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Measure constructions with relative measures: Towards a syntax of non-conservative construals

Abstract: Relative measures such as *percent* and *thirds* relate one quantity to another. We observe that, in several languages, determiner phrases containing relative measures can express two distinct construals: (1) The 'conservative' construal in *The company hired 75 % of the women* considers the ratio of the company's female hires to all women. (2) The 'non-conservative construal' in *The company hired 75 % women* is instead concerned with the ratio of the company's female hires to all the company's hires. We show that other languages that distinguish the two construals using morphosyntactic means include German, Korean, Georgian, Greek, French, Italian, Brazilian Portuguese, and Romanian. We argue that the non-conservative construal involves a different constituency of the measure construction. Both construals, however, derive from a structure where the measure structure forms a single DP. Therefore, our analysis of the non-conservative structures makes an argument that the Conservativity Universal may apply at an abstract level of structure rather than at the surface level.

Keywords: quantification, measurement, relations, fractions, conservativity, universals, copy theory, pseudo-partitive

1 Introduction

This paper considers measure structures that express a proportional relation of one substance quantity to another quantity such as *two thirds of Americans* and *ten percent of the ice cream*. We call the measure nouns that can express such relations (i. e. *thirds, percent*, and other fractions) *Relative Measures*. Structures with relative measures form a sub-type of the

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class of *Measure Constructions* (Krifka 1989 a,b, Schwarzschild 2006, Scontras to appear).[1] Generally measure constructions involve two nouns, one of which (the *measure noun*) denotes a unit of measurement such as *ounces* or *thirds* and the other denotes a substance (the *substance noun*), such as *gold* or *Americans*. Relative measrues, however, have received very little attention, and except for Ionin et al. (2006), work on measure constructions has been restricted to absolute measure nouns. It was assumed in prior studies that a semantics that is intersective would be sufficient for measure constructions. One version of this is illustrated in (1a): For the sentence (1) containing the absolute measure *ounces*, an appropriate semantic representation (1) can be paraphrased as *Something is gold and weighs 3 ounces and fell into the lake.*[2]

(1)   Three ounces of gold fell into the lake.

$$\exists x : \mu_{\text{ounces}}(x) = 3 \wedge \text{gold}(x) = 1 \wedge \text{fell-into-the-lake}(x) = 1 \tag{1}$$

But an intersective semantics is inappropriate for relative measures like *percent* and other fractions as Ionin et al. (2006) observe. Relative measures are not based on an absolute base, but relate an amount of a substance to another. In (2), the relevant relation is the one that holds between the total amount of gold and the amount of gold that fell into the lake.

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1 In some of the English literature the term *Pseudo-Partitive* is used instead of *Measure Constructions* like *two liters of milk* or *two thirds of Americans* where the second noun is indefinite following Selkirk (1977). We will not use this term for three reasons: 1) Originally Jespersen (1927: 111) introduced the term *Pseudo-Partitive* for structures such as *a book of mine*. 2) In several languages we discuss below, there are measure constructions that cannot be changed into partitives merely by addition of a definite article. 3) One of our research goals is to explain the presence or absence of the definite in measure constructions on the basis of a a general theory of definiteness. The distinction between *partitives* and *measurement phrases* we adopt also sits uneasily with some cases like *half of the children* (vs. *one half of the children*), but this is a lesser evil for our present paper.
2 The semantics in (1) is simplified compared to the proposals in the literature: It doesn't capture the difference between extensive measures such as *ounces* and intensive measures such as *degree Celsius* or *karat purity*. Intensive measures cannot occur in measure constructions (*twenty degree Celsius of gold), and both Krifka (1989a,b) and Schwarzschild (2006) capture this by adding an additional conjunct to the scope of the existential in (1). For example, Schwarzschild (2006: 105, (131)) as shown in (i) adds an existentially closed dimension DIM and a requirement that *Dim* establish a monotonous dimension of measurement for the substance.

  (i) $\exists x \, \exists \text{DIM}: \text{gold}(x) \wedge \text{3-ounces}'(\text{DIM}(x)) \wedge \text{MON}(\text{DIM, gold})$

(2)   Thirty percent of the gold fell into the lake

The compositional semantics given in (1) cannot capture sentences with relative measures because a measurement of a ratio requires two arguments while *ounces* takes only one argument in (1). Ionin et al. (2006) provide therefore a binary lexical entry for fractions, and assume that it is always straightforward to determine the two arguments of a relative measure. But we show in the following that this isn't so.

  Our paper addresses the way in which the two arguments of a relative measure are determined in the measure construction. In (2), the relevant ratio measured is determined by the syntactic structure: the content of the NP determines the totality that provides the denominator, while the numerator is determined by the content of NP and VP. One way to express this is given in (2).[3]

$$\exists x \sqsubseteq [\![\text{the gold}]\!] : \frac{\mu_{\text{ounces}}(x)}{\mu_{\text{ounces}}([\![\text{the gold}]\!])} = \frac{30}{100} \wedge \text{fell-into-the-lake}(x) = 1 \qquad (2)$$

But we show in this paper that the way in which the two arguments of relative measures are determined is surprisingly flexible in many languages including Korean, German, and to some extent also English. In particular, two construals of relative measures are morphosyntactically distinguished in several languages. We refer to these as the *conservative* and the *non-conservative* construal, where we adopt the term *conservative* from Keenan and Stavi (1986). Though the non-conservative construal with relative measures in English is more restricted than in most of the other languages we consider, it is convenient to consider the English examples in (3) for illustration. (3-a) like (1) above illustrates a conservative construal while (3-b) illustrates a non-conservative construal.[4]

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3 The interpretation sketched here only gives a lower bound as appropriate for *at least 30 %*. The upper bound could be derived pragmatically or we would need to adjust the interpretation (see Spector 2013b).

4 In English, the non-conservative form (3-b) is similar to *non-extensive* (Krifka 1989a) uses (also called *attributive* uses by Schwarzschild 2006a) of measure terms such as *two-pound bag* or *30 % liquor*. But on closer inspection, the two structures differ: Semantically, 30 % in *30 % liquors* measures the alcohol content per bottle (or other unit), but the salient reading of (3-b) is not one where individuals are women 75 % of the time. Intonationally, focus is required on *women* in (3-b), but *bag* or *liquor* in the non-extensiv measurement structures are unstressed. Finally, Schwarzschild mentions that in German the attributive can be expressed by adjectival derivational morphology as in *30 prozent-ige Schnaps* (30 percent-ADJ liquor), but the adjectival formation isn't possible to translate (3-b) and only (5-b) below can express the non-conservative construal in German.

(3)   a. The company hired 75% of the women.   (conservative)
      b. The company hired 75% women$_F$.   (non-conservative)

The terms we use for the two construals are rooted in the semantics of generalized quantifiers. Semantically, a generalized quantifier is a relation between two sets, a restrictor R and a nuclear scope S. A generalized quantifier Q is conservative if and only if $Q(R)(S) = Q(R)(R \cap S)$ for any two sets R and S. For conservative quantifiers, R restricts the domain that the quantifier ranges over, while S provides the property that applies to a subset of the restrictor set. Crucially, whether individuals that are not elements of R are elements of S or not doesn't affect the truth of a conservative generalized quantifier. Our terms relate to this work in the following manner: If it was the case that *75%* in both sentences in (3) took *(the) women* as its first argument R and *(who) the company hired* as its second argument S, the interpretation of *75%* (3-b) would be conservative, (3-a) but the interpretation required for *75%* in (3-b) wouldn't be conservative. The conservative (3-a) describes the ratio of women hired by the company relative to all (relevant) women, so women is the restrictor argument while the property of being hired is the scope. Crucially, men are irrelevant to the truth conditions of (3-a). But the non-conservative (3-b) concerns the ratio of women hired by the company relative to all people hired by the company. So, men that were hired by the company are relevant, and therefore we call (3-b) non-conservative. The two scenarios sketched in (14) distinguish the two construals. In both scenarios, there are 400 applicants, 300 of them male and 100 female. (4-a) is a scenario where (3-a) is true and (3-b) is false. Namely, the company hired 225 men and 75 women. The reverse situation – where (3-a) is false and (3-b) is true – arises in scenario (4-b) where the company hired 20 men and 60 women. The shading in (4-a) indicates the ratio relevant for (4-a), and the shading in (4-b) gives the relevant ratio for (3-b). The shading in (4) also displays graphically that for the truth conditions of (3-a) only subsets of the set of women matter, but for the truth conditions of (3-b) the number of men hired is important.

