b.  xank -ú   -θkja  
         mouth -DIM -NEU.PL  
         'little mouths'

The approach here is setting aside questions on the existence of a single grammar or two grammars following the competence of speakers in two languages. Instead, in the Cypriot Arabic grammar all of the following morphemes from the two languages can be assumed.

|  | SG.MASC | SG.FEM | PL | PL.FEM | SG.NEU | PL.NEU |
|---|---|---|---|---|---|---|
| CMA | *-∅* | *-e/-a* | *-at* |  |  |  |
| CG |  | *-a* |  | *-es* | *-i* | *-θkja* |

Table 4: Morphemes in CMA-CG noun code-mixing.

In the theoretical framework of Distributed Morphology, we can make a set of hypotheses about the distribution of these morphemes and the interaction among components of grammar: Morphology, in DM, is (a part of) the mapping from the output of a syntactic derivation characterized by morphosyntactic features to the input of phonological content (Bobaljik 2015, Embick and Noyer 2007, Harley and Noyer 1999). It consists on the one hand of a list of the syntactic atoms, used by syntax, in the construction of complex terminal nodes. Items on this list include features that project to a syntactic node (say [PLURAL]), and bundles of features that constitute a single node: for example English groups tense and agreement (person and number) under a single INFL node in the syntax. A second list, the Vocabulary, associates morphosyntactic features and their phonological exponents.

With these assumptions, the distribution of the morphemes can be predicted by assuming the following VI rule. The PLURAL is realized as *-at*, if there is no context of a diminutive which requires insertion of the Cypriot Greek plural suffix.

(6)  a.  [+PLURAL] ↔ -at  
      b.  [+PLURAL +NEUTER] ↔ *-θkja*/+DIM___

As additional evidence to the rules posited here, the presence of the Cypriot Greek diminutive *-u* cannot co-occur with the Arabic number suffix *-at*.

(7)  a.  hevan -u   -θkja  
         animal -DIM -PL  
         'little animals'

      b.  lat -u   -θkja  
         child -DIM -PL  
         'little children'

      c.  * hevan -u   -at  
           animal -DIM -PL  
           (Int. 'little animals')

      d.  * lat     -u   -at  
           child.PL -DIM -PL  
           (Int. 'little children')

The appearance of Cypriot Greek inflectional morphology following the diminutive also appears in adjectives in Cypriot Maronite Arabic. The portmanteaux morpheme that marks gender and number shows the exact same contextual restriction in code-mixing examples. The Cypriot Greek gender suffix used here is *-a* for singular feminine, while the Cypriot Arabic singular feminine suffix is *-e*. In (8c), the use of the Cypriot Arabic suffix with a Cypriot Greek diminutive is ungrammatical.

(8)    a.    xilv  -e
             sweet -FEM.SG
             'sweet'

       b.    xilv  -u    -a
             sweet -DIM -FEM.SG

       c.    *xilv -u    -e
             sweet -DIM -FEM.SG

At first glance, the generalization that appears with these cases is that the use of the Cypriot Greek number and gender morphemes is restricted to an adjacent preceding Cypriot Greek morpheme which is an environment that disallows use of the Cypriot Arabic morphemes. The question to be answered is why this ungrammaticality exists given that speakers can freely alternate between the two linguistic codes and have access to more than one available morpheme specified for gender and number. The speakers' competence in two codes, Cypriot Maronite Arabic and Cypriot Greek, is ignored by the grammatical constraints that apply in these cases exactly showing that code-mixing phenomena can be explained and predicted in a system that would otherwise explain other cases.

