# On the structure of sound and broken plurals in Moroccan Arabic

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In Moroccan Arabic (henceforth MA), like in Classical Arabic (henceforth CA), certain nouns display two plural forms: For instance MA singular *tˤəsˤwera* 'photo' leads to plurals *tˤsˤawər* and *tˤəsˤwerat*. Likewise CA singular *faʔr* 'mouse' has plurals *fiʔara* and *fiʔran*. Morphologically speaking, these are genuine plurals referring to so-called broken and sound plurals or internal and external plurals. From a semantic perspective, however, a crucial difference arises, at least in the case of MA: *tˤəsˤwerat* indicates a definite number, usually occurring with numerals, whereas *tˤsˤawər* has a collective reading. The examples in (1) illustrate the situation:

(1) a. mmul *ttˤsˤawər*

   owner det-photo.F.PL

   'photographer'

  b. ʒuʒ *tˤəsˤwerat*

   two photo-F.PL

   'two photos'

  Plural formations are well documented in the literature on Arabic. The reader is referred to Hammond (1988), Idrissi (1997), Kihm (2003, 2006), McCarthy & Prince (1990) Ratcliffe (1997), Wright (2004), among others. In this preliminary study, we focus on the structural location of number in MA. The aim is to show that the empirical contrast between internal and external plurals can be accounted for by positing that the first are derived from an *n* head and the second from a *Num* head. External evidence in favour of this analysis is drawn from the phenomenon of emphasis spread. It will be argued that the emphatic coronals spread their feature to the neighbouring segments within the *nP* domain. That is to say, the internal plurals containing an emphatic consonant will be entirely emphaticized, while the external plurals will be affected only partially.

## 1. Number in Moroccan Arabic nouns

MA nouns are marked for singular and plural. They lack the dual of CA. Plurals are generally formed by means of infixation (e.g. *wəld / wlad* 'boys'), vowel alternation (e.g. *ktaːb / ktuːb* 'books') or suffixation (e.g. *muʔəllim / muʔəllim-in* 'teacher.M'; *ħrajfi / ħrajfij-a* 'craftsman'). Note that the suffix –*a* also occurs in the feminine forms (e.g. *ħrajfij-a* 'craftswoman'; *xəjjatˤ* 'tailor.M' / *xəjjatˤ-a* 'tailor.F'). Further details and analysis are provided in Heath (1987). In this section, we focus on the analysis of nouns that have two plurals forms.

Nouns displaying more than one plural form are not specific to Arabic. Many other languages in the Afroasiatic family such as Somali, Hausa and Amharic have been reported to show similar forms (see Newman (2000: 463) on Hausa, Puglielli and Siyaad (1984) and Lecarme (2002) on Somali, and Kramer (2012: 227) on Amharic). In most cases, these forms involve so-called double pluralisation whereby a plural form derives from another plural. In Amharic, for instance, singular *mämhɨr* 'teacher' leads to plurals *mämhɨran* and *mämhɨranotʃtʃ*. Likewise, Somali *náːg* 'woman' has plurals *naːgó* 'women' and *naːgayáːl* (←/naːg+o+yaːl/) 'groups of women',[1] and Hausa *dóːkìː* 'horse' has plurals *dáwáːkíː* and *dàwàːkái*. In Arabic, however, very few double plurals are found, including MA *mwasat* 'knives' (plural of plural *mwas*) and *qwasat* 'arches' (plural of plural *qwas*), and CA *riʒaːlaːt* 'men' and *ʔahraːmaːt* 'pyramids'. The examples in (2) illustrate common coexisting broken and sound plurals in MA:

| (2) | *Singular* | *Broken plural* | *Sound plural* | |
|-----|-----------|-----------------|----------------|---|
| a. | muʒa | mmʷaʒ | muʒat | 'waves' |
| | baliza | bbʷalz | balizat | 'suitcases' |
| b. | ʕdˤəm | ʕdˤam | ʕədˤmat | 'bones' |
| | dˤəlʕa | dˤloʕ | dˤəlʕat | 'muscles' |
| c. | qamiʒa | qwamʒ | qamiʒat | 'shirts' |
| | gamila | gwaml | gamilat | 'bowls' |
| d. | blasˤa | blajəsˤ | blasˤat | 'places' |
| | ksˤedˤa | ksˤajədˤ | ksˤedˤat | 'smashes' |

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[1] It should be noticed, however, that plural formation in Somali involves so-called gender polarity whereby the gender of the singular form changes in the corresponding plural: in the examples at hand, singular *náːg* 'woman' is marked for feminine whereas its corresponding plural *naːgó* 'women' is masculine (see Lecarme (2002) and Lampitelli (to appear) for details and analysis).