(4)   a. conservative scenario   b. non-conservative scenario
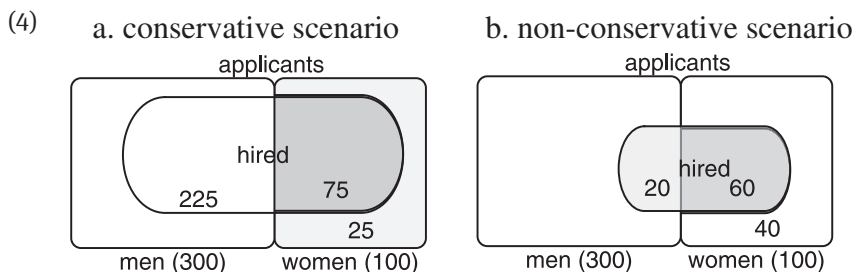
As far as we know the non-conservative construals have not been observed before with relative measures for any language except in some preliminary work of our own (Ahn 2012; Sauerland 2014; Ahn and Sauerland 2015a, 2015b). The existence of the non-conservative construals is of interest to the study of the syntax-semantics interface. Specifically, they are relevant for the *Conservatity Hypothesis* of Keenan and Stavi (1986) that require all natural language determiners to be conservative. Note that our term *non-conservative* is descriptive and does not assume a specific analysis. It is our goal to determine the nature of these construals and the way in which they relate to the Conservativity Hypothesis. In order to do so, we need to understand the syntactic structure of sentences with the non-conservative construal.

Our main concern in this paper is to investigate the syntactic structures possible with relative measures. We find data from languages other than English particularly helpful to this end. Specifically we focus on languages that allow the expression of the conservative and the non-conservative construal with very similar means. Two languages that do so are German and Korean. The two German examples in (5) that express the two different construals are only distinguished by the case of the noun *students* and focus placement.[5] The only differences between the two Korean examples in (6) are the position of the case marker *lul*, genitive marking on the substance noun, and focus placement.

(5) German
  a. 30 Prozent   der   Studierenden arbeiten.
     30 percent-NOM the- GEN students-GEN   work
     '30 percent of the students work.'   (conservative)
  b. 30 Prozent   STUDierende   arbeiten hier.
     30 Percent-NOM studierende-NOM work   here
     '30 percent of workers here are students.'   (non-conservative)

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5 Example (5-a) differs from (5-b) also by the presence of the definite determiner *der*. But definiteness doesn't seem to be the cause of the distinct interpretations since (i) without the definite determiner but with genitive case is also acceptable and can only have the conservative interpretation.

  (i) ?30 Prozent Studierender arbeiten.
  30 percent-NOM students-GEN work
  '30 percent of the students work.' (conservative)

Note also that speakers of some Bavarian dialects accept neither (5-b) and (i), which we plan to investigate further in the future.

(6)   Korean

    a. Hoysa-ka   [yeca-(uy)   osip-phulo]-lul   ceyyonghayssta.
       company-NOM woman-GEN fifty-percent-ACC hired
       'The company hired fifty percent of the women.'   (conservative)

    b. Hoysa-ka   yeca$_F$-lul   osip-phulo   ceyyonghayssta.
       company-NOM woman-ACC fifty-percent hired
       'The company hired fifty percent women.'   (non-conservative)

Other languages that allow the expression of both construals with very similar forms include Georgian, Greek, French, Italian, Brazilian Portuguese, Romanian, and Mandarin. We discuss data from these languages in more detail below. While we only provide a brief sketch, we believe the morphosyntactic cues in each language and cross-linguistic patterns we identify will be useful for more detailed language-specific investigations in the future.

    The paper is organized as follows. In Section 2, we present our syntactic proposal for the analysis of the two construals. Namely, motivated in part by our semantic analysis proposed in Ahn and Sauerland (2015b), we argue that the non-conservative construal involves both a different constituency of the measurement structure from the conservative construal and furthermore an obligatory movement that is covert in most languages. We then specifically focus on the morphosyntactic differences predicted between the conservative and the non-conservative construals which are concerned with marking of case, definiteness, and constituency. We also discuss an alternative account to our proposal, which treats the measure noun in the non-conservative construal as an adverbial. Throughout the paper we point to evidence from different languages that the adverbial account is untenable. In Section 3, we discuss how the two construals are realized across different languages. We organize the languages into four groups: a) those that use case to distinguish non-conservativity from conservativity, b) those that show overt movement, c) those that use definiteness, and d) those that do not show any morphological marking. We conclude in Section 4.

2 A general theory of relative measures

2.1 The structural ambiguity of measurement structures

As shown in the introduction, relative measures permit two distinct construals. In several languages, the two construals are not just different

readings, but are distinguished by the morphology used in measure constructions. Therefore we think it is necessary to propose two distinct syntactic structures for measure phrases at least with relative measures: one for the conservative construal, and one for the non-conservative one.

We propose one way of accounting for the existence of these two readings (see also Ahn and Sauerland 2015b). We argue that the conservative and the non-conservative construals have distinct underlying structures as shown in (7). We suggest that both of these structures are available across all measure phrases, including intersective ones. In the case of intersective measures, however, the structural difference cannot be perceived in the interpretation because both are concerned with the intersection and therefore not sensitive to the kinds of differences that relative measures are, specifically the order of arguments.[6]

(7) a. **Conservative**   b. **Non-Conservative**

$$NP_1$$

n

percent   (DP)NP$_2$

(the) [subs]

$$NP_1 \qquad NP_2$$

n
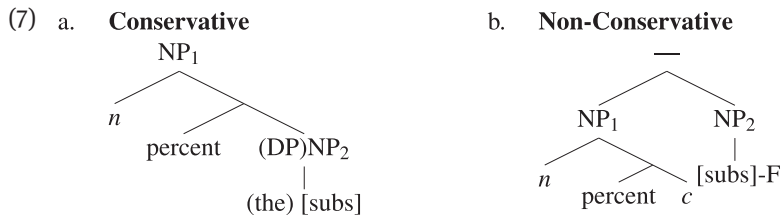
percent c [subs]-F

There are two main differences between the structures: constituency and the argument of *percent*. In (7-a), the measure noun and the substance (abbreviated to *subs*) form a constituent excluding the numeral argument of the measure noun. But in (7-b), the measure noun and its numeral form a constituent excluding the substance noun. In (7-a), the measure noun takes the substance noun as the argument, while in (7-b), the measure noun takes a contextually determined variable c (Stanley and Szabo 2000), which occupies the position of NP$_2$ in (7-a).[7] We assume that NP$_1$ and NP$_2$ are merged

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6 Several articles have argued for a structural ambiguity to capture the container vs. quantity interpretations of measurement constructions with container nouns (Selkirk 1977; Doetjes 1997; Rothstein 2009; Hankamer and Mikkelsen 2008; Grestenberger 2015). This ambiguity is, however, orthogonal to the conservative and non-conservative interpretations we discuss, and the morpho-syntactic properties associated with the two phenomena are different.

