# Cardinality and (in)definiteness[1]

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**Abstract.** In every language, numeral constructions (NCs) consistently exhibit a pattern of strong indefiniteness. Although they can also appear with an overt definite determiner, achieving definiteness in NCs in languages without articles typically necessitates the use of alternative markers, such as demonstratives (Jiang, 2012). This contrasts with bare nouns, which can freely take on definiteness in articleless languages, often attributed to a covert *iota* operator in the neo-Carlsonian approach. The prevailing view considers NCs to be predicative expressions of type $\langle e,t\rangle$, undergoing $\exists$ type-shifting in argument positions without overt determiners. Yet, it is unclear why the covert *iota* does not similarly apply to NCs in articleless languages, given their compatibility with the definite determiner in languages with articles. Taking up this puzzle, this study proposes that NCs primarily function as argumental expressions of type $e$, with their indefiniteness (via a choice function) stemming from a cardinal head residing within their structure. The proposal is grounded in an analysis of NCs in Turkish, an articleless language with an optional classifier, *tane*, and reinforced by data from Farsi.

**Keywords:** numeral constructions, optional classifiers, cardinality, (in)definiteness.

## 1. Introduction

Numeral constructions (NCs) can freely occupy argument positions and convey indefiniteness, even in languages like French, where overt determiners are required for nominal arguments. In languages with articles, NCs may also pair with the definite determiner, but in languages that lack articles, they generally require alternative overt markers, such as demonstratives, to convey a definite-like interpretation (Jiang, 2012). This property of NCs contrasts with bare nouns in articleless languages, which can be definite without overt marking, standardly assumed to be achieved through a covert *iota* operator in the neo-Carlsonian approach.

Since the seminal work of Link (1983), NCs are widely viewed as predicative expressions of type $\langle e,t\rangle$, defaulting to $\exists$ type-shift in argument positions in the absence of overt determiners (e.g., Partee 1987, Verkuyl 1993, Landman 2003, Ionin and Matushansky 2006, cf. Montague 1974, Bennett 1974, Barwise and Cooper 1981, Scha 1981, van der Does 1992, Dayal 2013). Under this view, it remains puzzling why the covert *iota* does not operate in a similar manner with NCs in articleless languages, especially considering their ability to combine with the definite determiner in languages that have articles. The puzzle gets more complicated with NCs in Turkish, which is an articleless language with an optional classifier system.

Counting systems vary across languages, and one aspect of divergence is the presence of an intervening item between the numeral and a (count) noun. For instance, languages like English, which systematically differentiate the unmarked and plural forms of nouns, use the plural form of a count noun with numerals other than 'one.' Crucially, count nouns directly combine with numerals, while mass nouns need a quantizing noun intervening between the two:

[1]I am grateful to Veneeta Dayal, Gennaro Chierchia, Luisa Martí, Mark Baker, Simon Charlow, Kathryn Davidson, Greg Scontras, Elizabeth Coppock, Ömer Demirok, Deniz Özyıldız, and Ümit Atlamaz for their valuable insights. Additionally, I thank the anonymous reviewers of the extended version of this paper (Sağ, 2024), as well as the audiences of SuB 28, the Language & Cognition Meeting at Harvard, and The Workshop on (In)definiteness Across Languages at Yale for their constructive feedback.

(1) a. three pens
b. three drops of water

Languages like Mandarin, which lack a systematic number marking system, use the unmarked form of the noun for all numereals. However, they require the mediation of an intervening item, generally known as a classifier, for all nouns, regardless of the ontological categorization of the noun as count or mass (Cheng and Sybesma 1999, pg. 514; see also Jiang 2012 and Kim 2009, among others, for Mandarin, Japanese, and Korean):

(2) a. san *(zhi) bi
three CL pen
'three pens'

b. san *(ba) mi
three handful rice
'three handfuls of rice'

A less familiar system, as in Turkish NCs, shares features with these two types of languages. Turkish has a systematic number marking mechanism akin to English, but the unmarked form of nouns is used with all numerals. Furthermore, Turkish NCs involve an optional item between the numeral and a count noun. This item, i.e., *tane*, is also termed as 'classifier' in the literature (Underhill 1976, Schroeder 1992, Lewis 2000, Göksel and Kerslake 2005, Öztürk 2005):

(3) a. bir (tane) kitap
one CL book
'one book'

b. iki (tane) kitap(*-lar)
two CL book-PL
'two books'

Similar to the other types of languages, in Turkish, mass nouns require a mediating quantizing noun for counting, as demonstrated in (4a). However, both numerals and *tane* are selective for the count sense of the noun —they can directly combine with mass nouns only when there is an implicit universal packaging/sorting mechanism, similar to 'two waters' in English, as in (4b).

(4) a. iki *(damla) su
two drop water
'two drops of water'

b. iki (tane) su
two CL water
'two waters' (coerced)

Crucial for our purposes, Turkish NCs deviate from the cross-linguistic pattern of NCs in the absence of *tane*, freely allowing both definite and indefinite interpretations, whereas NCs with *tane* exhibit an exclusively indefinite behavior (Schroeder 1992; Öztürk 2005). As demonstrated in (5), both forms of NCs can be indefinite evidenced by their ability to introduce new discourse referents in the initial sentence. In contrast, only the form without *tane* can behave as a definite description referring to a unique/maximal entity introduced precedingly.

(5) Sevgi müzik festival-in-de iki (tane) şarkıcı ve bir gitarist-le tanış-tı.
Sevgi music festival-COMP-LOC two CL singer and a guitarist-with meet-PAST
**İki (#tane) şarkıcı** önümüzdeki hafta Taksim-de konser ver-ecek-miş.
two CL singer next week Taksim-LOC concert give-FUT-EVID
'Sevgi met with two singers and a guitarist in the music festival. Apparently, the two singers will give a concert next week in Taksim.'

Based on the pattern of Turkish NCs, we are faced with two key questions: (i) How does counting work in Turkish and what role does *tane* play in this? (ii) How does the presence/absence of *tane* affect interpretation, contributing to the exceptional status of the Turkish counting system?

