

Surface Non-Conservativity in German

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Proportional determiner quantifiers in German allow interpretations that violate the conservativity universal of Keenan and Stavi (1986). I argue for an analysis that distinguishes between surface syntax and the logical form of sentences. I show that in surface syntax, German non-conservative quantifiers are determiners that form a constituent with a noun phrase and share case and agreement properties with the noun phrase. But I propose that at logical form the non-conservative determiners undergo an adverbialization movement and are interpreted by a mechanism that generalizes focus-affected quantification of Herburger (2000). This result refines the understanding of conservativity as a constraint on interpretation.

Keywords: quantification, German, conservativity, focus, logical form, partitive

1 Introduction

This paper is concerned with the interpretation of proportional quantifiers like *twenty percent* and *two thirds*. I will only consider proportional quantifiers that take two arguments, the restrictor and the scope. Proportional quantifiers in contrast to cardinal quantifiers have the property that the order of their two arguments affects sentence interpretation: *10% of linguists are German* might be true, but *10% of Germans are linguists* definitely isn't. In the following, I explore mostly in German an observation I owe to work on Korean by Ahn (2012) and Park (2007);¹ namely, that proportional quantifiers across languages seem to allow a switch of the two arguments with small morphosyntactic modifications. For example, in Korean, the placement of the nominative case marker *ka* in (1) changes the order of the two arguments of the quantifier.

- (1) KOREAN (Ahn 2012)
- a. Gyosu isib-pro-ka wa-as-ta.
Professor twenty-percent-NOM come-PAST-DECL
'Twenty percent of the professors came.' (conservative)
- b. Gyosu-ka isib-pro wa-as-ta.
Professor-NOM twenty-percent come-PAST-DECL
'Twenty percent of those who came were professors.' (reversed)

The interpretation in (1b), I call the *reversed interpretation* of the quantifier following Ahn. I also call occurrences of quantifiers with a reversed interpretation *reversed quantifier*, so (1b) shows

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¹Ahn and Park independently discovered similar Korean data. Since Park's work is written in Korean except for the abstract, I rely primarily on Ahn's description of Park's work.

the reversed quantifier *isib-pro* ('20%'), which contrasts this with the *conservative* quantifier in (1a).

In English, reversed interpretations are also possible, as shown in (2). Specifically, the omission of the preposition *of* and the determiner *the* from (1a) brings about the reversed interpretation in (2b). But reversed interpretation seem more restricted in English than in most other languages.

- (2) a. Most recent class of NASA astronauts consists of 50% of the women. (conservative)
 b. Most recent class of NASA astronauts consists of 50% women.² (reversed)

In French, the morphological change required to reverse a proportional quantifier is even smaller, as (3) illustrates: omission of the definite marker suffices.

- (3) FRENCH (Benjamin Spector, personal communication)
 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
 This movie has been seen by two thirds of journalists
 'Two thirds of the people who have seen this movie are journalists' (reversed)

This paper focuses, though, on German. In German, the omission of the definite determiner similarly reverses the quantifier's arguments, as in (4).³

- (4) a. 60% der Frauen haben gewählt.
 60% the.GEN women have voted
 '60% of the women voted.' (conservative)
 b. 60% Frauen_F haben gewählt.
 60% women have voted
 '60% of the voters were women.' (reversed)

In all the languages, the distinction between the conservative and reversed interpretation correlates also with a difference in focus placement as indicated in (4). Specifically, the reversed interpretation requires focus on the noun, while the conservative interpretation allows different focus placements (see section 3 below).

Much of this paper is dedicated to a detail empirical description of reversed quantifiers in German. Some highlights of their properties that I argue for below:

1. reversed quantification is similarly available with mass quantifiers as well
2. reversed quantification is available in any verbal argument position

²<http://iwasm.org/wp-blog/2013/06/20/4308/>, accessed 01/28/2014. Example (2b) is actually a headline as evidence by the omission of initial *the*. Example (i) from <http://www.youtube.com/watch?v=IRNN-0BuFyA> shows the reversed structure in a non-headline example.

(i) In this segment, Jon talks about the new gaming market, which consists of 50% women.

³The datum (4b) is not acceptable in some southern German dialects, but the majority of German speakers even from the south accept it. See also the further discussion of dialects below.

3. reversed quantifiers form constituents in the overt syntax
4. the proportion noun or fraction and head noun share the same morphological case
5. verbal agreement is preferred with the proportion or fraction noun, but can also be with the head noun