7 We do not have a stance on the exact syntactic category of the contextually-determined variable *c*. However, because it is a nominal, there is no c-selectional difference between the *percent* in the two structures.

into one constituent in (7-b), and that neither of them is clearly syntactically dominant in this merger in the sense of syntactic projection (Chomsky 2013; Ott 2012, 2015). Hence we label the node immediately dominating NP_1 and NP_2 with the placeholder '–'.[8] We show in the following subsection how structure (7-b) captures the non-conservative reading. In the remainder of the section we show how our proposal predicts morphosyntactic differences between the two structures, focusing on generalizations on definiteness, case-marking, and constituency. We first show how our proposal derives the conservative reading. The lexical entry for *percent* in (8) makes (7-a) straight-forwardly interpretable.[9]
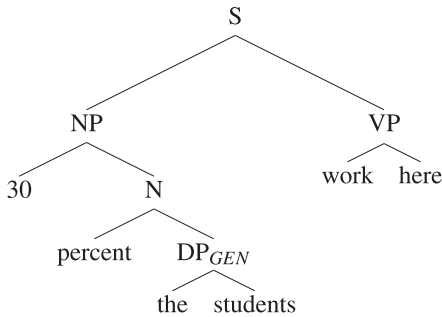
(8) $$[[\text{percent}]] = \lambda x \in D_e \; \lambda n \in D_d \; \lambda y \in D_{et} \; . \; \frac{\mu(x \sqcap \oplus y)}{\mu(x)} = \frac{n}{100}$$

In (8), μ is a contextual variable for a measure function mapping entities of type e to numbers. Typically with *percent*, μ is a measure of volume (e. g. in liters), a measure of weight (e. g. in grams), or a counting measure of either atomic units or unit-event pairs (e. g. *'The crimes are due to 70 % repeat offenders.'*) Consider (9), the English translation of (5-a), and its structure. We assume for this paper that genitive case is without semantic content, so the definite *the students* (of type e) provides the inner argument of *percent*. The cardinal *30* (of type d) and the VP are the other two arguments of *percent*. The resulting meaning is that the ratio of some measure (of atomic units in this case) of students working here and that of the totality of students is 30:100.

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8 Our assumptions are not fully compatible with that of Chomsky (2013) in that Chomsky's proposal assumes unlabeled structures to be illegitimate in both interpretive levels and thus requires overt movement. As we will show later in the paper, while Korean does show overt movement, other languages do not. Furthermore, a reviewer points out that the shared features of NP_1 and NP_2 should project in (7-b) if Chomsky (2013) is correct. This would predict both the case features and feature N to project, though not other lexical features of either measure or substance noun. This would lead to a different syntactic account from ours in this paper, and ultimately we would want to compare the two accounts across different classes of syntactic evidence. For now, however, we limit the scope of our paper to what seems to us to be the best analysis of measure constructions.

9 The lexical entry in (8) is inspired by that of Ionin et al. (2006). Recently Solt (2016) attempts to account for some relative measures using not a two-argument measure function, but by relying on relative scale, but Solt's proposal is yet to be fully developed.
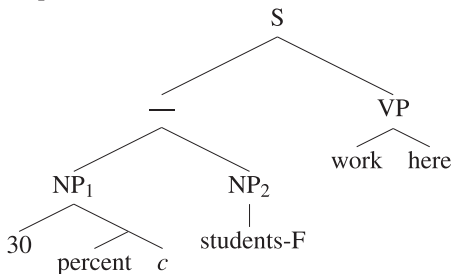
(9)   30% of the students work here.

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                        S
              ┌─────────┴──────────┐
             NP                    VP
          ┌───┴───┐          ┌──────┴──────┐
         30        N        work         here
               ┌───┴────┐
           percent    DP_GEN
                   ┌────┴─────┐
                  the      students
```

2.2 Non-conservative interpretation

In this section, we summarize the semantic assumptions underlying the derivation of the non-conservative construal from the structure in (7-b). The structure in (7-b) is not interpretable straightforwardly on the basis of the lexical entry for *percent* in (8). Consider again a concrete example, namely the German example (5-b) given in English translation with its proposed structure in (10). There are three interpretation problems with the structure in (10): 1) We assume that the internal argument of *percent*, c, is determined by focus, and therefore c is a set of focus alternatives (Rooth 1992) and cannot be of type e. We assume therefore that c can be turned into type e, as we show later in this section. 2) After resolving the problem with c, the unlabeled node in the structure shown in (10) is of type t and therefore cannot combine with the VP of type et. 3) Assuming the semantics of focus association of Rooth (1992), the value of c needs to be determined anaphorically by affixing a $\sim$ operator to a constituent containing the focus and *work here*, but not the occurrence of c. Such a constituent doesn't exist in structure (10).

(10)   30 percent students work here.

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                          S
              ┌───────────┴──────────┐
              ─                       VP
         ┌────┴─────┐           ┌─────┴─────┐
        NP_1       NP_2        work        here
     ┌───┴───┐      │
    30        ─  students-F
          ┌───┴───┐
       percent    c
```

We show in this section, that we predict the observed interpretation for (10) by a combination of established mechanisms at the syntax-semantics interface – namely quantifier raising and association with focus – and one new proposal concerning a modification of the copy theory of movement.

In Ahn and Sauerland (2015b), we argue already that the third problem is actually related to the second one on the basis of examples like (11), where the focus is on *Italian*, a subconstituent of the NP associated with *percent*, instead of the full NP. The interpretation of (11) is still non-conservative, but the non-focused part of the NP associated with *percent* also enters the inner, restrictor argument of *percent*, i. e. c in our analysis. As we show below, the bold faced restrictor argument of (11) includes both the non-focused *students* and the content of the VP.

(11) 30% Studenten aus ITALien$_F$ arbeiten hier.
     30% students   from Italy   work   here
     '30% of the **students that work here** are students from Italy.'

Example (11) provides evidence that c must be determined from a constituent that dominates both NP$_2$ and the VP of (11) instead of just the VP. But it cannot dominate c itself since that would lead to a self-reference. The conflict between these two requirements can only be resolved by an adjustment of the constituency, which we assume is brought about by quantifier raising (QR) in German (see Sauerland and Bott 2002; Bobaljik and Wurmbrand 2012 for other cases of QR in German). Specifically, we propose that the non-conservative structure involves QR of the measure phrase to clausal scope (Ahn and Sauerland 2015b) as shown in (12).

(12)
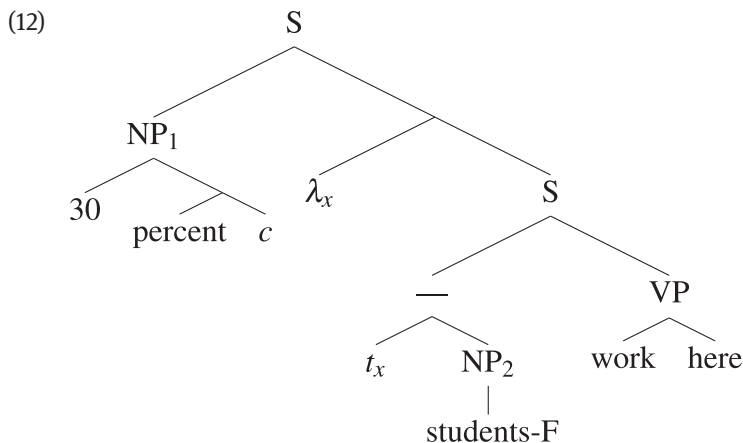
In (12), we capture the semantic dependency created by QR with the λ_x-operator, which appears as the sister of the constituent targeted by QR, and a coindexed trace t_x. Notice, however, that if t_x is interpreted as an individual of type e, (12) still gives rise to the second semantic problem mentioned above: the argument of the VP is of type t, rather than e. In other cases of QR, Fox (2002), Sauerland (1998, 2004) and others have argued that QR leaves behind not a trace, but a copy of the moved material that is interpreted as a definite description. Following Sauerland (2004), we assume that this involves a process that creates a copy of the DP and subsequently replacing the D part with an indexed definite determiner the_x that is coindexed with the λ-operator merged to the target of QR before the QRed DP is merged. But since a definite description is of type e just like the trace t_x, adopting the copy theory of movement would not solve the type problem in (12) either. Therefore, we propose that (12) is slightly different from other cases of QR in the following way: Instead of replacing a part of the trace copy to create a definite description, we propose that the entire trace is replaced by an indexed definite determiner of type $\langle et, e \rangle$. Furthermore, we propose that movement can generally involve both replacement of a part and replacement of the whole copy by a definite determiner, and that whichever results in an interpretable structure is the one observed. A statement of this syntax-semantics interface rule for movement is given in (13), where (13-c) is modified relative to Sauerland's (2004) account to also allow replacement of DP by an indexed definite.[10]

(13) *Modified Trace Conversion:* Movement of DP involves targeting the constituent X involves the following three steps:
   (i) merge an indexed λ-operator λ_i to X,
   (ii) merge a copy of DP to X,
   (iii) replace any projection of D (i.e. either D or DP) with an indexed definite determiner the_i that is coindexed with the λ-operator inserted in step (i).