While addressing these questions, I take the contrasting behavior of Turkish NCs as a means to identify the source of general indefinite characteristics of NCs. I propose that NCs primarily function as argumental expressions of type *e*, with their indefiniteness stemming from a cardinal head residing within their structure, via a choice function in the sense of Reinhart (1997). Predicative use of NCs (via Partee's *ident* operator) occurs only when structurally necessary —for instance, when they serve as arguments to determiners. This view implies that in articleless languages, where NCs cannot be definite without alternative markers, *iota* functions not as a covert D head but as a type-shifting operator. Assuming type-shifting occurs only with type mismatches, NCs do not undergo *iota* type-shifting (through *ident*) as they are in the appropriate type in the argument position of a verb.

However, I also argue that languages can accommodate inherently predicative NCs alongside default argumental NCs when they feature more than one form of the cardinal head. This enables definiteness with the predicative form by means of *iota* type-shifting in articleless languages. Analyzing *tane* as distinct from obligatory classifiers of Mandarin-like languages, I propose that Turkish utilizes both a covert and an overt cardinal head, with *tane* overtly realizing the default form with a built-in indefinite semantics. In contrast, the covert form lacks this indefinite force and results in inherently predicative NCs. I also illustrate that NCs in Farsi, an additional articleless optional classifier language, exhibit a mirror image of the Turkish pattern, enhancing the cross-linguistic strength of my proposal.[2]

The outline of this paper is as follows: Section 2 compares *tane* with obligatory classifiers. Section 3 presents the account of *tane* as an overt spell-out of the cardinal head. Section 4 discusses the indefiniteness associated with NCs and the divergent pattern observed in Turkish. Section 5 presents the core analysis. Section 6 discusses Farsi data. Section 7 concludes.[3]

## 2. Comparing *tane* with Obligatory Classifiers

In languages like Mandarin, all nouns, even those intuitively seen as count, need a classifier, as opposed to languages like English, where only mass nouns cannot directly combine with numerals (excluding 'packaging/sorting' coercions). The obligatory occurrence of classifiers in Mandarin-type languages has led scholars to treat all nouns as mass or mass-like kind terms in such languages, requiring a type-fixing/partitioning mechanism to enable counting, similar to mass nouns in English-like languages. Classifiers are thus posited as a counting aid in NCs. For example, Chierchia (1998) argues that classifiers return the atomic instances of the kind to fix the type mismatch based on the view that counting operates on the predicative meanings of nouns. Likewise, in Krifka's (1989, 1995, 2003) view, classifiers *measure* the number of specimens, countable object units of a kind (cf. Borer 2005; Cheng and Sybesma 1999, a.o.).

The Turkish classifier is similar to classifiers in Mandarin-like languages as it appears between a numeral and an (ontological) count noun. However, *tane* fundamentally differs from these

[2]A note on terminology: The term 'classifier' is variably used in the literature, sometimes referring specifically to obligatory classifiers in languages like Mandarin, and other times more broadly to any 'quantizing' element in NCs and measure constructions. In this paper, 'classifier' is used descriptively for an element intervening between a numeral and a count noun in NCs. Hence, following this convention, *tane* will be referred to as a classifier, even though it is analyzed distinctly from classifiers in Mandarin-like languages.

[3]The Turkish data reflect the judgments of fifteen native speakers. For the Farsi data, ten native speakers have been consulted via informal conversations, including Amir Anvari and Masoud Jasbi. The examples of all the other languages are sourced from the literature.

classifiers in being optional. The question is whether *tane* can still be analyzed similarly to obligatory classifiers in Mandarin-like languages. To address this, we must delve into the semantics of nominals in Turkish.

Sağ (2018, 2022) claims that Turkish aligns with English in its nominal semantics (see also Renans et al. 2017, 2020, Martí 2020, Scontras 2022, cf. Bliss 2004, Bale et al. 2010, Görgülü 2012). Unmarked nouns, such as *kitap* 'book,' are strictly singular in denoting a set of atomic entities, while plurals, such as *kitap-lar* 'books,' are number neutral in denoting a set inclusive of atomic entities and their pluralities, as illustrated in (6).[4]

(6) a. $[\![kitap]\!] = \{a,\ b,\ c\}$
b. $[\![kitap + PL]\!] = \{a,\ b,\ c,\ a \oplus b,\ a \oplus c,\ b \oplus c,\ a \oplus b \oplus c\}$

Moreover, both plurals and unmarked nouns can be used in kind-level statements, as shown in (7a), but only plurals can combine with distributive predicates applying to individual members of the species, such as *come from different regions*, as illustrated in (7b) (Sağ 2022: 755, 761).

(7) a. **Dinozor(-lar)** 250 milyon yıl önce evrimleş-miş-tir.
dinosaur-PL 250 million year ago evolve-PERF-GEN
'The dinosaur/Dinosaurs evolved 250 million years ago.'
b. **Ayı*(-lar)** bu hayvanat bahçesin-e farklı bölge-ler-den gel-di.
bear-PL this zoo-DAT different region-PL-ABL come-PAST
'Bears/*The bear came to this zoo from different regions.'

Following Chierchia's (1998) treatment of English plurals, Sağ analyzes Turkish plurals as kind terms derived via the *nom* operator ($^{\cap}$), a function from properties to functions from situations $s$ to the maximal entity satisfying that property in that situation (Chierchia 1998, pg. 351). For example, the plural kind term *dinozorlar* 'dinosaurs' in (7a) is interpreted as below:

(8) a. For any property $P$ and world/situation $s$, where $P_s$ is the extension of $P$ in $s$

$$^{\cap}P = \begin{cases} \lambda s.\ \iota x.\ P_s(x), \text{ if } \lambda s.\ \iota x.\ P_s(x) \text{ is in } K, \text{the set of kinds} \\ \text{undefined, otherwise} \end{cases}$$

b. $[\![\text{(7a) with plural}]\!] = evolved(\lambda s.\ \iota x.\ dinosaur_s(x))$

The *pred* ($^{\cup}$) operator allows plural kind terms to be type-shifted to sets of object-level entities that instantiate the kind. More precisely, *pred* applies to the extension of the kind (i.e., extension in whatever world/situation it is interpreted relative to) and returns the set of singular and plural instantiations of the kind (in that world/situation) (Chierchia 1998, pg. 350):

