

# Counting atoms or sums?

An evaluation of two theses about  
cross-linguistic variation  
in numeral-noun constructions

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## **Abstract**

The morphological form that nouns take when they combine with numerals varies greatly across languages. English numerals take a plural noun (*two boys*), while Turkish numerals require the noun to be singular (*iki çocuk*, lit. ‘two boy’). These data have led to two opposing views on the semantics of numerals: i) numerals are modifiers that restrict sets of pluralities (Bale et al., 2011), and ii) numerals are functions that operate on sets of singulars (Deal, 2017). In this thesis, I use data from Turkish, Western Armenian, Welsh, and Syrian Arabic to evaluate how both views deal with numeral-noun constructions from various number marking systems. I argue that neither Bale et al.’s (2011) nor Deal’s (2017) thesis can fully account for the presented data. Finally, I suggest that singularity or plurality may not be the relevant feature for number marking selection in numeral-noun constructions.



# Table of contents

Chapter 1. Introduction .....	7
1.1 Questions about countability and the semantics of numerals .....	7
1.2 Two explanations for variation in numeral-noun constructions .....	8
1.3 Method .....	9
1.3.1 Sample and terminology .....	9
1.3.2 Assessing nominal number .....	10
Chapter 2. Numerals as functions on singulars.....	12
2.1 Counting according to Deal (2017).....	12
2.2 Challenges for Deal’s view .....	14
2.2.1 Numerals and general number in Turkish.....	14
2.2.2 Numerals and exclusive plurals in Western Armenian.....	21
2.2.3 Plurals and variation across numerals in Syrian Arabic .....	26
2.3 Conclusion .....	29
Chapter 3. Numerals as restrictive modifiers.....	30
3.1 Bale et al.’s view on numerals: The Strong Thesis.....	30
3.2 Explaining cross-linguistic variation in numeral-noun constructions .....	32
3.3 Challenges for Bale et al.’s view .....	34
3.3.1 Singular and singulative nouns in Welsh.....	34
3.3.2 Singulatives and variation across numerals in Syrian Arabic.....	36
3.4 Conclusion .....	39
Chapter 4. Discussion .....	40
4.1 Conclusion .....	40
4.2 Study limitations .....	41
4.3 Towards a comprehensive account .....	43
Acknowledgements.....	49
References.....	49



# Chapter 1.

## Introduction

### 1.1 Questions about countability and the semantics of numerals

For any speaker of English, the answer to the question why the sentence in (1a) is ungrammatical may seem obvious. A given answer may be ontological ('substances cannot be counted') or linguistic ('mass nouns cannot be counted'), but either way: it is not as simple as it seems. For instance, there are languages where the equivalent of (1a) is just as grammatical as (1b). An example from the Nez Perce language is shown in (2).

- (1) a. \*two blood  
b. two boys

- (2) lepit kike't  
two blood  
'two portions of blood'

(Deal, 2017)

Does that mean the real-world referent of *kike't* is different from the substance to which English speakers refer by *blood*? Or does it imply that the linguistic properties of *kike't* are different from *blood*? Linguists have been debating for decades over what makes predicates countable or uncountable (some more recent contributions include Chierchia, 2010; Rothstein, 2010). Although there are reasons to assume that countability is not a simple, one-way distinction (e.g. Grimm, 2012; Landman, 2011), this thesis will be dealing with only one aspect of countability: the ability of a noun to combine with cardinal numerals (henceforth: numerals), in numeral-noun constructions as in the example above. Numeral-noun constructions provide a great tool for countability tests, but they also offer more interesting data. Consider example (3).

- (3) two { \*boy / boy-s }

Yet another seemingly obvious question is why the noun in (3) obligatorily takes plural number marking. One might say that the numeral *two* indicates that there are multiple entities which are referred to as *cat*, hence the use of the plural noun *cats*. Note that whatever answer is given, it includes some assumption about the semantics of numerals. Although the concept behind numerals such as *two*, *three* or *fourteen* seems universal and straightforward, the linguistic properties of numerals are subject to a lot of discussion within the field of semantics. The challenge for semanticists is to model the denotations of numerals in order to account for their linguistic behavior. The explanation of linguistic behavior includes the data shown in (3), but also cross-linguistic differences in numeral-noun constructions (henceforth: NNCs). For instance, while the English NNC in (3) requires the plural form of the noun (*boys*), the Turkish NNC in (4) requires the singular noun (*çocuk*).

- (4) iki { çocuk / \*çocuk-lar }  
two boy boy-PL  
'two boys'

(Bale, Gagnon, & Khanjian, 2010)

This cross-linguistic variation in morphological form of the noun leads to the question whether generalizations about the semantics of numerals can be made. In the next section, I will discuss two views of numeral modification that do assume there is a universal semantics of numerals in natural language.

## 1.2 Two explanations for variation in numeral-noun constructions

Both Deal (2017) and Bale et al. (2011) aim to model a semantics of NNCs and are occupied with the number semantics of the nouns involved. However, they have opposite intuitions about how counting operations are executed and, consequently, absolutely opposite predictions about possible numeral-noun constructions cross-linguistically. Whereas Deal (2017) argues that nouns in NNCs are atomic entities, Bale et al. (2011) claim those are pluralities.

Deal’s (2017) core idea is that counting is an operation on atoms. Leading for her view is the intuition that in a set consisting of atoms and their mereological sums (e.g. {a,b,ab}), one cannot easily answer the question ‘how many’. Because *ab* consists of two other entities, the entities in the domain are not truly distinct. It is unclear which level one should use to count (Chierchia, 1998). Thus, numerals involved in a counting operation are analyzed as functions on sets of atoms, which have a proper, individuated counting level. As a consequence, Deal (2017) states, numerals always combine with semantically singular predicates.

Bale et al. (2011) have different intuitions about counting. Their thesis on numeral modification incorporates the idea that numerals restrict sets to a subset with all members of that set with a certain cardinality. For example, the numeral 2 restricts the set {a,b,ab} to all entities in that set with the cardinality 2: the set {ab}. The modified set has to include sums to be able to be restricted. As a consequence, Bale et al. (2011) claim, all numerals above 1, which denote a plurality, can never combine with semantically singular nouns.

These two analyses present clearly contrary predictions for possible numeral-noun constructions, more specifically for constructions including numerals above 1. As shown in Table 1, Deal predicts numerals can never combine with non-singular predicates, whereas Bale et al. argue the opposite: numerals (above 1) should always combine with such predicates.

<i>Nominal denotation</i>	<i>Numerals (Deal)</i>	<i>Numerals (Bale)</i>
{a, b, c}	✓	*
{ab, bc, ac, abc}	*	✓
{a, b, c, ab, bc, ac, abc}	*	✓

Table 1. Predictions of Deal (2017) and Bale et al. (2011) regarding nominal denotation in NNCs.

This thesis aims to answer the question which theory is most tenable, given cross-linguistic numeral-noun constructions. Are these theses of numeral modification in line with the data we encounter; can they explain why numerals combine with certain nominal forms and not with others, in a given language? To answer this question, a variety of NNCs from various number marking systems in different languages will be examined. I evaluate the two theories by their potential to explain the cross-linguistic data.

This thesis is structured as follows. In the next section, 1.3, I set out the method I use to answer the main question. This includes not only the nominal number assessment methodology but



also the language sample and some assumptions about number and number marking. Chapter 2 is concerned with Deal's (2017) claims about numeral modification. I explain what her view is based on and what prediction she expresses. Next, I present data from Turkish, Western Armenian and Syrian Arabic that provide challenges for her view. Possible solutions and counterarguments for these solutions are discussed as well. In Chapter 3, I discuss the background literature on restrictive modification. The characteristics of a Strong Thesis as presented by Bale et al. (2011) are examined, as well as its very specific predictions of the morphological form of nouns in NNCs cross-linguistically. Next, I examine NNCs in Welsh and Syrian Arabic that disprove these predictions. In Chapter 4, I summarize the outcomes of this study and conclude that both views have their deficits and cannot completely account for the cross-linguistic data. Moreover, I discuss the shortcomings of the current approach and will sketch an outline for a way forward from here on. I suggest that singularity or plurality may not be the decisive feature for number marking selection in numeral-noun constructions.

## 1.3 Method

### 1.3.1 Sample and terminology

Bale et al. (2011) as well as Deal (2017) give some exemplary data to back up their claims. Both discuss English and Turkish NNCs, though with different explanations for their characteristics. In the next two chapters, their line of reasoning is examined for the languages they put forward, as well as other languages. The sample of languages that I will use consists of various number marking systems, which leads to a miscellaneous collection of NNCs functioning as test cases for the theories. In order to generalize over nominal meaning and number marking, this study is restricted to languages in which case or gender marking on the noun is not forced by numerals. This way, I can examine number marking in isolation.

The languages reviewed are Turkish, Western Armenian, Welsh, and Syrian Arabic. Turkish is one of the languages - Hungarian is another well-studied language in this category - where all numerals obligatorily combine with the singular, bare noun. Western Armenian numerals optionally combine with either singular or plural nouns. Welsh has a rare number marking system where the singular form is marked instead of unmarked. Furthermore, a few Welsh nouns have a three-way number distinction. In Syrian Arabic, a similar three-way paradigm is far more productive than in Welsh, and numerals below 10 behave differently from numerals above 10 regarding the nominal forms they combine with. I collected these data through papers, grammars, and informants; the specific sources are mentioned in the subsections concerned.

A significant part of this thesis is dedicated to examining the precise number semantics of nouns cross-linguistically. I use the phrases "singular" and "plural" at times to introduce certain nominal forms (e.g. for *boy* and *boys*). However, I do not intend for the reader to interpret those terms as describing the actual number semantics of a noun. I will discuss cases where, for instance, what is traditionally described as a singular noun, does not function as a semantically singular noun. In cases where the traditional number name and the number semantics do not correspond, I will mark nominal forms as "atom", "sum", or "atom+sum denoting", to emphasize the actual semantic number. How these labels are assigned is described in the following section.

### 1.3.2 Assessing nominal number

In order to conduct this study, some assumptions have to be made about how syntactic number morphemes and semantic number relate.<sup>1</sup> I do assume that number morphemes reflect meaning, although not necessarily the meaning traditionally assigned to them. The question is how we must determine the denotation of a given nominal form. Is a bare noun always singular, and do plural morphemes across languages all denote the same kind of plurality? As many studies have shown, this is not the case (see Corbett, 2000 for examples). Therefore, we have to set up a procedure to determine the number of nominal forms we will encounter.

First, I will provide an example of the necessity of a close investigation of nominal number in different contexts. In some languages, it seems redundant to investigate nominal meaning. For instance, intuitively, bare nouns in English refer to atomic entities, whereas nouns with the suffix *-s* refer to non-atomic entities i.e. sums. However, this is not indisputable at all. Consider (5). The English plural noun *boys* indeed has strict, ‘exclusive’ sum reference in an upward entailing context such as (5a); however, in downward entailing contexts such as (5b-d), both atoms and sums are included in the denotation of *boys*, a so-called ‘inclusive’ interpretation.<sup>2</sup>

- (5) a. I saw boys.  
= I saw two or more boys.  
b. I didn’t see boys.  
= I didn’t see one or more boys.  
c. Did you see boys?  
= Did you see one or more boys?  
d. If you saw boys, please raise your hand.  
= If you saw one or more boys, please raise your hand.

What semantics should we assign to the English plural? In this thesis, each nominal form will receive only one denotation, based on its combined semantics in different contexts. A nominal form will be labeled with one out of three possible denotations in (6): either “atom” for strict atomic reference, “sum” for strict sum reference, or “atom+sum” for possible atomic and possible sum reference, which may occur in different contexts. As *boys* has strict sum reference in some contexts (e.g. in (5a)), but atom+sum reference in other contexts (e.g. in (5b-d)), it will be labeled atom+sum. Thus, any noun form that has a number neutral interpretation in at least some context will be defined as atom+sum denoting.

- (6) atom = {a, b, c}  
sum = {ab, ac, bc, abc}  
atom+sum = {a, b, c, ab, ac, bc, abc}

May it be clear that this is a simplified approach that is not suitable for other purposes. First, the possibility of ambiguity is disregarded here. Hypothetically, ‘inclusive’ *boys* and ‘exclusive’ *boys* could be instances of different lexical items with distinct meanings; English atom+sum and sum morphemes could have different semantics while they surface as identical.

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<sup>1</sup> In most number systems, there tends to be one unmarked form of the nominal, i.e. the most basic form of the noun, without any number morphemes. I will not discuss the relation between unmarked form and unmarked meaning here, but see Farkas & De Swart (2010) for a discussion on the (un)markedness of singularity and plurality.

<sup>2</sup> It has been argued that the plural receives its ‘sum-only’ meaning in episodic upward entailing contexts by competition with the singular (Sauerland, Anderssen, & Yatsushiro, 2005; Spector, 2007; Zweig, 2009).

Furthermore, this mereological approach to number does not leave any room for a further distinction within atom+sum denoting nouns. There are many reasons to argue for a semantic distinction between a more traditional ‘neutral’ or ‘general’ number and the ‘collective’, or, in other words, between inclusive plurality and kind-denoting nouns (e.g. Grimm, 2013, see Chapter 4 for further discussion). For our purposes, however, labeling a nominal form either atom, sum or atom+sum denoting is sufficient. Finally, this approach is unable to deal with various forms of minor number, such as dual or paucal number (Corbett 2000: 20-26). These forms are ignored in the number marking systems we discuss.

Considering that nouns can have different denotations in different contexts, various contexts must be examined before it can be determined whether a noun has strict atom/sum or atom+sum reference. For nouns that appear to have strict sum reference, such as the English plural, I check whether the sum denotation emerges in a downward entailing context as well. That context can be negation, questions, or conditionals. The conditional in (7), for example, checks whether the Turkish plural has sum reference only. Unlike (5b), (7) is only compatible with a situation in which there is more than one child. Therefore, it must have strict sum reference.