As shown in (14), the structure for (12) after full replacement is interpretable and furthermore has a position $\sim c$ can attach to.

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10 The account we offer is similar to that of Takahashi and Hulsey (2009) for A-movement, except that they assume that the bare trace is interpreted as of type e, while for us it is of type $\langle et, e \rangle$. We assume that A-movement involves a N head of type et. Fox and Johnson (2015) argue for an account of trace conversion that makes use of remerge instead of the copy theory, but as far as we can see our proposal can be translated into their system straighforwardly.

(14)
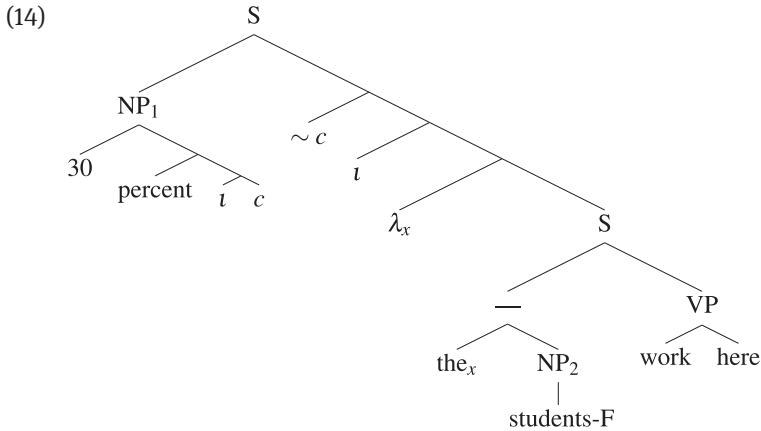
In this structure, the silent ι operator motivated by Partee (1987), Chierchia (1998) and others applies twice. As defined below, ι maps the characteristic function of a set S of individuals to the single individual that is the supremum of the S, i. e. the smallest individual z such that all individuals x in S form part of z.

$$\llbracket \iota_1 \rrbracket (f) = \sup\{x \mid f(x) = 1\} \tag{3}$$

Consider the interpretation of example (14) in a scenario where, out of ten people who work at a department: a, b, and c are students, d, e, f, and g are staff, and h, i, and j are professors. In (15), we show the semantic values or focus values of some subconstituents of (14). The focus value of the sister $\sim c$ is shown in (15-a): each of the three focus alternative to *students*, *students*, *staff*, and *professors*, leads to one plural individual of workers of that type that work here. The operator $\sim$ then establishes that the variable c has as its value the characteristic function of (15-a). Hence, the application of ι in (15-b) returns that entity consisting of all the individuals in the call, i. e. all individuals. (15-c) shows how the truth value of the full sentence is correctly predicted in this case.

(15)   a. $\llbracket \iota\lambda_x.\ \text{the}_x\ \text{students–F work here}\rrbracket^F$
            $= \{a \oplus b \oplus c, d \oplus e \oplus f \oplus g, h \oplus i \oplus j\}$
       b. $\iota c = a \oplus b \oplus c \oplus d \oplus e \oplus f \oplus g \oplus h \oplus i \oplus j$
       c. $\llbracket S \rrbracket = \llbracket \text{percent} \rrbracket (\iota c)(30)(a \oplus b \oplus c) = 1$

In this way, the non-conservative interpretation is derived from the structure we proposed in (7-b) using only independently needed operations other than the modification of the copy theory of movement.

We don't review here that our proposal also predicts the interpretation of (11) correctly, but readers are referred to the discussion in Ahn and Sauerland (2015b). One further aspect of (14), that we should mention, is that the structure would also be interpretable if focus wasn't on the noun *students*, but instead on the VP *work here*, but then the conservative interpretation is predicted for (14). In other words, structure (14) makes non-conservative interpretations possible, but doesn't force them. In fact, (14) predicts that it should even be possible to have the value c be determined fully by context when either there is no focus in the scope of the quantifier or the argument of $\sim$ is different from c. At present, we have not found strong evidence for either of these interpretations, but we think that a more systematic experimental approach may be required to detect them. Rooth (1995) also observes for averbial quantifiers a tendency to coindex their c argument with that of a $\sim$-operator in its scope.

The proposal we presented in this section was primarily motivated by general considerations of the syntax-semantics interface. Specifically, the observation that the same lexical items – i. e. the relative measures, *percent* and other fractions like *third* – allow both conservative and non-conservative construals, motivates a proposal that derives both construals from the same lexical entries, but different structures. We then showed that the non-conservative interpretations follow from the assumption that a contextually determined variable c can fill the inner argument position of a relative measure together with independently motivated assumptions about the syntax-semantics interface. In the following section, we discuss the predictions our proposal makes for morphosyntax, and argue that these predictions are borne out in the way different languages express the non-conservative construals.

3 Crosslinguistic morphosyntax of non-conservativity

In this section, we want to show that the morpho-syntactic properties of non-conservative construals across languages for the most part follow from our proposal. Central to the two structures we propose in (7) is the different constituency of the two construals: In the conservative structure, a relative measure noun like *percent* takes the DP containing the substance noun as its argument, while in the non-conservative structure, the measure noun does not form a constituent with the substance noun. The junction between the measure noun and the substance noun is

therefore tighter in the conservative structure – they are part of a constituent that excludes the numeral argument of the measure noun – than in the non-conservative structure. This difference makes interesting predictions for the two construals with respect to surface form, definiteness, and morphological properties such as case-marking, that we discuss in detail in the following paragraphs.

First, recall that in our proposal the non-conservative structure cannot be interpreted without movement. Above we assumed covert QR as the relevant movement, but the movement may also be overt. Therefore we expect that languages may require overt movement with the non-conservative construal, but not with the conservative one. Below we argue that Korean bears out this prediction.

Secondly we argued that after movement of the measure NP, its trace is converted into a definite determiner. This predicts that the substance NP must be able to serve as the argument of a definite determiner, i. e. it must be a bare NP denoting a property. It definitely cannot be a definite DP itself on the non-conservative construal. This predicts that the substance noun in non-conservative example should be required to be a bare noun phrase,[11] as it provides the inner arguments. The prediction concerning the non-conservative construals is as far as we know correct across languages as we show in the following.

The prediction for conservative construals is in this case more complex. We have given in (8) above a lexical entry for *percent* that requires an inner argument of the type of individuals, e, but an outer argument of type et. Since the substance noun on the conservative construal directly serves as the inner argument of the relative measure, definites are predicted to be possible. Our account predicts that noun phrases of type et should not be grammatical as the inner argument of *percent* on the conservative construal – our account essentially transfers the account of the *partitive constraint* Ladusaw (1982) (also Barwise and Cooper 1981: 206–7). For English, the type e constraint does predict bare nouns to be possible as the inner argument of *percent* if they are kind-denoting nouns. Data such as (16) confirm this prediction since *Americans* is kind-denoting, but *Americans in this room* isn't (see also Ionin et al. 2006 for discussion).

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11 Or more precisely a substance noun interpreted as type et, which allows also bare nouns that are modified by an adjective, prepositional phrase, or relative clause expressing since these can combine with a bare noun resulting in a property. If numerals expressed properties of type et, bare nouns with numerals such as *three students* should also allow a non-conservative construal, but this isn't possible as variant of (3-b) attests. We assume therefore that these are not of type et (see Spector 2013 and references therein for discussion).

(i) *The company hired 75 % 80 women.

(16) a. Ten percent of (*the) Americans smoke Marlboro.

   b. Ten percent of *(the) Americans in this room smoke Marlboro.

In languages such as Italian where kinds must be marked as definite (Chierchia 1998), though, the type *e* requirement should amount to a requirement of definiteness.

