

**(Non-)Restrictiveness of numerals and word order**

Atsushi Oho

International Christian University

**Abstract**

This paper explores the interpretive property of numerals in Japanese. The focus is on the case where numerals appear after a relative clause. It is shown that prenominal numerals receive non-restrictive interpretation, whereas postnominal numerals are ambiguous between restrictive and non-restrictive readings. I offer an E-type analysis, which is an extension of Shimoyama's (1999) proposal for internally headed relative clauses. The difference between the prenominal and postnominal numerals stems from the position of numerals, specifically, whether they are in DP-internal/external positions.

**1 Introduction**

This paper examines the syntax and semantics of numerals in Japanese by examining a novel interpretive pattern in Japanese. The empirical focus of this paper is the case where numerals appear after a relative clause as in (1). Numerals can appear two positions relative to a head noun: prenominal as in (1a) and postnominal as in (1b). In this paper, these constructions are referred to as *the (pre/postnominal) numeral constructions*.<sup>1</sup>

- (1) a. [John-ga katteiru] san-biki-no neko-ga nigeta. (prenominal)  
 John-NOM has 3-CL-GEN cat-NOM ran.away  
 'The three cats that John has ran away.'
- b. [John-ga katteiru] neko san-biki-ga nigeta. (postnominal)  
 John-NOM has cat 3-CL-NOM ran.away  
 'The three cats that John has ran away.' or 'Three (of the) cats that John has ran away.'

Noun modifiers are categorized into two types: restrictive and non-restrictive modifiers. Whitman (1981) claims that in Japanese, when a relative clause appears before a quantifier, it receives non-restrictive interpretation. Thus, the relative clause in (1) is a non-restrictive relative clause. It has been considered that numerals are adjectives and are treated as restrictive modifiers (e.g., Landman 2004). This paper, however, shows that the prenominal numeral as in (1a) is interpreted as non-restrictive, whereas the postnominal numeral as in (1b) is ambiguous between restrictive and non-restrictive.<sup>2</sup> This paper offers an E-type analysis, which accounts for how the non-restrictive interpretation is yielded and why there is a contrast between the prenominal and postnominal numerals.

**2 (Non-)restrictiveness of Japanese numerals**

This section observes whether numerals after a relative clause show (non-)restrictiveness based on three properties. First, restrictive modifiers restrict the value of the noun that they modify and as a result they typically implicitly produce a contrasting set. Non-restrictive modifiers, on the contrary, cannot restrict the value and hence no contrasting set is introduced. For this reason, a sentence

1. In this paper, numeral+classifier sequences in Japanese are treated as equivalent to numerals as in English.

2. Solt (2009) points out that in English, post-determiner numerals are interpreted as non-restrictive.

with a restrictive modifier can be continued with anaphora such as *the others*, whereas one with a non-restrictive modifiers cannot. Let us examine the prenominal numeral construction as in (2).

- (2) [John-ga katteiru] san-biki-no neko-ga nigeta.  
 John-NOM has 3-CL-GEN cat-NOM ran.away  
 ‘The three cats that John has ran away.’

(2) asserts that that the totality of cats that John has, whose number was three, ran away: it does not assert that the set of cats with three members, as opposed to some other set of cats, ran away. As a result, (2) cannot be continued with *Sono hoka-no neko-wa ...* ‘The others cats...’. Thus, the prenominal numeral construction shows the non-restrictiveness.

Second, non-restrictive modifiers show non-at-issueness. By not-at-issue content, I mean content expressing a secondary or parenthetical assertion. In contrast, by at-issue, I mean content expressing the main assertion (e.g., Potts 2005). Not-at-issue content cannot be targeted by operators in main clause such as negation (Simons et al. 2010). In the prenominal numeral construction, the information conveyed by the numeral (i.e., the number of cats) cannot be negated as indicated by the infelicitous continuation in (3).

- (3) [John-ga katteiru] san-biki-no neko-ga nigeta wakedewanai. #Ni-hiki-ga nigeta  
 John-NOM has 3-CL-GEN cat-NOM ran.away it.is.not.the.case.that 2-CL-NOM ran.away  
 ‘It is not that case that the three cats that John has ran away. Two cats did’

What is negated is the at-issue content, namely, the cats ran away. The escape from negation indicates that the prenominal numeral is interpreted as not at issue and hence as non-restrictive.