To my knowledge, no linguistic work has been done on the reversed uses of quantifiers shown in (1) through (4) other than the work on Korean. Surveys of quantification don't mention reversed interpretations of proportional quantifiers (e.g. Keenan and Paperno 2012). Herburger (1993, 1997, 2000) and Eckardt (1999) discuss similar phenomena with weak quantifiers, but specifically claim at least for English that strong quantifiers don't allow reversed uses. The phenomenon though seems widespread and it is important for the study of quantification generally, specifically the conservativity universal of Keenan and Stavi (1986). The universal proposes that all determiner quantifiers in language are conservative.⁴ The conservativity universal is widely assumed to be borne out, and discussed in some semantics textbooks (e.g. Chierchia and McConnell-Ginet 1990). But, all of the b-examples above are counterexamples to the conservativity constraint if their syntactic structure is like that of the a-examples.⁵ For example, assume that the quantifier 50% in (4b) is a determiner that takes as its first argument the noun *women* and the predicate $\lambda_x x \text{ haben gew\u00e4hlt}$ as its scope. Then the lexical entries for 60% in (4) and (4b) must be different, so I use the terms $60\%_A$ and $60\%_B$ for the following discussion. On such an analysis, the interpretations of $60\%_A$ and $60\%_B$ would need to differ such that, for any two sets A and B , $\llbracket 60\%_A \rrbracket (A)(B) = \llbracket 60\%_B \rrbracket (B)(A)$. $60\%_A$ is a standard proportional determiner quantifier as in (5). But, $60\%_B$ as a determiner quantifier would require the lexical entry in (6).

$$(5) \quad \llbracket 60\%_A \rrbracket (A)(B) = 1 \text{ iff. } \quad \frac{\#(A \cap B)}{\#A} \geq 60\%$$

$$(6) \quad \llbracket 60\%_B \rrbracket (A)(B) = 1 \text{ iff. } \quad \frac{\#(A \cap B)}{\#B} \geq 60\%$$

It is easy to see by inspecting the formula in (6) that $60\%_B$ violates the conservativity constraint: Since the cardinality of the set B is the denominator of the fraction in (6), the cardinality of B , and not just the set of $A \cap B$ plays a role in the truth conditions. Applied to the two sets A and $A \cap B$, the fraction in (6) is always equal to 1, but when $B \neq A \cap B$, the result in (6) will differ.

The non-conservativity of reversed quantifiers is also apparent in the examples. Consider just example (2b): if the quantifier *50% women* was conservative, (2b) ought to be equivalent to (7): since the first class of NASA astronauts didn't contain any women, the intersection of the set of women with the two restrictors is the same. But, clearly (7) is false, while (2b) is true.

⁴Recall that a quantifier Q is conservative if for any two sets A and B , $Q(A)(B) = Q(A)(A \cap B)$. For example, the universal quantifier is conservative, because if $A \subset B$, then also $A \subset A \cap B$ holds. But the focus particle *only* would be not conservative if it could occur as determiner. Namely, then *only As are Bs* would be interpreted as $\text{only}(A)(B) = 1$ iff $B \subset A$. But then, any two sets A and B where $B \not\subset A$ would be a counterexample to conservativity because $A \cap B \subset A$ always holds. However, there is general agreement that *only* and its equivalents across languages aren't determiners (pace Zuber 2004 on Polish *tylko/sam* 'only'), so that the conservativity universal isn't violated.

⁵A different challenge to the conservativity constraint comes from the analysis of the German quantifier *lauter* (roughly: 'all but possibly a few') by Eckardt (2006). However, Anderssen (2011) argues that *lauter* is conservative.

- (7) The most recent and the first class of NASA astronauts together consist of 50% women.

The goal of my paper is to investigate data like (4) in German in detail. The English data as well as the Korean and French data have many peculiarities that ought to be explored further on a future occasion, but are beyond the scope of this paper. For example, reversed quantification seems to be restricted to non-subjects in English, but this isn't the case in Korean and German, as (1) and (4) already show. The two central conclusions of my German findings are the following two: First, reversed quantifiers are part of the DP constituent in the overt syntax, but the associated NP is adjoined to the quantifier. Secondly, the reversed quantifiers combine with only one overt clausal scope argument at logical form, while the restrictor is determined by focus. Taken together, these two conclusions entail that conservativity holds at the level of logical form, but that there must be a syntactic rule moving determiner quantifiers to adverbial positions (Bayer 1996, Herburger 2000).

In the following, I first seek to establish that the morphological and syntactic properties of reversed quantifiers in German. On this basis, I conclude they occupy the determiner position in overt form and form a constituent with the associated NP. In the second section, I then argue that the semantic interpretation of reversed quantifiers requires a different structure than the overt one—namely, they need to occupy a position with clausal scope like adverbials. After that, I develop a complete syntax and semantics for the reversed quantifiers in German, including a novel covert movement rule applying to phrasal Determiners.

Before I enter the empirical discussion, I need to comment the dialectal status of my data. As I already mentioned in footnote 3, the German data I discuss are subject to some dialect variation. At this point, I have not had access to the necessary resources to properly investigate this variation systematically, but I have some impressions from asking about 30 German speakers about data with percentages like (4b) and also fractions as in (8). I encountered three German speakers that reject (4b), and they were all native speakers of a southern variety of German. Even most southern speakers accept (4b), (8), and similar examples.

- (8) Ein Drittel Frauen sitzt nur in Norwegen im Parlament.
 a third women sits only in Norway in parliament
 'A third of parliament members are women only in Norway.'