- (7) ?Eger çocuk-lar-ınız var-sa, el kaldır-ın<sup>3</sup>  
 If child-PL-POS.2PL there.be-COND hand raise-IMP.2PL  
 ‘If you have two or more children, raise your hand.’ (informant)

For nouns that appear to refer to atoms only, another instrument is needed. I use a tool suggested by Bale et al. (2011) to check this: if a noun can function as a predicate to a plural NP, it cannot have atomic semantics. An example is given in (8). The Western Armenian singular *dəgha* serves as a predicate for the conjoined NP *Johnə yev Bradə*, We cannot but conclude that *dəgha* has atom+sum reference. An alternative test using demonstratives is shown in (9). The Syrian Arabic *teffaha* ‘apple’ can only be referred to by a singular demonstrative and so it must be atom denoting.

- (8) John-ə yev Brad-ə dəgha en  
 John-DEF and Brad-DEF boy are  
 ‘John and Brad are boys.’ (Bale et al. 2011)
- (9) Hei / \*hadoleek teffaha  
 this these apple.SING  
 ‘This is / These are apple(s)’ (informant)

With these tools, the number semantics of nominal forms in different languages can be attested.

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<sup>3</sup> The questionability of this sentence is caused by the use of the plural marker in an conditional context. Such contexts are usually meant to inquire about whether someone has any instances of the concept of children, not whether someone has multiple. (Mathieu, 2014) notices a similar effect for interrogatives in Arabic, where the sum denoting plural is odd in a question like (i), since it is not neutral enough to inquire about the concept of oranges instead of multiple individual oranges.

i. ?\*hal sindik burtogal-a-t?  
 Q have-you oranges-SING-PL  
 ‘Do you have two or more oranges?’

However, the questionable well-formedness of the sentence is not an issue for the purpose of determining the denotation. Only the resulting interpretation of the noun, even if odd, is needed.

## Chapter 2.

# Numerals as functions on singulars

### 2.1 Counting according to Deal (2017)

Numerals can be treated as quantifiers that operate on singular predicates. The core intuition of this view is that, in order to count, one needs individuated, non-overlapping objects. Otherwise, there cannot be a clear answer to the question of ‘how many’. Thus, on a set consisting of *a*, *b*, and the sum of *a* and *b*, a counting operation cannot be performed. It follows from this that numerals most naturally combine with predicates that have atomic reference. Chierchia (1998) and Krifka (1995) have proposed such analyses in their work on count nouns. The obvious question, then, is: Why do we find numeral-noun constructions with plural nouns in so many languages? We would expect [[boy]] to be a better candidate for counting than [[boys]], given their denotation in (1).

- (1)    [[boy]] = {*a*, *b*, *c*}  
      [[boys]] = {*a*, *b*, *c*, *ab*, *bc*, *ac*, *abc*}

Krifka (1989, 1995) offers an explanation by separating the morphological form of the noun from its semantics. He states that the selection of singular or plural marking on a noun in numeral-noun constructions is a purely syntactic matter, based on whether numerals in that language have a syntactic number feature. The underlying form of the noun in NNCs is always singular, but in some languages, when a numeral is included in a noun phrase, plural number marking on the noun is triggered in syntax. The semantics of the noun, however, remain singular. The claim that morphosyntactic plurality is not necessarily in line with semantics is backed up by the existence of expressions like ‘0 bears’ and ‘1.0 bears’. These phrases do not denote sums of bears, so the plural marking *-s* on *bear* does not represent semantic plurality in these cases (Krifka, 1995). Plural marking can be a strictly syntactic matter for the sake of nominal concord or agreement.

More recently, Deal (2017) has seen the idea that numerals only modify singulars as an undeniable consequence of her work on countability distinctions. She argues that there exist two countability distinctions, one of sums and one of parts. Both distinctions are necessary for distributional tests on countability. First, nouns can be placed in two groups in terms of combinations with certain adjectives (e.g. *small*), which separates typical count nouns, such as *boys*, and object mass nouns such as *furniture*, from mass nouns like *blood*. This distinction was noted, amongst others, by McCawley (1975) and is illustrated in (2). The first two nouns are also grouped together in terms of comparison: *more* in (3a) is most naturally interpreted as ‘a greater number’, no matter how big those boys or furniture are.<sup>4</sup> On the other hand, *more* in (3b) only has ‘a greater mass/volume’ as a possible interpretation, no matter in how many portions the blood is stored (Barner & Snedeker, 2005).

- (2)    a. small boys / small furniture  
      b. \*small blood

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<sup>4</sup> See Grimm & Levin (2017) for an alternative view on the interpretation of ‘more furniture’. I will briefly come back to this in Section 2.2.1.

- (3) a. A has more boys / furniture than B.  
 b. A has more blood than B.

This first countability distinction is due to part-related semantic properties of these nouns. The count nouns and object mass nouns in (2a) and (3a) have atomic parts, the mass noun in (2b) and (3b) has not. This distinction is theorized in many ways by Chierchia (2010), Landman (2011), and Grimm (2012), among others.

The sum-based distinction, on the other hand, is crucial to distinguish the behavior of nouns with numerals (4), pluralization (5), and the choice of quantifiers (6). The count noun in phrases (4a), (5a) and (6a) does not have sums in its denotation, contrary to the object mass and mass nouns in the (4b), (5b), and (6b).

- (4) a. one cat  
 b. \*one furniture / \*one blood
- (5) a. cats  
 b. \*furniture / \*bloods
- (6) a. how many cats  
 b. how much furniture / how much water

This property is also known as cumulativity.  $P$  is a cumulative predicate if when  $x$  and  $y$  are in  $P$ , then the sum of  $x$  and  $y$  is also in  $P$ . In other words, if two entities can be referred to as being *water*, the sum of those two entities can be referred to as *water* as well. Hence, *water* has cumulative reference. Typically, mass predicates are cumulative, while singular count predicates ( $cat + cat \neq cat$ ) are not. As shown in (4-6), this places object mass nouns in the same category as mass nouns ( $furniture + furniture = furniture$ ).

Based on the necessity of two distinctions, Deal (2017) argues there must be three groups of nouns instead of two (i.e. mass vs count). She links those three groups directly to denotational varieties:<sup>5</sup>

- (7) a. [[boy]] = {a, b, c} (quantized denotation)  
 b. [[furniture]] = {a, b, c, ab, bc, ac, abc} (atomic join semilattice)  
 c. [[blood]] = {ab, bc, ac, abc} (non-atomic join semilattice)

As we saw in (4), the possibility of nouns combining with numerals depends on the sum-based property. Only non-cumulative predicates can be modified by numerals, and Deal draws the conclusion that whatever the surface morphology of the noun in a numeral-noun construction is, the noun that is *actually* modified always is a semantically singular predicate. Following Krifka (1995), she explicitly assumes that the occurrence of plural morphology must be solely for grammatical reasons in these cases. Concluding, according to Deal (2017), the numeral *two* quantifying the three noun groups in (7), would proceed as in (8). Thus, the plural marker *-s* that surfaces in English *two boys* is not represented in semantics.

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<sup>5</sup> A proposal along these lines is made by (Doetjes, 1997).

- (8)    [[two]] ([[boy]])            = [[two]] ({a, b, c})                    = {ab, ac, bc}  
          [[two]] ([[furniture]]) = [[two]] ({a, b, c, ab, ac, bc, abc}) = *undefined*  
          [[two]] ([[blood]])        = [[two]] ({ab, ac, bc, abc})            = *undefined*

An advantage of this view of numerals is their explanatory value regarding the impossibility of numerals combining with mass nouns (*furniture, blood*). However, cross-linguistic validation of this thesis has yet to be executed.

## 2.2 Challenges for Deal’s view

According to Deal, numerals must combine with semantically singular nouns. A counting operation must apply on an atom denoting predicate, and, thus, cannot be executed when a predicate is cumulative. The possible numeral-noun constructions according to this view are shown in Table 2.

<i>Nominal denotation</i>	<i>Numerals</i>
{a, b, c}	✓
{ab, bc, ac, abc}	*
{a, b, c, ab, bc, ac, abc}	*

Table 2. Deal’s prediction of possible cross-linguistic numeral-noun constructions.

In this section, we will examine numeral-noun constructions in Turkish, Western Armenian, and Syrian Arabic, which present some challenges for the predictions above.

### 2.2.1 Numerals and general number in Turkish

At first glance, the Turkish number marking resembles English: It is binary with a bare singular and marked plural. However, combining with numerals it acts differently from English, as shown in (9). The numeral combines with the bare singular, whereas combination with the plural renders ungrammaticality.

- (9)    iki { çocuk / \*çocuk-lar }  
          two boy        boy-PL  
          ‘two boys’  
(Bale et al. 2011)

Deal has an explanation for this behavior. As noticed in Section 2.1, Deal assumes that the occurrence of plural morphology in English (*two boy-s*) is due to nominal concord. The numeral has a syntactic – but no semantic – number feature, that needs to be checked by the noun. Languages with numerals that lack this feature may also exist, causing plural morphology not to surface in numeral-noun constructions. Deal suggests, following Krifka (1995), that Turkish might be such a language. Turkish and comparable languages therefore do not seem to be a problem for Deal’s account.

However, Krifka, as well as Deal, disregards the fact that the number of Turkish ‘singular’ and ‘plural’ nouns may be different from their English counterparts. A noun being not marked for plurality does not mean that the noun modified is semantically singular, as described in Section 1.3.

Turkish bare nouns can function as predicates for conjoined NPs, as we saw earlier and below in (10), so it cannot have singular semantics. This indicates that Turkish bare nouns are general number. The Turkish sentence (11) is only compatible with a situation in which there is more than one child, so the plural is defined as strict plural.

- (10) John ve Brad çocuk  
 John and Brad boy  
 ‘John and Brad are boys’ (Bale et al., 2011)
- (11) ?Eger çocuk-lar-ınız var-sa, el kaldır-ın  
 If child-PL-POS-2PL there.be-COND hand raise-IMP-2PL  
 ‘If you have two or more children, raise your hand.’ (informant)

*Çocuk* does not refer to a set of singular boys, but the set of singular boys and all possible groups that can be formed from those singular boys: {a, b, c, ab, bc, ac, abc}. Contrarily, *çocuklar* refers only to groups of those boys: {ab, bc, ac, abc}. Examining Turkish numeral-noun construction with this knowledge, we uncover a problem. The impossibility of a numeral combining with a plural like *çocuklar* is still accounted for, because it is cumulative. However, there is no such thing as a semantically singular noun for a numeral to combine with. Instead, the numeral combines with the cumulative *çocuk*. If we follow Deal, neither the unmarked nor the marked noun should be able to occur with a numeral, illustrated in (12).

- (12) *expected*: iki { \*çocuk / \*çocuk-lar }

How could we explain the well-formedness of *iki çocuk*? As the semantics of both numeral and noun are set now, an impasse is reached. The only option left is to find a solution in the structure of the Turkish NNCs. I will investigate the possibility of any intervening pieces we cannot see in the compositional semantics, by means of Deal’s (2017) own research. In her analysis of Nez Perce, an endangered Sahaptian language spoken by the eponymous tribe, Deal (2017) demonstrates the existence of a silent operator  $\alpha$ , for “atomization”. In NNCs, this atomizer resides between the numeral and the cumulative predicates such as *blood* ‘kike’t’ in (13).

- (13) a. Lepit kike’t hi-sseew-n-e  
 two blood 3SUBJ-drip-P-REM.PAST  
 ‘Two drops of blood fell.’
- b. [ lepit [  $\alpha$  kike’t ] ]

If a similar syntactic piece were present in Turkish NNCs, it would be implemented as in (14). Within the NNC *iki çocuk*, a silent piece  $\alpha$  resides between the numeral and the noun. The  $\alpha$  atomizes the cumulative predicate *çocuk* into atomic parts, which, in their turn, can be modified by a numeral *iki*.

- (14) a. [ iki [  $\alpha$  çocuk ] ]  
 b. [[iki]] ([[çocuk]])  
 = [[iki]] (  $\alpha$  {a, b, c, ab, ac, bc, abc} )  
 = [[iki]] {a, b, c}  
 = {ab, bc, ac}

However, I object to such a solution. A silent piece as proposed by Deal (2017) would not fit for application in these NNCs. The role of  $\alpha$  is very clear: “to map homogeneous denotations to quantized ones” (Deal 2017:22). It allows for a productive type of meaning shift, for example, from bread to loaves of bread, or slices of bread, depending on the atomization provided by the context. A Turkish count noun like *çocuk* clearly does not need a type shift like that: it is counterintuitive to treat an object noun as a homogeneous substance noun.

Moreover, the insertion of  $\alpha$  is not theoretically tenable in the case of Turkish bare singulars. A predicate only is homogeneous if it is both cumulative and lacking in (non-overlapping) minimal parts (see Section 2.1). We have established that *çocuk* is cumulative, but, additionally, that it does have minimal parts in its denotation, which is an atomic join semi-lattice: {a, b, c, ab, ac, bc, abc}. Since *çocuk* has non-overlapping minimal parts, it is not homogeneous and cannot be subject to an atomizer  $\alpha$ , like Deal (2017) proposes for Nez Perce.

An obvious follow-up question is whether we could invent our own silent piece that does work for Turkish. For instance, we could propose  $\beta$ , an operator that maps non-homogeneous but cumulative denotations like *çocuk* from complete join semi-lattices to atomic entities. There are two objections to such a proposal. First, we cannot use Deal’s tools for  $\alpha$  in Nez Perce to prove  $\beta$  in Turkish. All her evidence for the existence of  $\alpha$  – which I will not discuss here – is built on the differences in interpretation between substance nouns and substance nouns +  $\alpha$ . The gist of it is that the latter gives rise to a quantized denotation in certain contexts, while the former does not. These interpretational differences would not arise for  $\beta$ , since  $\beta$  operates on already quantized (non-homogeneous) denotations. Both *çocuk* and *çocuk* +  $\beta$  would give a quantized interpretation, so the interference of  $\beta$  cannot be proven with such tests. Thus, the independent evidence presented by Deal (2017) for  $\alpha$  does not work for  $\beta$ . This leads to my second objection: if we do not have any independent evidence for  $\beta$ , we should not propose it. We could invent a silent syntactic piece for every language in which NNCs appear with cumulative predicates to make Deal’s thesis work, but without independent support, we lose the desired explanatory power. In summary, a silent piece as Deal (2017) proposes does not provide a satisfactory solution for Turkish NNCs with bare singulars.