Several observations are in order. First, the examples in (2) involve native words and loans alike. Second, the final vowel in certain singular forms marks feminine. Third, the broken plurals behave irregularly insofar as they involve a variety of morphological changes such as gemination in (2a), vowel insertion in (2b), -wa- infixation (2c) and -jə- infixation in (2d), whereas the sound plurals invariably resort to –at suffixation. Fourth, MA broken and sound plurals do not combine into double plurals, except for the very few forms already mentioned. None of the plural forms in (2) allow such formation. Mostly and more importantly, broken plurals are often semantically associated with collective readings, while sound plural refer to definite number. One might argue that this semantic distinction is subject to variation as certain broken plurals can indicate definite numbers. However, as far as we know, sound plurals are hardly associated with collective readings.

The facts just discussed can be accounted for by arguing that MA broken plurals and sound plurals reside in distinct syntactic positions. In line with recent work on number and plurality, including Lowenstamm (2008), Acquaviva (2008) and Kramer (2012), we assume that the sound plurals in MA are associated with the standard *Number* projection (*NumP*), whereas the broken plurals are associated lower in the structure with the *noun* projection (*nP*). The forms represented below in (3) illustrate the analysis.
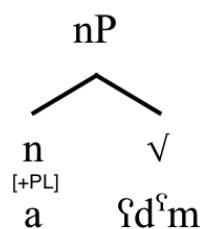
(3)  a.                              b.
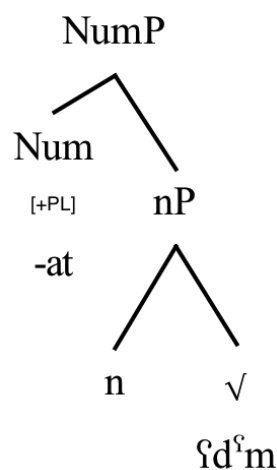


Under the general assumption that roots combine with category-defining heads (see Marantz (2001), Embick & Marantz (2008), and Embick & Noyer (2007: 296), among other references), *ʕdˤam* (3a) is formed within the nP, the head of which

has a plural feature, whereas *ʕədˤmat* (3b) obtains its plural feature higher in the structure from the NumP. These structures allow one to capture the morphological and semantic differences that broken and sound plurals display. Moreover, the lower location of the broken plurals, close to the root, accounts for their morphological irregularity, while the higher location of sound plurals represents their regularity and their being highly productive in most noun classes. It should be noticed, for instance, that mass nouns all resort to –at suffixation, especially when used with numerals: e.g. *zitun* 'olive' / *ʒuʒ zitun-at* 'two olives', *xubz* 'bread' / *ʒuʒ xubzat* 'two loaves of bread'. The same holds for loanwords: e.g. *taksi* 'cab' / *taksiyat* 'cabs', *tˤobis* 'bus' / *tˤobisat* 'buses'.

External evidence for the analysis advocated here is drawn from the emphasis spread. The following section provides an overview of this phenomenon.

## 2. Emphasis spread

### 2.1. MA emphatic consonants

The coronals *tˤ, dˤ, sˤ, zˤ* and *rˤ* are the uncontroversial emphatics (pharyngealized) in MA as well as in many other Arabic varieties (see Benhallam (1980), Ghazali (1981), Younes (1993), Davis (1995), Zeroual (2000), Kenstowicz and Louriz (2009)). There are important acoustic and articulatory differences between pharyngealized coronals and their plain counterparts, which induce clear auditory differences between items containing emphatic consonants and items containing plain ones. The acoustic differences are observed in terms of VOT durations for voiceless stops (the emphatic /tˤ/, for instance, has shorter VOT duration compared to its plain counterpart), and most importantly in terms of qualitative effects on adjacent vowels (see below). The articulatory differences are observed both at the supralaryngeal and laryngeal levels. At the supralaryngeal level, the emphatic coronals are produced with a backward movement of the tongue towards the posterior pharyngeal wall, while the anterior part of the tongue is substantially lowered. At the laryngeal level, voiceless emphatics have a smaller glottal opening, compared to their plain counterparts. The small glottal opening of /tˤ/ is the most likely reason for the shorter VOT displayed by this segment.