The third predicted difference concerns the morphosyntactic properties of the two construals. In the conservative structure, the substance noun is subordinated to the measure noun and we expect the two to have an asymmetric relationship. But in the non-conservative structure, the relationship between two nouns is symmetric. Specifically, consider the predictions for case: Ott (2012, 2015) proposes to use unlabeled constituents for left dislocation and quantifier float structures in German, and in both cases the two phrases merged into an unlabeled constituent agree in case. Case agreement between the measure and the substance noun is therefore also what we expect for non-conservative construals. For the conservative structure, we expect the case of the substance noun to be determined within the measure NP, and therefore to receive genitive case since that is typically assigned to NP internal argument nouns.[12]

The three predictions are born out cross-linguistically as far as we could determine. The relevant data is reported in the remainder of this section, testing these predictions when relevant, given the languages' morphosyntactic properties. Table 1 summarizes which language uses which type of marking for the non-conservative interpretation. In addition to the three predicted morphosyntactic properties, focus on the substance NP or a part of it is always required for the non-conservative reading. The role of focus is also predicted by our proposal.

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12 In addition to the case marking pattern, our proposal also makes predictions for verbal agreement: non-conservative construals should more readily allow the verb to agree with the substance noun. At this point, we have not been able to explore this systematically, but Sauerland (2014) discusses the relevant German data in (i).

(i) a. Ein Prozent Japaner wohn-t / ?wohn-en in Berlin.
     one percent Japanese. PL live- 3SG / live- 3pl in Berlin
     'One percent of Berlin residents is Japanese.'

   b. Sechzig Prozent Butter ?komm-t / komm-en in diesen Teig.
     60 percent butter come- 3sg / come- 3pl into this dough
     '60 % of what goes into this dough is butter.'

The data is very subtle, but might point the opposite way of the prediction. But because of the subtlety, we leave this prediction up for future research to test further.

Table 1: Marking of non-conservative (vs conservative) construal of relative measures (from Ahn and Sauerland 2015a). 'Subject' column indicates whether the non-conservative reading is possible in the subject position. All languages listed here allow the non-conservative reading in the object position.

Language(s)	Morpho-/phonological marking	Subject
English	focus, case (*of*), definiteness	no
German, Georgian, Greek	focus, case, definiteness	yes
French, Italian	focus, definiteness	(yes)
Korean	focus, case, definiteness, overt movement	yes
Mandarin	focus	no

The third column in Table 1 shows whether non-conservative construals are possible in the subject position in that language. Surprisingly, languages show significant variation on this point, and even closely related languages such as English and German differ on this point. The restriction to non-subject positions at this point doesn't follow from our proposal.[13]

We start with the English examples in (17). The difference between the two construals is marked doubly by the presence of the genitive marker *of* and the definite *the*. The genitive marker and the definite marker are required for the conservative reading.

(17)　a.　The audience consists of two thirds of the women.　　　(conservative)
　　　　b.　The audience consists of two thirds women$_F$.　　　(non-conservative)

This is consistent with what we predict from the conservative structure: the substance noun is taken as the dependent, DP argument of the measure noun.

As already mentioned above, English is relatively restrictive by allowing the non-conservative reading only in the object position. The restriction to non-subject position may suggest a similarity with an adverb. Note, however, that there are nontrivial differences between non-conservative uses of measure

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13 Reviewers have suggested a potential link between the subject-object asymmetry and respective positions of the subject. Because the subject-object division among languages is not so clear-cut, we cannot make strong claims yet, but we do believe there is a potential in pursuing these types of analyses. This will require more empirical work, which we leave for future investigation.

nouns and adverbs. For example adverbs can be separated from the substance noun in (18) and (19).

(18) a. The company will mostly/*75% hire women this year. (vs(3-b))
     b. The audience consists mostly/*two thirds of women. (vs (17-b))

(19) Who does the audience consist of mostly/*30%?

Adverbs also don't seem to restrict the substance noun with respect to definiteness as relative measures do.

(20) The company hired mostly/*75% {the women over there / them / some linguists}

Another evidence against the adverbial account suggested by an anonymous reviewer is shown in (21). It is possible to prepose the sequence *75% women*, which is not expected if *75%* were an adverbial and *women* were a direct object noun phrase.

(21) [75% women] (I believe) the company will hire _ this year

While the English data may have additional complexities, we move on to other languages that are less restricted in allowing both construals of measure words and allow further tests of the predictions of our proposal. We discuss the case and overt movement prediction in the following two subsections, and then we discuss additional data for the definiteness restriction from languages not considered up to then.

3.1 The case prediction: German, Georgian, and Greek

In this section, we discuss three languages that distinguish between the conservative and the non-conservative construal with case marking. In German, Georgian, and Greek, the substance noun is genitive marked in the conservative construal as in English. Additionally, in the non-conservative construal, the substance noun agrees in case with the measure noun. We discuss the data from German first.

The non-conservative reading is possible in both subject and other argument positions in German (Sauerland 2014).[14] In all positions, focus is needed for non-conservative readings. If the substance noun is genitive marked, the only possible reading is conservative. If, on the other hand, the substance noun appears with a case that matches that of the measure noun, the non-conservative reading results.

(22) GERMAN.
    a. ?30 Prozent   Studierender arbeiten.
       30 percent-NOM students-GEN work
       '30 percent of students work.'   (conservative)
    b. 30 Prozent   STUDierende   arbeiten hier.
       30 Percent-NOM studierende-NOM work here
       '30 percent of workers here are students.'   (non-conservative)

The lack of definiteness marking in (22-b) is predicted from our proposal where the underlying structure for the non-conservative construal is formed by the substance NP and the percent NP. The case agreement between the substance and the measure noun also follows from this structure under our assumption that case is assigned to the constituent containing the substance noun and the measure noun, then gets realized on both NPs.

    Georgian also indicates non-conservative readings by matching case marking on the measure noun and the substance noun, as shown in (23-b) and (24-b). Other morphological markings include focus and word order: the non-conservative reading requires the substance noun to be focused and to follow the measure noun.

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14 One reviewer asked about subjects in an embedded clause with a modal particle *ja doch* ('indeed'). We perceive example [a] where the focus is closer to the verb to be indeed better as predicted by the approach of Diesing (1992) and others. We leave this up for future research.

  a.   weil ja   doch 30 30 % STUDierende hier   arbeiten
        because indeed   30 % students   here   work
        'since indeed 30 % of workers here are students'
        weil 30 % STUDierende ja doch hier arbeiten
  b.   weil   30% STUDierende ja doch hier arbeiten
        because 30% students   indeed here work '
        since indeed 30% of workers here are students'

(23) GEORGIAN (Ekaterine Egutia, p.c.)
    a. Profesorebi-s   erti-mesamed-i movida.
       professor.PL-GEN one-third-ABS   came
       'One-third of the professors came.'   (conservative)
    b. Erti-mesamed-i profesoreb-i   movida.
       one-third-ABS   professor.PL-ABS came
       'One-third professors came.'   (non-conservative)

(24) a. Harvard-ma kalebi-s   ormutzda.at-i prochent-i daasakma.
       Harvard-ERG women-GEN fifty-ABS   percent-ABS hired.
       'Harvard hired 50% of the women.'   (conservative)
    b. Harvard-ma   ormutzda.at-i prochent-i kal-i daasakma.
       Harvard-ERG fifty-ABS   percent-ABS   woman-ABS hired
       'Harvard hired 50% women.'   (non-conservative)

The word order is not fixed for the conservative construal: it is possible for the substance noun to follow the measure noun as shown below. The *sa* marker that attaches to the substance noun can be analyzed as a dative marker serving the same role as genitive case in German, in which case the paraphrase could be more like "One-third from the professors came".

(25) Erti-mesamed-I profesorebi-sa movida.
    one-third-ABS   professor-DAT came
    'One-third of the professors came.'   (conservative)

As in German, relative measures in Georgian appear case-marked in all examples. They never appear with Georgian adverbial endings such as *-d*, suggesting that these are determiners rather than adverbials.

    Greek is the third language that uses case agreement to distinguish between the non-conservative and the conservative readings as shown in the example below. For the conservative interpretation, some speakers may prefer the prepositional variant also given in (26-a).

