Inverse-Linking Construction*

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This paper treats the inverse scope reading of the Inverse-Linking Construction under a new perspective that distributivity is reduced to plurality based on Landman (2000). The immediate advantage is that my analysis can explain the inverse scope reading of the Inverse-Linking Construction that does not contain a universal quantifier, the data that previous approaches could not explain. Second, my analysis can account for why there is no inverse scope reading when the first NP in the Inverse-Linking Construction is definite, without missing the generalization that indefiniteness licenses distributivity. Third, my analysis is compositional throughout the process of producing the distributive reading, without reinterpreting the prepositional phrase that contains a quantifier phrase. In addition to putting forth the analysis, I further characterize the inverse scope reading as NP-internal, backward, and embedded distributivity.

Keywords: inverse-linking construction, inverse scope reading, embedded distributivity, NP-internal distributivity, backward distributivity

1. Introduction

This paper examines the Inverse-Linking Construction (henceforth, ILC) exemplified in (1) from a new perspective that distributivity is plurality based on Landman (2000). Zimmermann (2002) describes the crucial properties of the ILC as follows. First, it is, most of the time, ambiguous between a surface reading and an inverse scope reading. On the inverse scope reading, the embedded QP takes scope over an indefinite or a numeral expression, resulting in the ∀∃-structure. Second, on the inverse scope reading only, the DP-internally positioned QP can bind a pronoun outside the ILC.

(1) [$_{DP}$ Ein Apfel [$_{PP}$ in [$_{QP}$ jedem Korb]]] ist faul.
'One apple in every basket is rotten.'

In particular, this paper examines the inverse scope reading of the ILC. The

* This paper is an extension of my Ph.D. Dissertation on Plurality and Distributivity, Y-K Joh (2008).

inverse scope reading is a distributive reading and the circumstances where the inverse scope reading arises pattern with those where an overt or a covert distributive particle evokes a distributive reading as shown in (2). What should not be missed in accounting for the ILC is that (1) and (2) both reveal the same ∀∃-structure, whether or not the distributive reading is forward or backward.

(2) a. The baskets have one apple.
 b. The baskets have one apple each.

In presenting a new analysis of the ILC, I will first review two previous approaches. One is the LF-movement analysis that May (1977, 1985), Larson (1985) and Heim and Kratzer (1998) propose. The other is Zimmermann's (2002) surface-structure-based analysis. Discussing the limitations of the two approaches, in section 3, I will put forth a new analysis that places the ILC within the broad picture of distributivity and point out the immediate merits. In section 4, I will examine three characteristics of the ILC. First, I will discuss that NP-internal distributivity appears in languages such as Korean and Japanese as Gil (1990) observes. Second, I will point out that inverse distributivity does not only occur NP-internally but also occurs at the sentential level. Third, I will show that the ILC is, most of the time, involved with embedded distributivity. Section 5 concludes this paper.

2. Previous Studies

2.1. An LF-Movement Approach

The sentences in (3) and (5) do not have readings that correspond to the surface structure, described in (4a) and (6a), respectively. They only allow the inverse scope reading delineated in (4b) and (6b). It seems that what is inversed is scope. Thus, May (1977, 1985), Larson (1985) and Heim and Kratzer (1998) suggest LF-movement to get the right scope of the available interpretation. That is, on the inverse scope reading, the QP undergoes LF-movement and takes scope over the indefinite/numeral expression and hence can bind a variable. The LF representations of the sentences in (3) and (5) are illustrated in (7a) and (7b), respectively.

(3) One apple in every basket is rotten.

(4) a #There is one apple which is in every basket and which is rotten.
 b. In every basket, there is one apple that is rotten.

(5) Some man from every city despises it.

(6) a. *There is a specific man from every city who despises it.
b. For every city y, some man from y despises y.

(7) a. $[_{DP}$ $[_{QP}$ every basket $]_1$ $[_{DP}$ one apple $[_{PP}$ in t_1]]] is rotten.
b. $[_{DP}$ $[_{QP}$ every city $]_1$ $[_{DP}$ some man $[_{PP}$ from t_1]]] despises it.

Yet, Zimmermann (2002) finds limitations of the LF-movement approach in the following three aspects. First, assuming LF-movement, we seem to get contradictory evidence concerning the landing site of the raised QP. On the one hand, Fiengo and Higginbotham (1981) assume extraction of the QP from the embedding DP. Under the assumption that specific DPs form a barrier for extraction, they can explain the non-specificity (or, indefiniteness) property of ILCs. That is, they argue that the absence of the inverse scope reading of ILCs with specific DPs follows from the fact that specific DPs would prevent the QPs from undergoing LF-movement out of the DPs as in (8).

(8) a. *Who_1 did [the teacher of t_1] call?
b. *$Whom_1$ did he read [this book of t_1]?

On the other hand, May (1985) and Larson (1985) argue for adjunction of the QP to the DP, refuting extraction of the QP from the DP. The motivation comes from the example in (9). The sentence in (9) means that it is too much that every plate is such that there is one apple on it while it is possible for some plates to have an apple on them. This reading is well represented in the adjunction analysis as shown in (10). However, extracting the QP out of the DP would result in a structure like (11a) and generate an incorrect reading as in (11b). In terms of (11b), there should be no apple in any plate.

(9) One apple on every plate is too much.

(10) $[_{DP}$ $[_{QP}$ every plate$]_1$ $[_{DP}$ one apple [on t_1]]] is too much.

(11) a. [every plate$]_1$ $[_{IP}$ $[_{DP}$ one apple on t_1] is too much.]
b. *'Every plate x is such that one apple on x is too much.'

Yet, the adjunction-based analysis cannot explain the indefiniteness property discussed above that the extraction-based analysis accounts for since the specific DP can serve as the barrier only when something is extracted out of it. In sum, neither the extraction analysis nor the adjunction approach explains a full set of relevant phenomena. The extraction analysis cannot generate the right interpretation whereas the adjunction analysis is unable to explain the specificity condition.

Second, Zimmermann (2002) observes a contrast between (12) and (13). The sentence in (12a) has an inverse scope reading as illustrated in (12b) while the sentence in (13a) does not. The absence of an inverse scope reading for the example in (13a) can be taken as an argument against the LF-movement analysis for the ILC since, under the approach, it is difficult to explain why scope-driven LF-movement only occurs with the ILC in German.

(12) a. Ein Apfel in jedem Korb ist faul.
One apple in every basket is rotten.
b. 'For every basket z, one apple in z is rotten.'

(13) a. Ein Arzt behandelte jeden Patienten.
A/some doctor treated every patient
b. *'For every patient, there was a (different) doctor who treated him.'

