Where Plurality Is: Agreement and DP Structure

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My goal is to argue that the availability of a collective reading comes from the DP itself, and not from other elements in the sentence. In addition, I argue that the presence of a cardinal in the DP does not entail that the DP is plural, syntactically (in terms of triggering agreement) or semantically (in terms of allowing a collective reading) (cf. also Landman 1989, 2000), and that cardinals do not have one single syntactic position within the DP.

This paper is organized as follows: Section 1 provides the basic observation that triggered the contrast and introduces the core empirical observation. Section 2 sketches and motivates the proposal of this paper. Section 3 elaborates on the implementation of the proposal. Section 4 discusses predictions and puzzles. Section 5 concludes.

1. Empirical starting point:

1.1. Morphology

Nouns in Lebanese Arabic overtly mark number, and verbs agree with the subject. This is illustrated in (1), and (2). Following cardinals ‘three’ through ‘ten’, nouns are plural marked (2), and so are verbs agreeing with the DP.

(1) a. l-wleed daras-u/*aras
    the-child-pl studied-pl/*studied-ø
    ‘The children studied’

    b. l-walad daras/*aras-u
    the-child-ø studied-ø/*studied-pl
    ‘The child studied’

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(2) tl tlat wleed/*walad daras-u/*aras
three child-pl/*child-Ø studied-pl/studied-Ø
‘Three children studied’

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 (3).

(3) tleetiin walad/*wleed
thirty child-Ø/*child-PL
‘Thirty children’

While the verb must be plural marked following the subject in (2), verbs whose subject is a DP like that in (3) can be either plural-marked or unmarked, as illustrated in (4).

(4) tleetiin walad daras-u/daras
thirty child studied-pl/studied-Ø
‘Thirty children studied’

1.2. Semantic Effect:

If the verb is plural marked following a DP containing a cardinal 11+, then both the collective and the distributive readings are available.

(5) tleetiin walad akal-u ‘aaleb gateau keemel
thirty child-Ø ate-pl pie cake whole
‘Thirty children ate a whole cake’

• True in a scenario in which thirty children each ate a whole cake, and where no thirty children shared a cake (distributive).

• 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 (collective).

If the verb is not plural marked following a DP containing a cardinal 11+, then only the distributive reading is available.

(6) tleetiin walad akal ‘aaleb gateau keemel
thirty child-Ø ate-Ø pie cake whole
‘Thirty children ate a whole cake’

• True in a scenario in which thirty children each ate a whole cake, even if no thirty children shared a cake (distributive)

• 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 (No collective reading)

In fact, following cardinals larger than ten, collective predicates must be plural marked, as in (7), and are ungrammatical when unmarked (8). Crucially, this is not due to a
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morphological restriction on collective predicates themselves, nor to the presence of a cardinal, as (9), where the noun itself denotes a predicate of non-atomic individuals, illustrates.

(7)  tleetiin  walad  txaana’-u/tjamma?-u  
     thirty  child-Ø  fought-PL  /gathered-PL
     ‘Thirty children fought/gathered’

(8)  *tleetiin  walad  txaana’  /tjamma?  
     thirty  child-Ø  fought-Ø/gathered-Ø
     ‘Thirty children fought/gathered’

(9)  tleetiin  coupl  txaana’/jtama?  
     thirty  couple-Ø  fought-Ø/met-Ø
     ‘Thirty couples fought’ / ‘Twelve couples met’

2. Towards a Proposal:

2.1. General Idea:

I propose that there is a pluralizing projection # that makes DPs plural; that # triggers plural agreement on the verb, and that # makes a collective reading of the noun available by forming a predicate of pluralities. I also propose that the presence of a cardinal does not entail that the DP is plural (syntactically or semantically), and that cardinals are not modifiers, rather, they are themselves arguments to something else.