(26) MODERN GREEK (Artemis Alexiadou, p.c.)
    a. I   eteria   proselave 30% ton   dopion   /apo tus
       the   company hired   30% the- GEN locals- GEN / from the- ACC
       dopius
       locals-ACC
       'The company hired 30% of the locals.'   (conservative)

    b. I⠀⠀⠀eteria⠀⠀⠀⠀⠀proselave⠀30%⠀dopius
       the⠀company⠀hired⠀⠀⠀⠀⠀30%⠀locals- ACC
       'The company hired 30% locals.'⠀⠀⠀⠀⠀⠀⠀⠀⠀(non-conservative)

The example (27) shows that the non-conservative interpretation is also available for at least derived subjects.[15]

(27)⠀⠀30%⠀dopii⠀⠀proselifthisan
      30%⠀locals⠀hired-Non-active-3PL
      '30% locals were hired.'⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀⠀(non-conservative)

The three languages discussed in this section, German, Georgian, and Greek, have many similarities with respect to how the non-conservative construal is realized. Unlike English, these languages allow the non-conservative construal in subject and other other argument positions as well. In the two construals, different case marking appears on the substance noun. In all three languages, the substance noun is marked genitive or dative in the conservative construal. This is predicted from our analysis as the substance noun is a proper argument of the measure noun. In the non-conservative construal, the substance noun and the measure noun show case agreement. This is also predicted in our analysis with the assumption that case is assigned to the constituent containing both NPs and then get realized on both. This analysis may be extended to English as well, which does mark the substance noun with the genitive 'of' in the conservative construal, but not in the non-conservative construal. With overt case marking, these languages provide arguments against the adverbial account, because, unlike English where the measure noun appears bare, the measure noun in the non-conservative construal agrees in case with the substance noun (above Nominative/Ergative or Accusative) and therefore must be syntactically related to the substance noun.

3.2 The constituency prediction: Korean

We proposed that the non-conservative construal involves an LF movement that destroys the constituency of the measure structure. Our proposal would therefore predict that in a language where this LF movement is overt, expressing the non-conservative construal should involve a discontinuous measure structure. In this subsection, we argue that Korean represents such as case.

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15 One reviewer pointed out that Greek subjects may not occupy Spec(TP) in matrix clauses. This may provide an avenue for further investigation.

Korean is similar to the case-marking languages discussed in the previous subsection in that the substance noun can only be genitive marked in the conservative construal. However, there are two additional phenomena that distinguish Korean from the case-marking languages. First, Korean shows overt movement of the measure noun in the non-conservative construal, forming a quantifier float structure. We argue that the LF movement of the measure noun proposed in our analysis is overtly realized in Korean, providing further support for our proposal of the non-conservative structure. The overt movement in Korean is not surprising as Korean is reported to identify intended scope orderings overtly (Beck and Kim 1997). Second, Korean allows a variant of the conservative construal in which the substance noun and the measure noun seem to agree in case. This is initially surprising because in the languages discussed above, case agreement was a characteristic found in the non-conservative construal. We argue, however, that case agreement shown in this variant is of different nature from the one shown in the non-conservative construction of German, Georgian, and Greek, and that the conservative reading results from an additional, unrelated structure that is reported in Korean with other types of floated quantifiers (Ko 2005).

The conservative and the non-conservative construals are shown in (28). Like the case-marking languages discussed in the previous section, Korean allows the non-conservative construal in the subject position, as shown in (29).[16]

(28) a. Hoysa-ka   [yeca-(uy)   osip-phulo]-lul   ceyyonghayssta.
company-NOM woman-GEN fifty-percent-ACC   hired
'The company hired fifty percent of the women.'   (conservative)

b. Hoysa-ka   yeca$_F$-lul   osip-phulo   ceyyonghayssta.
company-NOM woman-ACC   fifty-percent hired
'The company hired fifty percent women.'   (non-conservative)

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16 As an anonymous reviewer noted, the verb *come* in (29) leaves open the possibility of having an unaccusative structure. However, the verb *come* in Korean passes various unergative tests suggested by Yang (1991). For example, in Korean, duration/frequency adverbs like *two times* are marked Accusative with unergative verbs, while marked Nominative with unaccusative verbs. As shown in (i), the duration/frequency adverb is marked Accusative, supporting that (29) is an unergative structure with *kyoswu* in the subject position.

(i)   Kyoswu-ka   twu-pen-ul/*i   wassta.
professor-NOM two-times-ACC/*NOM came
'The professors came twice.'

(29) a. [Kyoswu-(uy)   isip-phulo]-ka   wassta.
         professor-GEN twenty-percent-NOM came
         'Twenty percent of the professors came.'   (conservative)
     b [Kyoswu$_F$]-ka isip-phulo wassta.
         professor$_F$-NOM twenty-percent came
         'Twenty percent of those who came were profs.'   (non-conservative)

Our findings are supported by the work of Park (2007), who finds the same non-conservative reading with the Korean quantifier *taypwupwun* ('most') and proposes an adverbial account. We extend this observation with other proportional quantifiers such as 'percent' and fractions, but do not adopt the adverbial account.

Korean makes one further structural distinction between the conservative and the non-conservative construals of measure constructions. For the non-conservative reading to be possible, the measure noun must overtly move out of the case-marked DP. This is shown in the examples above: the measure noun *osip-phulo* appears within the accusative-marked constituent in (28-a), resulting in the conservative reading, while it 'floats out' of the accusative-marked constituent in (28-b) to result in the non-conservative reading. The same applies in the subject position. The syntactic derivation of non-conservative construals in Korean is summarized for example (28-b) by the diagram in (30).

(30)   The company hired [woman$_F$ the$_x$] -ACC 50% λx [woman$_F$ the$_x$]

The fact that the measure phrase can move on its own provides evidence for the constituency we propose for the non-conservative structure. Not only can the measure phrase *osip-phulo* move on its own, but it can also be separated from the substance noun with an adverb like 'ever year', as shown in (31).

(31) Hoysa-ka   yeca$_F$-lul   (maynyen) osip-phulo   (maynyen)
      company-NOM   woman-ACC every.year fifty-percent every.year
      ceyyonghayssta.
      hired

      'The company hired fifty percent women every year.' (non-conservative)

We have argued that in other languages there is a covert QR of the measure phrase that results in the non-conservative reading. We propose that the overt movement of the measure phrase in Korean supports this analysis. There are two issues that need to be addressed. The first is to the issue of explaining why in Korean this movement is overt while it is covert in other languages. We suggest that this may be due to Korean's insensitivity to Left

Branch Condition (LBC), as it has been recently suggested by Kim (2011) that Korean allows LBC movements overtly.[17] The second issue is about the exact scope of QR. On the surface, the moved measure phrase follows both the nominative-marked subject and the accusative-marked object. One may assume from this surface position that the movement is not at the clause-level as we propose but at the vP-level. However, we suggest that this surface structure is a result of additional movements of the subject and the object nominal for case-assignment.

Korean like the languages discussed in the previous subsection also has overt case marking, but it functions not exactly in the same way as case in Greek, German, and Georgian does. In the remainder of this subsection, we discuss the role of case in measure structures in Korean. Like the languages discussed so far, the genitive marking can only appear on the substance noun in the conservative construal. The non-conservative, quantifier float construal cannot have the substance genitive marked: this results in an ungrammatical sentence as shown by (32).

(32). *Hoysa-ka   yeca$_F$-uy   osip-phulo   ceyyonghayssta.
       company-NOM woman-GEN   fifty-percent hired

However, the quantifier float structure in Korean has another variant, in which both the substance noun and the floated quantifier receive case marking, as shown in (33). The case-marked structure, however, does not allow non-conservative interpretations, even if the substance noun *professor* is focused. It is at first unclear how our structure would predict this pattern. We in fact would expect from examples in German and Greek that case agreement between the substance noun and the measure noun should only occur in the non-conservative structure. Thus, the fact that (33) is restricted to the conservative meaning may initially be surprising. However, we show that this example can receive an alternative analysis independently motivated in works on cardinal quantifiers (Ko 2005) that is compatible with our proposal. The contrast in the case pattern between Korean and languages like German and Greek can be said to result from the way their case morphology systems differ.

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[17] The status of Left Branch Condition (LBC) effect in Korean is debated: Choe (2009) argues that while overt movement does not allow LBE, covert movement does in Korean. Kim (2011) claims that LBC is not available for Korean, arguing that what looks like an LBC effect is a result of a separate morphological requirement that adnominals appear with nominals. Following Kim, we can explain why Korean allows this LBE: proportional measure nouns like 20 % can stand alone without a nominal.