(9) Let $d$ be a kind. Then for any world/situation $s$, where $d_s$ is the plural individual that comprises all of the atomic members of the kind

$$^{\cup}d = \begin{cases} \lambda x.\ x \leq d_s, \text{if } d_s \text{ is defined} \\ \lambda x.\ FALSE, \text{ otherwise} \end{cases}$$

Turkish unmarked nouns have been analyzed as ambiguous between denoting an atomic set of

[4]In Turkish, like in English, plurals can have a 'one or more' interpretation in downward entailing contexts and questions, while they convey multiplicity elsewhere. Building on the analyses in Sauerland et al. (2005), Spector (2007), and Zweig (2009) for English plurals, Sağ proposes that the multiplicity interpretation of Turkish plurals emerges as a conversational implicature. Renans et al. (2017, 2020) provide experimental evidence for this view.

ordinary object-level individuals, as shown in (10), and an atomic set of taxonomic individuals, as shown in (11a), following Dayal's (2004) view of English unmarked nouns. In their taxonomic use, unmarked nouns, depending on the context, can denote a singleton set containing a unique taxonomic kind individual (e.g., the dog kind), as in (38a), or an atomic set containing the sub-kinds of a kind individual (e.g., the bulldog, the poodle, etc.). Consequently, an unmarked noun in Turkish can be a definite description, referring to contextually salient unique object-level individual (e.g., *Fido*), or the unique dog kind through the covert *iota* operator.

(10) $[\![dog]\!] = \lambda x.\, dog(x) = \{Fido, Max, Tommy...\}$ $\langle e,t\rangle$

(11) a. $[\![dog_{K,c}]\!]$ = a singleton set containing the dog kind = $\{DOG\}$
b. $[\![dog_{K,c}]\!]$ = a set of subkinds of dog salient in a context c
= $\{BULLDOG,\ POODLE,\ GOLDEN.R, ...\}$ $\langle e_K,t\rangle$

In Dayal's view, singular kind terms denote impure atomic entities, analogous to group terms, such as *team*. While they hold a relation with the specimens at the conceptual level, singular kind terms differ from plural kind terms in not allowing type-shifting to sets of object-level entities via an operator like *pred*. This makes certain interpretations unavailable for unmarked nouns, in contrast to plural nouns, with one consequence being the incompatibility with distributive elements, as in (7b), which require access to sets of object-level instances of the kind.

Due to the type-shifting problem with singular kinds, Sağ (2018) argues that unmarked nouns in Turkish NCs denote atomic properties of object-level individuals, irrespective of *tane*. More precisely, *tane* cannot serve a type-fixing function on the kind-level denotation of nouns, unlike obligatory classifiers in languages like Mandarin. An alternative role for *tane*, aligning it with obligatory classifiers, could be to facilitate counting with mass nouns. As we have observed, *tane* selectively pairs with the count sense of the noun, similar to numerals, allowing combination with mass nouns only in contexts where they are coerced into a count denotation. This suggests that *tane* does not serve as a partitioning mechanism for mass nouns either. However, it is important to clarify where Turkish stands with respect to count vs. mass distinction.

Turkish grammatically distinguishes between the count and mass senses of nouns (Görgülü, 2010), aligning with English. This distinction becomes evident through several means, besides the direct combination of ontological count nouns with numerals, a feature not shared by ontological mass nouns. For instance, we observe differences in the form of quantifiers, as illustrated in (12). In contrast, Mandarin-like languages do not reflect the count vs. mass distinction beyond the choice of classifiers (Cheng and Sybesma, 1999).

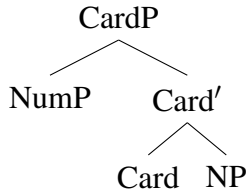
(12) a. birkaç (tane)/ *biraz (tane) kedi
a.few CL a.little CL cat
'a few cats'
b. *birkaç (tane)/ biraz (*tane) kan
a.few CL a.little CL blood
'a little blood'

Considering these patterns, I analyze *tane* as a category separate from obligatory classifiers. In line with Sağ (2018), I argue that unmarked count nouns in Turkish NCs uniformly denote atomic properties of object-level individuals, thus eliminating the need for an intermediary element in counting.

## 3. The Cardinal Head

Having established an initial understanding of *tane* in Turkish NCs, in this section, I delve into the preliminary part of my analysis. Following Scontras (2022), I propose that NCs universally involve a cardinal head denoting a counting function, as illustrated in (13).

(13) Generalized Structure of NCs




Ionin and Matushansky (2006) argue that counting universally necessitates semantically singular form of the noun, a requirement satisfied by morphologically unmarked nouns in languages such as Turkish, while English NCs further involve plural agreement marked on the noun. Applying their view of numerals to it, I analyze the cardinal head (CARD) as an expression of type $\langle\langle e,t\rangle,\langle n,\langle e,t\rangle\rangle\rangle$ in English, as shown in (14). CARD takes an atomic property $P$ and a number $n$, and returns a set of individuals $x$, where each $x$ evaluates to the cardinality $n$, and the atomic parts of each $x$ are in $P$ (cf. Ionin and Matushansky 2006, pg. 321):[5]

(14) The Semantics of CARD (to be revised):
$[\![\text{CARD}]\!] = \lambda P \lambda n \lambda x.\ \forall y\ [P(y) \rightarrow AT(y)].\ \exists S\ [\prod(S)(x) \wedge |S| = n \wedge \forall s \in S\ P(s)]$
a. $\prod(S)(x) = 1$ iff $S$ is a cover of $x$, and $\forall z, y \in S\ [z = y \vee \neg\exists a\ [a \leq_i z \wedge a \leq_i y]]$
b. A set of individuals $C$ is a cover of an individual $X$ iff $X$ is the sum of all members of $C$: $\sqcup C = X$

Based on this view, a NC such as *two books* denotes a set of plural individuals $x$ divisible into 2 non-overlapping individuals such that their sum is $x$ and each non-overlapping part is a book. While *books* in *two books* is lexically singular, denoting a set of atomic individuals, the entire NC is semantically plural, and thus *-s* on the NP is a marker of this plurality.