Also, it is quite easy to find relevant data on the internet: (9) shows four attested examples. Examples (9a) and (9b) are from an Austrian newspaper and an Austrian governmental organization, and therefore likely to be from a speaker of a southern variety of German:

- (9) a. Nur zwölf Prozent Frauen sind in der heimischen Start-up-Szene tätig.⁶
 Only twelve percent women are in the local start-up-scene working
 'Only 12% of the people working in the local start-up-scene are women.'

⁵http://diepresse.com/home/wirtschaft/economist/1492848/Startups_Maenner-sind-selbstbewusster. All of the following internet references were accessed on 01/23/2014.

⁶<https://www.kommunalnet.at/news/artikel/article/studie-frauen-in-der-burgenlaendischen-kommunalpolitik.html?cHash=70d53583994d521a425f64108c696c11>

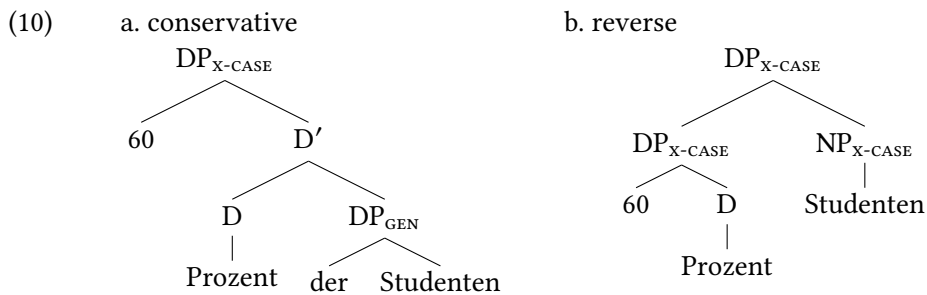
⁷http://www.franken-architekten.de/newsletter/1104/Interview_2.pdf

⁸<http://www.mission-einewelt.de/index.php?id=1375>

- b. Ganze 46 Prozent Frauen sind dort in den Kommunen politisch aktiv.⁷
 whole 46 percent women are there in the municipalities politically active
 ‘Of the people politically active at the municipal level there 46% are women.’
- c. Wieviel Prozent Frauen sind [...] in der Immobilienwirtschaft tätig?⁸
 how many percent women are [...] in the real estate business working
 ‘How many percent of the people working in real estate are generally women?’
- d. Gut ein Drittel Frauen haben die LDS-Kurse besucht, erzählt der 50-Jährige.⁹
 good a third women have the LDS-classes visited, tells the 50-year-old
 ‘The 50-year old men says that more than a third of the people attending the LDS-classes are women.’

2 The Constituency of Reversed Quantifiers

In this section, I show that German reversed quantifiers are phrasal determiners heading a DP constituent. Specifically, I propose the two structures exemplified in (10) (for (4)) for conservative and reversed quantifiers to explain the morphological and syntactic differences in German, where *x-CASE* indicates the externally licensed case on the DP.¹⁰



The conservative quantification structure I propose is similar to a proposal by Grestenberger (2013) for pseudo-partitives, except that her system of projection labels is more fine-grained than mine: Grestenberger argues that pseudo-partitives in German involve numberless measure nouns acting as the head of a projection she calls #, while I use the label *D* in (10). I don't think that this difference is important for the following. The important structural difference between conservative and reversed quantification for my analysis is the following: with conservative quantification, the determiner *Prozent* ('percent') takes an DP complement, while with reversed quantification, an NP is merged to the DP the determiner *Prozent* projects. I argue that this difference underlies morphosyntactic differences between the two structures: the second DP in conservative quantification is subordinate to the measure *D*, but in reversed quantification the DP and NP are more equal in status, and for example share the same externally licensed case indicated by *x-CASE*. Furthermore I show that the DP projected by the determiner *Prozent* in reversed quantification fills the determiner position of the associated NP. Finally, I also argue that the structural difference in (10) underlies the LF restructuring leading to reversed quantification in the second case.

In the first subsection, I present six different arguments for the constituency shown in (10b) for reversed quantifiers. Then I present an account of the morphological and syntactic differences with respect to case marking and agreement between the conservative and reversed DP structures in the second subsection.

¹⁰The reversed structure bears a similarity to cases discussed by Ott (2014).

2.1 Determiner Phrase Properties of Reversed Quantifiers

The first two arguments for the constituency of reversed quantification come from verb-second and from scope reconstruction. These two arguments show specifically that the reversed quantifier and the noun phrase following it form a constituent, but not yet what the head of this constituent is. I then present five further arguments that address the internal constituency of the reversed quantifier and its associated noun phrase, specifically, arguments from argumenthood, from a contrast with adverbs, from noun omission, from determiner insertion, and from left dislocation.

For the first argument that reversed quantifiers and the associated noun phrase form a constituent, recall that German is a verb-second language (e.g. Haider 2010): the material in front of the finite verb in German must form a single constituent. The reversed proportional quantifiers, however, can occur preverbally with the associated noun phrase as already shown by (4b) and (8) above.