(33)
Kyoswu$_F$-ka   isip-phulo-ka   wassta.
professor-NOM   twenty-percent-NOM   came
'20 percent of the professors came.'   (conservative)
*'20 percent of those who came were professors.'   (non-conservative)

For an analysis of this type of case-marked quantifier, we can turn to Ko (2005) where examples with cardinals parallel to our examples with relative measures are discussed. Specifically, Ko focuses on case-marking patterns on floating cardinal quantifiers. The cardinal quantifier *sey-myeng* in (34-a) can float out of the nominative-marked constituent. Ko observes that the cardinal quantifier can be either case-less as shown in (34-b), or nominative-marked as shown in (34-c).

(34) a. [Kyoswu   sey-myeng]-i   wassta.
         professor   three-CL-NOM   came
      b. Kyoswu-ka   sey-myeng   wassta.
         professor-NOM three-CL   came
      c. Kyoswu-ka   sey-myeng-i   wassta.
         professor-NOM three-CL-NOM came

         'Three professors came.'

Ko (2005) argues that two distinct types of floating quantifiers must be assumed in Korean. Specifically, Ko argues that caseless numeral quantifiers such as that shown in (34-b) form a constituent with its associate NP in the underlying structure, while case-marked numeral quantifiers like the one in (34-c) do not. This is based on the observation that the floated quantifier in (34-c) does not show what Ko calls the 'Subject Puzzle', meaning that an object can intervene between the subject and the subject-oriented quantifier.

(35) a. *Kyoswu-ka   sakwa-lul   sey-myeng   mekessta.
          professor-NOM apple-ACC   three-CL   ate
      b. Kyoswu-ka   sakwa-lul   sey-myeng-i   mekessta.
          professor-NOM apple-NOM   three-CL-NOM ate
          'Three professors ate apples.'

Ko analyzes the floated quantifier in (34-c) as a secondary predicate that is externally merged in the spec of *v*P, taking a null argument *pro* that refers to the

substance noun if present in the sentence.[18] Ko also notes that the null argument can be paraphrased as 'of them' in English as shown in (36).

(36)   Students three of them came

Following Ko, we assume that the null *pro* serves as the substance noun when the floating relative measure is case-marked as in (33) . Note that, as Ko observes for the case-marked floating cardinal quantifiers, it is possible for a *v*P-internal element such as an argument PP to intervene between the substance noun and the floated measure noun when it is case-marked. This is shown in (37-a) Crucially, as shown in (37-b), this is ruled out for the caseless floated measure noun.

(37) a. Kyoswu-ka   kyosil-lo   isip-phulo-ka   wassta.
         professor-NOM classroom-to twenty-percent-NOM came
         '20 percent of the professors came to the classroom'   (conservative)
     b. *Kyoswu$_F$-ka   kyosil-lo   isip-phulo   wassta.
         professor- NOM classroom-to twenty-percent came
         '20 percent of the professors came to the classroom'   (conservative)

We started out with the observation that it is possible for the floated measure noun in Korean to agree in case with the substance noun, and when it does, it is restricted to the conservative reading. Since it was shown that case-agreement between the substance noun and the measure noun made the non-conservative reading available in Georgian, German and Greek, examples lik (33) were initially surprising. However, we discussed works like Ko (2005) that argue that case-marked floating cardinal quantifiers must be analyzed not as being base-generated in the DP but in the *v*P as a secondary predicate. We further argued that it is reasonable to apply this analysis to the case-marked relative measure in (33), observing the similarity between the case-marked cardinal quantifier discussed by Ko (2005) and (33) in that both allow a *v*P-internal element to intervene, as shown in (35-b) and (37-a), respectively.

   With this assumption, the case agreement prediction is no longer relevant: the agreement does not result from case being marked on the matrix constituent. Since *pro*, and not *c*, serves as the argument of *percent*, our proposal predicts only the conservative interpretation to be possible, and this prediction is borne out.

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18 Ko assumes multiple spec positions for *v*P, but the details are beyond the scope of our paper.

Also, because *pro* is necessarily definite, this also corroborates the definiteness prediction.

A question that arises now is why the interpretation of the double-case-marked sentence is restricted in this way in Korean when it is not in languages like German and Greek. It seems possible for a case assigned to the complex DP to be overtly marked on both NPs in languages like German and Greek, while Korean does not allow this type of case sharing and requires case to be marked only on the substance NP. Because of this restriction, when the measure noun does carry overt case marking in Korean, it must be analyzed as a secondary predicate that is base-generated outside the DP. Why does Korean have this restriction against distributing case to substance noun and measure noun? We may have to stipulate that case marking in Korean works differently in that the case affix is realized on full phrases only once, and the only way around unique case-marker constraint is the dislocation structure with *pro* bound by another case-marked phrase. The motivations for such a restriction on Korean case marking are left for future investigation.

As we see in this section, Korean has an additional way of marking the non-conservative construal, which is the quantifier float structure where the measure noun appears floated out of the DP constituent. We argued that this provides further evidence for the QR in LF that we propose for the non-conservative structure. Also, we discuss the case agreement variant allowed in Korean quantifier float structure, where the substance noun and the measure noun agree on case marking. This apparent contrast from the languages discussed in the previous section is shown to be unproblematic for our account, as the conservative reading results from the secondary predicate structure that is independently motivated by Ko (2005) to account for cardinal quantifiers in Korean. Overall, the morphological markings of Korean are parallel to those shown in other languages: Focus is necessary on the substance noun, and genitive marking on the substance noun is restricted to the conservative construal.

3.3 The definiteness prediction: Other languages

The third prediction of our proposal that we discuss concerns definiteness: If the substance noun is a full DP, specifically a definite, we predict that the non-conservative construal should be blocked. As we have seen above, the data from English, German, and Korean confirm this prediction. To further corroborate the prediction, we discuss in this section Romance languages and Mandarin Chinese. So far we have looked at languages that distinguish the conservative

and non-conservative construals with case or word-order patterns. Now we turn to languages that mark the non-conservative construal only with differences in definiteness: specifically, the substance noun is necessarily indefinite in the non-conservative construal.

In French, only the conservative reading is possible if the substance noun appears with a definite 'of' as shown in (38-a). The indefinite 'of' appears in the non-conservative construal, as in (38-b).

(38) FRENCH (Benjamin Spector, p.c.)
- a. Ce film a été vu par deux tiers des journalistes.
  this movie has been seen by two thirds of the journalists
  'Two thirds of the journalists have seen this movie.'   (conservative)
- b. Ce film a été vu par deux tiers de journalistes$_F$
  this movie has been seen by two thirds of journalists
  'Two thirds of the people who have seen this movie are journalists.'
      (non-conservative)

Italian shows parallel patterns as in French: definiteness marks the distinction between conservative and non-conservative readings. The non-conservative reading is only possible when the indefinite version of 'of', *di*, is used.

(39) ITALIAN (Silvia Darteni, p.c.)
- a. Gianni ha parlato a un terzo delle donne
  Gianni has talked to a third of the women
  'Gianni talked to a third of the women.'   (conservative)
- b Gianni ha parlato a un terzo di donne
  Gianni has talked to a third of women
  'A third of those Gianni talked to were women.'   (non-conservative)

In both French and Italian, the syntactic position of the relative measure, which appears between a determiner and 'of', argues against an adverbial account. Also, unlike adverbs that can be dropped freely, it is impossible to drop the measure noun in the non-conservative construal in either language (Laurence B-Violette, Aurore Gonzalez, p.c.), providing a further argument against the adverbial analysis. A third Romance language that seems to exhibit very similar patterns is Brazilian Portuguese. Interestingly, the non-conservative construal is also possible with a bare singular as in (40-b).