At the surface level, emphasis is a property which can spread to any segment. For instance, in /tˤəbbaχ/ 'cook', which contains only one underlying emphatic

segment /tˤ/, all the segments contained in the word are pharyngealized. The exact delimitation of the propagation of this feature is a source of much controversy. It is generally considered that the minimal and maximal domains of this propagation are the syllable and the word, respectively. According to Kenstowicz and Louriz (2009:45): "*Emphasis can spread in both directions and dialects differ as to which segments if any block (or minimize) the propagation. In MA the process is restricted to the stem and does not affect inflectional suffixes except that a CV sequence must be realized uniformly as plain or emphatic*". It has been argued that the parameters underlying this propagation are both linguistic and paralinguistic. The linguistic factors include the structure of the syllable (open syllables being more sensitive to emphasis spread), vowel quality (more propagation in front vowels), and gemination (more propagation to singletons than to geminates). The paralinguistic parameters include speech rate, tempo, and style. For instance, the propagation of emphasis is more important in a fast speech rate, than in slow speech rate.

Owing to frequent uncertainties in acceptability judgments, we have conducted an acoustic study in order to assess the facts about emphasis spread in MA on experimental grounds. The acoustic data were recorded from five subjects producing thirty items with emphatic consonants in broken and internal plurals, as well as a set of minimal pairs contrasting emphatic to plain consonants. Results from three subjects are presented here.

### 2.2. Plural formation and emphasis spread: acoustic data

In all dialects of Arabic that have been acoustically investigated, pharyngealization is consistently manifested by a lowering of F2 of the vowel following the emphatic consonant. This pattern has been observed in Egyptian Arabic (Wahba 1993), Lebanese Arabic (Obrecht 1968), Jordanian Arabic (Khattab et al. 2006), and Tunisian Arabic (Ghazeli 1981). The same pattern has been observed in Moroccan Arabic based on our data, as figure 1 shows (see also Zeroual 2000 and Shoul 2007):
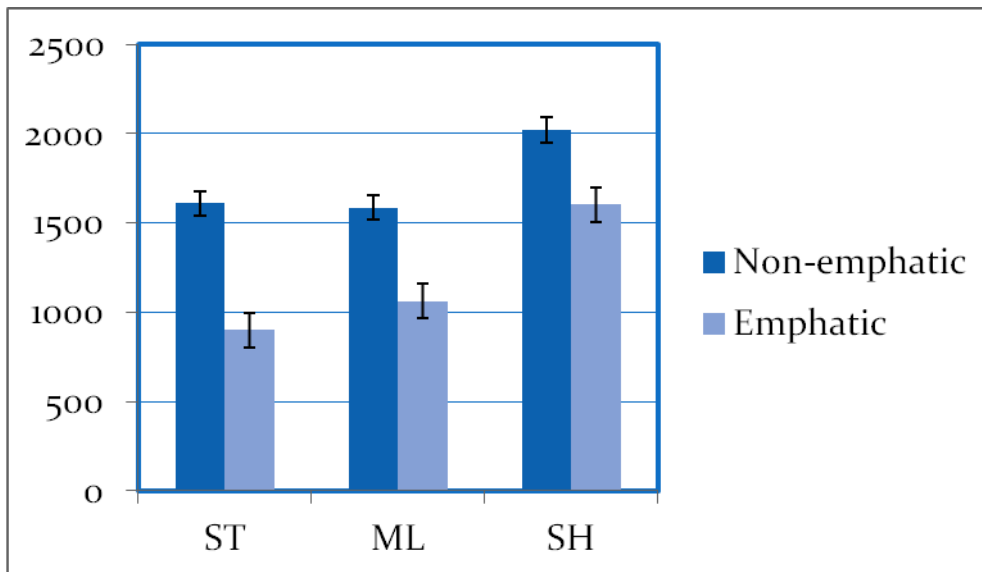
Figure 1. F2 values (in Hz) showing the effect of emphasis on the following /a/ vowel for three subjects (ST, ML and SH).

The large F2 drop after emphatic consonants can be attributed not only to their pharyngeal constriction, but also to the "*simultaneous depression of the palatine dosum*" (Ali and Daniloff 1972: 100) compared to their non-emphatic cognates. The pharyngeal articulation during MA emphatics does not seem to be narrow enough to induce substantial raising of F1 (Zeroual et al. 2007).