A second argument for the joint constituency of reversed quantifier and noun comes from scope reconstruction. This argument relates to a discussion of the focus particle *nur* ('only') in German. Jacobs (1983) suggests that focus particles like *nur* can adjoin to a full CP, but associate with the focus on the initial DP. On this analysis the sentence in (12) would need to be analyzed as [Nur [CP Maria liebt keiner]]. This proposal has some initial plausibility despite the fact that this structure violates the verb-second constraint because there are some exceptions to verb-second. Specifically, German allows examples like (11) with frame and sentence adverbials to the left of a verb-second construction (e.g. Frey and Pittner 1999).

- (11) Aber / Noch mal die Entscheidung ist gefallen.
 but / again the decision is fallen
 'But / Again, the decision was made.'

But Jacobs's analysis of *nur* turns out to make the wrong predictions for scope, as Reis (2005) and Meyer and Sauerland (2009) argue: (12) is scopally ambiguous. Scope ambiguity in German generally requires one scopal element to have moved across another making scope reconstruction possible (Frey 1993, Wurmbrand 2008). But, if *nur* was adjoined to CP, *nur* should not be able to undergo scope reconstruction. In contrast to Jacobs's analysis, an analysis where *nur* is adjoined to the DP *Maria* and both move together from the object position makes the correct prediction for (12).

- (12) Nur Maria liebt keiner
 only Mary.(ACC) loves no one.NOM.MASC
 'Nobody loves only Mary.' (no \gg only)
 'Only Mary is such that nobody loves her' (only \gg no)

For reversed quantifiers, a CP-adjunction analysis might initially seem as attractive as Jacobs's analysis of *nur*.¹¹ However, the CP-adjunction analysis can be dismissed for reversed quantifiers for the same reason as for *only*: scope reconstruction is also available for reversed quantifiers. Specifically, (13) shows that the reversed quantifier can take scope below negation.

¹¹Altmann (1978) proposes an analysis of *im Allgemeinen* 'in general' as a CP-adject.

- (13) 20% / Zwei Drittel Studenten sind diesmal nicht angenommen worden.
 20% / two thirds students are this time not accepted become
 ‘This time, it’s not the case that 20% / two thirds of the acceptances went to students.’
 (not \gg 20%, 2/3)
 ‘This time, 20% / two thirds of the rejections went to students.’ (20%, 2/3 \gg not)

Similarly, (14) shows that the reversed quantifier can also take narrow scope below the subject quantifier *only one*. (14) also allows the surface scope. This interpretation is most easily accessible in a scenario like the following: we compile a list of which department members successfully submitted a paper to a conference. Then we wonder who the people were whose papers were only accepted at one conference.

- (14) 20% / Zwei Drittel Studenten hat nur eine Konferenz angenommen.
 20% / two thirds students has only one conference accepted
 ‘At only one conference, 20% / two thirds of the acceptances went to students.’ (only one \gg 20%, 2/3)
 ‘Of the people who were accepted by only one conference, 20% / two thirds were students.’ (20%, 2/3 \gg only one)

Now consider the following data showing a cooccurrence restriction with other determiners. So far we considered data with a reversed quantifier and a bare plural noun phrase. While bare plurals could occur without a preceding determiner, in two other ways there are syntactic cooccurrence relations between reversed quantifiers and the associated bare NPs. Firstly, reversed quantifiers cannot occur without a following noun, as shown by the examples in (15): only (15c) where the reversed quantifier and the associated NP form one constituent is acceptable.¹²

- (15) a. *(Die) Kinder haben 20% / zwei Drittel übernachtet.
 (the) children has 20% / two thirds stayed overnight

¹²The data in (15) also show a difference to the extent adverbials with *zu* ‘to’. For both (15a) and (15b), the versions with *zu* in (i) and (ii) are fully acceptable.

- (i) (Die) Kinder haben zu 20% / zu zwei Dritteln übernachtet.
 (the) children has to 20% / to two thirds stayed overnight
 ‘20% / Two thirds of overnight stays were by (the) children.’
 ‘20% / Two thirds of the children stayed overnight.’
- (ii) Zu 20% / Zu zwei Dritteln haben (die) Kinder übernachtet.
 to 20% / to two thirds have (the) children stayed overnight
 ‘20% / Two thirds of overnight stays were by (the) children.’
 ‘20% / Two thirds of the children stayed overnight.’

The difference shows that the extent adverbials have a different syntax from reversed quantifiers. However, it seems also possible for extent adverbials with *zu* to occupy a similar position to the reversed quantifiers, as shown in (iii). In this position, furthermore, the interpretation is limited to the one also available with a reversed quantifier in (15c), while (i) and (ii) are more flexible. That the definite determiner is possible in (iii), though, indicates that there still is some difference between (iii) and the reversed quantifiers, as I discuss in the main text below. I conclude that the extent adverbials with *zu* involve different structures which are beyond the scope of this paper.

- (iii) Zu 20% / Zu zwei Dritteln (die) Kinder haben übernachtet
 to 20% / to two thirds (the) children have stayed overnight
 ‘20% / Two thirds of overnight stays were by (the) children.’
 *‘20% / Two thirds of the children stayed overnight.’