(40) BRAZILIAN PORTUGUESE (Suzi Lima, p.c.)
    a. O   filme foi   visto por 1/3 dos   jornalista-s
      the movie was seen by 1/3 of the journalists
    b. O   filme   foi   visto por 1/3 de jornalista-s / jornalista
      the movie was seen by 1/3 of journalist- PL / jornalista
                                                (non-conservative)

The fourth Romance language we have started to investigate at this point is Romanian. Romanian seems more alike to English in that both the partitive marker and the definite must be dropped for the non-conservative interpretation as example (41-b) shows. Furthermore, Romanian only allows non-conservative construals for the objects of some verbs at least for the one consultant we have queried, but leave a precise investigation of this up for future investigation. Even in this preliminary form, the Romanian data show that the Romance languages don't behave uniformly with respect to non-conservative construals.

(41) ROMANIAN (Andreea Nicolae, p.c.)
    a. Camera asta contine două   treimi din   mobilă
      room   this contains two- FEM thirds of the furniture
      'This room contains 2/3rds of the furniture.'   (conservative)
    b. Camera asta contine două   treimi mobilă
      room   this contains two- FEM thirds furniture
      '2/3rds of this room is furniture'   (non-conservative)

Finally consider Mandarin, another language like Korean without an overt definite determiner. In (42), the relative measure is ambiguous and the only distinction between the two construals is that the non-conservative reading requires focus on *běndì-rén* 'local person'.[19]

(42) MANDARIN (Hongyuan Sun, p.c.)
    Tāmen lùyòng le   5% de běndì-rén
    3pl.   hire   perf. 5% DE local-person
    a. 'They hired 5% of the locals.'   (conservative)
    b. '5% of the persons they hired are locals.'   (non-conservative)

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19 Li (2016) discusses the Mandarin data in more detail.

The ambiguity in Mandarin is consistent with our proposal. It is also clear that, because adverbs in Mandarin appear pre-verbally, the relative measure '*5%*' cannot be analyzed as an adverbial. One remaining question concerns the difference between Mandarin and Korean, as Mandarin has also been argued to lack covert movement Aoun and Li (1993). Possibly relevant for this difference is the presence of *de* in (42) (Cheng and Sybesma 2009). Sauerland and Bott (2002) and Bobaljik and Wurmbrand (2012) discuss in German a difference between DP-internal prepositional phrases vs case marked genitive phrases and suggest that only the prepositional phrases allow string-vacuous overt movement.

One other interesting difference between the languages is that Mandarin are more restricted than the first two groups of languages in that the non-conservative reading is degraded in the subject position. In Mandarin, the non-conservative construal does not seem to be available at all in the subject position as in (43) (C.-T. James Huang, Edwin Tsai, p.c.).

(43) 5% de běndì-rén   lái   le
      5% DE local-pereson come perf.
      a. '5% of the locals came.'   (conservative)
      b. *'Of those who came, 5% were locals.'   (non-conservative)

In the Romance languages except for Italian, the subject does not seem to allow non-conservative construals. In Italian, however, both pre- and postverbal subjects allow the non-conservative construal (Fabrizio Arosio, p.c.).

(44) a. Un terzo di donne ha   parlato a   Gianni.
          a   third of women have talked   with Gianni
          'A third of those who talked to Gianni were women.' (non-conservative)
      b. ?Ha parlato a   Gianni un terzo di donne.
          have talked   with Gianni a   third of women
          'A third of those who talked to Gianni were women.' (non-conservative)

While we do not have an explanation of this subject-object asymmetry, a generalization seems to emerge: languages that mark the non-conservative construal with case-marking – German, Georgian, Greek, and Korean – do not show this asymmetry, while languages that mark non-conservativity only with definiteness are more restricted in the subject position, with the possible exception of Italian. Mandarin, which does not make any morphological distinction

between the two construals, seems to rule out non-object positions altogether. The extent to which these reports of degradedness are accurate as well as the correlation between morphological marking and the availability of non-conservative construals are left for future investigation.

4 Conclusion

This paper was concerned with the analysis of the non-conservative construal of relative measures that is found in various languages. We proposed a syntactic analysis of the conservative and the non-conservative construals which involved a difference in constituency between the two structures: while in the conservative construal the measure noun and the substance noun form a constituent with the substance noun serving as a syntactic argument, the substance noun has a separate status in the non-conservative construal and merges with the constituent that contains the measure noun and a context-sensitive c variable. Furthermore, we proposed that the non-conservative construal involves an obligatory movement of the measure noun-c constituent to take clausal scope.

We then looked at various morphosyntactic predictions made by our proposal. The first prediction concerned case marking. We predicted that, because the substance noun in the conservative structure is a dependent argument of the relative measure noun, genitive marking would be possible on the substance noun. This was borne out in English, Georgian, German, Greek, as well as Korean. On the other hand, because the substance noun and the measure noun are of equal status in the non-conservative structure, it was predicted that case would be marked on the constituent containing both of the nouns, and that both nouns would carry the case. This is what we found in the case-marking languages German, Georgian, and Greek where the measure noun and the substance noun agree in case in the non-conservative construal. Secondly, we predicted that would be in principle possible to find a language that realizes the obligatory movement overtly. This was argued to be the case with the quantifier float structure required in Korean for the non-conservative reading. Lastly, we predicted that the substance noun in the non-conservative construal could not be definite since the trace of the measure itself is a definite determiner, and this was borne out with the Romance languages and also hinted at with languages like German, where the non-conservative reading lacks a definiteness marking on the substance noun, and Korean, where the case-marked floating measure noun – analyzed as carrying a definite pronoun – can only have the conservative reading. Thus,

the predictions made from the two structures we propose for the conservative and the non-conservative construals of relative measures are borne out. While languages differ in the way they mark case, definiteness, or constituency, we show that languages that do show certain aspects of grammatical marking do display the predictions we make based on our analysis.

To conclude, we discuss how our proposal relates to other discussions in the literature and take a look at some potential alternative proposals. Consider first the relation between our structure for the non-conservative construal to the Conservativity Universal as proposed by Keenan and Stavi (1986: 260).[20]

(45) *The Conservativity Hypothesis:* Extensional determiners in all languages are always interpreted by conservative functions.

Are the non-conservative construals of relative measures a counterexample to (45)? To answer this question on the basis of (45), we need to determine whether they are determiners. Keenan & Stavi (1986: 255) include the conservative *two thirds of the* among the proportional determiners, but we still find it difficult to attribute determiner status to *two thirds of the* as well as the non-conservative *two thirds*. We think a more productive approach is based on the restatement of conservativity in (46), which is independent of the DP-internal constituency: Even though *two thirds of the* is probably not a constituent, (46) requires the quantificational relationship it expresses to be conservative on the DP internal argument.

(46) If a quantificational relation Q between two sets A and B is expressed within a clause and there is a DP such that both Q and A, but not B can be determined by the semantic content of DP, then Q must be conservative on argument A.

What does (46) say about the non-conservative construal? In (7-b) above we used an unlabeled node '–' as the result of merging the measure and the substance NPs. If that is correct, (46) doesn't say anything about the non-conservative construals since there is no relevant DP node.[21] But '–' might really be a DP node at least after LF-movement of the measure noun phrase leaving

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20 Fortuny (2016) recently attempted a restatement of the conservativity hypothesis in term of witness set, but Von Fintel (2016) discusses this attempt critically. Hence we put Fortuny's proposal aside here.

21 One reviewer asks how to apply ((46)) to languages that lack the category D. The issue arises of course also for hypothesis ((45)) . With the notion of extended projections of Grimshaw

behind only the definite determiner *the*.[22] Assuming '–' is a DP, the non-conservative structures are a counter-example to conservativity before the covert movement of the measure NP is considered.[23] But after covert movement, the structure is consistent with generalization in (46). Our proposal is in this way interestingly related to the proposal made in (Romoli 2015) that derives conservativity from the copy theory of traces. Romoli argues that even non-conservative quantifiers receive a conservative interpretation when the quantificational DP in which it occurs moves. We have shown in this paper that covert movement can also enforce conservativity.

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(1990), it might be possible to replace the reference to DP in ((46)) with quantification over any extended projection of N.

22 In cases like (i), however, the non-conservative measure structure *'30 %'* patterns like an NP. In Ahn and Sauerland (2015b), we suggest to account for examples like (i) by reconstruction into the relative clause.

    (i). The 30 % women who voted voted for Jim.

23 We ignore the focus determined variable c for the purposes of this discussion.

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