CARDINALS WITHOUT PLURALITY

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1 Introduction

In this paper, I present empirical evidence from Lebanese Arabic showing that cardinal-containing DPs are not necessarily semantically plural, and suggesting that cardinals are of type n (Zabbal 2005), and against a semantics of cardinals as modifiers of type \(<e,t>,<e,t>\) (Ionin and Matushansky 2006). Syntactically, I propose a DP structure in which cardinals are not merged in a unique dedicated functional projection. Rather, more than one functional projection takes an n-type argument and thus has the potential to host a cardinal numeral. In this structure, the host of the cardinal numeral determines the order of composition and thus the interpretation of the DP as a whole. The next section introduces the core empirical observation of this paper after a brief overview on number marking in Lebanese Arabic. Section 3 lays out the proposal and motivates it, section 4 discusses a puzzle and its explanation, and section 5 concludes.

2 Empirical observations

2.1 Basic facts

Nouns in Lebanese Arabic overtly mark number. Adjectives, verbs, and pronouns agree. This is illustrated in (1).

(1) a. Plural: l-wleed š-šaaTr-iin/*-ø ?amal-u/*-ø deuvoir-on/*-u the-kid-PL the-smart-PL/*-ø did-PL/*-ø homework-their/*-his
b. Singular: l-walad š-šaaTer-ø/*-iin ?amal-ø/*-u deuvoir-u/*-on the-kid-ø the-smart-ø/*-PL did-ø/*-PL homework-his/*-their

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Following cardinals ‘three’ through ‘ten’, nouns are plural marked (2), and verbs, pronouns, and adjectives are also all plural-marked (3).

(2) a. tlat mhands-iin/*mhandes  
three engineer-PL/*engineer-Ø  
‘three engineers’

b. xams baneet/*bent  
five girl-PL/*girl-Ø  
‘five girls’

(3) a. tlat mhands-iin/*mhandes ej-ou/*eja  
three engineer-PL/*engineer-Ø arrived-PL/*arrived-Ø  
‘three engineers arrived’

b. xams baneet/*bent wa’a?-uu/*wa’?et  
five girl-PL/*girl-Ø fell-PL/*fell-Ø  
‘five girls fell’

Unlike nouns following numerals ‘three’ through ‘ten’, nouns following cardinals larger than ‘ten’ in Lebanese Arabic, or the quantifier kam ‘how many’/’small number of’, are never plural marked. This is illustrated in (4).

(4) a. tleetiin mhandes/*mhands-iin  
thirty engineer-Ø/*engineer-PL  
‘thirty engineers’

b. xamseh w ?eshriin shanta/*shanat  
fifteen bag-Ø/*bag-PL  
‘fifteen bags’

c. tleeteeh weshriin mhandes/*mhands-iin  
three and twenty engineer-Ø/*engineer-PL  
‘twenty three engineers’

d. xamsta?shar shanta/*shanat  
fifteen bag-Ø/*bag-PLBR  
‘twenty five bags’

Interestingly, following DPs such as those in (4), verbs can be either plural-marked or unmarked (whereas they must be plural marked when the noun itself is plural marked as in (2). This is illustrated in (5). Similarly, adjectives modifying the head noun in DPs containing a cardinals larger than ‘ten’ can be plural-marked or unmarked, and pronouns whose antecedent is a DP containing a cardinal larger than ‘ten’ can be plural or singular. This is illustrated in (6) and (7), respectively.

(5) a. Plural-marked verb: xamsta?shar bent wa’a?-u  
fifteen girl-Ø fell-PL  
‘Fifteen girls fell’

b. Unmarked verb: xamsta?shar bent wa’a?-et  
fifteen girl-Ø fell-r-Ø  
‘Fifteen girls fell’

(6) a. Plural-marked adjective: xamsta?shar shanta T’aal  
fifteen bag-Ø heavy-PL  
‘Fifteen heavy bags’

b. Unmarked adjective: xamsta?shar shanta T’iil-ch  
fifteen bag-Ø heavy-f-Ø  
‘Fifteen heavy bags’

(7) a. Plural pronoun: sa’alt xamsta?shar sabi ?an mashrou?-on  
asked.1s fifteen boy-Ø about project-their
b. Singular Pronoun: sa’alt xamsta?shar sabi ?an mashrou?-uh
asked.1s fifteen boy-ø about project-his
‘I asked fifteen boys about their project’

Notably, the presence vs. absence of plural agreement on adjectives, verbs, and pronouns, correlates with a semantic effect: availability vs. absence of a collective reading.