- b. *20% / Zwei Drittel haben (die) Kinder übernachtet
 20% / two thirds have (the) children stayed overnight
- c. 20% / zwei Drittel Kinder haben übernachtet.
 20% / two thirds children have stayed overnight
 '20% / Two thirds of overnight stays were by children.'

Also note that reversed quantifiers differ from the focus particle *nur* 'only' and adverbials like *größtenteils* 'for the most part' and *meistens* 'mostly' with respect to the data in (15), as (16) shows. This contrast shows that reversed quantifiers are more unequivocally determiners than elements like these.

- (16) (Die) Kinder haben größtenteils / meistens / nur übernachtet.
 (the) children has for the most part / most times / only stayed overnight
 '(The) children have for the most part / most of the time / only stayed overnight.'

The second type of cooccurrence restriction involves the combination of reversed quantifiers with full DPs. If reversed quantifiers occupy the determiner position, we expect such examples to be ill-formed. The data in (17) show that this prediction is borne out: reversed proportional quantifiers cannot combine with a definite DP, an indefinite DP, or a pronoun in (17), while the combination with a bare plural in (14) is fully grammatical.

- (17) *Zwanzig Prozent {diese/einige Studenten / sie} sind angenommen worden.
 twenty percent {these/some students / they} were accepted PASS

As shown in (18), *nur* 'only' and *größtenteils* 'for the most part' contrast reversed quantifiers in this respect (see also fn. 12). For example, the textbook of Chierchia and McConnell-Ginet (1990) cites the cooccurrence of *only* with pronouns and full DPs as an argument against analyzing *only* as a determiner. The data in (17), however, show that reversed quantifiers behave more like determiners in this respect than *only* does. Only temporal adverbials like *meistens* 'most times' cannot adjoin to a DP, and therefore cannot be construed with associated DPs or NPs.

- (18) {Nur / Größtenteils / ?*Meistens} {diese Studenten / sie} sind ang. worden.
 only / for the most part / most times {these students / they} were accepted PASS
 'Only/Mostly these students / they were accepted.'

Finally, consider left dislocation, which for example, Müller (2005) uses as a test for constituency in German. (19) shows that left-dislocation is possible with reversed quantifiers. The quantifier-noun sequence in (19) forms a DP that occupies one argument position of the verb *angenommen*, which is mediated by the resumptive pronoun *die*.

- (19) 20% / Zwei Drittel Studenten, die sind nur 2006 angenommen worden.
 20% / two thirds students they were only 2006 accepted PASS

In sum, the data in this section argue that reversed quantifier and noun form a constituent. The constituent has the distribution of DPs, as seen in (19). Furthermore, the acceptability of the reversed quantifier depends on an NP following it. All of this behavior follows straightforwardly from an analysis of the reversed quantifier-noun sequence as a DP. Of course, I couldn't possible rule out every other conceivable analysis. Nevertheless, I will restrict attention to the DP analysis for the remainder of this paper. In the following section, I address the case and agreement properties of reversed quantifiers and their NPs within the DP-analysis.

2.2 Case and Agreement

In this section, I argue for three generalizations regarding case and agreement of reversed quantifiers: the first relates to the pattern of strong and weak morphology in German DP-internal agreement, the second to verbal agreement, and the third to case agreement. I show that the reversed quantifier and its associated NP behave like two separate DPs for the strong/weak morphology. Secondly, I show that when the quantifier itself has a nominal constituent, the verb can agree with the noun of the quantifier or with the associated NP. Finally, I show that both the quantifier and the associated NP agree in case.

Within the German DP, there is generally agreement in number, case and, in the singular, gender among noun, determiner, and adjectives. Furthermore, German grammar imposes a distinction between *strong* and *weak* endings, which is more intricate: the endings for all three categories (D, N, and A) are similar and frequently syncretic. The class of endings with the greatest number of distinct items must be used, among others, with definite determiners. In German grammar, these are called the strong endings. Most adjectives and some nouns take strong endings only when they aren't preceded by a definite determiner or some other determiner that takes a strong ending. Otherwise, these adjectives and nouns must take a weak ending. (20) and (21) exemplify this behavior: with the definite in (20), the weak endings are used for an adjective and a noun, which don't mark case in the plural. But, the strong endings that mark case are used for both an adjective and a noun with either a bare plural NP or a bare numeral followed by an NP, as in (21).

- (20) a. Die schwedisch-en Studierend-en haben sich registriert.
 the.PL,NOM,STRONG Swedish-PL,WEAK student-PL,WEAK have self registered
 'The Swedish students registered.'
- b. (Drei) Schwedisch-e Studierend-e haben sich registriert.
 (three) Swedish-PL,NOM,STRONG student-PL,NOM,STRONG have self registered
 '(Three) Swedish students have self registered.'

As (21) shows, reversed quantifiers also require strong endings on the following adjective and noun.

- (21) 10% schwedisch-e Studierend-e haben sich registriert.
 10% Swedish-PL,STRONG,NOM students-PL,STRONG,NOM have self registered
 '10% of the people who registered were Swedish students.'