2.2. Reasons:

2.2.1. Morphological Asymmetry:

One of the main reasons to assume that the root of this effect is within the DP is that there are asymmetrical restrictions on the morphology. Like verbs, adjectives within DPs containing cardinals larger than ten, can be either plural marked or unmarked. This is illustrated in (10). Indeed, as (11) illustrates, any plural agreement within the noun phrase (adjectives) forces plural-agreement outside it (verbs). The opposite is not true. As (12) illustrates, when the verb is plural marked, the adjective can be either unmarked or plural marked.

(10)  shefet  tleetiin  walad  mnazzam/mnazzm-iin  
     saw.1s  thirty  child-Ø  organized-Ø/organized-PL
     ‘I saw thirty organized children’

(11)  tleetiin  walad  mnazzam-iin  daras-u/*/daras  
     thirty  child  organized-PL  studied-PL/studied-Ø
     ‘Thirty organized children studied’
2.2.2. Predictive Power

In addition, claiming that a collective reading is made possible through the formation of a predicate of pluralities inside the DP is desirable because it allows us to make stronger predictions: that we would get similar effects regardless of the position of the DP (object or subject), and for other agreeing elements. In the presence of \#, both a singular predicate is available (before \#) and a plural predicate is available (after \#), but the DP, as a whole, must be plural. Morphologically, this means that any verb agreeing with the DP must be plural-marked, but also any pronoun whose antecedent is the DP, and any adjective merging above \#. In the presence of \#, regardless of where the DP is, it is plural, and anything that would agree with it would have to be plural marked.

In the absence of \#, only a singular predicate is available, resulting in only a singular interpretation of the DP. Morphologically, anything agreeing with the DP must not be plural marked. In other words, verb agreeing with the DP must be unmarked, any pronoun whose antecedent is the DP must be singular, and any adjective within the DP, must be unmarked. As we will see in section 4, these predictions will be verified by the facts.

2.2.3. Cardinals Are Not Modifiers

Finally, assuming that the availability of a collective reading is indicative of the existence of a predicate of pluralities (see also Landman 2000), the claim that cardinals do not always result in a predicate of pluralities is a direct result of the fact that despite the presence of a cardinal, when no plural agreement is triggered, the collective reading is not available for DPs containing cardinals larger than ten in Lebanese Arabic.

In fact, if we do assume that cardinals result in the formation of predicates of pluralities, we would make the wrong predictions. Assume, for instance, the denotation in (13) for ‘thirty’.

(13) \([30] = \lambda p_e \cdot \lambda x_c . \exists s \subseteq x_e . |S| = 30 \text{ and } \forall s \in S \ p(s)\]

(30 takes a predicate \(P\), and returns another predicate which is true of individuals that, when partitioned to two, each partition is such that \(P\) is true of it)
(Ionin & Matushansky, 2006)

Recall, (6) has only a distributive reading is false in a scenario in which thirty children shared a cake. Given the semantics of ‘thirty’ in (13), however, such a reading is predicted to be available. This is illustrated in (14).

(14) \([30 \text{ child-ø ate-ø cake whole}] = 1 \text{ iff} \]
\[\exists x: \exists s \subseteq x_e . |S| = 20 \text{ and } \forall s \in S \ s \text{ is a child} \text{ and } x \text{ ate a whole cake}\]
\text{ i.e. A plurality of thirty children ate a whole cake} \rightarrow \text{Undesirable prediction}

In addition, the assumption that cardinals are arguments and do not themselves have a
complex semantic type is consistent with their flexible occurrence in language: with an overt determiner, without an overt determiner, etc.

3. Proposal:

3.1. Syntax-Semantics Interface

I assume that the syntax and the semantics of the DP are closely connected. Specifically, assuming Borer’s (2005) structures in (15) and (16) for mass and non-plural count DPs, I propose the structure (17) for plural DPs. In these structures, each functional projection is associated with a semantic function that alters the meaning. (18) elaborates on the semantics of the structure in (17)

(15) Mass DP:

Synt.: \[[D \quad [Q \quad [N]]]\n
Sem.: \[[\text{MASS DP} \quad \text{[NOUN]}]]\n
(16) Count Non-Plural DP:

Synt.: \[[D \quad [Q \quad [\text{COUNT NOUN} \quad [N]]]]\n
Sem.: \[[\text{COUNT DP} \quad \text{COUNT NOUN} \quad \text{[NOUN]}]]\n
(17) Plural DP:

Synt.: \[[D \quad [Q \quad [\# \quad [\text{COUNT NOUN} \quad [N]]]]]\n
Sem.: \[[\text{PLURAL DP} \quad \text{PLURAL NOUN} \quad \text{COUNT NOUN} \quad \text{[NOUN]}]]\n
(18) Plural Individual or Plural gen. quantifier

\[\lambda P. \lambda x. x \text{ is a plurality of some size, and every atomic part of it is a unit of apple, and } P(x) \text{ is true}\]

\[\lambda x. x \text{ is a plurality of some size, and every atomic part of it is a unit of apple}\]

\[\lambda x. x \text{ is a plurality of a certain size, and every atomic part of it is a unit of apple}\]

\[\lambda x. x \text{ is a unit of apple}\]

\[\lambda x. x \text{ is apple}\]

\[\lambda x. x \text{ is apple}\]

3.2. Semantics

I propose that cardinals are arguments to a determiner or some other functional item ((19)a), and do not, themselves, compose directly with the noun ((19)b). I will assume, as a working semantic type of cardinals, that they are of type n (cf. Zabbal 2005 for motivations).

I propose that an indefinite determiner in the form of an existential quantifier takes a type
n argument which, in the absence of a cardinal, is a default 1 (19). I also propose that a predicate of pluralities is only formed when a (modified) star operator, call it #, (denotation in (22)) composes with a cardinal, and subsequently, with a nominal predicate. Without #, no predicate of plural individuals is formed, regardless of the shape of the noun, or the presence or absence of a cardinal. (I am assuming, following Ionin and Matushansky (2006) and Borer (2005), among others, that plural marking on the noun does not necessarily indicate the formation of a predicate of pluralities).

In the presence of a cardinal and the absence of the pluralizer #, the cardinal will be the argument of the existential quantifier $D_E$, no predicate of plural individuals will be formed, and a distributive reading will emerges.

(19) a. ([…] $[F \text{\: cardinal}]$ … noun) $\leftrightarrow$ b. [F ([…] [cardinal noun])] (cf. Ionin and Matushansky 2011)

(20) [[$D_E$]] = $\lambda n_c. \lambda N_c. \lambda V_c. \exists S$ s.t. $\forall x(x \in S \implies N(x) = 1 \land V(x) = 1) \land |S| = n$

Paraphrase: Given a cardinal $n$, a predicate $N$ (corresponding to the noun), and a predicate $V$ (corresponding to the verb phrase, there are $n$-many individuals $x$ such that $N$ is true of $x$ and $V$ is true of $x$. (cf. Hackl, 2000:83 entry for many)

(21) $\text{Atoms}(x) = \{y \text{ such that } y \leq x \land \forall z \leq x \text{ it is not the case that } z \leq y\}$

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

Paraphrase: Given a cardinal $n$ and a predicate $P$, return a predicate $Q$ true of all individuals of size $n$ that $P$ is true of every atomic part of. (cf. Hackl, 2000:82/105)

3.3. Compositions:

The composition of a cardinal-containing DP that does not contain # (singular DP) with a VP would therefore be as in (24). As (24) 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). The composition of a cardinal-containing DP containing # with a VP would be as in (26). In (26), a predicate of pluralities of size 30 is formed in step ((26)bb), and a collective reading becomes available.