2.2 Semantic effects

Given a pre-verbal subject DP containing a cardinal larger than ‘ten’, if a verb is plural marked in agreement with the subject, both a collective and a distributive reading of the subject are available. In the absence of plural marking on the verb, however, the only interpretation available is one in which the verb distributes over the subject DP (i.e. is true of every atom). This is illustrated by the contrast between (8) and (9).

(8) tleetiin walad akal-u gateau keemel
   thirty child-ø ate-PL cake whole
   ‘Thirty children ate a whole cake’
   [distributive] True in a scenario in which thirty children each ate a whole cake, and
   where no thirty children shared a cake
   [collective] True in a scenario in which thirty children shared a cake and where it
   was not the case that any thirty children each ate a cake

(9) tleetiin walad akal gateau keemel
   thirty child-ø ate-ø cake whole
   ‘Thirty children ate a whole cake’
   [distributive] True in a scenario in which thirty children each ate a whole cake, and
   no thirty children shared a cake
   [*collective] False in a scenario in which thirty children shared a cake and where it
   was not the case that any thirty children each ate a cake

Similarly, plural marking on adjectives modifying the head noun in DPs containing a cardinals larger than ‘ten’ allows a collective reading that is unavailable for unmarked adjectives, as illustrated in the contrast between (10) and (11), and pronouns whose antecedent is a DP containing a cardinal larger than ‘ten’ receive, when plural, a collective reading of the DP that is unavailable when the pronoun is singular. This is illustrated in the contrast between (12) and (13).

(10) Hmelet xamsta?shar shanta xfeef
   carried.1s fifteen bag-ø light-PL
   [distributive] True in a scenario in which I carried fifteen bags (that are each light and)
   whose cumulative weight is small
   [collective] True in a scenario in which I carried fifteen bags that are each light
   but whose cumulative weight is heavy

(11) Hmelet xamsta?shar shanta t’iil-eh
    carried.1s fifteen bag-ø heavy-F-ø
[distributive] True in a scenario in which the bags I carried were each heavy
[*collective] False in a scenario in which the cumulative weight of the bags I carried is high, but they included one or more light bags

(12) sa’alt ?eshriin benet ?an mashuu?-ah asked.1s twenty girl-Ø about project-her
‘I asked twenty girls about her project’
[distributive] True in a scenario in which I asked twenty girls about their personal projects and it was not the case that I asked any twenty girls about a joint project of theirs
[*collective] False in a scenario in which I asked twenty girls about their joint project and where there are no twenty girls who I asked about their personal projects

(13) sa’alt ?eshriin benet ?an mashuu?-un asked.1s twenty girl-Ø about project-their
‘I asked twenty girls about their project’
[distributive] True in a scenario in which I asked twenty girls about their personal projects and it was not the case that I asked any twenty girls about a joint project of theirs
[collective] True in a scenario in which I asked twenty girls about their joint project and where it was not the case that I asked any single girl about her project

In fact, inherently collective verbs like ‘gather’ must be plural-marked following DPs containing cardinals larger than ‘ten’. This is illustrated in (14) where (a) but not (b) is acceptable. Note that this is not a morphological restriction on such verbs, as (c) illustrates: collective nouns such as ‘couple’ can be followed by an unmarked collective verb, because one couple can engage collectively in ‘meeting’ or ‘fighting’. Similarly, adjectives that can only modify predicates true of plural individuals like ‘aligned’ or ‘scattered’ must be plural-marked, as illustrated in (15).