The description of the code-mixing cases and the specific contexts in which inflectional morphology appears can be best explained in the framework of Distributed Morphology. By considering the alternants as morphemes of a single grammatical system, we can successfully predict their distribution. The vocabulary items competing for insertion are given below for the singular neuter and masculine morphemes and the corresponding plural in nouns.
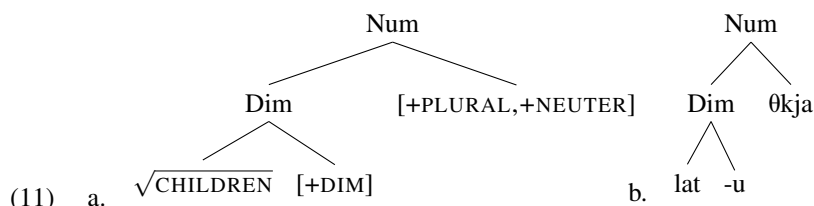
(9)    Vocabulary Items

       a.    +NEUTER, +SINGULAR ↔ -i /+DIM___

       b.    +FEMININE, +SINGULAR ↔ -a /+DIM___

       c.    +FEMININE, +PLURAL ↔ -es /+DIM___

       d.    +NEUTER, +PLURAL ↔ -θca /+DIM___

       e.    +MASCULINE, +SINGULAR ↔ -i

       f.    +FEMININE, +SINGULAR ↔ -e

       g.    +PLURAL ↔ -at

The competition for insertion at the relevant nodes is waged between the vocabulary entries above where in a given derivation only one may be inserted (a.k.a. *Uniqueness* property, see Embick 2010). Given this and the possibility of having more than one possible winner, these exponents are allomorphs that are suppletive alternants to each other as in contextual allomorphy. Similarly, the English plural node has three suppletive allomorphs, namely *-en, ∅*, and *-s*, that all act as suppletive alternants to each other (Embick 2010).
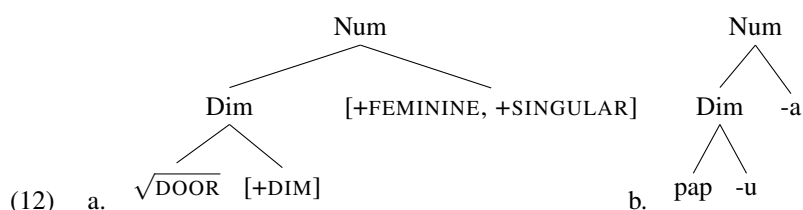
The sensitivity observed in the realization of a morpheme only in the environment where another morpheme in the same variety is used shows an adjacency requirement. It is, however, different from situations where morphemes are sensitive to each other in terms of linear adjacency and root allomorphy. Assuming the diminutive node as a functional head, then the allomorphy observed in the plural or feminine morpheme is determined by the adjacent functional head. Taking into consideration the adjacency, the conditioning environment will be restricted to the use of *-u* for insertion of the Cypriot Greek morphemes in nouns. This can be illustrated with the examples below.

(10)  a. lat    -u    -θkja
     children -DIM -NEU.PL
     'little children'

    b. pap  -u    -a
     door -DIM -FEM.SG
     'little door'

Insertion of the vocabulary items will realize the morphemes specified in the structures below.

(11)  a.

```
                    Num
                   /    \
                 Dim    [+PLURAL,+NEUTER]
                /   \
        √CHILDREN  [+DIM]
```

    b.

```
              Num
             /    \
           Dim    θkja
          /   \
        lat   -u
```

Similarly, the Cypriot Greek feminine morpheme will be inserted in the context of diminutive *-u*.

(12)  a.

```
                 Num
                /    \
              Dim    [+FEMININE, +SINGULAR]
             /   \
         √DOOR  [+DIM]
```

    b.

```
            Num
           /    \
         Dim    -a
        /   \
      pap   -u
```

By assuming the Elsewhere principle, we can predict the correct realization of the morphemes dependent on the existence of the diminutive in the structure. The use of the Elsewhere Principle in DM is to regulate use of the elsewhere item, the least specified vocabulary entry that still does not constitute a superset or nonoverlapping set of the set of morphosyntactic features on the terminal node to be expressed (Arregi and Nevins 2013). The Elsewhere Principle dictates that the elsewhere form is only to be used when a more specific form is not to be found. With contextually determined allomorphs, the more highly specified case takes priority (Bobaljik 2000). A careful examination of the distribution of the inflectional morphology of Cypriot Greek with Cypriot Arabic stems and their appearance in specific environments can easily be explained in the DM framework.