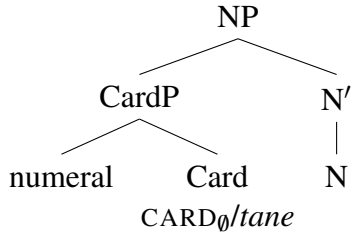
Turkish stands out not only due to the absence of plural agreement in NCs but also in the form of CARD it employs. While CARD is typically covert, as in languages like English, Turkish introduces both an overt and a covert variant of CARD, with the overt form realized as *tane*. The CARD heads in Turkish share the same semantics as CARD given in (14), with the exception that they combine with the numeral first, making them $\langle n,\langle\langle e,t\rangle,\langle e,t\rangle\rangle\rangle$ type expressions. This is shown in (15), where the atomicity presupposition is indicated by the subscripted $AT$ in $P_{AT}$.

(15) The Semantics of CARD in Turkish (to be revised):
$[\![\text{CARD}]\!] = \lambda n \lambda P_{AT} \lambda x.\ \exists S\ [\prod(S)(x) \wedge |S| = n \wedge \forall s \in S\ P(s)]$

[5]Contrasting with Ionin and Matushansky's numeral semantics, the semantics of CARD diverges in one key aspect: In their view, numerals must combine with a property with individuals of the same cardinality, a criterion met by atomic properties in the case of simplex numerals. This requirement also enables the compositional derivation of complex numerals. For instance, the set denoted by *hundred books* (type $\langle e,t\rangle$) can be an argument to the numeral *two* (type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$) since the set of *hundred books* comprises plural individuals with equal number of atoms. However, rather than following this generalization, I directly impose an atomic property requirement on the cardinal head for both simplex and complex numerals. See fn 12 for the rationale behind this approach.

The difference in composition of the Turkish CARD heads is grounded in the structural configuration of Turkish NCs, which I take to be a nominal projection instead of a CardP, primarily due to the strict head-final characteristics of Turkish. As shown in (16), Turkish NCs involve CardP, where CARD combines with a numeral, functioning as a modifier to the noun (cf. von Heusinger and Kornfilt 2017). The covert form of the Turkish CARD is represented as $\text{CARD}_{\emptyset}$.

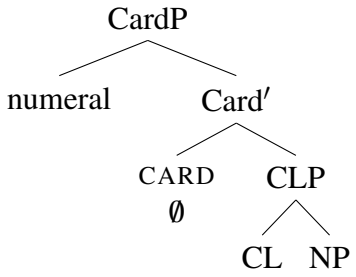
(16) The structure of Turkish NCs



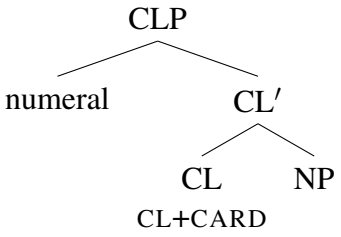

The optionality of an overt CARD head is not a universal feature. Some languages might always manifest CARD overtly.[6] Additionally, the overt or covert status of CARD can be subject to language-specific factors, as suggested by Scontras (2022) for Mayan languages like Chol and Mi'gmaq, where its realization varies with different numerals (see Bale et al. 2019).

Given that we have posited a CARD head in NCs, a note on the structure of NCs in obligatory classifier languages is imperative. As discussed earlier, obligatory classifiers in Mandarin-like languages serve as a type-fixing/partitioning mechanism for nouns that would otherwise be uncountable. Along with the classifier, we then also predict a CARD head in NCs of these languages. CARD could be a covert head merged separately above the projection of the classifier, as in (17a). Alternatively, classifiers in Mandarin-type languages might have a more complex semantics than we think —their denotation might involve a cardinality function besides the partitioning function, and thus CARD might be viewed as fused with the classifier head, as shown in (17b). While both possibilities are viable, for simplicity, I assume the structure in (17a).

(17) a. CARD as a separate head




b. CARD as part of CL's denotation




To summarize, *tane* represents the overt form of a cardinal head, which I propose to be an obligatory element of NCs, typically realized covertly across languages. The nominal argument of this cardinal head is semantically singular, although some languages obscure this with plural number agreement in their NCs.

[6]This is possibly seen in Bangla, an obligatory classifier language with systematic plural marking, where CARD might be realized by the classifier *ta/to* (cf. Dayal 2014, Saha 2023). Analyzing *ta/to* as CARD instead of a Mandarin-type classifier, is supported by its ability to co-occur with partitioning quantizing nouns: *du(-to) bosta caal* 'two-CL sack rice' (p.c., Ankana Saha).

## 4. Numeral Constructions and (In)definiteness

We have examined the optional appearance of *tane* in Turkish NCs. We will now explore the inherently indefinite characteristics of NCs across languages and the distinctive behavior of Turkish NCs: in the absence of *tane*, they allow both definite and indefinite interpretations.

### 4.1. Cross-linguistic Interpretation of NCs

The widely accepted view due to Link (1983) posits that NCs have an inherent predicative nature. As $\langle e,t \rangle$ type expressions, NCs can function as arguments for determiners, including definite, demonstrative, and quantificational determiners, and can occupy predicate positions, as exemplified below for English:

(18) a. These three students didn't submit their homework.
b. The first gift that I received this year was two books.

Under this view, NCs are assumed to undergo existential type-shifting in argument positions when not accompanied by an overt determiner, i.e., when they serve as bare arguments. As a result, NCs exhibit a strong indefinite behavior, with free scope-taking abilities:

(19) Three students are not standing but three are. (Dayal 2013, pg. 22)

Jiang (2012) highlights that in languages where bare nominal arguments are disallowed, such as French, NCs can still occupy the argument position of a verb without an overt determiner. In these languages, when NCs are used as bare arguments, they convey only a strong indefinite interpretation. Generally, in languages with articles, NCs require combination with the definite article or a demonstrative to function as a definite description, as shown for French below:

(20) Jean a acheté deux chiens et deux chats. *(Les)/ *(ces) deux chats sont coûteux.
John has bought two dogs and two cats the/these two cats are costly
'John bought two dogs and two cats. The/these two cats are very expensive.'
(Jiang 2012, pg. 95)

According to the neo-Carlsonian approach, bare nominal arguments in articleless languages can be definite through their association with the covert *iota* operator, which is either assumed to be inserted under a covert D head or function as a type-shifting operator. However, in languages with definite articles, the covert application of ι is unavailable due to the Blocking Principle, given in (21), which requires the use of overt determiners instead for reasons of economy.