I would like to introduce a second option for *iki çocuk*, which relies on the notion of measuring. It is well known that numerals cannot only be used to count, but also to measure. In English, for instance, mass nouns can be modified by a numeral in pseudopartitive constructions, illustrated in (15). As (16) shows, count nouns can also appear in such measure constructions.

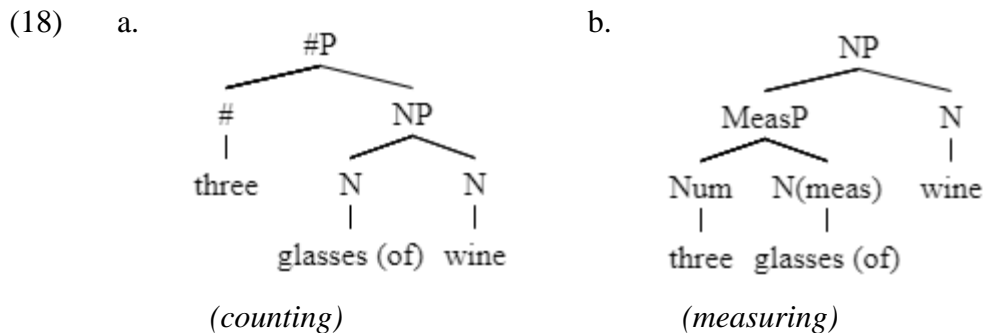
- (15) a. \*two flour  
b. two kilos of flour

- (16) a. two books  
b. two kilos of books

The use of the numeral in (16a) is different from its use in (16b), according to Rothstein (2012, 2017), as counting and measuring are two distinct operations with distinct structures. Rothstein (2012) shows how to differentiate between seemingly identical pseudopartitives in English by checking whether the morpheme *-ful* can be added to the classifier. As shown in (17a), this is not possible for counting (or: individuating) readings, but it is perfectly fine for the measure reading in (17b). The associated structures (Rothstein, 2009) are shown in (18).



- (17) a. Bring three glasses(#ful) of wine for our guests! (*counting*)  
 b. Add three glasses(ful) of wine to the soup! (*measuring*)



While counting requires access to the atomic parts of an entity to put them in correspondence with natural numbers, a measure operation does not refer to mereological structure at all. As Rothstein (2017) explains, measuring is merely assigning a value to a quantity on a contextually determined scale. Common dimensions are volume (e.g. 17b) or weight (e.g. 15b, 16b), but using a cardinal scale for measuring is also an option. If one wants to compare which of two sums has more atomic parts, one can compare the values of both sums on the cardinality scale. This may seem a complicated operation for a comparison that may as well be dealt with through counting, and in fact, the counting operation is a common way of avoiding cardinal measuring. Cardinal measuring is particularly useful for nouns that cannot be counted, that is object mass nouns. Take the statement in (19). As we know, it is linguistically impossible to count a noun like *jewelry* (*\*three jewelry*), but it does denote a set of individual entities (pieces of jewelry), that can be compared in terms of cardinality. Note that this is not the only option: other dimensional scales can be used for measurement, although they may be less salient. For instance, the comparison made in (19) can be considered true if Ann has four pieces of jewelry, while Mary has three. However, if Mary’s three pieces include a very showy necklace, tiara, and earrings, while Ann only wears a modest set of bracelets, one may conclude (19) is false (Grimm and Levin, 2019).

- (19) Ann is wearing more jewelry than Mary.

Now, why is the notion of cardinal measuring relevant for this Turkish case? Keeping the above in mind, I will try to explore the possibility that *iki çocuk* is a measure construction instead of a counting construction. Pires de Oliveira and Rothstein (2011) have shown before that bare singulars in Brazilian Portuguese are object mass nouns, by comparing their behavior to bare plurals, mass and object mass nouns. They show that, in contrast to bare plurals (20), bare singulars pattern like mass nouns in giving rise to a generic reading only in sentences like (21) and (22).

- (20) Bombeiro-s são disponíveis. (generic OR existential reading)  
 fireman-PL be.PRS.3PL available.PL  
 ‘Firemen in general are available.’ OR ‘Some firemen are available.’

- (21) Bombeiro é disponível. (ONLY generic reading)  
 fireman.SG be.PRS.3SG available  
 ‘Firemen in general are available.’

- (22) Petróleo é disponível. (ONLY generic reading)  
 oil.SG be.PRS.3SG available.  
 ‘Oil is available.’

A previous argument against analyzing bare singular in Brazilian Portuguese as mass nouns was made by Schmitt and Munn (1999). They observed bare singulars allow distributive predicates as in (23), while a mass noun in (24) does not. However, Pires de Oliveira and Rothstein show in (25) that object mass nouns allow distributive predicates as well.

- (23) Criança (nessa idade) pesa vinte kilo-s  
 child.SG (at.this age) weigh.PRS.3SG twenty kilo-PL  
 ‘Children (at this age) weigh twenty kg.’
- (24) #Ouro pesa duas grama-s.  
 gold.SG weigh.PRS.3SG two gram-PL  
 Intended meaning: ‘Pieces of gold weigh two grams.’
- (25) Móvel (nesta loja) pesa vinte kilo-s.  
 furniture (in.this store) weigh.PRS.3SG twenty kilo-PL  
 ‘Furniture (in this store) weighs 20 kilos.’

Pires de Oliveira and Rothstein go on to show that bare singulars behave like mass nouns in comparative constructions. They allow not only cardinal comparison but other dimensions as well, as do object mass nouns. Whereas the plural count noun *livros* in (26a) makes a comparison based on counting salient, the bare singular *livro* in (26b) can be compared based either on cardinal comparison or on, for example, volume.

- (26) a. João tem mais livro-s que a Maria. (cardinal ✓, volume #)  
 João has more book-PL than the Maria  
 ‘João has more books than Maria.’
- b. João tem mais livro que a Maria. (cardinal ✓, volume ✓)  
 João has more book.SG than the Maria  
 ‘João has more book than Maria.’

Pires de Oliveira and Rothstein (2011) conclude that the Brazilian Portuguese bare singular is an object mass noun and, therefore, allows both cardinal and non-cardinal comparison, as seen previously in (19). Rothstein (2017) makes the same argument for Hungarian, a language with singular nouns in NNCs and quantity expressions. Both the count quantifier *hány* ‘how many’ and the mass quantifier *mennyi* ‘how much’ take the singular, but with an interpretational difference. The ‘how many’ question in (27) triggers a counting interpretation and can only be answered with a cardinal statement, while the ‘how much’ question in (28) allows for a cardinal or non-cardinal answer. Equivalent to Brazilian Portuguese, Hungarian bare nouns should be analyzed as object mass noun.

- (27) Hány könyv van a táská-d-ban?  
 how.many book be.3SG the bag-2POSS-in  
 ‘How many books are there in your bag?’
- (i) Csak három. (cardinal ✓)  
 only three  
 ‘Only three.’
- (ii) #Három kilo. (weight #)  
 three kilo  
 ‘Three kilos.’

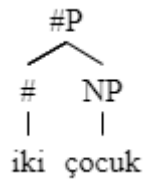
- (28) Mennyi könyv-et tudsz cipelni?  
 how.much book.SG-ACC able.2SG to.carry  
 ‘What quantity of books are you able to carry?’
- (i) Hárma-t. (cardinal ✓)  
 three-ACC  
 ‘Three.’
- (ii) Három kilo-t. (weight ✓)  
 three kilo-ACC  
 ‘Three kilos.’

Thus, it is established that bare singulars can be classified as object mass nouns by looking for potential cardinal and non-cardinal evaluations in comparing or quantifying contexts. Next, I will determine whether this is probable for Turkish nouns as well. In (29-30) we see, indeed, that a bare count noun like *kitap* ‘book’ does not only occur with the count quantifier *kaç*, but also with mass quantifier *ne kadar*. Moreover, (30) shows that cardinal as well as non-cardinal answers are possible. From this, I derive that the Turkish bare singular is an object mass noun, similar to Brazilian Portuguese and Hungarian.

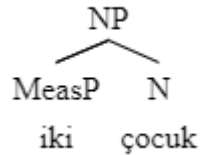
- (29) Kaç kitap var?  
 how.many book EX  
 ‘How many books do you have?’ (informant)
- (i) Sadece iki. (cardinal ✓)  
 only two  
 ‘Only two.’
- (ii) #İki kilo. (weight #)  
 two kilo  
 ‘Two kilos.’
- (30) Ne kadar kitap taşıy-abil-ir-sin  
 how much book carry-can-PRS-2SG  
 ‘What quantity of books can you carry?’ (informant)
- (i) İki. (cardinal ✓)  
 two  
 ‘Two.’
- (ii) İki kilo. (weight ✓)  
 two kilo  
 ‘Two kilos.’

Since counting and measuring are different operations and constructions, the above could provide a solution for the data found in Turkish. All NNCs could be instances of a measure construction instead of a counting construction. As a consequence, there is no need for a semantically singular noun. This means that the cumulativity of *çocuk* in *iki çocuk* is no longer a problem, because there is no counting involved. The structure of *iki çocuk* then, corresponds to either (31b) or (31c), instead of the counting structure in (31a) (cf. (18a-b)).

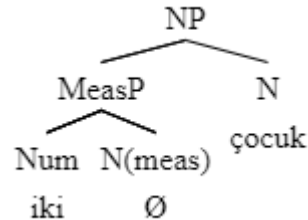
(31) a.



b.



c.



How feasible is such an analysis for Turkish NNCs? I have a few observations to be made before evaluating this proposal. As can be seen in the structure above, *iki çocuk* and measure constructions like *three glasses of wine* differ in one obvious respect: the former does not feature a classifier. While this is in accordance with the intuition that the unit of measurement is the atomic individual children, a formal unit of measurement is nonetheless needed in MeasP. Therefore, we need to commit to one of two possibilities: either the classifier is built-in in the numeral, as in (31b), or the classifier is silent (as in 31c).

If we propose a classifier within the numeral, this has some undesirable consequences. That is, the numeral including classifier looks exactly the same as all other occurrences of the numeral where no classifier is needed. Those uses include neutral counting sequences (*bir, iki, üç* ‘one, two, three’) and mathematical enumeration (*iki artı iki dördür* ‘two plus two is four’). Similarly, we would have a problem with compound numerals such as *iki yüz* ‘two hundred’ and *yirmi iki* ‘twenty-two’. These complex numerals are formed in (morpho)syntax and would have multiple built-in classifiers, one for each simple numeral involved. To avoid classifier doubling, Turkish would, again, require homogeneous non-classifier numerals to act in the construction of compound numerals. Furthermore, the built-in classifier option gives rise to another problem in measure constructions with an overt classifier, such as *iki litre şarap* ‘two liters of wine’. Since the presence of two classifiers in this constructions is objectionable, we need the ambiguous non-classifier version of *iki* to appear in this phrase as well, while this numeral is otherwise indistinguishable from its built-in classifier counterpart. In addition to this solution being inelegant, it would be hard to obtain independent proof that those superficially similar numerals have different semantics depending on whether they occur in NNCs or outside NNCs, in contexts where classifiers are not desirable, with other numerals or overt classifiers.

The rejection of (31b) as the structure for Turkish NNCs leaves us with the option of a silent classifier in  $N_{\text{meas}}$ , as in (31c). This option bears resemblance to the silent piece we tried to introduce before, as Deal (2017) did for Nez Perce. The above could be seen as supporting data for such a silent classifier, although, as stated before, there is no independent proof that such a silent syntactic piece exists.

I would like to make a last remark about the analysis of Turkish NNCs as measure constructions. If we accept this analysis, an inevitable consequence is that counting Turkish nouns is not possible at all. Note that this should not be inherently problematic. It is merely

surprising that Turkish speakers would be able to count objects cognitively, but not linguistically.

That leaves me to conclude that the Turkish NNC as measure construction is theoretically possible, but also nearly improvable and with little explanatory power.

## 2.2.2 Numerals and exclusive plurals in Western Armenian

Nominal number semantics in Western Armenian is comparable to Turkish. As demonstrated by Bale et al. (2011), the bare noun is general number, see (32), while the plural is strictly sum denoting, which can be seen in slightly odd, but interpretable sentences such as (33). The denotations of these nominal forms in (34) lead to the predictions in (35): neither the bare nor the plural noun should combine directly with numerals.

- (32) John-ə yev Brad-ə dəgha en  
 John-DEF and Brad-DEF boy are  
 ‘John and Brad are boys.’ (Bale et al., 2010)
- (33) ?Amen mart vor bəzdig-ner uner vodk-i gaine-tsav  
 all person that child-PL had foot-DAT stand.up-PST  
 ‘Everyone that had two or more children stood up.’ (Bale et al., 2010)
- (34) [[dəgha]] = {a, b, c, ab, ac, bc, abc}  
 [[dəgha-ner]] = {ab, ac, bc, abc}
- (35) *expected*: yergu { \*dəgha / \*dəgha-ner }

Counter to Deal’s (2017) expectation, (36) shows that Western Armenian bare nouns combine with numerals, so in this respect, the situation is the same as the problematic case of *iki çocuk* in Turkish. A numeral is able to modify a cumulative noun, which should not be possible according to Deal. Since this is the same problem as in Turkish, I will not repeat the line of argumentation laid out in Section 2.2.1, but it holds for the Western Armenian singular NNC as well.