From our perspective, the projections of category-forming heads, including the nP, are the maximal domain of emphasis spread in MA. According to this view, the internal plurals containing an emphatic consonant will be entirely pharyngealized, while the external plurals will be affected only partially. That is to say, nP demarcates a domain, wherein the broken plural is spelled out and is hence sensitive to emphasis spread. For instance, both *sˤəbbat* 'shoe' and *sˤbabt* 'shoes, IP' will be entirely emphatic. If we consider *tˤəbbaχa* 'cook, IP.' and *tˤəbbaχat* 'cook, EP', however, the suffix –at along with the onset consonant χ are expected to remain unaffected by pharyngealization. We tested this through the analysis of the 2nd formant of /a/ vowel in a series of triplets with internal and external plurals. Two such triplets are shown in (4), where the compared /a/'s are bolded and underlined:

(4)      /tˤəsˤwer**a**/                "photo"

         /tˤsˤawər/                "photos, IP "

/tˤəsˤwer**at**/                "photos, EP"

/tˤəbbaχ/                       "cook"

/tˤəbbaχ**a**/                  "cook, IP"

/tˤəbbaχ**at**/                 "cook, EP"

Our results show a quasi-systematic difference in F2 values of the two /a/ vowels. The vowel affected by emphasis displays a lower F2 suggesting a more posterior realization characteristic of a dorsopharyngealized production, unlike the /a/ of the suffix–at. This pattern is illustrated in figure 2. Theses differences are rather easy to perceive even for non-native speakers. The final /a/ of /tˤəbbaχ<u>a</u>/, for instance, sounds like /ɑ/, whereas the /a/ of /tˤəbbaχ<u>at</u>/ is close to /æ/.
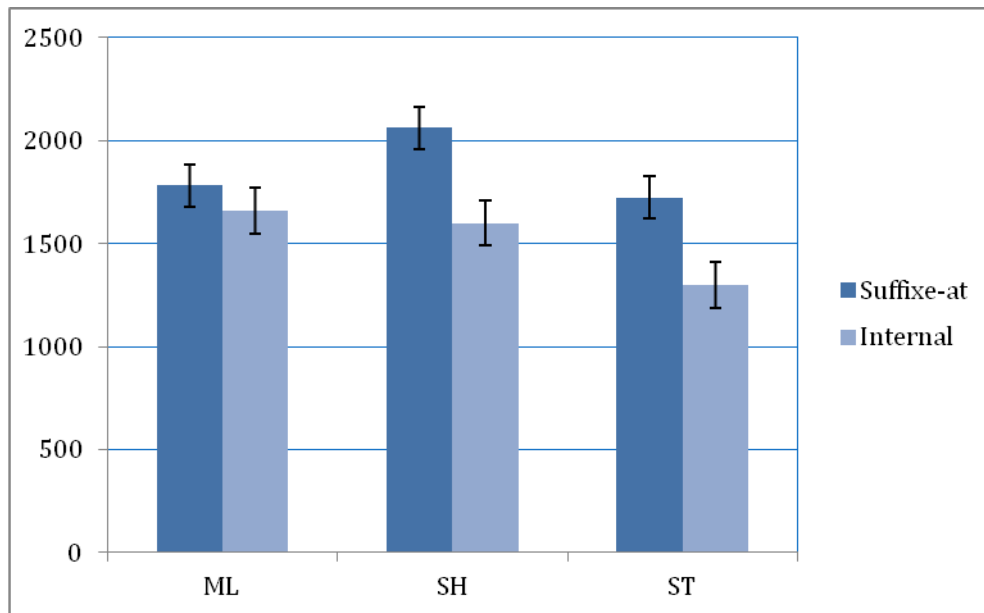


Figure 2. F2 values (in Hz) showing the spread of emphasis on the internal /a/ vowel as opposed to the plain /a/ of the suffix -at.

## 3. Conclusion

In this study, we have argued that internal (broken) and external (sound) plurals are located in distinct syntactic positions, namely nP for internal and NumP for external plurals. This analysis provides a principled way of capturing the morphological and semantic differences that broken and sound plurals display. External evidence in favour of this account has been drawn from the phenomenon of emphasis spread.

Based on some preliminary acoustic data from three subjects, nP has been shown to be the domain of emphasis spread, evidenced from the F2 lowering characteristic of dorsopharyngealization. The /a/ of the suffix –at remains unaffected. This study contributes to the ongoing debate on emphasis spread and calls for future work on categories other than nouns (verbs, adjectives, etc.)

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