3.3.1. DP-VP composition without #

(23) tleetin walad akal aaleb gateau

thirty child ate ø a cake

‘Thirty children ate a cake (each)’ (only distributive reading)

(24)

3.3.1. DP-VP composition without #

(23) tleetin walad akal aaleb gateau

thirty child ate ø a cake

‘Thirty children ate a cake (each)’ (only distributive reading)
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Paraphrase: There are thirty individuals that are each a child, and each ate a cake

3.3.2. DP-VP composition with #

(25) tleetiin walad akal-u aaleb gateau
    thirty child ate–PL a cake
    ‘Thirty children ate a cake’ (ambiguous: shared or each ate one)

(26)

Paraphrase: There is a plural individual of thirty atomic parts that are each a child, and the plurality ate a cake

4. Predictions:

4.1. Generalizability: Pronouns

The claim that the availability of a collective reading is dependent on what is in the DP
predicts that pronouns agreeing with a DP should behave like verbs agreeing with it. In other words, pronouns whose antecedent is of these DP should have the same optionality and semantic effect. Indeed, pronouns whose antecedent is a DP containing a cardinal 11+ can be plural or singular.

(27) sa’alt tleetiin walad ?an mashrou’?-on asked.1s thirty child-Ø about project-their ‘I asked thirty children about their project’

And, as it turns out, the effects are the same for pronouns: If a pronoun whose antecedent is a DP containing a cardinal 11+ is plural, both the collective and the distributive readings are available: (27) is true in a scenario in which I asked thirty about their joint project, and where it was not the case that I asked any single children about her project. And it is also true in a scenario in which I asked thirty children about their personal projects and it was not the case that I asked any thirty children about a joint project of theirs. However when the pronoun is not plural, as in (28), only a distributive reading is available, and (28) is true only in a scenario in which I asked thirty children about their individual projects. It is false if I did not ask thirty children about their individual projects, even if I asked thirty children about their joint project.

4.2. Generalizability: Adjectives

Like verbs and pronouns, adjectives are expected to also show some optionality in agreement and the same semantic effects associated with this optionality. Indeed, like pronouns and verbs, adjectives occurring within DPs containing a cardinals larger than ten can be either unmarked (29) or plural marked (30).

(29) Hmelt tleetiin shanta T’iil-eh carried.1s thirty bag-Ø heavy-F-Ø ‘I carried thirty heavy bags’

(30) Hmelt tleetiin shanta T’aal carried.1s thirty bag-Ø heavy-PL ‘I carried thirty heavy bags’

The semantic effects observed on verbs and pronouns are paralleled for adjectives: If an adjective within a DP containing a cardinal 11+ is not plural marked, only a distributive reading is available. Thus, (29) is only true in a scenario in which I carried thirty bags each of which was heavy. It is false in a scenario in which I carried thirty bags whose cumulative weight is heavy, but which were not all heavy. The sentence in (30), however, is true in both scenarios.

2 In fact, for many speakers, the effect is even stronger for adjectives, and the distributive reading is not
4.3. Asymmetrical Morphological Restrictions

Another prediction is that the morphological asymmetry observed for verbs in section 2.2.1 would also be true for pronouns. This is again true. As shown in (31), Plural marking on any adjectives in the DP imposes plural marking on pronouns. The converse is not true: As shown in (32), when a pronoun agreeing with a DP is plural, adjectives within the DP do not have to be plural marked.

(31) sa’alt tleetiin walad mnazzam-iin ?an mashrou?-on/*mashrou?-uh asked.1s thirty child-ø organized-PL about project-their/*project-his
     I asked thirty organized children about their project(s)

(32) sa’alt tleetiin walad mnazzam/mnazzam-iin ?an mashrou?-on asked.1s thirty child-ø organized-ø/organized-PL about project-their
     ‘I asked thirty organized children about their project(s)’

4.4. Uniform Agreement:

Finally, if plural marking on the verbs and pronouns are only agreement, and are not meaningful in themselves, all things outside the DP, agreeing with the same DP should agree uniformly. In other words, they should be either all plural, or all singular. This is verified. As (33) and (34) illustrate, within a sentence, two pronouns with the same DP antecedent must be either both plural or both singular.