For reversed mass quantifiers, as well, the strong endings are used, as shown by (22).

- (22) Aus 50% zugefügtem Zucker besteht dieses Müsli.
 out of 50% added-SG,STRONG,DAT sugar consists this musli
 '50% of this musli is added sugar.'

The same pattern is corroborated by fractions, but these data are more complicated since the fractions themselves have an internal syntax.¹³ The singular fraction in (23a) and the plural one

¹³The word *Prozent* 'percent' can also function as a noun in German, as in (i).

in (23b) both contain the adjective *gut* (lit. ‘good’, here ‘slightly more’) construed with the head noun of the fraction.¹⁴

- (23) a. Ein-e gut-e Hälft-e schwedisch-e
 one-SG,NOM good-SG,NOM half-SG,NOM Swedish-PL,STRONG,NOM
 Studierend-e hat / ?haben sich registriert.
 students-PL,STRONG,NOM have.3SG / have.3PL self registered
 ‘Slightly more than half of the registrations were by Swedish students.’
- b. ?Zwei gut-e Drittel schwedisch-e
 two good-PL,STRONG,NOM thirds.NOM Swedish-PL,STRONG,NOM
 Studierend-e haben sich registriert.
 students-PL,STRONG,NOM have.3PL self registered
 ‘Slightly more than two thirds of the registrations were by Swedish students.’

For these data, the observation plays a role that the numeral *ein* ‘one’/‘a’ has a mixed status in the strong/weak system of German, while all other numerals are followed by strong agreement, as we see in (23b). *Ein*, however, for some feature combinations has an ending of its own and then generally triggers the weak endings, as seen in (23a). For the feature combination in (23a), the strong and weak endings are homophonous, but the dative example in (24) shows conclusively that indeed the weak ending must be used.

- (24) ?Aus ein-er gut-en Hälft-e
 out of one-DAT,SG,FEM,STRONG good-DAT,SG,WEAK half-SG
 zugefügt-em Zucker besteht dieses Müsli.
 added-DAT,SG,MASC,STRONG sugar consists this musli
 ‘Slightly more than half of this musli is added sugar.’

The pattern in (24) shows most clearly that the determination of weak/strong morphology in within the fraction is independent of that on the associated NP. This shows that there are two DPs present in these examples.

Now consider verbal agreement, which German exhibits with subjects in person and number. Since all reversed quantifiers are third person and there is no gender agreement on the verb

- (i) Diese Partei hat ihr Ergebnis um 12 Procente gesteigert.
 this party.[FEM] has PRO.FEM.POSS result by 12 percent-PL increased
 ‘This party increased its result by 12 percent.’

However, the inflected form is incompatible with a proportional quantifier in (ii) and (iii) (vs. (22)).

- (ii) *10 Prozent-e der schwedisch-en Studierend-en haben sich registriert.
 10 percent-PL of the Swedish students have self registiered
- (iii) *10 Prozent-e schwedisch-e Studierend-e haben sich registriert.
 10 percent-PL Swedish students have self registered

¹⁴The preferred version of (23b) would be to use *gut* ‘good’ without inflection and in a different position, as in (i). However, (23b) is also quite acceptable.

- (i) Gut zwei Drittel schwedisch-e Studierende haben sich registriert.
 good two thirds.NOM Swedish-PL,STRONG,NOM students-PL,STRONG,NOM have.PL self registered
 ‘Slightly more than two thirds of the registrations were by Swedish students.’

in German, number agreement is all we can investigate. The example in (23a) already indicates the general pattern: both agreement with the head noun of the fraction and also agreement with the noun associated with the quantifier is possible, but agreement with the head noun of the fraction is preferred. This is confirmed by the data in (25a) (a simplified version of (23a)) with a singular fraction and plural NP and in (25b) with a plural fraction and a singular NP.

- (25) a. Ein-e Hälfte Japaner hat / ?haben sich registriert
 one-SG,NOM half Japanese-PL have-3SG / have-3PL self registered
 ‘One half of the registrations were by Japanese.’
 b. Zwei Drittel Butter ?kommt / kommen in diesen Teig.
 two thirds butter come-3SG / come-3PL into this dough
 ‘Two thirds of what goes into this dough is butter.’

The same pattern also is found with percentages even though the noun *Prozent* ‘percent’ itself doesn’t exhibit full nominal morphology (as discussed in fn. 13). (26a) shows *Prozent* in the singular with a plural associated noun, and (26b) shows *Prozent* in the plural with a singular associated noun.

- (26) 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.’

Finally consider case-marking. For the reversed quantifiers, both the quantifier and the associated NP exhibit the case that is appropriate for the verbal or prepositional argument position that they occur in. In other words, the two phrases generally agree in case. This pattern is already exemplified by much of the data above (especially, (24)), but since the nominative and accusative forms are homophonous except for the masculine singular, I present some more examples. The first pair in (27) shows nominative vs. accusative case on both the quantifier and the associated NP.