(14) a. tna?shar lee?eb txaana’-u/tjamma?-u
twelve player-Ø fought-PL/gathered-PL
‘Twelve players fought’/‘Twelve players gathered’
b. *tna?shar lee?eb txaana’/tjamma?
twelve player-Ø fought-Ø/gathered-Ø
‘Twelve players fought’/‘Twelve players gathered’
c. l-coupl txaana’/tjama?
the-couple-Ø fought-Ø/met-Ø
‘the couple fought’/‘The couples met’

(15) a. shefet tleteen gharad maSfouf-iin/*maSfouf
saw.1s thirty thing-Ø aligned-PL/*aligned-Ø
‘I saw thirty aligned objects’
b. kam walad-Ø mfarTa?-iin/*mfarTa? za?aj-u-ni
s.n.o. kid-Ø scattered-PL/*scattered-Ø bothered-PL-me
‘A small number of scattered kids bothered me’
Thus, when no agreement is triggered on verbs and pronouns, only a distributive reading is available of the DP. I propose that the absence of a collective reading means the DP as a whole appears to not be interpreted as plural at all, and that no predicate of pluralities is formed within the DP in those cases, and what I have so far been referring to as a distributive reading is in fact a predication of singular individuals.

3 Towards a proposal

3.1 Main idea

Taking the availability of a collective interpretation to be an indicator of a semantically plural DP (cf. Landman 2000), these facts suggest that a cardinal containing DP, as a whole, is not always semantically plural. Rather, I propose, semantic plurality come from a pluralizing functional projection inside the DP, call it # that can, but does not have to be present in the presence of a cardinal. Without #, no predicate of pluralities is formed, and thus, no collective reading is available: the available reading, though called distributive, is not the usual distributive reading. Rather, it is simply predication to singular individuals. I also propose that # is responsible for triggering plural agreement when there is no plural marking on the noun.

That cardinal-containing DPs are not always semantically plural falls out naturally from the unavailability of a collective reading: Despite the presence of a cardinal in the DP in (9) and (12) the verb (or pronoun) is necessarily interpreted as true of atoms, and does not find a plural subject (or antecedent). Treating cardinals as modifiers that form predicates of plurality when they compose with nouns (Ionin & Matushansky 2006) or as determiners (e.g. Montague 1974) would always result in a semantically plural subject or antecedent. Given a semantics for cardinals as modifiers (16), when a cardinal, e.g. twenty, appears in a DP, the DP necessarily denotes a plurality that can be partitioned into twenty parts each. Thus, as (18) illustrates, such a semantics of cardinals as pluralizing modifiers predicts that a sentence like (17) would be at least ambiguous, when that is not empirically the case2.

\[
(16) \quad [(20)] = \lambda P_{et} \cdot \lambda x_{et} \cdot \exists S_{et} [\pi(S)(x) \text{ and } |S| = 20 \text{ and } \forall s \in S P(s)]
\]

(i.e. 20 takes a predicate P, and returns another predicate true of individuals that, partitioned to two, each partition is such that P is true of it)

2 One can propose that, maintaining Ionin and Matushansky’s (2006) semantics of cardinals, the unavailability of a collective reading is due to a covert distributor that also blocks plural agreement (Heim p.c. and Ionin p.c.). Such a proposal is unlikely to be true for several reasons. One of them is that, if such a covert distributor existed, one would expect it to appear with cardinals 3-10 as much as it occurs with cardinals 11+, predicting sentences like (i) to be grammatical, which is not the case. Moreover, an overt distributor is ungrammatical with indefinite cardinal containing DPs in Arabic in general, as illustrated in (ii).

(i) *tlat wleed akal gateau keemel (rather, akal-ou ‘ate-PL’ is required)
   three child.pl ate-Ø cake whole
   ‘Three children ate a whole cake each’
(ii) a. tleetiin walad Hakka emm uh
    thirty child talked mother-his
   b. *tlat wleed Hakkou emm-ON kell weeHed
    three child.pl talked-PL mother-their every one
   c. *tlat wleed Hakka emm-uh kell weeHed
    three child.pl talked-Ø mother-his every one
   d. *tleetiin walad Hakkou emm-on kell weeHed
    thirty child.pl talked-pl mother-their every one
(17) ?eshriin benet akalet gateu keemel
twenty girl-ø ate-ø cake whole
‘Twenty girls ate a whole cake each’ (‘distributive’, predicated of singular girls)

(18) \[\exists x: \exists S_{\text{set}} \left[ \pi(S)(x) \right. \text{ and } |S|=20 \text{ and } \forall s \in S \text{ s is a girl} \left. \right] \text{ and } x \text{ ate a whole cake} \]
\text{i.e. a plurality of twenty girls ate a whole cake } \rightarrow \text{ Undesirable collective reading}