(33) sa’alet tleetiin walad ?an mashrou?-uh ablma arrer ?aleemt-uh/*on asked.1s thirty child about project-his before deciding grade-his/*-their
     ‘I asked thirty children about their projects before deciding on their grades’

(34) sa’alet tleetiin walad ?an mashrou?-on ablma arrer ?aleemt-on/*uh asked.1s thirty child about project-their before deciding grade-their/*-his
     ‘I asked thirty children about their project(s) before deciding on their grade(s)’

It is also true for verbs and pronouns agreeing with the same DP. If the verb agreeing with the DP is unmarked, any pronoun whose antecedent is this DP will be singular (35). Also vice versa, if the verb agreeing with the DP is plural-marked, any pronoun whose antecedent is this DP will be plural (36).

available for plural-marked adjectives in this context. In other words, a sentence like (i) would be only true if I carried thirty bags where the cumulative weight of the bags is light, and it would be false if I carried thirty bags where each bag was light but the total weight was high.

(i) Hmelet tleetiin shanta xfeef
carried.1s thirty bag-ø light-PL
     ‘I carried thirty light bags’
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(35)  tleetiin walad akal laflouft-uh/*-on
      thirty child ate-ø sandwich-his/*their
   ‘Thirty children ate their sandwich’

(36)  tleetiin walad akal-u laflouft-on/*-uh
      thirty child ate-PL sandwich-their/*his
   ‘Thirty children ate their sandwich’

4.5. Non-Uniform Agreement:

When it comes to agreement, adjectives behave somewhat differently from verbs and pronouns. With adjectives, when you have more than one within the same cardinal containing DP in Lebanese Arabic, you can get more than one agreement: one adjective can be plural marked while another is not. This is illustrated in (37).

(37)  tleetiin walad kesleen mnazzam-iin Htajj-u
      thirty child-ø lazy-ø organized-PL complained-PL
   ‘Thirty organized lazy children complained (about their grades)’

This is unlike pronouns and verbs, and multiple pronouns, which, we just said, have to match each other in number, as illustrated in (33)-(36). Note, however, that not all combinations are admissible. Unmarked adjectives must be closer to the noun than plural-marked ones. In fact, (38), which is the same sentence as (37), with a different adjective ordering, is ungrammatical. This ungrammaticality is not due to adjective ordering restrictions in the language, as even maintaining the same word order as the grammatical sentence but placing the agreement differently would result in ungrammaticality.

(38)  *tleetiin walad mnazzam-iin kesleen Htajj-u
      thirty child-ø organized-PL lazy-ø complained-PL
   ‘Thirty organized lazy children complained (about their grades)’

(39)  tleetiin walad kesleen-iin mnazzam Htajj-u
      thirty child-ø lazy-PL organized-ø complained-PL
   ‘Thirty organized lazy children complained (about their grades)’

This is the case, I propose, because something like what’s illustrated in (40) is happening. Assuming # merges at some point in the derivation, adjectives may compose with the predicate before #, or after #. Adjectives that merge below # modify a predicate of singularities, and are therefore unmarked, and are interpreted as strictly distributive. Adjectives that merge above #, however, end up modifying a predicate of pluralities. They are therefore plural-marked and are interpreted as modifying a predicate of pluralities. This predicts the linear ordering restriction with marking. Only adjectives closer to the noun than # may be unmarked. Pesetsky (2010) and Asarina (2010) propose something very similar for mixed gender agreement in Russian3.

3 For other explanations of mixed gender agreement in Russian, cf. Matushansky (2011) and references
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5. Ambiguity Puzzle

Recall that while in the absence of agreement only the distributive reading is available (6), in the presence of plural agreement, two interpretations are available: a distributive one and a collective one (5). To complicate matters, sentences like (41) come into the picture, where one verb is a collective predicate and must be interpreted as true of a plurality (collective reading), and another is a distributive predicate that must be interpreted as true of the atoms (distributive reading).

(41) Thirty boys met and swallowed a goldfish (Schein p.c.)

Given the proposed account, these sentences are predicted to be only grammatical in Lebanese Arabic with plural agreement on both verbs, because # must be present in the DP for the collective reading to be available.

Such sentences are indeed possible in Arabic, and require plural agreement on both verbs. Thus, (42) is grammatical, but all other agreement combinations, as illustrated in (43), are not.