- (27) a. Ein hoher Prozentsatz deutscher Käse wurde verkauft.
 a-NOM high-NOM percentage German-NOM cheese was sold
 ‘A high percentage of what was sold was German cheese.’
 b. Einen hohen Prozentsatz deutschen Käse hat sie verkauft.
 a-ACC high-ACC percentage German-ACC cheese has she sold
 ‘A high percentage of what she sold was German cheese.’

The example in (28) shows a contrast with the data in (23) above. Namely, (28) has dative case on both the fraction and the associated NP while the data in (23) show nominative/accusative case.¹⁵

- (28) ?Zwei Drittel-n Studierend-en wurde gratuliert.
 two third-PL,DAT student-PL,DAT PASS congratulated
 ‘Two thirds of the congratulations went to students.’

¹⁵The case marking on *Drittel* is optional in (28).

In sum, this section showed that both the quantifier and the associated NP act like they are arguments of the verb (or a preposition), but in some sense are parallel. We saw that with respect to the strong/weak morphology and case-marking the following descriptive pattern holds: If the reversed quantification structure (29a) is grammatical, both (29b) with NP-ellipsis and (29c) with a bare NP also are grammatical.

- (29) a. [reversed quantifier] [associated NP] verb ...
 b. [reversed quantifier] verb ...
 c. [associated NP] verb ...

Also verbal agreement exhibits a similar generalization that both quantifier and verb: if there is a mismatch in number between the reversed quantifier and the associated NP, either one can trigger agreement on the verb, though agreement with the reversed quantifier is slightly preferred.

- (30) [reversed quantifier] [associated NP] Verb ...

3 Logical Form and Semantics

Up to now, I have characterized reversed quantification as a true reversal of the conservative interpretation of a quantifier: when the conservative interpretation was $Q(A)(B)$, the reversed interpretation was $Q(B)(A)$ in the data above. However, example (31) shows that this characterization isn't always correct. With focus on the adjective *deutsche* 'German', the interpretation of (31) differs from the reverse application of the quantifier. Reverse application would predict an interpretation requiring that twenty percent of all accepted people, including both students and faculty, were German students. But, (31) is interpreted with a smaller restrictor of the quantifier 20%: the set of accepted students, excluding accepted faculty.

- (31) Zwanzig Prozent [DEUTsche]_F Studenten sind angenommen worden.
 twenty percent German_F students be accepted become
 'Twenty percent of the accepted students were German.'

The effect of narrow focus in the associated noun phrase can be observed in all examples where the associated noun phrase of the reversed quantifier is complex. (32) is an example with a fraction. In this case, the plain reversed interpretation would be clearly false: It would require that most Berlin residents be foreigners from Europe. But (32) with narrow focus on *Europa* has an interpretation that is actually true at least if Russia and Turkey are regarded as parts of Europe.

- (32) Zwei Drittel Ausländer aus [EuROpa]_F wohnen in Berlin.
 two thirds foreigners from Europe reside in Berlin
 'Two thirds of the foreigners living in Berlin are from Europe.'

Examples (31) and (32) show that the restrictor of the reversed quantifiers is determined by focus, rather than by surface constituency. A similar phenomenon was studied by Herburger (1993, 1997, 2000), who introduced the term *focus-affected quantification*. Herburger's data in

(33) concern the proportional reading of the quantifiers *few* and *many*.¹⁶ She points out that (33b) has an interpretation that can be paraphrased as follows: a large percentage of the cooks that applied were incompetent.

- (33) a. Many [ScandiNAvians]_F have won the Nobel prize in literature.
(Westerstahl 1985:403)
b. Few [inCOMpetent]_F cooks applied. (Herburger 1993:81)

As indicated in (33), the focus-affected interpretation requires a focus on or within the NP associate with *many* or *few*. Herburger already points out that similar data are available in German as illustrated in (34).

- (34) a. Viel-e / Wenig-e [KÖCH-e]_F haben sich beworben.
many-PL.NOM / Few-PL.NOM [cook-PL.NOM]_F have self applied
'A small / large proportion of applicants were cooks.'
b. ... weil ja doch viele / einige / wenige [SCHWALben]_F in den Süden
because PRT PRT many / some / few [swallows]_F to the South
fliegen
fly
'because many / some / few of those flying to the South are swallows'
(Herburger 1997:95)

In contrast to the reversed quantification data with percentages and fractions, focus-affected quantification and conservative quantification show no morphological differences other than the placement of focus. While (34a) has a salient focus-affected (i.e. in effect, reverse) reading, (35) has a conservative interpretation.¹⁷

- (35) Viel-e / Wenig-e Köch-e haben sich [beWORben]_F
many-PL.NOM / Few-PL.NOM cook-PL.NOM have self applied
'A small / large proportion of all cooks applied.'

However, this lack of morphological distinction may also indicate that the interpretation of (35) should also be derived as a focus-affected interpretation. Note that the arguments of the quantifier *viele* 'many' also depend on focus more than on syntactic constituency even when the focus is not part of the NP associated with *viele*: the focus in (36) is place on part of the object DP, and the resulting interpretation has a restriction solely determined by focus.