- (36) yergu { dəgha / dəgha-ner }  
 two boy boy-PL  
 ‘two boys’ (Bale et al., 2010)

Furthermore, a second problem is exhibited in (36). The example shows that Western Armenian plurals combine with numerals as well. This NNC with a plural noun initially resembles English, where a cumulative predicate combines with a numeral. I will examine two possible solutions Deal (2017) mentions for the English problematic data, and evaluate their usefulness for Western Armenian plural NNC. The first one is assuming that numerals have the property of “undoing” the semantic pluralization of the noun. Chierchia (1998) proposes that numerals have a built-in function SG, which acts as a domain regulator. This function checks whether a predicate has atomic parts and if not, it cannot be used in counting operations. This need for granularity within a predicate is fulfilled when the denotation is either a set of atoms (*boy*), or is a pluralized set of atoms via a pluralization function PL (*boys*). If not, then SG is undefined. This is formalized by Chierchia as follows:

(37) For any set A:

$$SG(A) \begin{cases} A, & \text{if } A \subseteq At \text{ or if } A = PL(B), \text{ for some } B \subseteq At \\ \text{undefined,} & \text{otherwise} \end{cases}$$

(38)  $PL(boy)$   
 $= PL(\{a, b, c\})$   
 $= boys \begin{cases} \{ab\}, \{ac\}, \{bc\} \\ \{abc\} \end{cases}$

(39)  $SG(boys) = boys$

By using SG, Chierchia excludes mass nouns and object mass nouns, such as *furniture*, to be counted, since they are not derived via PL from atomic parts. In English,  $SG(boys)$  would simply return *boys*, because *boys* is derived through PL from *boy*, which is a set of atoms. Thus, *boys* can occur in NNCs.

Nevertheless, I refute Chierchia's function SG to be a viable solution to our problem. There are two objections for such a function as an explanation for the occurrence of numerals with plurals in Western Armenian. Whereas SG would work for languages with semantically singular bare nouns, like English, it does not for languages in which the bare noun is atom+sum denoting. The specifics of the PL operation dictates that the original predicate has to be semantically singular. As shown before and formalized in (40), this does not hold for *dəgha*. Therefore, a plural like *dəghaner*, cannot be derived through Chierchia's PL as in (38), and  $SG(dəghaner)$  will be undefined:

(40)  $PL(dəgha)$   
 $= PL \left( \begin{array}{c} \{abc\} \\ \{ab\}, \{ac\}, \{bc\} \\ a \quad b \quad c \end{array} \right) \quad \text{cf. (21)}$   
 $= \text{undefined}$

(41)  $SG(dəghaner) = \text{undefined}$

Now, we could easily invent another pluralization function to work around this problem. We could reject the condition of the original predicate being atom denoting, so  $PL(dəgha)$  would render a plural *dəghaner*. However, it is crucial that such a function will not prevent using PL over object mass nouns (*furniture*) and mass nouns (*water*). In that case, it loses all its explanatory power. Therefore, an alternative PL without this prerequisite is not an option.

Furthermore, Deal's view on cumulativity and numeral modification is in fact not helped by a function SG. Note that Chierchia (1998) does not claim that the numeral has to modify a semantically singular predicate, as Deal states. The only requirement for numeral modification is that the noun, whether singular or plural, is derived from a semantically singular noun. SG acts as a domain regulator, not as a de-pluralization operation, and, thus, can still take a cumulative predicate as a complement. Deal's original standing point is that numerals cannot modify cumulative nouns, regardless of how they are derived. I conclude that a function such

as Chierchia’s SG will not suffice as an explanation for the cumulative nominals in Western Armenian NNCs.

An alternative perspective is presented by Deal (2017) herself. She chooses to adopt Krifka’s proposal, briefly mentioned in Section 2.1, which I will explore in depth now. The core thought is as follows: if plural nominal morphology shows in NNCs, then that is a consequence of the syntactic number feature of the numerals in that language. This feature requires to be checked in the derivation for reasons of nominal concord, but “has no semantic value” (Krifka 1995:). Contra our initial assumption, Krifka claims plural marking can be a strictly syntactic matter for the sake of nominal concord or agreement. I will first consider the characteristics and prerequisites of such an agreement process and thereafter its applicability to the Western Armenian data.

Nominal concord refers to the agreement processes within the DP. In typical cases, adjectives, determiners, and nouns show corresponding inflectional morphemes for  $\phi$ -features gender or number (Norris 2014). In French phrases (42-43), the differences regarding the inflectional affixes are shown between a singular feminine DP and a plural masculine DP. In (42), the article *la* and adjective *belle* both reflect the gender and number of the noun *fille*. The masculine and plural counterpart of (42) is shown in (43).

- |      |                      |                 |             |
|------|----------------------|-----------------|-------------|
| (42) | la                   | belle           | fille       |
|      | the.FM.SG            | beautiful.FM.SG | child.FM.SG |
|      | ‘the beautiful girl’ |                 |             |
|      |                      |                 |             |
| (43) | le-s                 | beau-x          | fil-s       |
|      | the.M-PL             | beautiful.M-PL  | child.M-PL  |
|      | ‘the beautiful boys’ |                 |             |

It has been repeatedly mentioned in the literature that, although concord is intuitively characterized as “agreement with the head noun”, the head noun is not undisputedly the structural source of these  $\phi$ -features (e.g. Norris, 2014, Danon, 2010). In fact, we *need* to assume that grammatical number does not originate from the noun for concord to be a solution for plural nouns in NNCs. The reason is straightforward: according to Deal, the noun in NNCs cannot be a semantic plural, and, consequently, cannot qualify as the origin of plural number markings within the DP. Instead, it must be that an independent projection carries the number feature with which other heads agree.

Indeed, there seems to be evidence that suggests that number depends on higher parts of the DP. Danon (2010) gives some straightforward examples, such as languages with independent words for marking plurality, instead of noun morphology, for example in Hawaiian (Dryer, 2005):

- |      |               |     |     |      |
|------|---------------|-----|-----|------|
| (44) | ‘elua         | a‘u | mau | i‘a  |
|      | two           | my  | PL  | fish |
|      | ‘my two fish’ |     |     |      |

Another illustrative language in this respect is Finnish. Example (45) from Brattico (2010) shows that the number of the noun in NNCs is singular and that the DP as a whole triggers singular verbal morphology. However, when a demonstrative precedes the NNC, as in (46),

the demonstrative as well as the agreeing verb require plural marking, while the noun remains singular (Brattico 2010).

- (45) Kolme auto-a aja-a tiellä.  
 three car-par.SG drive-SG road  
 ‘Three cars drive on the road.’
- (46) Ne kaksi pien-tä auto-a seiso-ivat tiellä.  
 those.PL two.SG small-SG.PAR car-SG.PAR stand-past.3PL at.the.road  
 ‘Those two small cars stood at the road.’

These Finnish data confirm the idea that DP-internal agreement depends on a higher projection than the noun, which not necessarily reflects the number of the entire DP. Thus, DP-internal agreement could be an explanation for the plural marking in Western Armenian NNCs. We do have to make an adjustment in Krifka’s original claim: the syntactic number feature does not originate from the numeral, but from an independent projection.

However, if syntactic agreement is the cause of plural marking in *yergu daghaner*, it is somewhat surprising that *yergu dagma* is well-formed as well. This concord appears to be optional: the numeral allows for both the bare noun *dagma* and the plural marked *daghaner* to follow. In the few cases in the literature where concord is analyzed as optional to some degree, this optionality always relates to determiners, adjectives, or possessors (Norris, 2017). To the best of my knowledge, there are no other instances described of optional number concord on nouns, while other parts of the DP obligatorily show plural marking. Further research, both descriptive and analytic, needs to be conducted in this area.

Besides the possibility of optional concord, I go on to explore an alternative: different semantics for the different forms of the NNC. Western Armenian grammars provide some pointers in this direction, since plural marking appears not equally suited for all contexts. Bardakjian & Thomson (1977) note that using the singular is mostly used in NNCs, unless it is emphasized or definite, or an adjective is located between the numeral and noun:

- (47) a. *yergu tun*  
 two house  
 ‘two houses’
- b. *yergu t-ner-y*  
 two house-PL-DET  
 ‘the two houses’
- c. *yergu nor t-ner*  
 two new house-PL  
 ‘two new houses’

In general, the plural marker is used when the speaker wants to “focus attention on the referents as individuals rather than instances of a type or to the collection of individuals as an entity” (Sigler 1997). This contrast is illustrated below: (48) shows the singular is preferred in general, while the specificity of the noun phrases with an adjective or relative clause in (49) allows or even prefers the plural. Sigler (1997) describes how the point of the utterance in (48a) is the quantity and the type of object that is bought, and not the specifics of these dictionaries, as in



(49a). Alike, in (48b), the number of people and the fact that they are guests is salient, while the individual properties of these guests are emphasized in (49b).

- (48) a. Zarmig-əs yeresun pararan/#-ner kən-ad e  
 cousin-1POSS thirty dictionary/-PL buy-PPT be.3SG  
 ‘My cousin has bought thirty dictionaries.’
- b. Mer dun-ə kisher-ə utə hyur/#-er gec-av/-an  
 our house-DET night-DET eight guest/-PL stayed-3SG/3PL  
 ‘Eight guests stayed overnight at our house.’
- (49) a. Zarmig-əs yeresun hayeren-ankleren pararan-ner kən-ad e  
 cousin-1POSS thirty Armenian-English dictionary-PL buy-PPT be.3SG
- b. Mer dun-ə kisher-ə utə təram ė-unec-ogh hyur(-er) gec-av(/-an)  
 our house-DET night-DET eight money NEG-had-SR guest(-PL) stayed-3SG/3PL  
 ‘Eight guests who had no money stayed overnight at our house’

An even stronger effect arises when the NNC contains a definite article. Sigler (1997) reports the plural marker on the noun in the sentences (50) is obligatory. In contrast to (48), nouns without plural marking cannot obtain the necessary plural interpretation when they are accompanied by a determiner.

- (50) a. Zarmig-əs ays yeresun pararan\*(-ner)-ə təbroc-i-n hamar kən-ad e  
 cousin-1POSS this thirty dictionary-PL-DET school-DAT-DET for buy-PPT be.3SG  
 ‘My cousin has bought these thirty dictionaries for the school.’
- b. Mer utə hyur\*(-er)-ə kisher-ə mer kov-ə gec-an  
 our eight guest-PL-DET night-DET our side-DET stayed-3PL  
 ‘Our eight guests stayed overnight.’<sup>6</sup>

Although the semantic contrast in specificity Sigler describes is rather vague, it brings back to mind the difference in semantics between the bare singular and plural in Brazilian Portuguese and Hungarian, discussed in Section 2.2.1. Pires de Oliveira & Rothstein (2011) illustrated that bare singulars in Brazilian Portuguese give rise to a generic reading only in sentence (52), compared to the bare plural in (51), which also allows for an existential interpretation.

- (51) Bombeiro-s são disponíveis. (generic OR existential reading)  
 fireman-PL be.PRS.3PL available.PL  
 ‘Firemen in general are available.’ OR ‘Some firemen are available.’
- (52) Bombeiro é disponível. (ONLY generic reading)  
 fireman.SG be.PRS.3SG available  
 ‘Firemen in general are available.’

Although Sigler (1997) does not compare the bare singular to the bare plural, she does mention that the bare singular in (53) only allows a generic reading. It cannot have the existential

<sup>6</sup> The parentheses around the plural marker *-er* in both (33a) and (33b) and my own. Sigler states in the text accompanying the examples that without the marker, the sentence is ill-formed.

reading where some specific figs were sold by Maro. Sigler (1997) specifically calls these bare nouns *mass indefinites*, because they refer to individuals or groups of individuals that cannot be distinguished, just as mass nouns do.

- (53) Maro-n tuz gə-dzaxe-ø (ONLY generic reading)  
 Maro-the fig IMP-sell-3SG  
 ‘Maro sells figs (in general).’

This resemblance to Brazilian Portuguese nudges us in the direction of measuring (as discussed in Section 2.2.1). Could Western Armenian NNCs involve measuring of object mass noun as well, as was speculated for *iki çocuk*? They could, but it would not solve the problem of *yergu dəghaner*. The form that would involve measuring instead of counting, in that case, would be *yergu dəgha*, with the bare singular i.e. object mass noun.

Although it would not solve the issue with the plural NNC, we could still assume Western Armenian singular NNCs are instances of measure constructions. However, Western Armenian provides a harder case for measuring NNCs than Turkish. In Turkish, one of the problems with *iki çocuk* was needing to assume two different *ikis*, one with a built-in classifier and one without, for outside NNCs, where the classifier was not needed. In Western Armenian, this problem is amplified. Sigler (1997) provides, without remark, the measure construction with overt classifier in (54a’) as an alternative for the plural NNC in (49a), repeated here as (54a).

- (54) a. Zarmig-əs yeresun hayeren-ankleren pararan-ner kən-ad e  
 cousin-1POSS thirty Armenian-English dictionary-PL buy-PPT be.3SG  
 a’. Zarmig-əs yeresun had hayeren-ankleren pararan kən-ad e  
 cousin-1POSS thirty CL Armenian-English dictionary buy-PPT be.3SG  
 ‘My cousin has bought thirty Armenian-English dictionaries.’

If we assume *yeresun pararan* to be a measure construction, not only would the numeral *yeresun* need a without-classifier counterpart, but this counterpart would also be used in NNCs with the exact same form of the noun. Then, *yeresun pararan* and *yeresun had pararan* would both be measure constructions, with the difference that the numeral in the former has a built-in classifier and the numeral in the latter does not. Similar to Turkish, this solution has no independent supporting evidence and thus no explanatory power.

In conclusion, the Western Armenian data provide a hard case for Deal’s thesis. The singular NNC (*yergu dəgha*) faces the same problems as the Turkish NNC. The plural NNC (*yergu dəghaner*) can be explained by DP-internal concord, although its optionality is surprising. The different interpretations of the singular and the plural NNC point into the direction of measuring, but that does not help *yergu dəghaner*, since the bare singular, as possible object mass noun, is the only candidate for a measuring construction.