Finally, since not-at-issue content expresses a secondary assertion, non-restrictive modifiers introduce a separate proposition. As pointed by Whitman (1981), pre-numeral relative clauses are interpreted as non-restrictive and they introduce propositions. What is important here is that the information expressed by the prenominal numeral is part of such separated proposition. For example, (2) is considered as a double assertion, paraphrased as (4a) but not (4b).

- (4) a. John-ga san-biki-no neko-o katteiru. Sore-ga nigeta.  
 John-NOM 3-CL-GEN cat-ACC have they-NOM ran.away  
 ‘John has three cats. They ran away.’  
 b. John-ga neko-o katteiru. So-no san-biki-ga nigeta.  
 John-NOM cat-ACC have that-GEN 3-CL-NOM ran.away  
 ‘John has three cats. {Three of them/They three} ran away.’

These observations suggest that the prenominal numeral is interpreted as non-restrictive.

Let us turn to the numeral in the postnominal numeral construction as in (5).

- (5) [John-ga katteiru] neko san-biki-ga nigeta.  
 John-NOM has cat 3-CL-NOM ran.away  
 ‘The three cats that John has ran away.’ or ‘Three (of the) cats that John has ran away.’

In contrast to the prenominal numeral construction, for the postnominal numeral construction, there is individual variation regarding the interpretation. For some speakers, the numeral in (5) is only interpreted as non-restrictive just like the one in the prenominal construction. For these speakers, the same interpretive patterns hold as in the prenominal numeral construction demonstrated above. For others, the numeral in the postnominal numeral construction is ambiguous between restrictive

and non-restrictive. In what follows, the observations are about the restrictive use of postnominal numerals. First, for those who allow the numeral to be interpreted as restrictive, (5) asserts that the set of cats with three members, as opposed to some other set of cats, ran away, that is, a contrasting set is implied. Thus, (5) can be followed by *Sono-hoka-no neko-wa...* ‘The other cats...’.

Second, the content of the numeral can be negated as shown in (6).

- (6) [John-ga katteiru] neko san-biki-ga nigeta wakedewanai. Ni-hiki-ga nigeta  
 John-NOM has cat 3-CL-NOM ran.away it.is.not.the.case.that 2-CL-NOM ran.away  
 ‘It is not that case that the three cats that John has ran away. Two cats did’

Finally, unlike the prenominal numeral, the content of the postnominal numeral must be part of the main assertion. Thus, (5) will be paraphrased as (7).

- (7) John-ga neko-o katteiru. So-no san-biki-ga nigeta.  
 John-NOM cat-ACC have that-GEN 3-CL-NOM ran.away  
 ‘John has cats. {Three of them/They three} ran away.’

To summarize, these observations show that prenominal numerals are interpreted non-restrictively, whereas postnominal numerals are ambiguous between restrictive and non-restrictive modifiers.

### 3 Analysis

I propose that the prenominal and postnominal numeral constructions such as (2) and (5) involve E-type anaphora, following the suggestion in Hoshi (1995). My analysis is based on the E-type analysis proposed by Shimoyama (1999) for internally headed relative clauses (IHRCs). The motivation for the E-type analysis is the parallelisms between IHRCs and the non-restrictive use of numerals in the prenominal postnominal numeral constructions.

#### 3.1 Parallelisms between IHRCs and the non-restrictive numerals

One of the typical interpretive properties of E-type pronouns is the maximality effect (Evans 1980).

- (8) John owns some sheep. Harry vaccinates them.

In (8), the pronoun *them* refers to the maximal collection of sheep owned by John. Hoshi (1995) observes that IHRCs in Japanese also show the maximality effect as illustrated in (9).

- (9) [[John-ga san-biki-no neko-o katteiru]-no ]-ga nigeta.  
 John-NOM 3-CL-GEN cat-ACC has -NM -NOM ran.away  
 ‘John has three cats and they ran away.’

The example (9) entails that John has only three cats and all of them ran away. It is infelicitous in a situation where John has more than three cats. The exact same pattern holds in the non-restrictively interpreted numeral constructions in (10) (see also Hoshi 1995).

- (10) [John-ga katteiru] {san-biki-no neko / neko san-biki}-ga nigeta.  
 John-NOM has 3-CL-GEN cat / cat 3-CL -NOM ran.away  
 ‘John has three cats. They ran away.’