Third, Zimmermann (2002) further argues that there is evidence for a different surface structure of ILCs. He finds that the QPP – the PP that contains the QP – that gives rise to the inverse scope reading of the ILC differs syntactically from other postnominal modifiers. They cannot freely change places with other modifiers as shown in (14b) and (15b) but must be DP-final. For instance, as in (14a), ILCs can have an inverse scope reading if the QPP follows the relative clause. Likewise, in (15a), when the QPP follows the PP-modifier, the inverse scope reading is possible. Yet, when the QPP precedes the relative clause or the PP-modifier as in the (b) sentences, the inverse scope reading is unavailable.

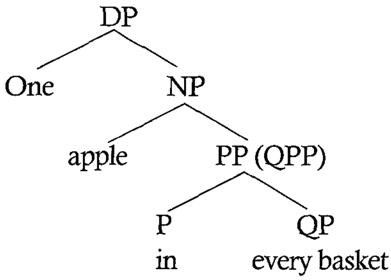
(14) a. One person [$_{RC}$ who was famous] [$_{QPP}$ from every city] was visited.
b. #One person [$_{QPP}$ from every city] [$_{RC}$ who was famous] was visited.

(15) a. One slave [$_{PP}$ with good manners] [$_{QPP}$ from every province] was freed.
b. #One slave [$_{QPP}$ from every province] [$_{PP}$ with good manners] was freed.

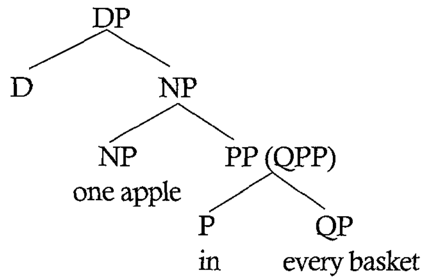
2.2. A Surface-Structure Approach

Based on the points discussed above, Zimmermann (2002) proposes an alternative analysis of the inverse scope reading of ILCs. He explains the two different readings of ILCs based on two different structures: the Low-NP Adjunction tree in (16) and the High-NP Adjunction tree in (17). That is, (16) is a structure for the surface reading while (17) is a structure for the inverse scope reading. In (16), the PP that contains the QP is a regular modifier and is adjoined to the NP below the numeral/indefinite expression. On the other hand, in (17), the PP containing the QP *in every basket* adjoins the NP so that it is placed above the numeral/indefinite expression. For this tree, it is assumed that numerals are cardinality adjectives, not quantificational expressions.

(16)



(17)



Based on the structure in (17), Zimmermann (2002) proposes the semantic composition of the inverse scope reading of the ILC in (1) as below. Crucial moves on the semantic part in interpreting the ILC are reinterpreting the QPP as a generalized quantifier and positing an implicit set variable X_i that is later targeted by λ-abstraction.

(18) a. [[in jedem Korb]] = $\lambda P.\forall z[\, z\in \text{basket}(z) \rightarrow \exists X[\, P(X) \wedge \text{in}(X, z)]]$

b. [[ein Apfel n jedem Korb]] = $\forall z[\, z\in \text{basket}(z) \rightarrow \exists X[\text{one-apple}(X) \wedge \text{in}(X, z)]]$

$\Rightarrow \forall z[\, z\in \text{basket}(z) \rightarrow \exists X[{}^*X_i(X) \wedge \text{one-apple}(X) \wedge \text{in}(X, z)]]$

$\Rightarrow \lambda {}^*X_i.\forall z[\, z\in \text{basket}(z) \rightarrow \exists X[{}^*X_i(X) \wedge \text{one-apple}(X) \wedge \text{in}(X, z)]]$

c. [[ein Apfel in jedem Korb ist faul]]

$= \forall z[\, z\in \text{basket}(z) \rightarrow \exists X[\, \text{rotten}(X) \wedge \text{one-apple}(X) \wedge \text{in}(X, z)]]$

Zimmermann (2002) claims that the two properties of ILCs naturally fall out of his analysis: the non-specific DPs and the DP-final QPPs. First, he argues that the restriction of inverse scope readings to indefinite/numeral expressions comes from the fact that the demonstrative determiner or the definite in DPs is located in the D-head above the postnominal PP. This means that the definite or the demonstrative determiner is placed above the QPP. He claims that it explains why the QPP cannot scope over it. Second, Zimmermann (2002) points out that the reason why the QPP must be the DP-final element for the inverse scope reading is because the adjunction of the QPP blocks the adjunction of additional modifying elements above the QP. In sum, he makes the following arguments: on the inverse scope reading, the postnominal PP in ILCs is base-generated above the numeral *one*, not below it. In particular, it is right-adjoined to an NP that is composed of a numeral and the head noun. His proposal seems to address many interesting properties of ILCs but there are some insufficient aspects.

First, Zimmermann (2002) reinterprets the QPP as a generalized quantifier as in the formula in (18a). Yet, reanalyzing the QPP as a generalized quantifier does not seem quite natural since the process of reinterpretation is not a compositional semantic operation. It might be more adequate if the $\forall\exists$ structure comes as a result of the composition of the meanings of the smaller parts, rather than being imposed as a special denotation of a complex phrase.

Second, as in the formula in (18b), Zimmermann (2002) inserts an implicit variable X in the middle of a semantic composition. The insertion of the implicit variable is unavoidable since the sentence has two distributive readings that are embedded to each other. However, the way that the implicit variable is introduced in his system is not based on any principle. Incorporating such non-compositional and non-principled procedures as in the formulae in (18a) and (18b) into the semantic component seems to relax compositionality in a rather extreme way.

Third, Zimmermann (2002) argues that ILCs have many properties that are parallel to those of anti-quantifier constructions. Even though he made a good observation, his analysis of ILCs does not reflect the parallelisms very well. Although the denotation of the underlined phrase in (19a) appears to resemble that of the underlined phrase with the anti-quantifier *je* in (19b), the two denotations are derived in a very different way in his system.

(19) a. Drei Äpfel in *jedem* Korb haben je zwei Blätter.
three apples in every basket have each two leaves.
'Three apples in every basket have two leaves each.'
b. *Je* drei Äpfel in den Körben haben je zwei Blätter.
each three apples in the baskets have each two leaves.
'Three apples in the baskets have two leaves each.'

The interpretations of the phrases in (19) can be derived as in (20). Zimmermann does not treat the cases where one sentence has two overt distributivity markers. Thus, in (20), I will only show how he would treat the phrases underlined in (19) that have the same meaning differently. For (19a), the QPP has to be reinterpreted as a generalized quantifier and thus the $\forall\exists$-structure is projected by the entire phrase *in jedem Korb* as shown in (20a). However, for (19b), *je* itself is supposed to project the ∀∃-structure as shown in (20b).