### 2.2.3 Plurals and variation across numerals in Syrian Arabic

Arabic dialects provide an interesting case for NNC research, since numerals 10 and below behave differently from numerals above 10. In general, numerals 3 to 10 take the plural form of the noun, whereas numerals 11 and above only combine with the singular form.<sup>7</sup> In this

<sup>7</sup> The numeral 2 is barely used in Syrian Arabic NNCs; the dual form of the noun without numeral is used to express a sum with the cardinality 2.

section, NNCs for two of the many number marking systems of Syrian Arabic are examined. Syrian Arabic, not to be confused with the Syrian or Syriac Aramaic language, is the variety of Levantine Arabic mainly spoken in Syria.

The first paradigm is a common two-way system with a bare singular and a marked plural. (55) shows that the singular is atom denoting, as it cannot be used as a predicate to a plural NP – in contrast to the plural. The plural is atom+sum denoting, hence its inclusive interpretation in the conditional in (56).

- (55) John w Brad { \*kazzaab / kazzaab-en }  
 John and Brad liar / liar-PL  
 ‘John and Brad are liars’ (informant)
- (56) ʔitha qaabalt kazzaab-en, ʔerfeʃ yadak  
 if met.2SG liar-PL raise hand.2POSS  
 ‘If you met (one or more) liars, raise your hand.’ (Mathieu, 2014)

These denotations would lead to the prediction that numerals in Syrian Arabic only combine with the atom denoting bare noun, and certainly not with the plural, as shown in (57). Numerals above 10 show this exact behavior, as shown in (58). However, numerals below 10, such as 3 in (60), only occur with the plural, in contrast to the expectation in (59).

- (57) *expected*: edeash { kazzaab / \*kazzaab-en }
- (58) edaesh { kazzaab / \*kazzaab-en }  
 eleven liar / liar-PL  
 ‘eleven liars’ (informant)
- (59) *expected*: tlatt { kazzaab / \*kazzaab-en }
- (60) tlatt { \*kazzaab / kazzaab-en }  
 three liar / liar-PL  
 ‘three liars’ (informant)

Example (60) initially poses the same problem as the English case does: the numeral obligatorily combines with an atom+sum instead of an atom denoting noun. Deal’s (2017) solution for English NNCs was assuming a syntactic number feature on the numeral that needs to be checked by the noun. In Section 2.2.2, we established that the syntactic number feature does not originate from the numeral, but from an independent projection higher up in the DP. If the number feature is present in Syrian Arabic DPs, we would expect all NNCs to show plural marking on the noun. Therefore, if we strive for agreement to be a viable solution for *tlatt kazzaaben*, we need to explain why this projection only exists in NNCs for numerals 3 to 10, instead of for all numerals. At this point, I have no means of explaining this without treating the two kinds of Arabic numerals as completely different categories. We will need to take distance from Deal (2017) to such an extent, for instance by taking into account the DP-structure, allowing variable structures for NNCs, that it will be very far for the core of her proposal. In Chapter 4 I do pursue such an approach, but for now, I can only conclude that the case of *tlatt kazzaab* raises serious problems for Deal that are not easily solved with the means presented in her own account.

To emphasize the magnitude of this problem, I will show that it is not limited to the singular-plural number distinction in Syrian Arabic, but occurs in the three-way number marking system as well. In these paradigms, the bare noun is not the singular, but the so-called collective, which is used for groups of small animals, vegetables, fruit and such (Cowell 1964: 297–302; Corbett 2000: 13). This form is atom+sum denoting, as the downward entailing context in (61) shows: it is true if the speaker ate one or multiple *teffah* ‘apples’. A singulative suffix *-a* can be appended to create an atom denoting form. (62) illustrates that this singulative cannot refer to a sum, and, therefore, is not atom+sum denoting. In turn, a plural suffix *-t* can be added to the singulative. This results in a sum denoting plural, as is shown by sum denotation in the downward entailing context in (63).

- (61) Ana ma akaltu teffah  
 I not eat.1SG.PST apple.COLL  
 ‘I didn’t eat (one or more) apples.’ (informant)
- (62) { Hei / \*Hadoleek } teffah-a  
 it / these apple-SING  
 ‘This is an apple.’ / ‘These are apples.’ (informant)
- (63) ?Ana ma akaltu teffah-a-t  
 I not eat.1SG.PST apple-SING-PL  
 ‘I didn’t eat two or more apples.’ (informant)

As the singulative form is the atom denoting form in this paradigm, it should be expected that this is the only form to appear in NNCs, as illustrated in (64). (65) shows that the NNC with numerals above 10 behaves as expected and takes the singulative.

- (64) *expected*: edeash { \*teffah / teffah-a / \*teffah-a-t }
- (65) edaesh { \*teffah / teffah-a / \*teffah-a-t }  
 eleven apple.COLL / apple-SING / apple-SING-PL  
 ‘eleven apples’ (informant)

Crucially, (67) demonstrates that numerals 3 to 10, again, take a sum denoting noun, which is the pluralized singulative *teffahat* in this paradigm. Not only is this a cumulative form, but also one without any atoms in its denotation: it is a strictly sum denoting form.

- (66) *expected*: tlatt { \*teffah / teffah-a / \*teffah-a-t }
- (67) tlatt { \*teffah / \*teffah-a / teffah-a-t }  
 three apple.COLL / apple-SING / apple-SING-PL  
 ‘three apples’ (informant)

As with the previous problem of *tlatt kazzaaben*, agreement seems like the most feasible solution, but that would require an explanation for the absence of a syntactic number feature in DPs with numerals above 10. In conclusion, Syrian Arabic NNCs provides a serious problem for Deal’s (2017) thesis that numerals only modify semantically singular predicates.

## 2.3 Conclusion

Deal (2017) defends the thesis that the grammaticality of an NNC is dependent on the sum-based property of the noun: only non-cumulative predicates can be counted. She predicts that only atom denoting nouns can occur in NNCs. Any plural marking that surfaces on the noun, must be the result of independent grammatical factors such as nominal concord. In this chapter, I challenged that claim by investigating languages with varying nominal number marking strategies and NNCs.

At first glance, Turkish seemed to be a language that fits perfectly in Deal's picture: the numeral combines with the singular (*iki çocuk* 'two boys'). However, after examination of the nominal semantics, I derived that the Turkish singular is atom+sum denoting. Since the noun has no plural marking, agreement is no solution. Neither did a silent syntactic operator  $\alpha$  between numeral and noun provide a satisfactory result. The most promising option was analyzing the bare singular as an object mass noun, so the NNC as a measure construction would be an option. Although the Turkish NNC as a measure construction is theoretically possible, it is also nearly improvable and has little explanatory power. In the same way, Western Armenian data provide a hard case for Deal's thesis. The singular NNC (*yergu dāgha* 'two boys') faces the same problems as the Turkish. The other NNC, with a sum denoting noun (*yergu dāghaner* 'two boys'), can be explained by DP-internal concord, although its optionality is surprising. The different interpretations of the singular and the plural NNC point into the direction of measuring. However, that does not help *yergu dāghaner*, considering that the bare singular, as possible object mass noun, is the only candidate for a measuring construction. Finally, the Syrian Arabic picture was rather complicated. Numerals 11 and above provide no issue for Deal; they all combine with atom denoting nouns (*edeash kazzaab* 'eleven liars', *edeash teffaha* 'eleven apples'). Numerals 3 to 10, on the other hand, take the atom+sum denoting form in the two-way number marking system (*tlatt kazzaaben* 'three liars') and the sum denoting form in the three-way system (*tlatt teffahat* 'three apples'). Proposing that the plural marking in these cases is not semantic but a syntactic reflex to the number feature in the DP, is not a viable solution. Then, we would need to explain why this feature does not exist for DPs with numerals above 10.

Overall, a lot of diversity was attested. There are many variations in NNCs, besides the expected numeral+singular and numeral+plural because of concord. For instance, we have seen possible measure constructions with object mass nouns, which are neither atom denoting nor plural marked. Therefore, although we cannot completely refute Deal's (2017) idea about counting, I do believe it is fair to say that at least not all numeral modification – including possible measure constructions – is on singular entities.

# Chapter 3.

## Numerals as restrictive modifiers

### 3.1 Bale et al.'s view on numerals: The Strong Thesis

The starting point of Bale, Gagnon, and Khanjian's (2011) analysis is Link (1983), who was one of the first to propose that numerals are restrictive modifiers. These are modifiers that always yield a subset of the noun being modified. Bale et al.'s view on numeral semantics is built upon the different forms of modification, so, first, let us investigate the subtypes of restrictive modification and their counterpart: privative modification.

The first subtype is intersective modification. When modification is intersective, its semantics can be calculated by simply intersecting the set denoted by the modifier and the set denoted by the noun, as defined in (1). *Pregnant pianist* is an example of this type of modification. The intersection of the two denotations of *pregnant* and *pianist* will lead to the correct interpretation, as illustrated in (1).

- (1) a.  $[[\text{Modifier N}]] = [[\text{Modifier}]] \cap [[\text{N}]]$   
b.  $[[\text{pregnant pianist}]] = [[\text{pregnant}]] \cap [[\text{pianist}]]$

Modification is subsective when the interpretation of the modifier is relative to the interpretation of the modified noun. Take the adjective *skillful*: its interpretation will always depend on the noun it modifies, as someone who is skillful at playing the piano, might not be regarded skillful in general. However, subsective modification is still restrictive, as the set of skillful pianists can never include an entity that is no pianist. The modification restricts the denotation of the noun, as illustrated in (2).

- (2) a.  $[[\text{Modifier N}]] \subset [[\text{N}]]$   
b.  $[[\text{skillful pianist}]] \subset [[\text{pianist}]]$

The opposite of restrictive modification is privative modification. For privative modifiers, such as *former*, neither of the definitions above holds. On the contrary, the denotation for privative modification is assumed to be as in (3) (Partee, 2010). The intuition is that someone who is a former pianist, cannot at the same time be said to be a pianist.

- (3) a.  $[[\text{Modifier N}]] \cap [[\text{N}]] = \emptyset$   
b.  $[[\text{former pianist}]] \cap [[\text{pianist}]] = \emptyset$

In (4), an overview of these three kinds of modifiers is given and for each some exemplar adjectives.

- (4) a. intersective: pregnant, red, rectangular  
b. subsective: skillful, perfect, typical  
c. privative: former, past, fake

In more recent research, this division has been challenged. In particular, Partee (2010) has argued that there is no such thing as a privative adjective: Adjectives that are allegedly privative, are in fact subsective. In the case of *former pianist*, the denotation of *pianist* should be expanded to include both former and current pianists. Thus, the subsective relation in (4) holds for *former pianist* as well.

Partee (2010) builds this claim on puzzling sentences like (5). Adjectives like *fake* are allegedly privative, but if that were the case, how is it possible to interpret this sentence? Since the denotation of *gun* cannot include fake guns, it should not be perfectly well-formed and interpretable to ask whether a certain gun is fake. Partee (2010) derives that *fake gun* must be a subset of *gun*, and, consequently, *fake* is a restrictive adjective, as is any other supposed privative adjective.

(5) Is that gun real or fake?

The claim that there are no privative adjectives seems courageous, since their existence was proposed decades ago (e.g. Montague, 1970; Parsons, 1970) and is widely assumed. However, based on Partee's (2010) thesis, Bale, Gagnon, and Khanjian (2011) defend an even stronger claim. Their Strong Thesis, defined in (6), is a particularly strong one in that it aims to cover semantics of all modification in natural language and is easily falsifiable.

(6) *The Strong Thesis* (Bale et al. 2011:583)  
All modifiers – including all adjectival, adverbial and numeral modifiers – are restrictive.

Bale et al. take numerals as modifiers that are either intersective or subsective. As a consequence, numeral modification cannot result in a denotation that is no subset of the denotation of the modified noun. In (7), the two options for the relation between numerals and nouns are shown. Whichever is the case, [[two boys]] will always be a subset of [[boys]].

(7) a. [[two boys]] = [[two]]  $\cap$  [[boys]]                    *intersective numeral modification*  
b. [[two boys]]  $\subset$  [[boys]]                                    *subsective numeral modification*

If there are three boys *a*, *b* and *c*, the modification of the numeral *two* and the English plural *boys*, looks like (8). The numeral restricts the denotation of *boys* to groups of boys that have a cardinality of 2. Crucial is that Bale et al. take the plural morpheme *-s* in *boys* to imply semantic plurality.<sup>8</sup>

(8) [[two]] ([[boys]]) = [[two]] ({a, b, c, ab, bc, ac, abc}) = {ab, ac, bc}

The Strong Thesis makes various predictions about possible numeral-noun constructions. The most striking one is that no numerals above 1, denoting a plurality, could ever combine with a semantically singular noun, since a singular predicate could never be restrictively modified into a plural predicate. The ill-formedness of such a modification is illustrated in (9).

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<sup>8</sup> Bale et al. (2011) do not specifically mention what denotation for [[boys]] they take, but I suspect they assume it to be atom+sum denoting. In Section 1.3 it is discussed why it is more feasible to analyze the English plural as general number than as strictly sum denoting.

- (9) \*two boy  
 $[[\text{two}]] ([[ \text{boy} ]]) = [[\text{two}]] (\{a, b, c\}) = \emptyset^9$

At first glance, there seems to be one big problem for the Strong Thesis: numeral-noun constructions such as the following, from Turkish in (10). Bale et al. (2011) argue that *çocuk* must not be singular but general number and support their claim by showing that Turkish nouns can function as a predicate for conjoined NPs, as examined previously in Section 2.2.1 and shown again in (11).

- (10) iki { çocuk / \*çocuk-lar }  
 two boy boy-PL

- (11) John ve Brad çocuk  
 John and Brad boy  
 ‘John and Brad are boys.’