Since E-type pronouns are disguised definite descriptions, if E-type anaphora is involved in IHRCs and the numeral constructions, the maximality effect is expected. It should be noted that for sentences

with the restrictive use of postnominal numerals, no maximality effect is found. That is, (5), repeated here as (11), is felicitous in a situation where John has more than three cats.

- (11) [John-ga katteiru] neko san-biki-ga nigeta.  
 John-NOM has cat 3-CL-NOM ran.away  
 ‘John has cats. {Three of them/They three} ran away.’

However, I assume that this example also contains E-type anaphora. As indicated in the translation, the pronoun *them* or *they* is interpreted as an E-type pronoun, that is, the cats John has. Thus, pre-numeral relative clauses, which are interpreted as non-restrictive, always involve E-type anaphora.

In addition to the maximality effect, the content represented by numerals in IHRCs cannot be negated as in (12).

- (12) [[John-ga san-biki-no neko-o katteiru]-no ]-ga nigeta wakedewanai. #Ni-hiki-ga nigeta  
 John-NOM 3-CL-GEN cat-ACC has -NM -NOM ran.away it.is.not.the.case.that 2-CL-NOM ran.away  
 ‘It is not that case that John has three cats and they ran away. Two cats did’

Moreover, as the translation in (9) indicates, IHRCs are interpreted as separate sentences and the content conveyed by the numeral in IHRCs is in the separate sentence.

These parallalims suggest that as in IHRCs, the prenominal and postnominal numeral constructions also involve E-type anaphora.

### 3.2 Shimoyama’s (1999) E-type analysis

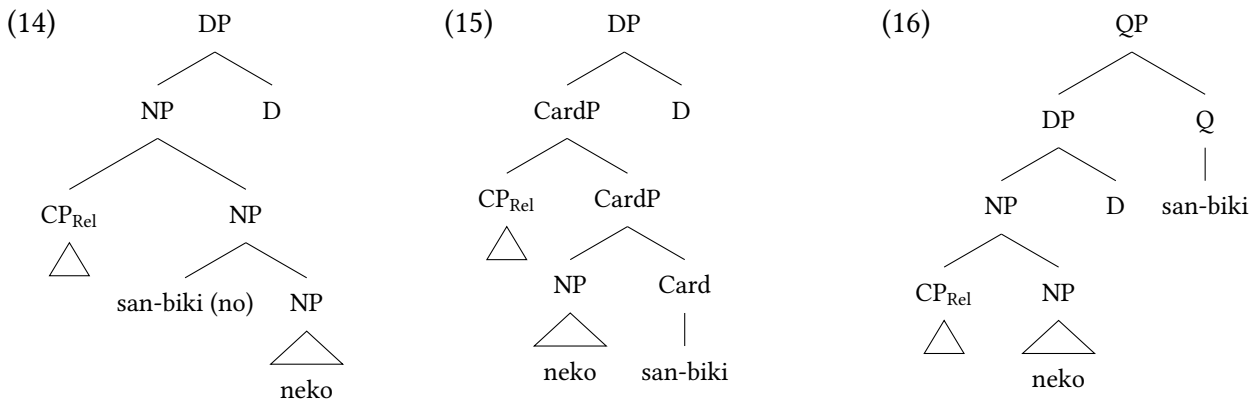
In Shimoyama, an internal head of IHRCs is interpreted in the IHRC at LF (cf. the LF raising analysis (e.g., Itô 1986)). The matrix  $N^0$  position is filled by a phonologically null proform, whose denotation is obtained from a relative clause. The morpheme *-no* is treated as a definite determiner just like *the* in English. The IHRC is assumed to be adjoined to the matrix IP, resulting in the separate proposition. Thus, the LF representation of (9) will be (13a).

- (13) a.  $[_{IP} [_{CP} \text{John-ga san-biki-no neko-o katteiru}]_i [_{IP} [_{DP} t_i [_{NP} \text{pro}_{\langle e,t \rangle}] \text{no} ]\text{-ga nigeta}]]$   
 b.  $[[\text{pro}]] = \lambda x. *cat \wedge |x| = 3$  (\*P(x) is the closure of P(x) under i-sum formation <sup>1</sup>)

The denotation of the proform is the property of being plurality of cats with the cardinality of three (13b). By combining the proform with *-no*, the denotation of the DP is obtained, which is equivalent to the English definite ‘the three cats that John has’. In the next subsection, an E-type analysis for the numeral constructions is proposed, which is the extension of Shimoyama’s (1999) analysis .