(42) a. Tleetiin walad lta’-u w bala?-u samkeh zghiireh
   thirty child met-PL and swallowed-PL fish small
   ‘Thirty children met, and (each) swallowed a small fish’

(43) a. *Tleetiin walad lta’a w bala? samkeh zghiireh
    thirty child met-Ø and swallowed-Ø fish small

b. *Tleetiin walad lta’-u w bala? samkeh zghiireh
    thirty child met-PL and swallowed-Ø fish small

c. *Tleetiin walad lta’a w bala?-u samkeh zghiireh
    thirty child met-Ø and swallowed-PL fish small

Given a plural DP, I assume DP-VP is true if and only if there is a cover of the denotee of the DP such that the VP is true of all the members of the cover (Schwarzschild 1996). This gives us the ambiguity between a distributive and a collective reading when the DP

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is plural. For simplicity, I formalize this by putting it on the VP, such that ‘ate a cake’ has the denotation in ((44)a). Assuming the DP denotation in ((44)b) from ((26)bb), the result would be as in ((44)c), where it is ambiguous whether thirty children shared a cake or each ate a cake.

\[
(44) \quad \text{a. } \left[\text{ate a cake}\right] = \lambda x. \exists C \text{ s.t. } C \text{ is a cover of } x, \forall z \left( z \in C \rightarrow z \text{ ate a cake} \right)
\]

\[
\text{b. } \left[\# \text{ 30 child} \right] = \lambda V. \exists S |S|=1 \text{ and } \forall x \left( x \in S \rightarrow |\text{Atoms}(x)| \neq 1, |\text{Atoms}(x)| = 30 \text{ and } \forall y \left( y \in \text{Atoms}(x) \rightarrow y \text{ is a child} \right) \text{ and } V(x) \right)
\]

\[
\text{c. } \left[\# \text{ 30 child ate a cake} \right] = \lambda V. \exists S |S|=1 \text{ and } \forall x \left( x \in S \rightarrow |\text{Atoms}(x)| \neq 1, |\text{Atoms}(x)| = 30 \text{ and } \forall y \left( y \in \text{Atoms}(x) \rightarrow y \text{ is a child} \right) \right.
\]

\[
\text{and } \exists C \text{ s.t. } C \text{ is a cover of } x, \forall z \left( z \in C \rightarrow z \text{ ate a cake} \right)
\]

Going back to sentences like (42), with two conjoined VPs which are interpreted differently with respect to distributivity (one VP necessarily interpreted collectively, and the other necessarily interpreted distributively): in these cases, each conjunct must be true of some cover of the DP, but that need not be the same cover for both conjuncts. Therefore, \( lta' - u \) ‘met’ can be true of all members of the set containing only one element: a plurality, resulting in a collective interpretation; and \( bala? - u \) samkeh zghiireh ‘swallowed a small fish can be true of all members of the set containing all the atomic parts of that plurality, resulting in a distributive interpretation.

6. Conclusion:

In this paper, I have argued that a collective reading of a DP is made available inside the DP, and is not dependent on agreement markers on the verb. In addition, I argued that a DP is not necessarily plural by virtue of containing a cardinal, both in terms of triggering agreement and in terms of the availability of a collective reading. My empirical support came from Lebanese Arabic, specifically from cases where certain cardinal-containing DPs have only a distributive reading, and trigger no plural agreements, thus behaving like singulars both semantically and syntactically.

Several predictions made by the proposal turn out to be true, and the effects are found to be true regardless of the position of the DP (subject, object, etc.) and of the nature of the agreeing element (verb, pronoun). In addition, asymmetrical morphological restrictions provided support for the proposal. The special status of adjectives, which allow more heterogeneity in agreement, is analyzed in terms of their position within the DP, whereby they can merge before or after the formation of a predicate of pluralities.

Finally, I showed how I derive the ambiguous interpretation of plural DPs, and showed how the execution works with conjoined VPs that are pragmatically forced to be interpreted differently in terms of collective and distributive reading.

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