Thus, Bale et al. (2011) reason that *çocuk* does not refer to a set of singular boys, but the set of singular boys and all possible groups that can be formed from those singular boys. For instance, if there are three boys *a*, *b* and *c*,  $[[\text{çocuk}]]$  does not denote the set of atoms  $\{a, b, c\}$ , but the complete join semilattice  $\{a, b, c, ab, bc, ac, abc\}$ . A restrictive interpretation of  $[[\text{iki}]]$ , as commanded by the Strong Thesis, would now denote only those members of  $[[\text{çocuk}]]$  that consist of two items. The result of this modification is shown in (12).

- (12)  $[[\text{iki}]] ([[ \text{çocuk} ]]) = [[\text{iki}]] (\{a, b, c, ab, bc, ac, abc\}) = \{ab, ac, bc\}$

### 3.2 Explaining cross-linguistic variation in numeral-noun constructions

Bale et al.’s (2011) restrictive semantics for numerals raises the obvious question whether numerals are intersective or subsective, as the Strong Thesis does not exclude one of these. The authors claim that this property varies across languages and that this variation leads to diversity in number marking on nouns. Let us first consider the difference between intersective and subsective numeral modification.

Intersective numeral modification seems rather straightforward. The numeral denotes all groups consisting of a certain number of atoms, and the intersection with a noun yields a set of groups with that cardinality, as shown in (7a) (e.g. Bartsch, 1973; Rothstein, 2017). In contrast, numerals with subsective semantics have an interpretation that is relative to the noun they modify, just as a subsective adjective, Bale et al. (2011) state.

To explain this, we need to consider their definition of “individual”. They assume that what counts as an individual varies from noun to noun, and is defined as a minimal part in the nominal set. Let me illustrate that with example (13). In (13a), the minimal parts of *çocuk* are *a*, *b* and *c*, but in (13b), the smallest aggregates of *çocuklar* are *ab*, *ac* and *bc*. These aggregates are overlapping, as *ab* and *ac* share *a*, *ac* and *bc* share *c*, and *ab* and *bc* share *b*, but are minimal parts nonetheless.

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<sup>9</sup> Bale et al. (2011) do not formalize this modification, but I assume this is how they envision it, with a  $\emptyset$  result, unlike the *undefined* result of e.g. (15b).



- (13) a. [[çocuk]] : {a, b, c, ab, ac, bc, abc}  
 b. [[çocuklar]] : {ab, ac, bc, abc}

However, Bale et al. (2011) proceed, when a noun has minimal parts that overlap, it does not contain the required non-overlapping individuals for modification by subsective numerals, that are dependent on those individuals. The semantics of such a subsective numeral  $n$  is “a function from denotations that are closed under the sum operator to one of their subsets, namely the subset that consists of all and only the groups that are composed of  $[n]$  non-overlapping minimal parts” (Bale et al., 2011: 591-592). These semantics differ from those of intersective numerals in that they require their nominal complement to have atomic minimal parts in their denotation. Bale et al. (2011) state this is “similar to how gradable adjectives like big change their meaning depending on their nominal complement”.

Thus, the noun in (13a) is a suitable candidate for subsective modification, but (13b) is not. The minimal parts of (13b) are overlapping, so the strictly plural denotation of *çocuklar* cannot be subject to subsective numeral modification.

This distinction between intersective and subsective modification, combined with the variability of either singular or general number denotations for bare nouns, leads to some very specific cross-linguistic predictions about the selection of number marking in numeral-noun constructions. First of all, in languages with semantically singular bare nouns, such as English, numerals greater than 1 can only combine with plural nouns. Whether the numeral is subsective or intersective, it cannot restrict an atom denoting set {a,b,c} to a plural entity. This prediction is borne out for English in (14a). (14b) shows that the NNC is grammatical when the plural noun is used.<sup>10</sup>

- (14) a. \*two boy  
 [[two]] ([[boy]]) = [[two]] ({a, b, c}) =  $\emptyset$   
 b. two boys  
 [[two]] ([[boys]]) = [[two]] ({a, b, c, ab, bc, ac, abc}) = {ab, bc, ac}

For languages with general number, there are at least two possibilities. The first option is that numerals are subsective, which means they obligatorily combine with bare nouns. Plural nouns in these languages have a strict sum denotation {ab, bc, ac, abc}, Bale et al. (2011) claim, and therefore have overlapping minimal parts. As a consequence, they cannot be modified by subsective numerals. Turkish is such a language, as shown in (15).

- (15) a. iki çocuk  
 two boy  
 [[iki]] ([[çocuk]]) = [[iki]] ({a, b, c, ab, bc, ac, abc}) = {ab, ac, bc}  
 b. \*iki çocuk-lar  
 two boy-PL  
 [[iki]] ([[çocuk-lar]]) = [[iki]] ({ab, bc, ac, abc}) = *undefined*

<sup>10</sup> Bale et al. do not mention whether they assume the English numeral to be intersective or subsective, but that does not frustrate their global analysis. Both are possible in (14b).

The second option for languages with bare nouns that are general number, is intersective numerals. In this scenario, numerals could modify both bare and plural nouns. Intersecting the set of all groups consisting of a certain cardinality of atoms and the set denoted by the noun, would result in an interpretable denotation in both cases. Bale et al. (2011) argue that Western Armenian is such a language, as the numeral *yergu* can combine optionally with the bare noun *dəgha* or its plural alternate *dəghaner*, as can be seen in (16).

- (16) a. *yergu dəgha*  
 two boy  
 $[[yergu]] ([[dəgha]]) = [[yergu]] (\{a, b, c, ab, ac, bc, abc\}) = \{ab, ac, bc\}$
- b. *yergu dəgha-ner*  
 two boy-PL  
 $[[yergu]] ([[dəgha-ner]]) = [[yergu]] (\{ab, ac, bc, abc\}) = \{ab, ac, bc\}$

By making a distinction between subsective and intersective numerals, along with the assumption that bare nouns in some languages are unspecified for number, the Strong Thesis is able to predict relevant data from English, Turkish, and Western Armenian. Bale et al. (2011) suggest that there might be more ways in which numerals and nouns combine, for instance when a language has both subsective and intersective numerals. Despite the various possibilities, their thesis has one strong, universal prediction: numerals above 1 can never combine with singular nouns.

### 3.3 Challenges for Bale et al.’s view

If numerals are restrictive modifiers, as Bale et al. (2011) argue, numerals above 1 must always operate on non-singular nouns. When numerals are intersective, they can combine with both inclusive plurals (atom+sum) and strict plurals (sum). When numerals are subsective, they can modify only inclusive plurals (atom+sum). Whether numerals above 1 are either subsective or intersective, they can never modify atom denoting nouns. These predictions are summed up in Table 3.

<i>Nominal denotation</i>	<i>Numerals above one</i>
{a, b, c}	*
{ab, bc, ac, abc}	✓ (intersective) OR * (subsective)
{a, b, c, ab, bc, ac, abc}	✓

Table 3. Bale et al.’s prediction of possible cross-linguistic numeral-noun constructions.

In this section, we will examine numeral-noun construction in Welsh and Syrian Arabic, which both have three-way number marking systems in addition to their two-way systems.

#### 3.3.1 Singular and singulative nouns in Welsh

Welsh, a Keltic language primarily spoken in Wales, has numerous number marking strategies, of which I will discuss three. First, there is a two-way number marking system that resembles English, in that the marked form includes (at least) sums in its denotation. There is no reason to believe that the bare noun is not strictly atom denoting, as it cannot serve as a predicate for a plural NP:

- (17) Bessie a Bully yn { \*fuwch / fuch-od }  
 Bessie and Bully be.AUX cow / cow-PL  
 ‘Bessie and Bully are cows’ (informant)

Based on the Strong Thesis, we would expect that numerals in Welsh combine only with plural marked nouns, as shown in (18). A numeral *tri* cannot restrict an atom denoting predicate like *buwch*; only the plural would be a candidate for numeral modification. However, Welsh numerals combine with singular nouns, as can be seen in (19). This is contrary to the Strong Thesis’ predictions, as *buwch* does not have sums in its denotation.

- (18) a. *expected*:  $[[tri]] ([[buwch]]) = [[tri]] (\{a, b, c\}) = \emptyset$   
 b. *expected*:  $[[tri]] ([[buchod]]) = [[tri]] (\{a, b, c, ab, ac, bc, abc\}) = \{abc\}$

- (19) tri { buwch / \*buch-od }  
 three cow / cow-PL  
 ‘three cows’ (informant)

A second number marking strategy consists of an unmarked collective (e.g. *adar* ‘birds’) and a marked singulative (*aderyn* ‘bird’). The lexical items that fall into this paradigm consist of insects, small or middle-sized animals, vegetables, fruits and cereals, having in common their small size and large numbers in which they appear (Grimm, 2012; Stolz, 2001). This collective is atom+sum denoting, as can be seen by its inclusive interpretation in (20). The individual parts of the collective can be made salient by adding the singulative suffix *-yn*. This form is atom denoting, as is shown in (21).

- (20) Welaist ti adar yn yr ardd?  
 saw you birds.COLL in the garden?  
 ‘Did you see (one or more) birds in the garden?’ (informant)

- (21) Ader-yn yw { \*hwn / rhain }  
 bird-SG be.AUX this / these  
 ‘This is a bird’ / ‘These are birds.’ (informant)

Now consider the exemplary numeral-noun construction in this number marking system in (22). Again, the numeral requires an atom denoting nominal form. The data of this strategy make an even stronger argument for the necessity of a semantically singular noun in Welsh NNCs, since the numeral does not combine with a regular bare noun, but atom denoting nominal specifically marked for singularity.

- (22) tri { \*adar / ader-yn }  
 three bird.COLL / bird-SG (informant)

The grammaticality of *tri aderyn* is a problem, as (23b) shows that a restrictive numeral combining with an atom denoting noun should give a null result. Moreover, the impossibility of combining the numeral with the collective is a problem as well. Since the collective *adar* is atom+sum denoting, as we saw in (20), the Strong Thesis would expect *tri adar* to be perfectly fine. The complete join semilattice should allow any subsective or intersective numeral to combine with it, but this expectation (in (23a)) is not borne out.

- (23) a. *expected*:  $[[\text{tri}]] ([[ \text{adar} ]]) = [[\text{tri}]] (\{a, b, c, ab, bc, ac, abc\}) = \{abc\}$   
 b. *expected*:  $[[\text{tri}]] ([[ \text{aderyn} ]]) = [[\text{tri}]] (\{a, b, c\}) = \emptyset$

The third number marking system has three nominal forms, the base of which is the collective as well (Grimm, 2012). An example of this not very productive paradigm is *grawn* ‘grain’. From this collective form, a singulative can be formed, similar to *ader-yn*, by adding the same suffix to the bare noun: *gron-yn*. In its turn, the singulative can get a plural suffix *-au*, resulting in the form *gron-ynn-au*. This pluralized singulative is used when the speaker wants to make the individual items within a set salient, such as the individual grains instead of a heap of grain (Stolz, 2001). Since the question in (24) can only be answered ‘yes’ if the speaker saw multiple grains, the pluralized singulative must be strictly sum denoting.

- (24) Welaist ti ron-ynn-au yn y bocs?  
 saw you grain-SING-PL in the box?  
 ‘Did you see two or more grains in the box?’ (informant)

This strategy follows the same regulations in NNCs as the nouns above: the numeral requires an atom denoting noun, hence the well-formedness of the singulative in (25).

- (25) tri { \*grawn / gron-yn / \*gron-ynn-au }  
 three grain.COLL / grain-SING / grain-SING-PL  
 ‘three (single) grains’ (informant)

Again, this contradicts the predictions of the Strong Thesis in (26). The numeral *tri* should either combine only with the atom+sum denoting *grawn*, if it were subsective, or with both the atom+sum denoting *grawn* and the sum denoting *gronynnau*, if it were intersective. Under no condition, the singulative *gronyn* should be selected for the NNC, see (26b).

- (26) a. *expected*:  $[[\text{tri}]] ([[ \text{grawn} ]]) = [[\text{tri}]] (\{a, b, c, ab, bc, ac, abc\}) = \{abc\}$   
 b. *expected*:  $[[\text{tri}]] ([[ \text{gronyn} ]]) = [[\text{tri}]] (\{a, b, c\}) = \emptyset$   
 c. *expected*:  $[[\text{tri}]] ([[ \text{gronynnau} ]]) = [[\text{tri}]] (\{ab, bc, ac, abc\}) = \{abc\}$  OR *undefined*

In Summary, the Welsh data point to the exact opposite direction as the Strong Thesis: all numerals in Welsh modify semantically singular nouns. Moreover, atom+sum and sum denoting nouns never occur in NNCs.

### 3.3.2 Singulatives and variation across numerals in Syrian Arabic

As mentioned before, Syrian Arabic has a wide variety of number marking strategies. Here, I discuss the same two paradigms as in Section 2.2.3. Let us first briefly consider the denotations we assessed earlier for the two-way distinction. We know for nouns like *kazzaab* ‘liar’, the singular is atom denoting and the plural (*kazzaaben*) in atom+sum denoting:

- (27) John w Brad { \*kazzaab / kazaab-en }  
 John and Brad liar.SG / liar-PL  
 ‘John and Brad are liars’ (informant)

- (28)  $\text{ʔitha qaabalt kazzaab-en, ʔerfeʃ yadak}$   
 if met.2SG liar-PL raise hand.2POSS  
 ‘If you met (one or more) liars, raise your hand.’ (Mathieu, 2014)

The Strong Thesis predicts that only the plural should be able to combine with numerals, as in English NNCs, see (29). (30) demonstrates how *kazzaaben* is the form of the noun that seems to combine with the numerals indeed.

- (29) a. *expected*:  $[[\text{tlatt}]] ([[kazzaab]])$   
 $= [[\text{tlatt}]] (\{a, b, c\}) = \emptyset$   
 b. *expected*:  $[[\text{tlatt}]] ([[kazzaab-en]])$   
 $= [[\text{tlatt}]] (\{a, b, c, ab, ac, bc, abc\}) = \{abc\}$

- (30)  $\text{tlatt } \{ *kazzaab / kazzaab-en \}$   
 three liar / liar-PL  
 ‘three liars’ (informant)

However, not all numerals force plural marking on the noun they modify; only numerals 3 to 10 do so. Numerals 11 and above combine with the singular form of the noun, as can be seen in (32). This is a challenge for the Strong Thesis, as the prediction, shown in (31), is that the combination of the numeral and the singular should be an empty set.