## 3  Number-conditioned Stem Allomorphy

Suppletion is modeled as contextual allomorphy; that is, although a particular feature bundle has a corresponding exponent as a context free default, an exponent specified for a more specific context takes precedence (per the Elsewhere Principle). The analysis on the interaction of the Cypriot Greek and Cypriot Arabic morphemes builds on common assumptions of contextual allomorphy in adjacent concatenation (Embick 2010) and provides us with a tool to understand this particular case of code-mixing as a more systematic operation in the grammar. A puzzle at this point concerns the cases where plural number seems to be marked twice: once with an internal plural and once with an external plural on the same noun. The pattern is not random, as it seems that the plural morpheme used as a suffix affects the exponence of the stem or that the stem defines the exponence of the suffix; in any case, it would be seen as allomorphy.

(13)  a. it    -u    -i
     hand -DIM -NEU.SG
     'little hand'

    b. *it   -u    -θkja
     hand -DIM -NEU.PL
     (Int. 'little hands')

    c. *ten -u    -i
     hand -DIM -NEU.SG
     (Int.'little hand')

    d. ten   -u    -θkja
     hand -DIM -NEU.PL
     'little hands'

This would suggest that the following data show suppletion, as already mentioned, conditioned by the Cypriot Greek number/Case suffix in the presence of a diminutive. So, the following VI rules would have to be assumed in these cases:

(14)  a. $\sqrt{hand}\leftrightarrow$-it/ ___+DIM+SG
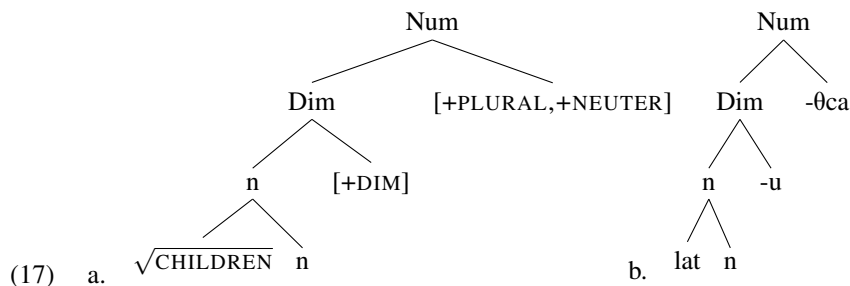      b. $\sqrt{hand}\leftrightarrow$ten/___ +DIM +PL

Some more examples are given below; use of the NEUTER SINGULAR morpheme -*i* appears with the stem *sap-*, while use of the NEUTER PLURAL morpheme -*θca* is found with the stem *ʃpap*. The suffix marked for feminine, singular, namely -*a*, appears with the feminine noun *pint*, while the plural -*θkja* appears with the broken plural stem *pnat*.

(15)  a. sap -u   -i
         boy -DIM -NEU.SG
         'little boy'

      b. *sap -u   -θkja
         boy  -DIM -NEU.PL

      c. *ʃpap -u   -i
         boy.PL -DIM -NEU.SG

      d. ʃpap   -u   -θkja
         boy.PL -DIM -NEU.PL
         'little boys'

      e. pint   -u   -a
         girl.SG -DIM -FEM.SG
         'little girl'

      f. *pint  -u   -θkja
         girl.SG -DIM -NEU.PL
         'little girls'

      g. *pnat  -u   -a
         girl.PL -DIM -FEM.SG

      h. pnat   -u   -θkja
         girl.PL -DIM -NEU.PL
         'little girls'

The problem here is that according to existing theories (Moskal 2015b, Embick 2010) the presence of overt intervening material, in this case the diminutive -*u*, should not allow either the stem or the morpheme to be allomorphic depending on each other, if allomorphy is found in adjacent positions (Embick 2010). In Embick's words, an intervening x needs to always be non-overt (even in cases where allomorphy appears as in non-cyclic heads).