(20) a. $[[\text{in jedem Korb}]] = \lambda P.\forall z[\, z\in \text{basket}(z) \rightarrow \exists X[\, P(X) \wedge \text{in}(X, z)]]$
$[[\text{drei Äpfel in jedem Korb}]] = \forall z[\, z\in \text{basket}(z) \rightarrow \exists X[\, \text{3apples}(X) \wedge \text{in}(X, z)]]$
b. $[[\text{je}]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists X\, [P(X)\, \&\, R_j(X)(z)]]$
$[[\text{je 3 Äpfel}]] = \forall z[z \in Z_i \rightarrow \exists X\, [\text{3 apples}(X)\, \&\, R_j(X)(z)]]$
$\Rightarrow \lambda R_j.\forall z[z \in Z_i \rightarrow \exists X\, [\text{3 apples}(X)\, \&\, R_j(X)(z)]]$
$[[\text{je 3 Äpfel in t}]] = \forall z[z \in Z_i \rightarrow \exists X[\text{3 apples}(X)\, \&\, \text{in}(X, z)]]$
$\Rightarrow \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists X[\text{3 apples}(X)\, \&\, \text{in}(X, z)]]$
$[[\text{je 3Äpfel in den Körben}]] = \forall z[z\in[[\text{the baskets}]] \rightarrow \exists X[\text{3 apples}(X)\, \&\, \text{in}(X, z)]]$

Fourth, in his analysis, the inverse scope reading of ILCs expressing the ∀∃ structure is essentially explained by the presence of the universal quantifier *jedem* inside the PP. If so, how can we account for the inverse scope reading of the ILC that does not include a universal quantifier? As in (21), the NP inside the PP is not universally quantified but we get the inverse scope reading from the ILC. Zimmermann (2002) cannot account for exactly where the universal quantificational force comes from for the inverse scope reading of (21). Even more, the universal reading for distributivity can also be revealed by the phrase that is ordinarily translated into the existential quantifier as shown in (22). This example suggests that the universal quantificational force is the result of a projection of an independent operator of some kind, rather than a direct translation of the corresponding lexical item.

(21) Residents of the cities hate them.

(22) One apple in some baskets has two leaves (each).

Fifth, Zimmermann (2002) claims that the reason why the sentence in (23) does not have the inverse scope reading is because the demonstrative determiner is located in the D-head above the post-nominal PP. However, it seems to me that the explanation for the restriction of inverse readings to indefinite noun phrases must be parallel to the account for the indefiniteness condition operating on distributivity in general.

(23) This picture of everybody is now on sale.

3. A New Account

3.1. Theory

In this section, I will provide a new account for the ILC. In providing a new analysis, I propose a pluralization operator defined in the formula in (24) below. In the denotation of the pluralization operator, there are three variables -- *Z*, *P* and *R*. The variables mirror the three essential components of distributivity. *Z* is the distributive antecedent (SrtKy) and *P* is the Distributed Share (DstrShr). *R* expresses the relation between the SrtKy and the DstrShr.[1]

(24) $[[*_{ij}]] = \lambda P_{<\alpha,t>}.\forall z[z_{<\alpha>} \in Z_{i<\alpha,t>} \rightarrow \exists x_{<\alpha>}[P(x) \& R_{j<e,<\alpha,t>>}(x)(z)]]$

In the denotation of the pluralization operator, the semantic type of the variables *Z* and *P* is <α,t>. The former is a plural set while the latter is an atomic set. The relation-denoting variable *R* is of type <e,< α ,t>>. In all the variables, type < α > that can be either type <e> or type <v> expresses the parallel between the nominal domain and the verbal domain since either the nominal or the eventul adverbial can serve as the SrtKy and the DstrShr. The reason why the relation variable *R* has α in its type is for its flexibility. The variable *R* incorporates intransitives, transitives, and ditransitives. In the denotation of the pluralization operator, the type < α > is assigned to the variables *z* and *x*. The lower-case of the variables *z* and *x* indicates that they are singular. The variable *z* is necessarily a pure atom since it constitutes the sub-parts of a set plural. However, the variable x is either a pure or an impure atom.

My proposal is on the basis of Zimmermann's (2002) analysis for the anti-quantifier. Yet, my analysis differs from him, largely in the following five aspects. First of all, I claim that pluralization generates both forward and inverse distributive interpretations, based on Landman (2000) who reduces distributivity to plurality in terms of the formula in (25). I claim that the pluralization operator in (24) is evoked by an overt or a covert distributive particle. Expressing the ∀∃-structure inside the pluralization operator further allows us to introduce a plural variable to the formula via sum formation.

(25) If P is a set of atoms then: $\alpha \in {}^*P$ iff $\forall a \in AT(\alpha): a \in P$

The example with a distributive quantifier in (26) empirically attests Landman's (2000) claim that distributivity is, in fact, semantic plurality. In (26), the number of baskets is multiplied by the number of students and thus there are six baskets in total. The fact that we can get the total number of elements in-

[1] The terms Sorting Key and Distributed Share are from J-W Choe (1987).

volved in a distributive reading by multiplying the number of the DstrShr by that of the SrtKy when they are specified shows us that distributivity is plurality since plurality is mulitplying.

(26) The two students carried three baskets each.

Furthermore, the pluralization operator I propose is designed to apply a group-forming operation when the DstrShr is plural.[2] The lower-case variable x ensures that the DstrShr must be atomic. When the predicate that comes to serve as the DstrShr is singular in itself, nothing happens and the DstrShr is a pure atom. However, when the predicate that comes to function as the DstrShr is plural, the group-forming operation occurs and an impure atom is created out of the plural predicate. A pluralization operator can only apply to a set of atoms. Thus, when the DstrShr is plural, the group-forming operation has to take place to make the plural an impure atom. The process is explicated in (27). When the pluralization operator is evoked, the plural DstrShr *three baskets* goes through group formation and becomes *a group of three baskets.* Then, the pluralization operator applies to it and the group with plural members is pluralized as in *two groups of three baskets.* Zabbal (2002) notes that the same process is evidenced in Arabic, as shown in (28). That is, in Arabic, a broken plural that corresponds to a group is systematically used to make a plural out of a plural. In fact, Lakoff (1970), J-W Choe (1987), and Landman (2000) describe the group denotation of the plural DstrShr. My analysis can explain why the group reading arises when the DstrShr is plural in a principled manner.