### 3.3 Syntax and semantics of numerals

Before moving on the E-type analysis, I first propose the syntax and semantics of numerals. I postulate that a prenominal numeral adjoins to NP as in (14). On the other hand, I suggest that a postnominal numeral has two options: it is in DP-internal or external position. In one option, a numeral is a head of CardP, the projection of a cardinal numeral, which takes NP (Danon 2012) as shown in (15). In the other option, I assume that a numeral is a quantifier determiner in the sense of the Generalized quantifier analysis (Barwise & Cooper 1981). Unlike the traditional Generalized quantifier treatment, I adopt Matthewson’s (2001) analysis, in which a quantifier determiner takes DP as its complement, that is, it is of type  $\langle e, \langle et, t \rangle \rangle$  as (16) shows.



Among the three structures, the prenominal numeral in (14) and the postnominal numeral of  $\text{Card}^0$  in (15) are both in DP-internal position. On the other hand, the postnominal numeral of  $\text{Q}^0$  in (16) is in DP-external position. I will show later that this syntactic difference results in the observed interpretive difference with respect to the (non-)restrictiveness.

For the semantics of numerals, I adopt the adjective analysis of numerals (e.g., Landman 2004) for prenominal numerals (14), and numerals of  $\text{Card}^0$  (15) as in (17).

(17)  $\llbracket \text{san-biki} \rrbracket = \lambda x. |x| = 3$

As a result, the denotation of the combination of a noun and a prenominal numeral is identical to that of the combination of a noun and a postnominal numeral of  $\text{Card}^0$  (*-no* is assumed to have no semantic contribution).

(18)  $\llbracket \text{san-biki-no neko} \rrbracket = \llbracket \text{neko san-biki} \rrbracket = \llbracket \text{three} \rrbracket \cap \llbracket \text{cats} \rrbracket = \lambda x. *cat \wedge |x| = 3$

On the other hand, the denotation of numerals in  $\text{Q}^0$  (type  $\langle e, \langle et, t \rangle \rangle$ ) in (16) is as follows.

(19)  $\llbracket \text{san-biki} \rrbracket = \lambda y. \lambda P. \exists x [x \leq y \wedge |x| = 3 \wedge P(x)]$

Let us now move on to the E-type analysis. Unlike IHRCs, relative clauses followed by numerals are non-restrictive externally headed relative clauses (Whitman 1981). I submit that at LF, an external head is reconstructed into the relative clause. The following example shows that Japanese non-restrictive relative clauses show reconstruction effects (the same holds for postnominal numerals) (see also Hoshi 2004).

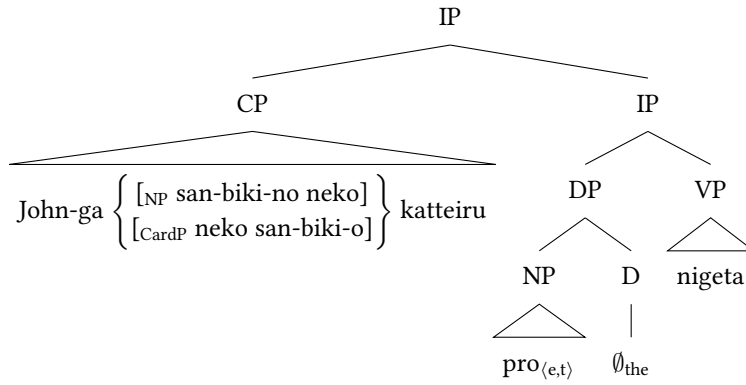
- (20) Mary-wa [John<sub>i</sub>-ga taipu-shita] kare-jisin<sub>i</sub>-no san-bon-no ronbun-o mottekita  
 Mary-TOP John-NOM type-did him-self-GEN 3-CL-GEN paper-ACC brought  
 ‘Mary brought the three papers of himself that John typed’

After an external head is reconstructed, the relative clause is adjoined to the matrix IP. As in Shimoyama’s (1999) analysis, I assume that a proform of type  $\langle e, t \rangle$  occupies the matrix  $\text{N}^0$  position, whose denotation is retrieved from the relative clause.