- (31) a. *expected*:  $[[\text{edaesh}]] ([[kazzaab]])$   
 $= [[\text{edaesh}]] (\{a, b, c, \dots\}) = \emptyset$   
 b. *expected*:  $[[\text{edaesh}]] ([[kazzaab-en]])$   
 $= [[\text{edaesh}]] (\{a, b, c, ab, bc, ac, abc, \dots\}) = \{abcdefghijk\}$

- (32)  $\text{edaesh } \{ kazzaab / *kazzaab-en \}$   
 eleven liar / liar-PL  
 ‘eleven liars’ (informant)

A similar problem arises in the three-way number marking system, where the bare noun is used for small groups of animals, vegetables, fruit and such (Cowell 1964: 297–302; Corbett 2000: 13). The example used in the previous chapter was *teffah* ‘apples’. This collective form has atom+sum denotation, as the downward entailing context in (35) shows: it is true if the speaker ate one or multiple *teffah* ‘apples’. A singulative suffix *-a* can be appended to create an atom denoting form. (34) illustrates that this singulative cannot refer to a sum, and, therefore, is not atom+sum denoting. In turn, a plural suffix *-t* can be added to the singulative. This results in a sum denoting plural, as is shown by the downward entailing context in (35).

- (33) Ana ma akaltu teffah  
 I not eat.1SG.PST apple.COLL  
 ‘I didn’t eat (one or more) apples.’ (informant)

- (34)  $\{ \text{Hei} / *\text{Hadoleek} \}$  teffaha  
 it / these apple.SING  
 ‘This is an apple.’ / ‘These are apples.’ (informant)

- (35) ?Ana ma akaltu teffah-a-t  
 I not eat.1SG.PST apple-SING-PL  
 ‘I didn’t eat two or more apples.’ (informant)

This nominal paradigm is far more productive in Arabic than it is in Welsh, and provides even more problems for the Strong Thesis. The predictions of possible NNCs, based on the denotations in (33-35) are as presented in (36). According to Bale et al. (2011), Syrian Arabic numerals should restrict the denotation of a nominal that includes at least sums. As a result, the denotation of *edaesh teffaha* should be an empty set (see (36b)). Both the atom+sum denoting collective in (36a) and the sum denoting pluralized singulative in (36c) are candidates for appearance in an NNC, depending on whether the numeral is subsective or intersective. In the case of the former, only the collective *teffah* should appear in NNCs. In case of the latter, both *teffah* and *teffahat* are potentially suited.

- (36) a. *expected*: [[edaesh]] ([[teffah]])  
 = [[edaesh]] ({a, b, c, ab, bc, ac, abc...}) = {abcdefghijk}
- b. *expected*: [[edaesh]] ([[teffaha]])  
 = [[edaesh]] ({a, b, c...}) =  $\emptyset$
- c. *expected*: [[edaesh]] ([[teffahat]])  
 = [[edaesh]] ({ab, bc, abc...}) = {abcdefghijk} OR *undefined*

Thus, whatever the exact nature of Syrian Arabic numeral, the bare noun should be able to combine with numerals. However, the bare noun is neither suitable for numerals 3 to 10, nor numerals above 10, as can be seen in (37) and (38). For the numerals 10 and under, the pluralized singulative is necessary for numeral modification. (37) illustrates that the plural of the singulative takes numerals 3 to 10. Crucially, (38) demonstrates that 11, again, takes the atom denoting form, in this paradigm the singulative. The Strong Thesis cannot account for this combination of numeral and noun at all, since its prediction is the complete opposite of the data: atom denoting singulatives are not expected in NNCs, and yet they are the only attested nominal forms combination with numerals 11 and above.

- (37) tlatt { \*teffah / \*teffah-a / teffah-a-t }  
 three apple.COLL / apple-SING / apple-SING-PL  
 ‘three apples’ (informant)

- (38) edaesh { \*teffah / teffah-a / \*teffah-a-t }  
 eleven apple.COLL / apple-SING / apple-SING-PL  
 ‘eleven apples’ (informant)

In summary, Syrian Arabic data do not follow the expectations formulated in Bale et al. (2011), since numerals combine with atom denoting nouns in some cases. Moreover, the Strong Thesis cannot rule out the combination numeral+collective, since both intersective and subsective numerals should be able to combine with a complete join semilattice, as is the collective form of the noun.

### 3.4 Conclusion

Bale et al. (2011) defend the Strong Thesis that all modification is restrictive, which leads to the prediction that no numeral above 1 should be able to combine with a semantically singular noun. In this chapter, I challenged that claim by investigating languages with other number marking strategies than they studied, such as a three-way distinction in number or collective-singulative number systems. The possible combinations of such nouns with numerals above 1 were evaluated in terms of the Strong Thesis' predictions.

In Welsh, numerals behave the exact opposite of what the Strong Thesis predicts: numerals select atom denoting nouns in the standard singular-plural number system (*tri buwch* 'three cows'), in the collective-singulative system (*tri aderyn* 'three birds'), and in the three-way collective-singulative-pluralized singulative system (*tri gronyn* 'three (single) grains'). A more complicated situation was examined in Syrian Arabic, where numerals above 10 behave differently from numerals 10 and below. Numerals 3 to 10 mostly follows the Strong Thesis, taking the atom+sum denoting noun (*tlatt kazzaaben* 'three liars') or the sum denoting noun (*tlatt teffahat* 'three apples'), although it remains unexplained why the atom+sum denoting form in the three-way (*\*tlatt teffah* 'three apples') is ungrammatical. Numerals 11 and above provide more problems, since they take precisely those forms that are excluded from numeral modification by the Strong Thesis: the atom denoting singular (*edeash kazzaab* 'eleven liars') or singulative (*edeash teffaha* 'eleven apples'). Since Bale et al. (2011) implicitly assume that number morphemes reflect the nominal semantics in NNCs and that nominal number can be assessed through the method I used, there are no opportunities to present alternative explanations of this crucial data.

In conclusion, Syrian Arabic and Welsh number marking systems both caused severe problems, as numerals in certain constructions precisely combine with those nominal forms that have strictly atom denoting semantics. Therefore, a restrictive semantics for numerals in those languages is undesirable and unsatisfactory. The Strong Thesis overgeneralizes and wrongly predicts the dependencies of number meaning of nominal forms and the way those forms combine with numerals.

# Chapter 4. Discussion

## 4.1 Conclusion

In this thesis, I aimed to contribute to the debate on the semantics of numerals. The field of research that attempts to generalize over numeral semantics, is very diverse in its analyses and predictions. Bale et al.'s (2011) Strong Thesis and Deal (2017) present opposing claims about numeral modification and, consequently, contradictory predictions for cross-linguistic morphological variation in numeral-noun constructions (NNCs). The Strong Thesis argues that NNCs, just as any form of modification, are constructions that involve restrictive modification. Numerals restrict a group of entities to a cardinality and, thus, operate on semantically plural predicates. In cases where a numeral combines with a morphologically singular noun, this noun is not semantically singular. Contrarily, Deal insists that a counting operation can only be performed on atoms, and deduces that numerals can only operate on singular predicates. In cases where a numeral combines with a plural noun, this plural morpheme does not reflect semantic plurality. The conflicting predictions of these theses are shown in Table 4.

<i>Nominal denotation</i>	<i>Numerals (Deal)</i>	<i>Numerals (Bale)</i>
{a, b, c}	✓	*
{ab, bc, ac, abc}	*	✓ (intersective) OR * (subsective)
{a, b, c, ab, bc, ac, abc}	*	✓

Table 4. Predictions of Deal (2017) and Bale et al. (2011) regarding nominal denotation in NNCs.

The central question of this thesis was which of these two theories is most tenable, given various numeral-noun constructions across languages. I examined a sample from Turkish, Western Armenian, Syrian Arabic, and Welsh, where much variation was found in the morphological forms of nouns that combine with numerals.

My most rigid conclusion is that the Strong Thesis is too strong to hold for numeral modification. The claims presented by Bale et al. (2011) were easy falsifiable, since they assumed morphological form always reflect nominal semantics in NNCs. Consequently, when any singular noun was found combining with a numeral, there was little room for loopholes to save the theory. This was the case for multiple constructions in Welsh and Arabic.

Since Deal does not assume that plural morphology inherently indicates plural semantics, her claim was harder to disprove. She provided means of escape for seemingly problematic data herself, although those were not fully worked out. Therefore, I had to make many assumptions in order to explore some possible explanations for the data. Some twists and turns in the argumentation were inevitable to uphold Deal's thesis. Deal's claim about the nature of numeral modification cannot be fully disproven. However, as I explained in Section 2.2, in view of the data discussed, there are good reasons to doubt it is a promising and elegant solution.

I conclude that it is implausible that there is a universal semantics for numerals in so far that they always take a singular or plural predicate. Cross-linguistic NNCs provide problems for



both Bale et al.'s (2011) and Deal's (2017) ideas. Neither can fully, elegantly account for the cross-linguistic variation that was found, with the current assumptions. Currently, Deal exceeds the Strong Thesis in terms of plausibility. Further research needs to be conducted to learn whether Deal's thesis can be sustained. Amongst urgent topics for inquiry is nominal concord. Specifically, the possibility of optional plural marking on the noun needs to be examined, in order to account for NNCs with sum denoting nouns. Additionally, it should be studied what the consequences are of an account with NNCs as measure constructions with bare object mass nouns.

Lastly, we need to consider the possibility that nominal number is not decisive for noun selection in NNCs. Both Deal (2017) and Bale et al. (2011) are occupied with the number semantics of the noun involved, but it may as well be that other semantic or morphosyntactic factors regulate a noun's appearance in NNCs. I will take a glance at such an approach in Section 4.3, after discussing the present study's limitations.

## 4.2 Study limitations

The findings of this study have to be seen in the light of some limitations. Previously, in Section 1.3, it was briefly mentioned that the used method had its shortcomings. The assumptions about nominal number semantics and the manner in which nominal number was assessed are the main areas of reflection I will discuss here.

First of all, this thesis should be viewed in light of a morphosemantic theory of number, as propagated by Harbour (2007). I made assumptions about the relationship between the morphological form of nouns and their number semantics. This is not the only way to study numeral semantics. Deal's (2017) thesis was a good example of a different approach, following a line of research by Ionin & Matushansky (2006) and Krifka (1989, 1995), among others. I certainly have not excluded the possibility of purely syntactic expressions of plurality, such as nominal concord. However, I do believe a unified, morphosemantic theory of number adds value to research on numerals, because even if there is no one-to-one correspondence, semantic and morphosyntactic plurality are in some way related. Semantic theories should aim at reflecting that.

Regarding the methodology, a critical note has to be made for some of the tests from Bale et al. (2011) I used to determine whether a singular has atom or atom+sum denotation. According to sentence (1), *çocuk* has atom+sum denotation, because it can function as a predicate to a plural DP.

- (1) John-ə yev Brad-ə dəgha en  
 John-DEF and Brad-DEF boy are  
 'John and Brad are boys.' (Bale et al., 2011)

However, the possibility of a construction like (1) depends on the ability of the noun to occur without an article, which is impossible in many languages. For example, the English counterpart of this sentence in (2a) is ill-formed. It is unclear whether this is caused by the atom denotation of *boy*, because the absence of an article in (2b) prevents the singular DP from being predicated by *boy* as well. Then, it might not be the atom denotation of the noun that blocks (2a), but the ungrammaticality of bare singulars in this context in English. The necessity of an

indefinite article *a* in (2a) influences the DP semantics to referring to atoms only, which makes it unable to function as a predicate to a plural DP.

- (2) a. \*John and Brad are (a) boy  
 Intended: ‘John and Brad both are boys’  
 b. \*John is boy

Another example: in Turkish sentence (3), the bare singular in an episodic upward entailing sentence includes atoms and sums. The English counterpart in (4) needs an article to be well-formed, which gives rise to an existential reading: it does not exclude other boys to be walking, besides the boy to whom the speaker intends to refer. In this case, the English singular is indistinguishable from the atom+sum denoting Turkish singular. Therefore, it does not seem completely fair to compare singulars in different languages this way, since they appear in different syntactic environments.<sup>11</sup>

- (3) Çocuk yürü-r  
 boy walk-3SG  
 ‘One or more boys walk.’ (informant)
- (4) A boy walks  
 ‘At least one boy walks.’

This is closely related to the next remark. The assessment of number semantics was done in various contexts. While this enabled us to explore interpretations beyond the commonly assumed ones, this choice also had a negative side effect. This method showed that a noun may have different denotations depending on its function and place in the sentence: *horses* may be sum denoting in one context, e.g. (5a), but atom+sum denoting in a context like (5b).

- (5) a. You saw horses in the meadow. = sum  
 b. Did you see horses in the meadow? = atom + sum  
 c. two horses = ?

As a consequence, we can hardly be sure that the nominal number we assessed in a certain context without NNC is the number of the same nominal form in an NNC, such as (5c), as well. We encountered that semantics in one environment do not necessarily reflect semantics in an NNC. A noun is always examined within its morphosyntactic environment, which may be different from the NNC environment. I believe it is difficult to overcome this issue. Again, consider the English singular. Is it even possible to derive the denotation of *boy* without taking its morphosyntactic structure into account, or does *boy* only receive singular number when merged in a DP, with, for example, an indefinite article, as in (4)?

Lastly, the approach of number in this thesis was rather one-dimensional. To model denotations of predicates, semi-lattices were used. Therefore, only part-sum relations could be included in the definitions of singular (i.e. atom denoting) and plural (i.e. sum or atom+sum denoting). No other differentiations were incorporated, although it is known that variation in number systems between languages are numerous (Corbett, 2000). Within this standard atom-sum contrast, there is no way to structure the difference between neutral or general number, the collective

<sup>11</sup> A better test for the singular would be examining which anaphora can be used to refer to it. If the singular anaphoric pronoun can be used, the noun denotation does not include sums, as in (i).  
 i. A boy walks. \*They / he ...

and the inclusive plural, while there are many reasons to argue for a semantic distinction between those.