(27) three baskets → a group of three baskets
→ two groups of three baskets

(28)	bayt-un	singular 'a house/rent'
	buyuut-un	broken plural 'houses' → 'family'
	buyuut-aat-un	sound plural of broken plural 'families'

The three variables Z, P and R in the extension of the pluralization operator can be permuted to be the first semantic argument. That is, the first constituent that combines with the operator does not have to be the DstrShr but it can be the SrtKy or the Relation. The permutation is empirically attested by the three

2 Both sum and group are plural terms. The former is composed of discrete entities while in the latter the entities are lumped into one set. Thus, group is semantically plural but grammatically singular. For this reason, singular entities constitute pure atoms while group entities constitute impure atoms. Since the group has plural members but is regarded as a singular, it can be utilized to make a plural of a plural.

uses of distributive quantifiers -- the anti-quantifier in (29a), the floated-quantifier in (29b) and the determiner-quantifier in (29c) -- that select each variable as their first semantic argument.

(29) a. The boys have two flowers each.
b. The boys each have two flowers.
c. Each of the boys have two flowers.

The semantic derivations for each sentence in (29) are illustrated from (30) to (32).

(30) $[[\text{each-A}]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \& R_j(x)(z)]]$
$[[\text{two flowers each-A}]]$
$= \forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& R_j(x)(z)]]$
$\Rightarrow \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& R_j(x)(z)]]$
$[[\text{have two flowers each-A}]]$
$= \forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z, x)]]$
$\Rightarrow \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z, x)]]$
$[[\text{The boys have two flowers each}]]$
$= \forall z[z \in [[\text{the boys}]] \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z,x)]]$

(31) $[[\text{each-F}]] = \lambda R.\forall z[z \in Z_i \rightarrow \exists x[P_j(x) \& R(x)(z)]]$
$[[\text{each have}]]$
$= \forall z[z \in Z_i \rightarrow \exists x[P_j(x) \& \text{have}(z, x)]]$
$\Rightarrow \lambda P_j.\forall z[z \in Z_i \rightarrow \exists x[P_j(x) \& \text{have}(z, x)]]$
$[[\text{each have two flowers}]]$
$= \forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z, x)]]$
$\Rightarrow \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z, x)]]$
$[[\text{The boys each have two flowers}]]$
$= \forall z[z \in [[\text{the boys}]] \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{have}(z, x)]]$

(32) $[[\text{each-D}]] = \lambda Z.\forall z[z \in Z \rightarrow \exists x[P_i(x) \& R_j(x)(z)]]$
$[[\text{each (of) the boys}]]$
$= \forall z[z \in [[\text{the boys}]] \rightarrow \exists x[P_i(x) \& R_j(x)(z)]]$
$\Rightarrow \lambda R_j.\forall z[z \in [[\text{the boys}]] \rightarrow \exists x[P_i(x) \& R_j(x)(z)]]$
$[[\text{each of the boys has t}]]$
$= \forall z[z \in [[\text{the boys}]] \rightarrow \exists x[P_i(x) \& \text{has}(z, x)]]$
$\Rightarrow \lambda P_i.\forall z[z \in [[\text{the boys}]] \rightarrow \exists x[P_i(x) \& \text{has}(z, x)]]$
$[[\text{each of the boys has two flowers}]]$
$= \forall z[z \in [[\text{the boys}]] \rightarrow \exists x[\uparrow(2\ \text{flowers})(x) \& \text{has}(z, x)]]$

To get the compositional facts correctly, I assume two indices for the variables that remain free and are ready to be lambda-abstracted in order to be filled with a proper value. The indices capture the dependency character of distributivity and make sure that each variable gets the right value. That is, in my system, the indices constrain the pluralization operator that is defined in a highly flexible manner. This is another aspect I depart from Zimmermann (2002) who uses indices as pro-form markers.

Departing from Zimmermann (2002) who utilizes two types of complex λ-abstraction rules such as the Index-triggered rule and the Type-triggered rule, I employ Bittner's (1994) λ-abstraction rule defined in (33) for compositionality.

(33) Let α have a translation $[[\alpha]]$ and let the index 'i' be the index of either α or a sister of α, and let $[[\alpha]]$ contain a variable u with index 'i.' Then $\lambda u_i.[[\alpha]]$ is a translation of α.

3.2. Data Analysis

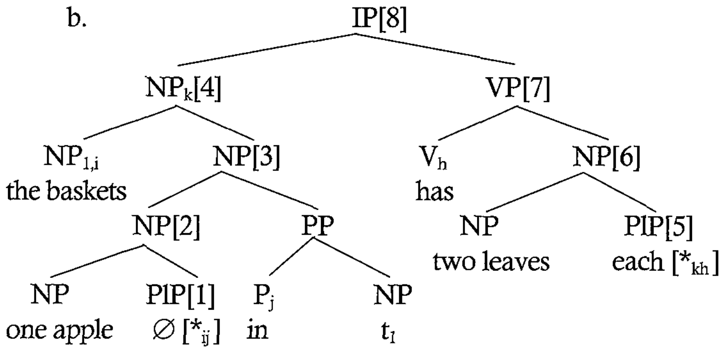
Now, based on the pluralization operator defined in (24) and the λ-abstraction rule in (33), I will analyze the ILC data in this section. First, the plural SrtKy is represented as a set by the variable *Z* in the denotation of the pluralization operator. The immediate advantage of having the set-denoting variable *Z* is that any noun phrase can be shifted to a term of type <e,t>. In this way, various quantificational phrases of the basic type <<e,t>,t> such as *no* NPs, *most* NPs, *every* NPs, *few* NPs, *the* NPs can fill the value of the SrtKy *Z*. The operator *LOWER* discussed in Partee (1987) shifts a denotation of <<e,t>,t> type to a denotation of <e> type but it is a partial function and thus it is not allowed to occur all the time. Yet, we can easily get a denotation of type <e,t> from a denotation of type <<e,t>,t> by applying the function, $\lambda P\lambda x[P(\lambda y[y=x])]$, denoted by Montague's PTQ translation of English *be*. Moreover, the type-shifting operator *ident* can always apply to shift <e> to <e,t>. Both *ident* and *be* are total functions and thus the least restrictions can be imposed on the SrtKy.

In the analysis of the ILC, a plural variable that is of <e,t> type will be made available through a sum-forming operation when it is needed in the process of semantic derivation and the operation that forms a sum plural will be represented by the $\leq$ relation. Most of the time, the ILC is embedded in another distributive reading. This makes it necessary to insert a plural variable to express the embeddedness. Different from Zimmermann, in my analysis, the plural variable introduced is motivated by the fact that the distributive reading is pluralization and the sum-formation occurs inside the pluralization operator.

To get the correct interpretation of (34a), I propose the LF-structure described in (34b). The new aspect of my analysis for the ILC is that the universal quantificational force comes from the pluralization operator that is projected by an overt or a covert distributive particle.