(16)  ...x] W] y

This predicts that it would be impossible to assume that the number/Case morpheme triggers allomorphy on the stem as below, since a derivation built on strict locality conditions, such as cycles, would make the relevant elements invisible to each other.

(17)  a.
```
              Num
             /    \
           Dim    [+PLURAL,+NEUTER]
          /   \
         n    [+DIM]
        /  \
 √CHILDREN  n
```

b.
```
              Num
             /    \
           Dim    -θca
          /   \
         n    -u
        /  \
      lat   n
```

Bobaljik (2012) also considers structural adjacency on root allomorphy as a constraint of contextual allomorphy. As a locality condition, $\beta$ conditions allomorphy for $\alpha$ in an environment where a maximal projection does not intervene.

(18)  a. $\alpha...]X^0...\beta$
      b. $*\alpha...]XP...\beta$

The case of an intervening diminutive is expected not to trigger stem allomorphy, as also discussed by Moskal (2015b), even if number-driven suppletion is common across languages. A

category-defining n is a VI-node that creates a Spell-out domain occupied by the root. The Accessibility Domain, which refers to material accessible as a possible context for VI, includes the cyclic node and one node up. With the assumption that Vocabulary Insertion proceeds cyclically from the root outwards, the category-defining n creates a Spell-Out Domain and the Accessibility Domain, comprised by the cyclic node and one node up (i.e., #), delimits possible allomorphy triggers and only allows suppletive forms triggered by the portmanteaux #.

(19)
```
              K
           /\
          #
        /\
   √ROOT  n
```
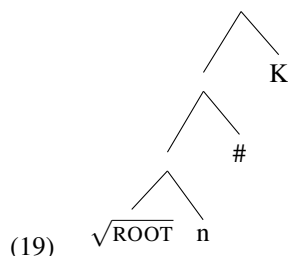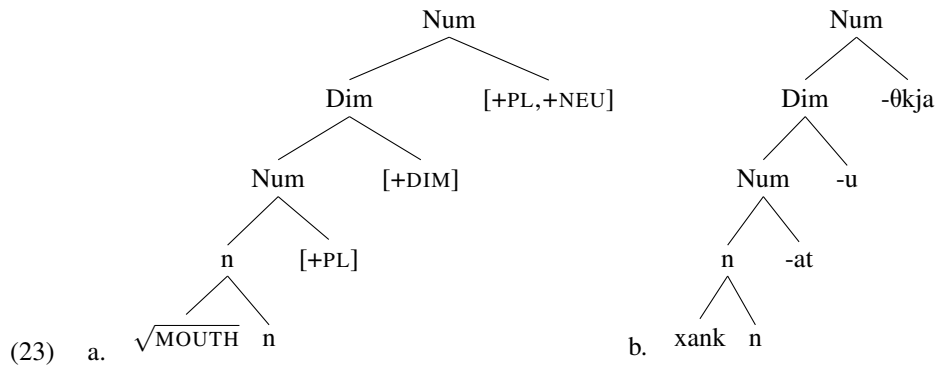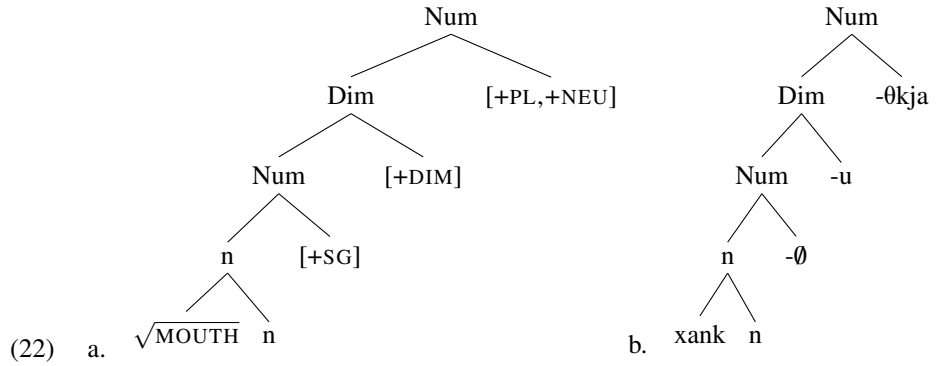
This restriction then predicts that Case-driven stem allomorphy will not be attested, unless it is the result of defective structures where structure has been removed with K being a node up from the category defining n and allowing for Case-driven suppletion. A prediction following the locality conditions in Moskal 2015b is that any intervening X which is an overt element between n and number must block root suppletion by a higher number morpheme that is no longer one node up from category *n*. Blocking cases as consequences of such strict locality conditions disallow suppletive allomorphy triggering across intervening nodes, such as those discussed in Arregi and Nevins 2014. If we adopt these systems, then the Cypriot Arabic-Greek code-mixing examples are counter-examples to the adjacency requirement and the strict locality conditions (see also Merchant 2015 for related discussion).