For example, Grimm (2013) argues that the English plural is not actually atom+sum denoting, but that the “inclusive” interpretation in some contexts is due to the interpretation of the noun as kind-denoting, instead of referring to particular entities, where quantity is relevant. Grimm calls this use of the plural noun “number neutral”, so not denoting any number at all. He names these nouns concept-level, in contrast to object-level nouns, which can be assigned number because the entities are already available in the discourse.

A similar case can be made for Western-Armenian bare singulars. Sigler (1997:23) explicitly mentions that bare NPs as in (6) are neither singular nor plural. They can only be interpreted as generic i.e. kind-denoting.

- (6) Maro-n            shun    gə-pəndre        gor  
Maro-DT        dog    IMP-look.3S    PROG  
‘Maro is looking for a dog/dogs’ [*cannot be a particular dog or dogs*]

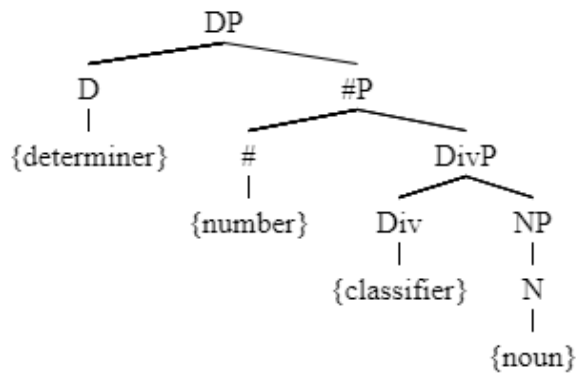
Concludingly, it is well possible that numerals do not merely select their nominal complement based on whether they include atoms or sums, but other number facets could as well. In further research, more attention should be paid to the morphosyntax of nouns (within or outside NNCs) and the different kinds of number, or the absence of number, that can be encountered cross-linguistically. Nonetheless, the present approach did not affect the results of this study significantly, since the most troublesome data did not include inclusive plurals. The assessment of atom denoting and sum denoting still hold, which caused the problems for Bale et al. (2011) and Deal (2017) respectively.

### 4.3 Towards a comprehensive account

The previous sections lead to the idea that we may need to take a different approach in the research on the semantics of nouns in NNCs. Since nominal number did not prove itself uniformly decisive in the selection of the nominal form, we should consider other factors that might play a role.

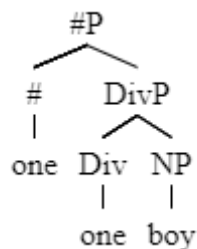
I would like to draw an outline of a proposal that follows a tradition in which a close mapping between syntactic structure and semantic interpretation is assumed. Instead of mere singularity of plurality, an important role in the NNC is reserved for the structural projections that compose nominal and DP semantics. More specifically, the notion of dividedness in combination with the place where numerals merge is decisive. Following Borer (2005), I assume the following DP-structure:

(7)



A crucial characteristic of this structure is that the numeral does not modify the NP directly, but a *divided* phrase DivP. Borer (2005) proposed the influential idea that the count/mass distinction is embodied by the presence or absence by the Div-projection in the DP. Mass nouns lack this projection. Therefore, they cannot interact with the count system i.e. occur with count quantifiers or numerals. Notably, Div does not assign any kind of number by itself; it only provides division into countable units. However, some morphemes can function as both a divider and a counter (in #P). Borer (2005) states the English numeral ‘one’ is an example, indicating both division (Div) and quantity (#):

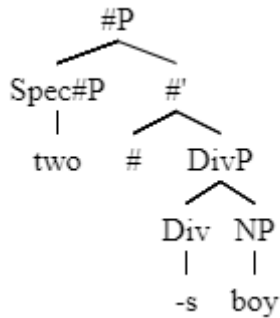
(8)



Furthermore, I assume that numerals (Danon, 2012) and number marking morphemes (Mathieu, 2014) are not bound to one designated structural position, such as Spec#P or Div0 respectively. This means these morphemes can function as dividers, counters, or even both, depending on the language and number marking system (Mathieu, 2012). The cross-linguistic variation in the nominal form in NNCs that we encountered in the previous chapters was problematic for Deal (2017) and Bale et al. (2011). However, within this framework, this variation is explained with ease. It stems from at least two things: i) languages have different morphemes that can function as a divider and ii) languages have different numeral merging sites. For instance, dividers can be classifiers, plural morphemes, numerals (Borer, 2005), singulative morphemes (e.g. Mathieu, 2012), diminutive morphemes (e.g. De Belder, 2013; Doetjes, 2013) or silent syntactic pieces (e.g.  $\alpha$  in Deal, 2017).

Let us briefly consider how this would be implemented for an NNC in English. The morpheme *-s* acts as a divider in DivP. Numerals merge in Spec#P, as argued by e.g. Zabbal (2005). The corresponding structure is shown in (9). Crucially, the English morpheme *-s* does not necessarily assign plural number in #. This explains the obligatory plural marking in non-plural predicates such as *0.8 boys* in (10): *-s* is necessary for division, not for plurality.

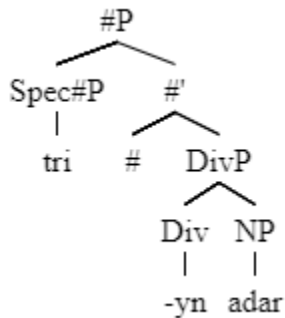
(9)



- (10) What is the average number of boys in Dutch households?  
a. 0.8 boys  
b. \*0.8 boy

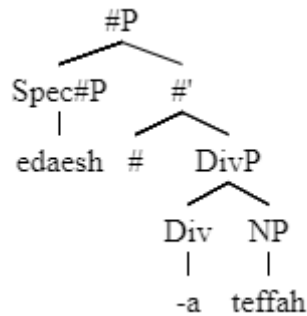
This structure can be mapped onto NNCs in other languages, possibly with other morphemes functioning as a divider, including numerals. The crucial ingredient in this view of numeral modification is not the number of the nominal, but the presence of dividing element in DivP. I believe that this Div-based approach offers various advantages over an approach that considers nominal number decisive for noun selection in NNCs. First and foremost, it is considerably better than Bale et al. (2011) at explaining why numerals can combine with atom denoting nouns in some languages. For Bale et al., any semantically singular noun has no place in an NNC. However, when we assume numerals require divided nouns as their complement instead of nouns with sets in their denotation, a lot of the data in Chapter 3 is no longer problematic. For instance, singulative markers can function as a divider, so singulatives are perfectly acceptable in NNCs. Consider the Welsh collective/singulative paradigm with *adar/ader-yn* ‘birds/bird’. The singulative morpheme *-yn* performs the division of *adar* in Div0. The numeral resides in Spec#P, so the NNC looks like (11).

(11)



This analysis can be extended to the Syrian Arabic collective/singulative paradigm. Recall the collective *teffah* ‘apples’ and the corresponding singulative *teffaha* ‘apple’. The singulative marker *-a* resides in Div0 as a dividing morpheme, and the numeral merges in Spec#P:

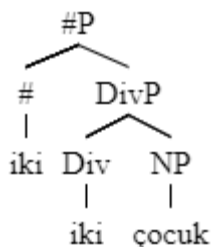
(12)



The one advantage of Bale et. al.'s (2011) view over Deal's (2017), was its ability to explain Turkish and Western Armenian data, where numerals combined with plural nouns. The Div-based view on numeral modification allows for plural marked nouns in NNCs as well. Plural morphemes could be dividers as was argued for English, but I believe it is most promising to analyze the plural morphemes in Turkish and Western Armenian as both dividers and counters in one. The fact that Turkish and Western Armenian plural marked nouns have an exclusive, strictly sum denoting denotation, strongly suggests that they are assigned plural number in #P.

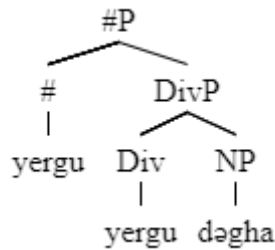
For Turkish NNCs, I propose the structure in (13). It has been argued before that, alike English *one*, all Turkish numerals act as both dividers and counters (Borer, 2005). The NNC *iki çocuk* is well-formed because the bare noun *çocuk* is not yet divided when *iki* occupies both Div and # projections. The plural marker *-lar*, interpreted exclusively, can be analysed as a dividing and a counting element, contrary to the mere dividing English plural *-s*. Thus, the ill-formedness of *\*iki çocuklar* is easily explained by the competition of the plural marking *-lar* and the numeral *iki* for the same positions: both function as #0 and Div0.

(13)

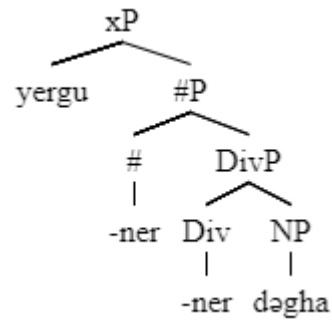


This analysis cannot be copied one-to-one to Western Armenian, since those NNCs can accommodate both singular and plural nouns. However, this can be resolved by assuming that Western Armenian numerals can merge not only in Div and # simultaneously like Turkish numerals, shown in (14a), but also have other possible merging sites. For now, I remain neutral whether this should be in Spec#P, as English numerals, or higher up in the DP, for example in QP. The latter option is illustrated in (14b). An advantage of this approach for Western Armenian is that this proposed structural difference could be linked to the semantic difference between singular and plural NNCs, as encountered in Section 2.2.2.

(14) a.



b.



These global implementations of this Div-based approach for the languages discussed in the previous chapters are favored over the Strong Thesis. Let us now compare this approach to Deal (2017). The observant reader might have noticed that the analysis of *iki çocuk* in (13) exhibits some similarities to the measure construction with a built-in classifier for *iki*, as discussed in Section 2.2.1. Previously, I concluded that this solution was undesirable, despite being theoretically possible. One might ask how a Div-based account is any different from that inelegant solution with ambiguous numerals. First, it does better justice to the intuition that numeral-noun constructions in Turkish involve a counting operation like any other numeral-noun construction, instead of measuring an object mass noun. Second, for this approach, no extra syntactic pieces or constructions need to be invented without any independent evidence, besides the assumptions made about different merging place for numerals and other morphemes. The elegance of this analysis lies in the opportunity of describing a more universal semantics for numerals in natural language, only capturing the numeral aspect<sup>12</sup>, while at the same time being able to account for the various functions they have in and outside NNCs. Focused on Turkish, we do not need to propose an ambiguous *iki* for the different occurrences. Instead, we can assume one basic meaning for the numeral, which has one simple function in a larger structure full of morphemes that each to their own make a contribution to the DP as a whole.

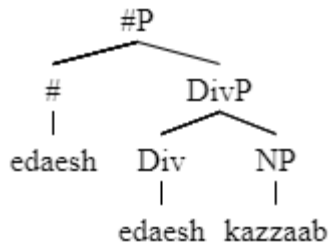
As a consequence, we can also account for different nominal forms in NNCs within one language. One of my conclusions that Deal's approach was hard to uphold for the data in Syrian Arabic. Nominal concord could not be the cause of plural marking in an NNC like *tlatt teffahat*, because we know DP-internal agreement originates in another, higher projection than the numeral. Since *edaesh teffaha* did not show the same agreement as *tlatt teffahat*, there must be something different with the numeral or the NNC structure, instead. In Deal's (2017) view, there was a uniform semantics for numerals in NNCs, with no possibility to distinguish between numerals within one language. The current view allows for Syrian Arabic numerals 3-10 and 11+ to have different possible merging sites in DP – for whatever historical or etymological reasons – which is why they can require different nominal forms in their complements.

How this would be executed for Syrian Arabic is a task for future research. At this moment, I already see some challenges. Mainly, combining multiple number marking strategies in one system. Consider (15a), a possible structure for *edaesh kazzaab*. Since the noun has no plural marking to act as a divider, we could assume *edaesh* must be a counter and a divider, comparable to English *one*. However, in (12), we assumed that *edaesh* merged in Spec#P and required another morpheme (such as *-a*) to perform the division. If we refute this and apply the

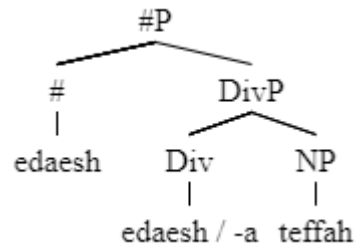
<sup>12</sup> See Bylinina & Nouwen (2020) for such a basic semantics of numerals, based on the intuition that “numerals should denote numbers, *whatever* it may be that numbers are.”

proposed structure in (15a) to *edaesh teffaha* in (15b), the singulative marker *-a* and *edaesh* compete for the same position, and the NNC should be ill-formed.

(15) a.



b.



Of course, we want the Arabic numeral to have the same combining abilities in all NNCs. If *edaesh* could function as both a divider and a counter, the singulative marker would not be necessary and *\*edaesh teffah* would be a well-formed NNC. Similar problems arise in Welsh as well, with two number marking systems comparable to Syrian Arabic: singular/plural (*buwch/buchod*) and a collective/singulative (*adar/aderyn*).

The attraction of Deal (2017) and especially Bale et al. (2011) was their simple claims that resulted strong cross-linguistic predictions. Unfortunately, I have drawn the conclusion in Chapter 2 and 3 that these predictions are not confirmed by the data. The way forward presented in this section can account for more cross-linguistic variation in numeral-noun constructions. However, the great amount of possibilities it creates asks for a great amount of explorations and explanations of data. I believe a more nuanced approach like the one I propose is more fruitful than an approach based on singularity or plurality as the requirement for numeral modification. Nevertheless, it will take a lot of work to pursue this way forward and make it applicable cross-linguistically.



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