(21) ***Blocking Principle*** (Chierchia, 1998):
For any type shifting operation $\phi$ and for any $X$: $*\phi(X)$ if there is a Determiner D such that for any set $X$ in its domain, $D(X) = \phi(X)$.

The Blocking Principle explains why in languages with articles, NCs cannot be definite without the overt definite determiner (or a demonstrative). However, in languages without articles, the scenario is strikingly alike. While bare nouns can acquire definite meanings via the covert ι operator, such a mechanism does not appear to apply to NCs. Jiang (2012) bases this generalization on Mandarin and Russian NCs. Additionally, Dayal (2013) notes that Hindi NCs cannot have definite interpretations freely; they require an overt marking, such as a demonstrative:[7]

[7]Hindi NCs can alternatively be definite if the numeral is inflected with the particle *-no*: *do-no bacce khel rahe*

(22) do bacce kamre meN the. *(ve) do bacce khel rahe the
two kids room in were those two kids play PROG PAST
'Two kids were in the room. Those two kids were playing.' (p.c. Veneeta Dayal)

Compelling evidence that NCs resist definiteness through the covert ɩ operator is found in Yi, an obligatory classifier language that also has a definite article. In Yi, bare nouns can be definite in the absence of the overt definite determiner, which suggests that the Blocking Principle might not be applicable in this language (see Jiang 2018 though). However, even with this flexibility for bare nouns, NCs necessitate the definite article to convey definite interpretations:

(23) sse-vo nyip ma *(su) dza dzu ndʑɔ.
boy two CL DEF rice eat PROG
'The two boys are having meal.' (Jiang 2012, pg. 334)

Drawing from these patterns, we see that NCs naturally lean towards indefiniteness. For NCs to attain definite interpretations, the covert application of the ɩ operator falls short; overt markers such as a definite article, or in its absence, demonstratives, are necessary. This resistance of NCs to covertly convey definiteness in articleless languages is particularly perplexing, if they are of inherently predicative nature. It remains an open question why, unlike with bare nouns, ɩ does not consistently apply to NCs in argument positions in these languages.

Exploring Turkish NCs reveals a more complex scenario. NCs with *tane* adhere to the typical constraint of being restricted to indefiniteness. However, NCs without *tane* exhibit a unique flexibility, permitting both definite and indefinite interpretations, which we turn to next.

### 4.2. Turkish NCs and (In)definiteness

Indefinites are distinct from other quantifiers in exhibiting unusual scope-taking abilities. Besides their ability to show scope ambiguities, akin to, for instance, universal quantifiers, indefinites can also take exceptional scope out of islands (e.g., Fodor and Sag 1982). Additionally, indefinites are known to be capable of receiving intermediate scope interpretations (Ruys 1992, Abusch 1993, Farkas 1981).

Just like indefinites and NCs in other languages, both forms of Turkish NCs display the general indefinite characteristics (for Turkish indefinites, see Zidani-Eroğlu 1997 and Kelepir 2001, a.o.). For example, in a scenario where three out of six students wrote comments on two (potentially different) books, (24) holds true, indicative of the narrow scope interpretation of the NC. Alternatively, (24) is also true in a situation where more than half the students commented on two books, provided these two books are the same ones chosen by half the students, reflecting the wide scope interpretation of the NC. Similar to English, (24) can also gain a distributive reading when the NC is interpreted in a wide scope context: There exist two books, each receiving comments from exactly half of the students.

(24) Öğrenci-ler-in tam olarak yarısı iki (tane) kitab-a yorum yaz-dı.
student-PL-GEN exactly half two CL book-DAT comment write-PAST

*the* 'The two kids were playing.' Although the nature of this particle remains elusive, it is only compatible with certain numerals and cannot combine with bare nouns. This precludes a potential analysis of the particle as a definite determiner (p.c. Veneeta Dayal).

'Exactly half of the students wrote comments on two books.'
(**exactly half > two, two > exactly half**)

The exceptional scope-taking ability of Turkish NCs is shown in (25), which could be true in two distinct situations. In the first one, (25) entails that my receiving funding is contingent upon the selection of any two of my projects, where the NC takes scope inside the antecedent of the conditional. In the second one, where the NC takes scope outside of the island, the selection of two particular projects is required for funding. Yet, differing from (24), the wide scope reading necessitates a collective selection of two projects, paralleling the pattern in English.

(25) Eğer iki (tane) proje-m seçil-ir-se, ödenek
if two CL project-1SGPOSS select-PASS-AOR-COND, funding
al-abil-eceğ-im.
take-ABIL-FUT-1SG
'If two of my projects are selected, I will receive funding.' (**if > two, two > if**)

Finally, (26) exemplifies the intermediate scope reading of NCs. It is felicitous in a scenario, where each linguist awards an A to every student, provided they respond to two specific questions consistent for all students under a single professor.

(26) Çoğu dilbilimci iki (tane) soru-ya yanıt ver-en her öğrenci-ye A
most linguist two CL question-DAT answer-REL every student-DAT A
ver-di.
give-PAST
'Most linguists gave an A to every student that answered two questions.'

Building on these patterns, we can conclude that both NCs with and without *tane* can be indefinite. However, central to the discussion in this paper, NCs without *tane* differ in also functioning as a definite description, as first illustrated in Section 1 (Schroeder 1992; Öztürk 2005). We have seen this in (5) through the ability of NCs without *tane* to refer back to a unique or maximal entity previously established in the context. NCs with *tane*, though, can gain a definite-like reading only when they co-occur with a demonstrative, as further exemplified below:

(27) Polis beş (tane) hemşire-nin ölüm-ün-ü araştır-ıyor.
police five CL female.nurse-GEN death-3SGPOSS-ACC investigate-IMPERF
Edinilen bilgilere göre, **beş (#tane) kadın**-ın/ **bu beş (?tane)**
gathered information according.to five CL woman-GEN this five CL
**kadın**-ın ellili yaş-lar-da ol-duğ-u tahmin ed-il-iyor.
woman-GEN fifties age-PL-LOC be-NMLZ-3SGPOSS predict-PASS-IMPERF
'The police is investigating the death of five nurses. Based on the information gathered, it is predicted that the/these five women were in their fifties.'