(34) a. One apple in the baskets has two leaves each.

b.



To derive the reading of (34a), two pluralization operators are evoked. One is induced by a covert distributive particle inside the noun phrase in the subject and the other is evoked by an overt anti-quantifier in the direct object. Inside the subject, an inverse distributive reading is generated and the NP inside the PP undergoes LF-movement. Yet, what actually produces the ∀∃-structure is the pluralization operator in the formula in (35a). The pluralization operator first applies to the DstrShr *one apple* and then the relation-denoting expression *in* is factored in via lambda-abstraction that is followed by function application. Another lambda-abstraction takes place as in (35e) and the SrtKy *the baskets* fills the value of the variable *Z*. Then, a plural variable is introduced to the proposition via sum formation and gets lambda-abstracted as in (35g). This provides the value for the SrtKy of the distributive interpretation that is evoked by the anti-quantifier in the direct object when the nodes [4] and [7] combine via predicate modification as shown in (35m).

(35) a. $[[1]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \,\&\, R_j(x)(z)]]$ *-operator

b. $[[2]] = \forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \,\&\, R_j(x)(z)]]$ function application

c. $[[2]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \,\&\, R_j(x)(z)]]$ λ-abstraction

d. $[[3]] = \forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$ function application

e. $[[3]] = \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$ λ-abstraction

f. $[[4]] = \forall z[z \in [[\text{the baskets}]] \rightarrow \exists x[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$ function application

g. $[[4]] = \lambda X.\forall z[z \in [[\text{the baskets}]] \rightarrow \exists x \in X[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$ pluralization & λ-abstraction

h. $[[5]] = \lambda P.\forall u[u \in U_k \rightarrow \exists y[P(y) \,\&\, R_h(y)(u)]]$ *-operator

i. $[[6]] = \forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& R_h(y)(u)]]$
function application

j. $[[6]] = \lambda R_h.\forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& R_h(y)(u)]]$
λ-abstraction

k. $[[7]] = \forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& \text{has}(u, y)]]$
function application

l. $[[7]] = \lambda U_k.\forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& \text{has}(u, y)]]$
λ-abstraction

m. $[[8]] = \lambda X.\forall z[z \in [[\text{the baskets}]] \rightarrow \exists x \in X[\text{one apple}(x) \& \text{in}(x, z)]] \& \forall u[u \in X \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& \text{has}(u, y)]]$
Predicate Modification

n. $[[8]] = \exists X.\forall z[z \in [[\text{the baskets}]] \rightarrow \exists x \in X[\text{one apple}(x) \& \text{in}(x, z)]] \& \forall u[u \in X \rightarrow \exists y[\uparrow(\text{two leaves})(y) \& \text{has}(u, y)]]$
Existential Closure

The analysis above can apply to the sentence in (36) and the sentential meaning is composed as in (37). The semantic derivation described in (37) is similar to that in (35). A difference is that both of the two distributive readings that are present in (36) are elicited by covert distributive particles: one is in its anti-quantifier use and the other is in its floated-quantifier use. Particularly, in the pluralization operator evoked by the covert distributive particle in the use of the floated-quantifier which is delineated in (37h), the frist semantic variable is the variable *R* and it directly applies to the relation-denoting expression.

(36) [[One apple in every basket is rotten]]

(37) a. $[[\varnothing]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \& R_j(x)(z)]]$ *-operator

b. $[[\text{one apple}]] = \forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \& R_j(x)(z)]]$
function application

c. $[[\text{one apple}]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \& R_j(x)(z)]]$
λ-abstraction

d. $[[\text{one apple in t}]] = \forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \& \text{in}(x, z)]]$
function application

e. $[[\text{one apple in t}]] = \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\text{one apple}(x) \& \text{in}(x, z)]]$
λ-abstraction

f. $[[\text{one apple in every basket}]]$
$= \forall z[z \in [[\text{every basket}]] \rightarrow \exists x[\text{one apple}(x) \& \text{in}(x, z)]]$
function application

g. $[[\text{one apple in every basket}]]$
$= \lambda X.\forall z[z \in [[\text{every basket}]] \rightarrow \exists x \in X[\text{one apple}(x) \& \text{in}(x, z)]]$
pluralization & λ-abstraction

h. $[[\varnothing]] = \lambda R.\forall u[u \in U_k \rightarrow \exists y[P(y) \& R(y)(u)]]$ *-operator

i. $[[\text{is rotten}]] = \forall u[u \in U_k \rightarrow \exists y[P(y) \,\&\, \text{rotten}(u, y)]]$
function application

j. $[[\text{is rotten}]] = \lambda U_k.\forall u[u \in U_k \rightarrow \exists y[P(y) \,\&\, \text{rotten}(u, y)]]$
λ-abstraction

k. [[one apple in every basket is rotten]]
$= \lambda X.\forall z[z \in [[\text{every basket}]] \rightarrow \exists x \in X[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$
$\& \ \forall u[u \in X \rightarrow \exists y[P(y) \,\&\, \text{rotten}(u, y)]]$
Predicate Modification

l. [[one apple in every basket is rotten]]
$= \exists X.\forall z[z \in [[\text{every basket}]] \rightarrow \exists x \in X[\text{one apple}(x) \,\&\, \text{in}(x, z)]]$
$\& \ \forall u[u \in X \rightarrow \exists y[P(y) \,\&\, \text{rotten}(u, y)]]$
Existential Closure

The formula in (37l) is complete since the value of a variable can contextually be filled. Especially, in intransitive sentences like (37), the relevant aspect of the event usually expressed by an adverbial will provide the appropriate value for the variable *P*.[3] The variable *P* for the DstrShr in (38), the variable *Z* for the SrtKy in (39), and the variable *R* for the Relation in (40) can remain free[4] and the context provides each of the variables the appropriate value. In zero-subject sentences, the appropriate plural subject available in the discourse context will fill the value of *Z*. Only when the plural that can fill the value of the *Z* is available, the sentence can felicitously be uttered. In ordinary plurals as in (40), no value for the variable *R* is available and the identity function (z = x), the default relation, fills the value of the variable *R*.

(38) a. The boys ran.
b. $\forall z[z \in [[\text{the boys}]] \rightarrow \exists x[P(x) \,\&\, \text{ran}(z, x)]]$

(39) a. chayk twu-kwen-ssik-ul sa-ss-ta.
Book two-Cl-each-Acc buy-Pst-Dec
'bought two books each.'
b. $\forall z[z \in Z_i \rightarrow \exists x[\text{two books}(x) \,\&\, \exists e[\text{bought}(z, x, e)]]]$

(40) a. students
b. $\forall z[z \in [[\text{students}]] \rightarrow \exists x[\text{student}(x) \,\&\, R(z, x)]]$

One thing to note about the semantic derivations for the ILC in the above is that an LF-movment was assumed. The LF-movement has been assumed to

3 The variable *y* is of type <v> when it comes to intransitives and in such a case the variable *P* whose value is determined contextually describes some aspect relevant to the main predicate.