A claim that a collective reading is made possible through the formation of a predicate of pluralities inside the DP is desirable because the effects are independent of the position of the DP in the sentence, whether it is a subject (recall (8)-(9)), or an object (recall (12)-(13)). It is also supported empirically by restrictions in the presence of multiple agreeing elements: Any plural agreement within the noun phrase (e.g. adjectives) forces plural-agreement outside it (e.g. verbs and pronouns), but not vice versa. This is illustrated in the contrast between (19) and (20). Moreover, any agreement outside the DP, be it pronouns and verbs, multiple verbs, or multiple pronouns, must be homogeneous. This is illustrated in (21) and (22). (Agreement within the DP will be addressed in section 4)

(19) a. xamsiin sabi mnazzam-iin wesel-ou/*wessel-ø
fifty boy-ø organized-PL arrived-PL/*arrived-ø
‘fifty organized boys arrived’ (an orderly squad)
b. sa’alt telmiiz mnazzam-iin ?an saff-on/*saff-uh
asked.1s thirty student organized-PL about class-their/*class-his
‘I asked thirty organized students about their class(es)’

(20) a. xamsiin sabi mnazzam(-iin) wesel-ou
fifty boy-ø organized-ø/-PL arrived-PL
‘fifty organized boys arrived’
b. sa’alt telmiiz mnazzam(-iin) ?an saff-on
asked.1s thirty student organized-ø/-PL about class-their
‘I asked thirty organized boys about their class(es)’

(21) a. sa’alet ?eshriin sabi ?an mashrou?-uh ablma arrer ?aleemt-uh/*on
asked.1s twenty boy about project-his before deciding grade-his/*-their
‘I asked twenty boys about their projects before deciding on their grades’
b. sa’alet ?eshriin sabi ?an mashrou?-on ablma arrer ?aleemt-on/*uh
asked.1s twenty boy about project-their before deciding grade-their/*-his
‘I asked twenty boys about their project(s) before deciding on their grade(s)’

(22) a. ?eshriin sabi xabbar emm-uh/*-on (w rteeH/*rteeH-ou)
twenty boy told-ø mother-his/*-their (and relaxed-ø/*relaxed-PL)
‘Twenty boys told their mothers (and eased their conscience)’
b. ?eshriin sabi xabbar-ou emm-on/*-uh (w rteeH-ou/*rteeH)
twenty boy told-PL mother-their/*-his (and relaxed-PL/*relaxed-ø)
‘Twenty boys told their mother(s) (and eased their conscience)’
3.2 Execution

I assume that plural marking does not entail the formation of a predicate of plurality (cf. Sauerland et al. 2005, Ionin and Matushansky 2006, Borer 2005), and argue that the presence of a cardinal does not either (cf. also Landman 1989, 2000). I propose that a predicate of pluralities is formed when a (modified) star operator, call it #, ((23)a) composes with the nominal predicate.

\[(23)\]  

a. \[\text{[[#]]} = \lambda n. \lambda N. \lambda x. |\text{Atoms}(x)| \neq 1, |\text{Atoms}(x)| = n, \text{ and } \forall y \in \text{Atoms}(x), N(y) = 1\]  

b. **Paraphrase:** Given a cardinal n and a predicate N, return a predicate true of all individuals of cardinality n that N is true of every atomic part of (cf. Hackl, 2000:82/105)

I take the structure in (24), from Borer (2005), to be the structure of a singular count DP, and propose that the structure in (25) is the structure of a plural count DP.

\[(24)\]  

\[\text{Synt.: } [\text{D} [\text{Q} [\text{DIV} [\text{NOUN} [\text{NOUN} [\text{ROOT} \text{]]}]]]]]\]  

\[\text{Sem.: } [\text{DP} [\text{COUNT NOUN} [\text{NOUN} [\text{ROOT} \text{]]}]]]\]

\[(25)\]  

\[\text{Synt.: } [\text{D} [\text{Q} [# [\text{DIV} [\text{NOUN} [\text{NOUN} [\text{ROOT} \text{]]}]]]]]\]  

\[\text{Sem.: } [\text{PLURAL DP} [\text{PLURAL NOUN} [\text{COUNT NOUN} [\text{NOUN} [\text{ROOT} \text{]]}]]]\]

Moreover, I take cardinals to be of type \(n\) (Zabbal 2005) and to be arguments to a determiner or to #, and propose the existential quantifier to be a distributor, as in (26), adapted from Hackl’s (2000:83) entry for *many*.

\[(26)\]  

a. \[\text{[[D_E]]} = \lambda n. \lambda N. \lambda V. \exists S \text{ s.t. } |S| = n \text{ and } \forall x, x \in S \text{ entails } N(x) = 1 \text{ and } V(x) = 1\]  

b. **Paraphrase:** Given a cardinal n, a predicate N, and a predicate V, there are \(n\)-many individuals x such that N is true of x and V is true of x.