When a numeral is in DP-internal position, namely, the case of the prenominal numeral and the postnominal numeral in  $\text{Card}^0$ , both the numeral and noun are reconstructed. (21a) illustrates the simplified LF representation for these two cases.<sup>3</sup>

3. This LF representation and the one in (22) are greatly simplified ones. At issue of the present analysis is how and when the proform is introduced in the derivation. One possibility is that the proform is base-generated in DP-internal position. Another possibility is that it is inserted sometime in the derivation in a similar fashion as Trace Conversion in Fox (2002). I must leave this issues for future research.

(21) a.



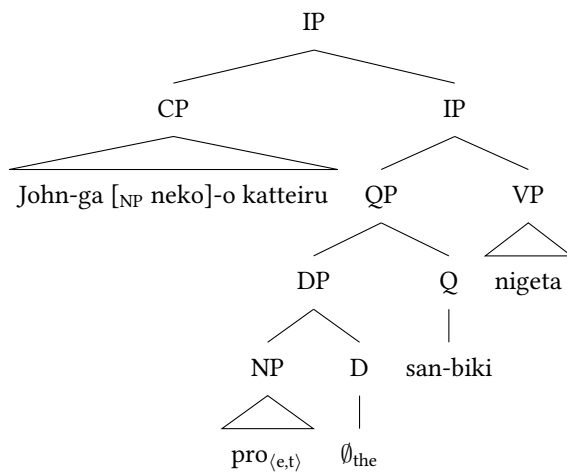
b.  $\llbracket \text{pro}_{(e,t)} \rrbracket = \lambda x. *cat(x) \wedge |x| = 3 \wedge \text{have}(j, x)$

c. John has three cats. They (= the three cats John has) ran away.

The *pro* obtains its denotation from the relative clause, the property of being a plurality of cats that John has and the number of them is three (21b). Lastly, a silent definite determiner combines and the DP denotes the maximal plurality of three cats that John has. The result is the interpretation paraphrased in (21c).

In contrast, when a numeral is in DP-external position, a noun to the exclusion of a numeral is the external head and is reconstructed. Thus, the LF for the numeral of  $Q^0$  will be (22a).

(22) a.



b.  $\llbracket \text{pro}_{(e,t)} \rrbracket = \lambda x. *cat(x) \wedge \text{have}(j, x)$

c.  $\llbracket \text{QP} \rrbracket = \lambda P. \exists x [x \leq \sigma y. *cat(y) \wedge |x| = 3 \wedge P(x)]$

d. John has cats. {Three of them /They three} ran away.  
(them/they = the cats John has)

The denotation of the proform is retrieved from the relative clause (22b), the property of being plurality of cats that John has. Due to the denotation of the numeral in  $Q^0$ , the sentence can yield the partitive interpretation (*three of them*) and the non-partitive/totality interpretation (*they three*) in (22c). This LF yields the interpretation in (22d).

The proposed E-type analysis together with the syntax and semantics of numerals accounts for the (non-)restrictiveness of numerals which appear after a relative clause. The difference between the prenominal and postnominal numeral constructions stems from the syntactic difference, specifically, whether numerals are located DP-internally or DP-externally.

#### 4 Conclusion and future direction

This paper has shown that the prenominal numeral receives non-restrictive interpretation, whereas the postnominal one is ambiguous between restrictive and non-restrictive. I offered an E-type analysis based on Shimoyama's (1999) proposal for IHRCs. The difference between the prenominal

and postnominal numerals is accounted for by the syntactic difference of numerals, specifically, whether numerals are in DP-internal position or DP-external position.

The current analysis predicts that when a numeral is in DP-external position, it will be interpreted restrictively. Floating numerals are considered as a VP adjunct (see Nakanishi 2008), which is a DP-external position. As predicted, the sentence in (23) is only interpreted as restrictive.

- (23) [John-ga katteiru] neko-ga san-biki nigeta.  
John-NOM has cat-NOM 3-CL ran.away  
'The three cats that John has ran away.' or 'Three (of the) cats that John has ran away.'

In the proposed analysis, the LF representations for the non-restrictively interpreted numeral constructions are identical to that for IHRCs. However, these two constructions differ in several points as pointed out by Shimoyama (1999). I must leave it to future work to find out how the differences arise.

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