4 The variables that are not filled with a value during the semantic composition can either remain free or get λ-abstracted and be existentially closed.

reflect the fact that the universal force scopes over the existential quantification in the interpretational structure of the ILC. However, I would like to point out that the LF-movement is not necessary since the variables can be permuted to be the first semantic argument in my analysis. That is, the LF-movement does not have to take place when the inverse-scope reading is projected by the *-operator whose first semantic argument is the SrtKy.

Furthermore, in the semantic derivations for the ILC presented above, I did not overtly treat the trace that is left behind by the LF-movement. This is simply because the trace consumes an <e> type and then the λ-abstraction rule can generate the <e> type right away. Here, I would simply like to note that my analysis does not encounter type mismatches due to traces.

3.3. Advantages

The most immediate advantage of my analysis is that it is strictly compositional. First, I don't need to employ an implicit variable that Zimmermann (2002) couldn't do without. Inserting an implicit variable that is generated in an unprincipled manner in the middle of a compositional process does not seem very desirable. My analysis improves this undesriable aspect. Furthermore, I do not need to incorporate the complex process of the reinterpretation of the QPP as a generalized quantifier as Zimmermann (2002) and hence my analysis advanced above is strictly compositional throughout the process of yielding the distributive interpretation.

Second, I do not miss the generalization that the ILC is one of the constructions that generate distributivity. I derive the ∀∃ structure of ILCs just the way I derive the ∀∃ structure for the anti-quantifier. In the above, the distributive reading inside the subject has been generated in the same way as the distributive reading in the entire sentence that is evoked by the anti-quantifier. In this way, I can account for the inverse distributive reading of ILCs that do not contain a universal quantifier in the PP. Previous approaches to ILCs depend on the universal quantifier in the PP for the ∀∃-structure of the distributive reading so that they cannot explain the ILC without an overt universal quantifier in the PP. However, my analysis can explain not only the sentence in (19a) where the universal quantifier is in the PP but also the distributive reading of (19b) where the distributive particle appears with the DstrShr. Moreover, in my analysis, the parallelism between the typical ILC example in (19a) and the sentence with an anti-quantifier in (19b) is adequately captured. After all, both of them are involved with the same distributive reading that expresses the identical ∀∃-structure.

Third, on the basis of it, I can further explain the indefiniteness condition on the first noun phrase of ILCs as a general property of distributivity, not by a structural restriction that only works for ILCs. My analysis precisely analyzes the first noun phrase in ILCs as DstrShr and thus I can account for the indefinite/numeral property of the first noun phrase in ILCs described in (41) in the same line with the indefinite/numeral condition on DstrShr that has been proposed by J-W Choe (1987). As in (41b), when the DstrShr is definite, the inverse distributive reading is unavailable, in contrast to (41a). The contrast observed in (41) patterns with the contrast in (42). The anti-quantifier in (42) enforces a distributive reading. When the DstrShr is indefinite, the sentence is grammatical as in (42a), but the definite DstrShr makes the sentence ungrammatical as in (42b).[5]

(41) a. <u>One picture</u> of everybody is on sale.
b. <u>The picture</u> of everybody is on sale.

(42) a. The boys pulled <u>one cart</u> each.
b. *The boys pulled <u>the cart</u> each.

Fourth, I can explain why (43a) is grammatical whereas (43b) is ungrammatical. Ordinarily, a singular noun phrase cannot license the anti-quantifier as shown in (43b). However, an apparent singular noun phrase can serve as the SrtKy in (43a). The reason is evident in my analysis. The singular *one apple* in (43a) is, in fact, plural since a pluralization operator has been evoked to generate the inverse distributive reading inside the subject as shown above. The reason why (43b) is ungrammatical, in contrast to (43a), is because no pluralization has been evoked in the absence of the prepositional phrase that can possibly be interpreted distributively with the noun phrase *one apple.* No previous approaches can address the contrast in (43).

(43) a. One apple in the baskets has two leaves each.
b. *One apple has two leaves each.

Fifth, I can further explicate the oddness of the sentences in (44) that Zimmer-mann (2002) discusses. The sentences are not natural because the phrases *one person who was famous* and *one slave with good manners* do not form constituents. To serve as DstrShr, they must be single constituents because they have to be the values of a single variable.

(44) a. #One person [$_{QPP}$ from every city] [$_{RC}$ who was famous] was visited.
b. #One slave [$_{QPP}$ from every province] [$_{PP}$ with good manners] was freed.

---

[5] Indefiniteness is the general condition of the DstrShr. However, I would like to note that some sub-cases of definites which are characterized as weak definites are also able to generate distributivity.

Sixth, my analysis can explain how the oridinarily existentially interpreted quantified phrase can serve as the SrtKy and has the universal reading. In my anlaysis, what generates the distributive reading including the inverse-scope reading is the pluralization operator, not the quantificational force of the SrtKy or that of the DstrShr. Thus, the ILC in (45a) can adeqately be addressed in my analysis. The underlined phrase in (45a) naturally has the denotation in (45b). In fact, the data in (45a) reinforces my claim: what projects the ∀∃-structure is an independent pluralization operator.

(45) a. <u>One apple in some baskets</u> has three ribbons each.
b. $\forall z[z \in [[\text{some baskets}]] \rightarrow \exists x[\text{one apple}(x)\ \&\ \text{in}(x, z)]]$

Seventh, my analysis follows the structural analysis of the adjunction analysis and thus I don't encounter the interpretational problem that the extraction analysis couldn't avoid. However, at the same time, my analysis can deal with the specificity condition by projecting distributivity based on plurality. That is, (46) is ungrammatical since the DP *the apple* has to serve as the DstrShr with respect to the SrtKy *some baskets* but cannot be pluralized. The reason why *the apple* cannot be pluralized is because the definite phrase presupposes a unique referent.

(46) *The apple in some baskets has three ribbons each.

4. Discussion

In this section, I will briefly discuss constructions related to the ILC in three aspects. The inverse scope reading of the ILC can be characterized as NP-internal distributivity, backward distributivity and embedded distributivity. Below, I will show how the three characteristics of the ILC are separately revealed in other constructions.