The contrast between the two forms of NCs is also evident in situational contexts involving reference to a familiar and unique/maximal entity. For instance, in a context where Sevgi has three apples only and this is known by both the speaker and the addressee, the NC without *tane* can refer to these three apples, unlike the NC with *tane*, as shown in (28). However, in a context where Sevgi has four apples, both forms of NCs can refer to three of these apples, as in (29), indicating partitive specificity. These patterns further demonstrate that only NCs without *tane* can receive definite interpretations, while both forms are compatible with indefiniteness.

Context: Sevgi has three apples only, familiar to the interlocutors.

(28) Sevgi-nin üç (#tane) elma-sın-ı Merve-ye ver-di-m.
Sevgi-GEN three CL apple-3SGPOSS-ACC Merve-DAT give-PAST-1SG
'I gave Sevgi's three apples to Merve.'

Context: Sevgi has four apples, not necessarily familiar to the addressee.

(29) Sevgi-nin üç (tane) elma-sın-ı Merve-ye ver-di-m.
Sevgi-GEN three CL apple-3SGPOSS-ACC Merve-DAT give-PAST-1SG
'I gave three of Sevgi's apples to Merve.'

Our objective is to explain why NCs manifest obligatory indefiniteness when *tane* is present, but this limitation seems to dissolve in the absence of *tane*.

## 5. Associating the Cardinal Head with Indefiniteness

The indefiniteness associated with NCs has been addressed within an ambiguity-based approach in Jiang (2012). In this view, numerals are considered ambiguous: they can either be modifiers of type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$ or modifiers of type $\langle\langle\langle e,t\rangle,e\rangle$ with a built-in choice function variable à la Reinhart (1997) (cf. Fodor and Sag 1982, Winter 1997, and Kratzer 1998). NCs with the first variant have a predicative denotation of type $\langle e,t\rangle$, which can occupy the predicate position or serve as an argument to a determiner. NCs with the second variant, however, are argumental expressions of type $e$. The choice function variable in their denotation requires $\exists$-closure, which in Reinhart's system, can occur at any level of composition, ensuring exceptional and intermediate scope properties of indefinites. Moreover, the absence of distributive readings with NCs in exceptional scope scenarios is explained, as such readings emerge from a Quantifier Raising (QR) analysis of indefinites, which Reinhart's theory does not support.

In the following, I semi-formally demonstrate how a NC is interpreted with respect to an island within the choice function theory.

(30) If two of my projects are selected, I will receive funding.
   a. Narrow Scope Reading (**if** $>$ **two**):
   $[\exists f\ [CH(f) \wedge\ be.selected(f([\![two\ projects]\!]))] \rightarrow funding]$
   I will get funding if there is a choice function and the two projects that it selects are selected (by the committee).
   b. Wide Scope Reading (**two** $>$ **if**):
   $\exists f\ [CH(f) \wedge [be.selected(f([\![two\ projects]\!])) \rightarrow funding]]$
   There is a choice function such that if the two projects that it selects are selected (by the committee), I will get funding.

Differing from Jiang (2012), I claim that the inherent indefiniteness in NCs stems from CARD. In other words, NCs are typically argumental expressions across languages due to CARD being hard-wired with a choice function variable. The structural composition of NCs in a language determines the type of CARD, which can be $\langle n,\langle\langle e,t\rangle,e\rangle\rangle$ type, as in Turkish, or $\langle\langle e,t\rangle,\langle n,e\rangle\rangle$ type, as in English, differing only in the order of the arguments taken by CARD. Illustrated below is the cross-linguistic semantic representation of CARD, modeled on the English version, where the subscript $f$ on $\text{CARD}_f$ represents the argumental nature of the cardinal head.[8]

[8]The selection of English as the basis for CARD is not pivotal to the analysis; it is made to align with the general

(31) The cross-linguistic semantics of CARD (final) $\langle\langle e,t\rangle,\langle n,e\rangle\rangle$
$[\![\text{CARD}_f]\!] = \lambda P_{AT}\lambda n.\ f(\lambda x\ \exists S\ [\prod(S)(x) \wedge |S| = \wedge\ \forall s \in S\ P(s)])$

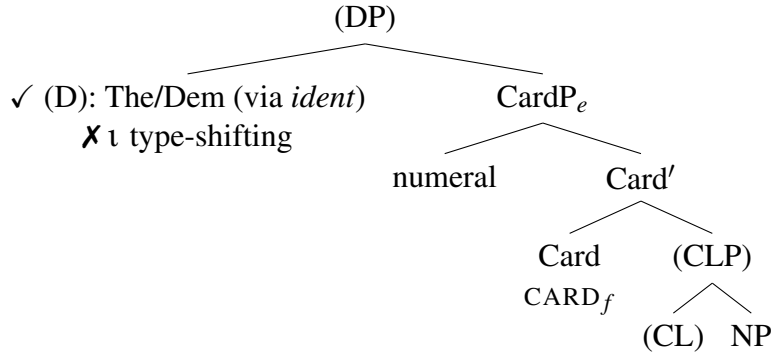
Following Dayal (2013), predicative use of NCs is derived only when structurally necessary —when NCs merge with overt determiners, which require an $\langle e,t\rangle$ type expression as an argument, or when they are used in the predicate position as a complement to the copula. Given that NCs are inherently *e*-type expressions, the shift to a predicate type is assumed to occur through Partee's (1987) *ident* operator, as shown below:

(32) a. *ident*: $\lambda x\lambda y.\ y = x$
b. *ident*($[\![\text{two books}]\!]$) = $\lambda y.\ y = f(\lambda x\ \exists S\ [\prod(S)(x) \wedge |S| = 2 \wedge \forall s \in S\ book(s)])\ \langle e,t\rangle$