This is indeed problematic to existent theories, if no other morpheme can be identified as triggering the allomorphy observed on the root. The double number marking observed in code-mixing nouns provides a possible solution to the problem: the plural morpheme *-at* is acceptable in non-suppletive roots, suggesting the availability of a number projection (see also Ritter 1992) at that position conditioning an environment for root allomorphy in nouns that allow it.

(20)  a.  ta          xank  (-at) -ú    -θkja
          the.NEU.PL mouth -PL  -DIM -NEU.PL
          'little mouths'

      b.  to          xank  (-at) -ú    -i
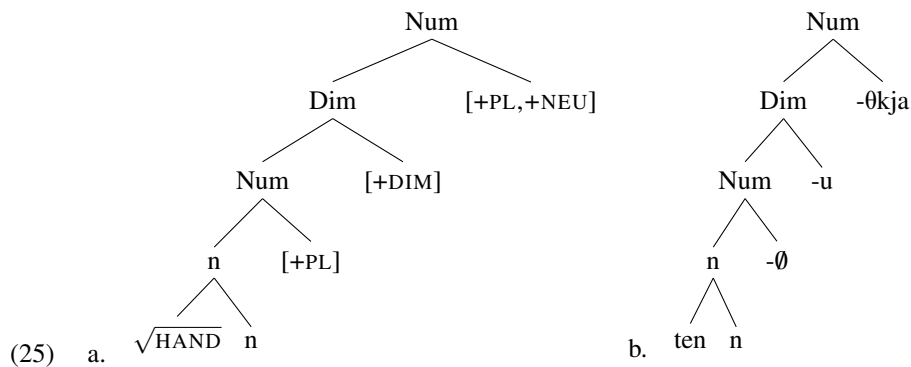          the.NEU.SG mouth -PL  -DIM -NEU.SG
          'little mouth'

(21)  a.  ʃam   (-at) -u   -θkja          c.  ʃam   (-at) -u   -i
          candle -PL  -DIM -NEU.PL            candle -PL  -DIM -NEU.SG

      b.  ʃam   (-at) -u   -es            d.  ʃam   (-at) -u   -a
          candle -PL  -DIM -FEM.PL            candle -PL  -DIM -FEM.SG
          'little candles'                    'little candle'

These data show the existence of a NUM head adjacent to Arabic stem in code-mixing cases, while the Cypriot Greek portmanteau suffix creates either a plural-of-plural or a singular-of-plural construction. The head closer to the stem where the number feature is available conditions stem suppletion since at the point where the stem undergoes VI, number is local to govern suppletion. When PLURAL is merged, the domain n is spelled out as its complement, where VI applies at the stem. VI proceeds cyclically from the root outward (Bobaljik 2000, Embick 2010, Moskal 2015a). Given these data, we can posit the following underlying structure:

(22)  a.

```
              Num
             /    \
           Dim    [+PL,+NEU]
          /   \
        Num   [+DIM]
       /   \
      n    [+SG]
     /  \
  √MOUTH  n
```

b.

```
              Num
             /    \
           Dim    -θkja
          /   \
        Num    -u
       /   \
      n    -∅
     /  \
  xank   n
```

(23)  a.

```
              Num
             /    \
           Dim    [+PL,+NEU]
          /   \
        Num   [+DIM]
       /   \
      n    [+PL]
     /  \
  √MOUTH  n
```

b.

```
              Num
             /    \
           Dim    -θkja
          /   \
        Num    -u
       /   \
      n    -at
     /  \
  xank   n
```

The availability of a NUM head, realized as *-at*, adjacent to the root in the code-mixed cases gives an interesting twist to the problem initially presented. With the assumption of this structure being available to the speakers, DM provides us with the tools to assume that a zero PLURAL morpheme is realized in cases of broken plurals given lexical conditioning. I propose that in (13d), repeated below, number is realized as zero, but conditions stem allomorphy, namely *ten*, in a local domain.

(24)  a.  *ten  -u     -i
          hand -DIM -NEU.SG
          (Int.'little hand')

      b.  ten   -u     -θkja
          hand -DIM -NEU.PL
          'little hands'

(25)  a.

```
              Num
             /    \
           Dim    [+PL,+NEU]
          /   \
        Num   [+DIM]
       /   \
      n    [+PL]
     /  \
  √HAND   n
```

b.

```
              Num
             /    \
           Dim    -θkja
          /   \
        Num    -u
       /   \
      n    -∅
     /  \
   ten   n
```

This requires positing the following VI rules:

(26)  a.  [+PLURAL] ↔ ∅ / √GIRL, BOY... ___+DIM
      b.  [+PLURAL] ↔ -at

The same assumption can be made for the realization of singular number without any lexical conditioning for particular stems.

(27)  $[+\text{SINGULAR}] \leftrightarrow \emptyset / \underline{\quad} + \text{DIM}$

This leaves one last question: While this analysis can predict number-driven stem suppletion in a local configuration (Moskal 2015b), the ungrammaticality of the following remains a puzzle.

(28)  a.  *it  -u  -θkja          b.  *ten  -u  -i
          hand -DIM -NEU.PL            hand -DIM -NEU.SG
          (Int. 'little hands')        (Int. 'little hand')

If the stem form is conditioned by a local NumP, why is it the case that particular suffixes in Cypriot Greek are required? A possible explanation of these facts could be that the Cypriot Greek suffix depends on the phonological content of the stem, which in a cyclic derivation is already available to it. If the derivation contains an *it*, then *-i* is inserted; if it contains a *ten* stem, then *-θkja* is inserted. The Cypriot Greek suffixes appear to be independent in non-suppletive cases in terms of number realization. This exactly shows that the lower Number head realizing *-at* does not help explain the ungrammaticality of (28).

(29)  ʃam  (-at) -u  -i
      candle -PL  -DIM -NEU.SG

Deletion of features with the assumption of Impoverishment seems to be the most plausible explanation here, where singular features or plural features of the Cypriot Greek suffix are deleted according to the spelled-out form of the stem. Therefore, realization of the number/Case suffix depends on the phonological content already provided in the derivation. For reasons of space, I leave this question to future work investigating more code-mixing dependencies and their interaction with functional elements.

## 4 Conclusion

Cases of suppletive stems that *prima facie* seem to be conditioned by a non-adjacent trigger are not necessarily true instances of long-distance allomorphy conditioning, with a more careful examination of the facts. Still, the discussion pursued here highlights the important aspects of allomorphy in context that may be subject to locality constraints and acts as a tool for a theoretical direction towards phenomena of code-mixing.

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