First, NP-internal distributivity is found in Korean and Japanese. Gil (1990) claims that the Korean anti-quantifier *ssik* can trigger distributivity NP-internally as in (47). The Korean sentences in (47) contain anti-quantifier *ssik.* Both (47a) and (47b) generate the ordinary distributive sense. But, additionally, there is another sense of distributivity. He calls it an NP-internal distributivity. That is, in (47a), within the phrase *kapang sey kay ssik* 'three suitcases each,' the numeral-plus-classifier phrase *sey kay* 'three-classifier' distributes over the head noun *kapang* 'suitcase,' yielding the reading: each member of the denotation of the head noun is of cardinality three. The same kind of reading is also available in (47b). The Korean anti-quantifier *ssik* can trigger distributivity NP-internally. The phrase consisting of a numeral and a classifier *twu myeng* 'two-classifier' distributes over the head noun *salam* 'people,' meaning each member of the people is of cardinality two. Gil (1990) claims that, when there are two occurrences of *ssik* in the same sentence as in (47c), only NP-internal distributivity is possible.[6]

(47) a. salam twu myeng-i kapang sey kay ssik-ul wunpanha-ess-ta.
Man two Cl-Nom suitcase three Cl-DIST-Acc carry-Pst-Dec
'Two men carried three suitcases each.'
'Two men carried sets of three suitcases.'
b. salam twu myeng-ssik-i kapang sey kay-lul wunpanha-ess-ta.
Man two Cl-DIST-Nom suitcase three Cl-Acc carry-Pst-Dec
'Three suitcases were carried by two men each.'
'Sets of two men carried three suitcases.'
c. salam twu myeng-ssik-i kapang sey kay ssik-ul wunpanha-ess-ta.
Man two Cl-DIST-Nom suitcase three Cl-DIST-Acc carry-Pst-Dec
'Sets of two men carried sets of three suitcases.'

Gil (1990) observes the same pattern in Japanese as well. That is, the numeral-classifier phrase *sanko* 'three-classifier' distributes over the head noun *sutukeisu* 'suitcase,' yielding the reading in which each member of the denotation of the head noun is of cardinality three. Also, the numeral-classifier phrase *hutari* 'two-classifier' distributes over the head noun *otoko* 'man' producing the interpretation in which each member of the denotation of the head noun is of cardinality two.

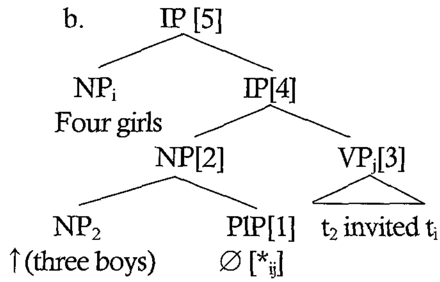
(48) a. otoko hutari-ga sutukeisu sanko-*zutu*-o hakonda
man two-CL-Nom suitcase three-CL-DIST-ACC carry-PFV
b. otoko hutari- *zutu*-ga sutukeisu sanko-o hakonda
man two-CL-DIST-Nom suitcase three-CL-ACC carry-PFV
c. otoko hutari- *zutu*-ga sutukeisu sanko-*zutu*-o hakonda
man two-CL-DIST-Nom suitcase three-CL-DIST-ACC carry-PFV

The second point I would like to make is that the inverse scope reading is also observed NP-externally. Landman (2000) argues for two kinds of distributive readings for (49a). One is forward and the other is inverse. My analysis for the inverse scope reading of the ILC can further apply to generate the same inverse scope reading that is projected at the sentential level. For the inverse distributive reading of (49a), I assume the LF-structure in (49b). The semantic derivation is provided as below. The reason why the inverse distributivity is generated by the pluralization operator is evidenced by the fact that 12 boys are involved in the reading at issue.

[6] It seems that the NP-internal distributive reading in (47) is salient to some speakers and not so to others. However, it does not change the fact that the ILC is NP-internal distributivity.

(49) a. Three boys invited four girls.

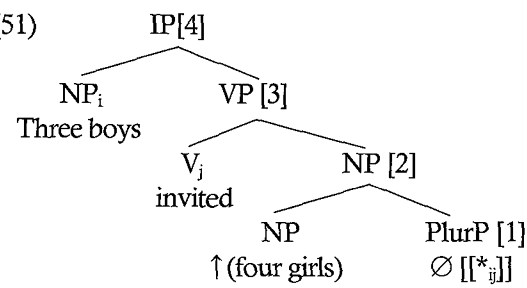
b.



(50) a. $[[1]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \,\&\, R_j (x)(z)]]$
b. $[[2]] = \forall z[z \in Z_i \rightarrow \exists x[\uparrow(3\ boys)(x) \,\&\, R_j(x)(z)]]$
c. $[[2]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(3\ boys)(x) \,\&\, R_j(x)(z)]]$
d. $[[3]] = \exists e[invited\,(x_2, y_i, e)]$
e. $[[3]] = \lambda x_2 \lambda y_i.\ \exists e[invited\,(x_2, y_i, e)]$
f. $[[4]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(3\ boys)(x) \& R_j(x)(z)]](\lambda x_2 \lambda y_i.\exists e[invited\,(x_2, y_i, e)])$
g. $[[4]] = \forall z[z \in Z_i \rightarrow \exists x[\uparrow(3\ boys)(x) \,\&\, \exists e[invited\,(x, z, e)]]]$
h. $[[4]] = \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(3\ boys)(x) \,\&\, \exists e[invited\,(x, z, e)]]]$
i. $[[5]] = \forall z[z \in [[4\ girls]] \rightarrow \exists x[\uparrow(3\ boys)(x) \,\&\, \exists e[invited\,(x, z, e)]]]$

What is more significant is that my anlaysis for inverse (backward) distributivity can also directly apply to forward distributivity that is manifested in the same sentence. The forward distributive reading is generated based on the structure delineated in (51). The pluralization operator adjoins to the NP *four girls* and the SrtKy is *three boys*. The semantic composition works in the same way as the inverse distributive reading. The difference only comes from which element of the sentence is interpreted as the SrtKy or the Dstrshr. Just like (49a), the evidence that pluralization does operate to generate this particular reading can be found in the fact that 12 girls are involved in this reading.