The composition of a cardinal-containing DP that does not contain # (singular DP) with a VP would therefore be as in (27), and the composition of a cardinal-containing DP containing # with a VP would be as in (28).
(27) i. 

(28) i. 

As (27) illustrates, no predicate of pluralities is formed at any point of the derivation. Rather, the sentence describes fifteen events of a boy eating a cake (on his own).
(c) \( \lambda V \exists S |S|=1 \) and \( \forall x, x \in S \) entails \( |\text{Atoms}(x)| \neq 1, |\text{Atoms}(x)|=15 \), and 
\( \forall y \in \text{Atoms}(x), y \text{ is a boy and } V(x)=1 \) \( (\lambda k. k \text{ ate a cake}) \)

\[ \Rightarrow \exists S |S|=1 \& \forall x, x \in S \text{ iff } |\text{Atoms}(x)| \neq 1, |\text{Atoms}(x)|=15 \text{ and } \forall y \in \text{Atoms}(x), y \text{ is a boy and } x \text{ ate a cake} \]

ii. Paraphrase: There is a plural individual of fifteen atomic parts that are each a boy, and the plurality ate a cake

As (28) illustrates, in the presence of \( " \) in a carinal-containing DP, a predicate of pluralities whose size is the cardinal, is formed in the structure. In this case, since the cardinal is composing with the pluralizer, there is no cardinal to fill the n-type argument position of \( D_E \), so the latter takes a default ‘1’ to fill its n-type argument position. In the presence of \( " \), the cardinal must compose with it because unlike \( D_E \), being a pluralizer, \( " \)’s lexical semantics does not allow it to take a default ‘1’ as its first argument.

So in (28), corresponding to the structure in (25) (but not in (27), corresponding to the structure in (26)), the DP is plural (contains a predicate of pluralities) and can result in a collective reading.

4 Adjective puzzle: heterogeneous agreement

Unlike verbs and pronouns following a cardinal-containing DP, when a cardinal-containing DP contains multiple adjectives, the different adjectives can show heterogeneous agreement. This is illustrated in (29). Note, however, that this heterogeneity is restricted: All unmarked adjectives must be closer to the noun than all plural marked adjectives. This is illustrated by the ungrammatical (30).

(29) tleetiin telmiiz kesleen majmou?-iin Htajj-u ?a-l?-alemeet
    thirty student-Ø lazy-Ø gathered-PL complained-PL on-the-grades
    Thirty assembled lazy students complained about the grades

(30) *tleetiin telmiiz majmou?-iin kesleen Htajj-u ?al?-alemeet
    thirty student-Ø gathered-PL lazy-Ø complained-PL on-the-grades
\[ \Rightarrow \text{Word salad} \]

This behavior of adjectives that separates them from verbs and pronouns is actually predicted given the proposal in section 3. Given that it is the function \( " \) that introduces plurality into the DP, anything merging lower than \( " \) is predicted to be singular: to show non-plural agreement, and to be interpreted as true of atoms. This is illustrated in (31)

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3 Pesetsky (2010), Asarina (2010), propose something very similar for mixed gender agreement in Russian. For more on mixed gender agreement, see these references, as well as Matushansky (2011) and references therein.
5 Conclusion

In this paper, I presented empirical evidence from Lebanese Arabic showing that the presence of cardinals does not entail the formation of a predicate of pluralities (Landman 2000), using truth conditional contrasts between DPs allowing a collective reading and DPs not allowing one. I proposed a DP structure in which cardinals do merge in a unique dedicated position. Rather, more than one functional projection takes an n-type argument and has the potential to host a cardinal numeral. I showed that whether a cardinal merges in one position or another has significant effects on the interpretation.

References