In languages lacking articles, where the definite interpretation of NCs requires alternative overt markers, *iota* must operate as a type-shifting mechanism rather than acting as a covert D head. This hinges on the premise that type-shifting is necessitated only when there is a type mismatch in the composition. Consequently, NCs in the argument position of a verb do not undergo *iota* type-shifting, as this would require the initial triggering of *ident* type-shifting. In other words, since NCs are already of the appropriate type in their composition with a verb, *ident* type-shifting is not justified, thus hindering the subsequent application of ɪ. If the ɪ operator were to be inserted under a silent D head, it is expected that this covert D head would function similarly to an overt D head. Specifically, a covert definite determiner would initiate *ident* type-shifting due to type mistmatch, paralleling the behavior seen with an overt definite determiner.[9]

In languages where there is only one form of CARD (typically covert), such as French, English, Russian, Hindi, and presumably Mandarin, I analyze NCs to have the generalized structure in (33), ignoring potential structural variations. The parentheses enclosing the DP indicate two interpretative possibilities for an argumental type NC: First, it can directly fill an argument position of a verb as a CardP. Alternatively, it may act as a complement to a D category, such as definite and demonstrative determiners, leading to *ident* type-shifting to rectify the type mismatch. Conversely, as explained above, *iota* type-shifting is not an available option.

(33) The Generalized Structure of NCs




structure of NCs given in (33).

[9]The possibility remains open that in some articleless languages, ɪ may be introduced within a covert DP projection rather than functioning as a type-shifting operation. In line with the analysis offered in this study, such languages are expected to allow definiteness in NCs via ɪ. For Turkish, I align with the views of Öztürk (2005) and Bošković and Şener (2014), who argue against the existence of a D projection in the absence of an overt definite article (cf. Arslan-Kechriotis 2009; von Heusinger and Kornfilt 2017, a.o.).

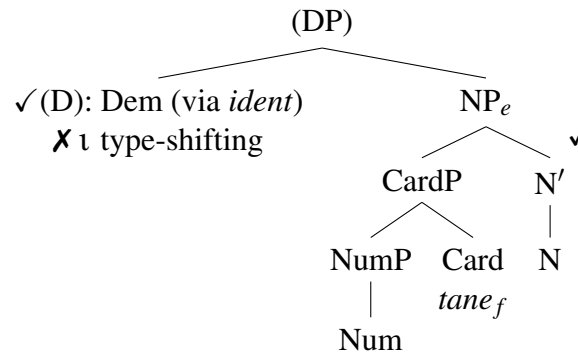
I further argue that languages can integrate inherently predicative NCs in addition to the standard argumental NCs, particularly when they exhibit multiple forms of the cardinal head. If the language at issue lacks articles, definiteness is expected to be possible with the predicative form of NCs through covert *iota* type-shifting. Turkish, being an exemplar of such languages, features NCs with *tane* as the typical indefinite form, reflecting the general construal in cardinal semantics. However, the covert CARD lacks the choice function, thus leading to a predicative denotation of NCs, as demonstrated below.

(34) a. The Semantics of the overt CARD in Turkish $\langle n, \langle\langle e,t\rangle, e\rangle\rangle$
$[\![tane_f]\!] = \lambda n \lambda P_{AT}.\ f(\lambda x\ \exists S\ [\prod(S)(x) \wedge |S| = n \wedge \forall s \in S\ P(s)])$

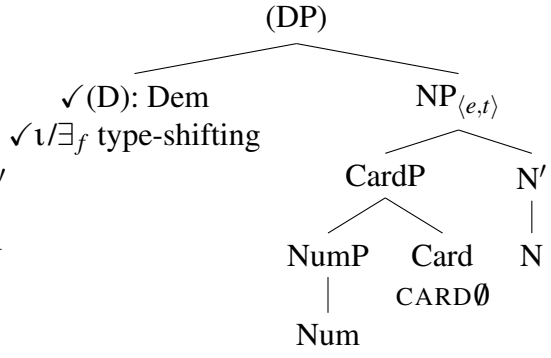
b. The Semantics of the covert CARD in Turkish $\langle n, \langle\langle e,t\rangle, \langle e,t\rangle\rangle\rangle$
$[\![\text{CARD}_\emptyset]\!] = \lambda n \lambda P_{AT} \lambda x.\ \exists S\ [\prod(S)(x) \wedge |S| = n \wedge \forall s \in S\ P(s)]$

As expressions of type $\langle e,t\rangle$, NCs with the covert CARD can directly occupy the predicate position or merge with an overt D. They can also undergo covert *iota* type-shifting or $\exists$ type-shifting through the choice function, as shown in (36). This allows them to receive not only indefinite but also definite interpretations without demonstratives. In contrast, NCs with *tane* mirror the intrinsic indefiniteness seen in NCs of other languages, as illustrated in (35).

(35) NCs with $tane_f$




(36) NCs with $\text{CARD}_\emptyset$




It is essential to highlight that the $\exists$ type-shift of NCs with $\text{CARD}_\emptyset$ via the choice function is not expected to be impeded by NCs with *tane*. This is because the choice function is introduced through separate mechanisms in these constructions —as a lexical item in one case and as a covert type-shifting operation in the other —at different syntactic levels, thereby eliminating the possibility of a blockage effect.

To wrap up the discussion so far, the fundamental reasoning supporting the view that NCs are predominantly argumental expressions across different languages is grounded in the exceptional pattern observed in Turkish NCs. Viewing NCs as consistently of the predicative type fails to account for the resistance of NCs with *tane* and NCs in languages without articles to *iota* type-shifting for definite interpretations, a resistance not observed in NCs lacking *tane*. However, the existence of intrinsically predicative NCs must also be recognized to explain the availability of definite interpretations for NCs without *tane*, unlike their counterparts with the classifier. In short, this distinction in Turkish NCs hints at the existence of two distinct types of NCs: the typical argumental type and a less common predicative type, the latter perhaps existing alongside inherently indefinite NCs within the same language. The analysis of Farsi NCs, which we turn to next, will shed more light on this point.

## 6. The Mirror-image Pattern in Farsi NCs

We have seen that in Turkish, NCs with the overt CARD are the default form with a built-in indefinite semantics, whereas NCs with the covert CARD have a predicative denotation. I will now demonstrate that Farsi exhibits an opposite pattern compared to Turkish NCs.