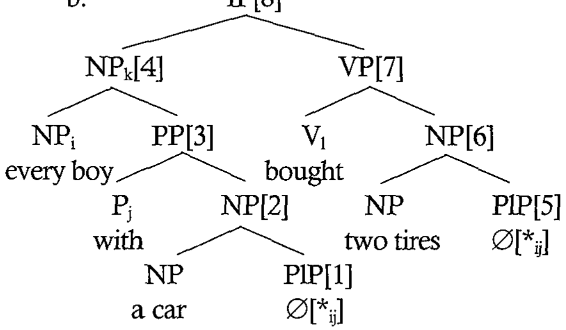
(51)



(52) a. $[[1]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \& R_j(x)(z)]]$
b. $[[2]] = \forall z[z \in Z_i \rightarrow \exists x[\uparrow(4\ girls)(x) \& R_j(x)(z)]]$
c. $[[2]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(4\ girls)(x) \& R_j(x)(z)]]$
d. $[[2]] = \forall z[z \in Z_i \rightarrow \exists x[\uparrow(4\ girls)(x) \& \exists e[invited(z, x, e)]]]$
e. $[[3]] = \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[\uparrow(4\ girls)(x) \& \exists e[invited(z, x, e)]]]$
f. $[[4]] = \forall z[z \in [[3\ boys]] \rightarrow \exists x[\uparrow(4\ girls)(x) \& \exists e[invited(z, x, e)]]]$

Moreover, the inverse scope reading of the ILC is, most of the time, embedded in another distributive relation in the same sentence as shown above. There are more types of embedded occurrences of distributivity and the structure of the relative clause donkey sentence is, in fact, another construction of embedded distributivity. The only difference between the ILC and the relative donkey sentence is that the distributive sense inside the subject is forward, not inverse. In the semantic derivation for (53a), two pluralization operators are evoked just in the case of the ILC. The distributive sense generated inside the subject becomes the value of the SrtKy of the distributive sense that resides at the sentential level via predicate modification that is followed by existential closure as shown in the formulae in (54n) and (54o).

(53) a. Every boy with a car bought two tires.
b.



(54) a. $[[1]] = [[\varnothing]] = \lambda P.\forall z[z \in Z_i \rightarrow \exists x[P(x) \& R_j(x)(z)]]$
b. $[[2]] = \forall z[z \in Z_i \rightarrow \exists x[a\ car(x) \& R_j(x)(z)]]$
c. $[[2]] = \lambda R_j.\forall z[z \in Z_i \rightarrow \exists x[a\ car(x) \& R_j(x)(z)]]$
d. $[[3]] = \forall z[z \in Z_i \rightarrow \exists x[a\ car(x) \& with(z, x)]]$
e. $[[3]] = \lambda Z_i.\forall z[z \in Z_i \rightarrow \exists x[a\ car(x) \& with(z, x)]]$
f. $[[4]] = \forall z[z \in [[every\ boy]] \rightarrow \exists x[a\ car(x) \& with(z, x)]]$
g. $[[4]] = \forall z[z \in [[every\ boy]] \& z \in Q \rightarrow \exists x[a\ car(x) \& with(z, x)]]$
h. $[[4]] = \lambda Q_h.\forall z[z \in [[every\ boy]] \& z \in Q_h \rightarrow \exists x[a\ car(x) \& with(z, x)]]$
i. $[[5]] = [[\varnothing]] = \lambda P.\forall u[u \in U_k \rightarrow \exists y[P(y) \& R_l(y)(u)]]$
j. $[[6]] = \forall u[u \in U_k \rightarrow \exists y[\uparrow(two\ tires)(y) \& R_l(y)(u)]]$
k. $[[6]] = \lambda R_l.\forall u[u \in U_k \rightarrow \exists y[\uparrow(two\ tires)(y) \& R_l(y)(u)]]$

l. $[[7]] = \forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two tires})(y) \;\&\; \exists e[\text{bought}(u, y, e)]]]$
m. $[[7]] = \lambda U_k.\forall u[u \in U_k \rightarrow \exists y[\uparrow(\text{two tires})(y) \;\&\; \exists e[\text{bought}(u, y, e)]]]$
n. $[[8]] = \lambda Q.\forall z[z \in [[\text{every boy}]] \;\&\; z \in Q \rightarrow \exists x[\text{a car}(x) \;\&\; \text{with}(z, x)]]$
$\;\&\; \forall u[u \in \rightarrow \exists y[\uparrow(\text{two tires})(y) \;\&\; \exists e[\text{bought}(u, y, e)]]]$
o. $[[8]] = \exists Q.\forall z[z \in [[\text{every boy}]] \;\&\; z \in Q \rightarrow \exists x[\text{a car}(x) \;\&\; \text{with}(z, x)]]$
$\;\&\; \forall u[u \in Q \rightarrow \exists y[\uparrow(\text{two tires})(y) \;\&\; \exists e[\text{bought}(u, y, e)]]]$

The semantic analysis for (54a) can directly apply to the numeral-based donkey sentence in (55) once the donkey pronoun is analyzed as an E-type pronoun as Heim (1990) and many others claim.

(55) Fathers with two children send them to the Montessori school.
(Roberts 1987: 226)

5. Conclusion

I have provided a new analysis for the inverse scope reading of the ILC. The novel analysis I have presented in this paper is on the basis of the fact that distributivity is plurality. There are two immediate advantages I get from this aspect of my analysis. The first advantage is that I can explain the essential meaning invovled with distributivity. In fact, distributivity is about multiplying. Another merit of analyzing distributivity as plurality resides in the fact that the group denotation arises when the DstrShr is plural. This fact can adequately be explained only when distributivity is treated as plurality.

More specific merits of my analysis of the ILC can be summarized in the following seven aspects. First, my analysis can explain the ILC that does not have a universal quantifier by eliciting the universal quantificational force from a pluralization operator that can be evoked either overtly or covertly. Second, pointing out that the inverse scope reading is a backward distributive reading, I explain the indefiniteness effect found in the ILC under the broad perspective that indefiniteness, in general, licenses distributivity. Third, my analysis is strictly compositional in the sense that I do not need to reinterpret the prepositional phrase that contains a quantifier phrase. Fourth, by not utilizing the reinterpretation technique for the case where the universal quantifier is placed inside the prepositional phrase, I can further capture the uniformity of the distributivie particles appearing in different syntactic positions. Distributive particles in the ILC generate one and the same inverse scope reading, regardless of their positions. Fifth, my analysis for backward distributivity can further explain forward distributivity based on the same mechanisms. Sixth, my analysis can also naturally explain why the QPP must be the DP-final element based on the fact that both the DstrShr and the SrtKy must be constituents. Seventh, my analysis of the ILC can properly address the data that can be explained only when covert pluralization is assumed in order to generate distirbutivity. A singular subject can license an anti-quantifier in the direct object only when there is a distributive sense inside the subject. This phenomenon serves as the direct evidence of the existence of the invisible pluralizing operation.

Furthermore, I have characterized the ILC in relation with other constructions such as the construction of NP-internal distributivity that is observed in Korean and Japanese, backward (inverse) distributivity in sentences with two numerals, and (numeral-based) relative clause donkey sentences. By pointing out that the inverse scope reading is the NP-internal, backward, and embedded distributive reading, I have further extended the current analysis to forward distributivity and relative clause donkey sentences.

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