Farsi is an optional classifier language with a systematic number marking system and lacks an overt definite article, similar to Turkish (Ghomeshi 2003, 2016, Gebhardt 2009, Mache 2012, Krifka and Modarresi 2016, Sağ 2019, a.o.). Not surprising at this point, NCs in Farsi can be indefinite irrespective of the classifier *tā*, as demonstrated by their ability to introduce new discourse referents in the initial sentence of (37). However, Farsi diverges from Turkish by also allowing plural marking in NCs, which results in definiteness.[10] Without plural marking, NCs can only convey indefinite interpretations. Crucially, plural marking is exclusively applicable to NCs with *tā*, suggesting that a definite interpretation is possible only in this form. In contrast, NCs without *tā* can only display a definite-like behavior if accompanied by a demonstrative, as the contrast in the follow-up sentence in (37) illustrates (cf. with the Turkish (27)):

(37) Polis dar h*ā*l-e barrasi-e marg-e **se (t*ā*) moallem-e zan-(*h*ā*)** ast.
police in investigation-EZ death-EZ three CL teacher-EZ female-PL is
Ras*ā*ne-h*ā*-ye mahali migooyand **se *(t*ā*) zan-h*ā*/ #(in) se (t*ā*) zan** ke
channel-PL-EZ local say three CL woman-PL this three CL woman that
dar daheye panjah-e zendegi-e khod budand.
in fifties-EZ life-EZ themselves were.
'The police are investigating the death of three female teachers. Local channels report that *the three women/ these three women* were in their fifties.'

I propose that, similar to the case in Turkish, *tā* is the overt form of CARD and in the absence of *tā*, Farsi NCs feature a covert CARD. However, in Farsi, the covert CARD is associated with the choice function, and the overt CARD results in predicative NCs.

Building on the proposals in Ionin and Matushansky (2019) and Alexiadou (2019), I analyze plural marking in Farsi NCs as a form of number agreement, which, unlike plural agreement in English NCs, is constrained by definiteness (see also Smith-Stark 1974; Corbett 2000).[11] As *e* type expressions, NCs without *tā* cannot receive definite interpretations due to the unavailability of ι type-shifting. Consequently, we do not witness plural agreement on the lexical NP in the absence of *tā*. Similar to the case of Turkish NCs with *tane*, NCs without *tā* can combine with a demonstrative through the *ident* operator, triggered as a result of the type-mismatch arising when the NC is a complement to the D head. In contrast, NCs with *tā*, as predicative expressions of type $\langle e,t \rangle$, allow for ι type-shifting, which results in plural agreement.[12]

[10]The plural marking does not necessarily yield definiteness when marked on nouns in Farsi. Farsi plural nouns can denote non-specific narrow scope existential readings, similar to English bare plurals: In ruzh*ā*, gorbe-h*ā* be b*ā*gh-e-man nemi*ā*yand. 'These days, cats are not coming to my garden.' (no cats, # some cats > not)

[11]Ionin and Matushansky (2019) and Alexiadou (2019) propose an agreement-based analysis for Western Armenian NCs, which differ from Farsi NCs in exhibiting plural marking with specific indefinite and definite NCs (cf. Sigler 1996, Bale et al. 2010, Martí 2020, Kalomoiros 2021, Scontras 2022, a.o.). In Sağ (2024), I also analyze Western Armenian NCs within the proposal offered in this paper.

[12]Regarding complex numerals, as indicated in fn 5, Ionin and Matushansky (2006, 2019) suggest a compositional derivation. In their framework applied to the current analysis, complex numerals would involve multiple cardinal heads: [[three CARD] [hundred CARD apples]] (cf. Rothstein 2017). However, this approach is incompatible

This pattern of interpretation in Farsi NCs, mirroring what we observed in Turkish, demonstrates that Turkish is not unique in permitting both predicative and argumental NCs. It also emphasizes that the determination of which CARD head assumes an indefinite or predicative role is language-specific and not linked to the morphological form of CARD itself.

## 7. Conclusion

This study has explored the inherent indefiniteness of NCs across languages, focusing on the patterns that emerge in languages with and without articles. We have seen that while NCs can pair with overt definite determiners to achieve definiteness, in articleless languages they often require alternative markers for a definite interpretation, a divergence from the behavior of bare nouns, with which definiteness is possible through a covert *iota* operator. Aiming to understand why in articleless languages, the covert *iota* does not universally apply to NCs for definiteness, our investigation has centered on the optional classifier system in Turkish NCs. A key focus of this study has been the influence that the presence or absence of *tane* exerts on the interpretation of NCs. Notably, we have discovered that definiteness, unattainable when *tane* is present, becomes available in NCs in the absence of *tane*.

I have proposed that across languages, NCs function primarily as argumental expressions of type *e* with their indefiniteness derived from a cardinal head via a choice function. This proposal, which posits that the predicative use of inherently argumental type NCs is contingent upon structural necessities, challenges the traditional view of NCs as inherently predicative expressions and reveals the role of *iota* in articleless languages as a type-shifting operator, rather than a covert D head. The seemingly exceptional pattern of Turkish NCs has further led to the conclusion that languages can feature inherently predicative NCs alongside default argumental ones, particularly when multiple forms of the cardinal head are present. Turkish, with its use of both a covert and an overt cardinal head, the latter realized as *tane*, exemplifies this phenomenon. The analysis of Farsi NCs further corroborates these findings, providing a cross-linguistic perspective that solidifies my proposal. The subsequent challenge involves investigating the broader issue of why cardinality is intrinsically linked with indefiniteness.

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with argumental (*e* type) NCs, where CARD needs a property as its argument, thereby precluding iterative CARD heads. This is confirmed in Turkish argumental NCs, where the *tane* is non-iterative and only follows the numeral closest to the noun (e.g., *üç (*tane) yüz (tane) elma* 'three hundred apples'). Similarly, in Farsi predicative NCs with *tā*, CARD cannot be repeated within a numeral complex (e.g., *si (*tā) sad (tā) sib* 'three hundred apples'). Therefore, I have imposed an atomic property requirement on CARD, diverging from Ionin and Matushansky's view. Predicative NCs like *sad tā sib* 'hundred apples,' not being atomic properties, cannot combine with an additional CARD head in our model. I propose that complex numerals are formed by covert arithmetic operators (multiplication and addition) yielding a complex number that feeds the argument slot of the cardinality function.

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