- (36) Viel-e / Wenig-e Köch-e haben sich in [INA]'s Abteilung beworben
many-PL.NOM / Few-PL.NOM cook-PL.NOM have self in [INA]'s department applied
'A large / small proportion of the cooks that applied applied to Ina's department.'

¹⁶Herburger also discusses examples with intersective quantifiers like *some*. But with intersective quantifiers the relevant distinctions in interpretation cannot be detected since they are symmetric, so I disregard these data in my discussion.

¹⁷A scenario with two versions to bring out the conservative readings for (35) is the following: the human resources department reviews which employees applied for outside positions to estimate job satisfaction. Cooks stand out in the results: [Version for *many*:] Out of the 5 cooks, 4 applied elsewhere. [Version for *few*:] Out of the 1000 cooks, only 100 applied elsewhere.

I propose therefore that the reversed readings and Herburger's focus-affected readings have the same grammatical source. One effect that also corroborates this proposal comes the restriction of focus-affected reading to stage level predicates that Herburger (1997) observes. (38) shows two examples similar to Herburger's example (37). If focus-affected interpretations were available in (38), both should have a reading that is actually true: 10% of the about 100 million German speakers are Austrian. But this reading isn't easily available for (38a) with *wenige* ('few') nor for (38b) with a percentage.¹⁸

(37) #Few [SalvaDOreans]_F speak Spanish. (Herburger 1997:63)

- (38) a. #Wenige Österreicher_F sprechen Deutsch
 few Austrians speak German
 Intended: 'Few of the German speakers are Austrian.'
- b. #10% Österreicher_F sprechen Deutsch.
 10% Austrians speak German.
 Intended: '10% of the German speakers are Austrian.'

That the cardinal determiners *many/few* behave like the pseudo-partitives and the proportional determiners we are considering also follows from work on cardinal determiners such as that by Hackl (2000). Hackl argues that cardinal determiners involve a null measurement head *CARD*. The abstract head *CARD* is structurally analogous to the unit noun in pseudo-partitives and the nouns *percent* and the fraction nouns in the proportional quantifiers.

The analysis I propose for focus-affected readings—now including the reversed quantification data—adopts central elements from the work of Herburger (1997, 2000). Specifically, I follow Herburger to assume that the quantifiers receiving the focus-affected interpretation take clausal scope. Herburger's proposal entails that focus-affected readings involve a mismatch between overt syntax and logical form. Specifically, Herburger's focus-affected quantifiers are determiners in the overt syntax. Furthermore, I argued above that reversed quantifiers form a DP constituent with their associated noun in overt syntax. But, that the quantifier in both cases takes clausal scope at LF like an adverb is the claim of Herburger's I adopt. The syntactic transformation required to accomplish this is unusual. I first illustrate the proposal by means of example (39) (repeated from (4b)).

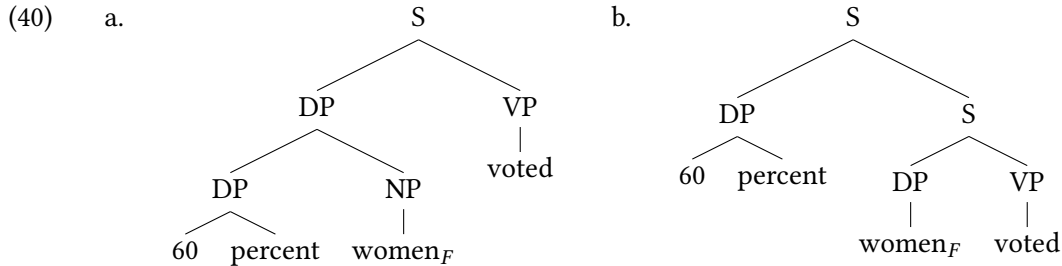
- (39) 60% [FRAU-en]_F haben gewählt.
 60% [woman-PL] have-PL voted
 '60% of the voters were women.'

In (40), I again show focus-marking on *Frauen* ('women').¹⁹ Focus on the associated NP *Frauen* is obligatory in (39). I propose, therefore, that the structural configuration of focus-affected quantification requires the NP that forms a constituent with the focus-affected quantifier to either be in focus or to contain a subconstituent that is in focus.

¹⁸In my judgment, though, example (37b) is slightly easier to accept than (38a). This difference may arise because (38b) is morphologically unambiguous: the reversed interpretation is required.

¹⁹In the discussion of reversed quantification in the previous sections, I generally omitted focus. However, it is as far as I can tell always the case the NP associated with the reversed quantifier must be focussed, as shown in (39).

The overt constituency of the (39) that I have argued for is shown in (40a). The LF representation I assume for (39), however, has the constituency in (40b).²⁰



Following Herburger, I assume that there is a syntactic movement rule that must apply covertly to transform (39) into (40). To make this explicit, I state the generalization in (41):

- (41) *DP-Adverbification Generalization*: The structural configuration [_{DP} DP NP] in an argument position that case *Z* is assigned to have the following properties:
- DP and NP share the same case marking, namely for case *Z*
 - both DP and NP are accessible for verbal agreement
 - NP must contain a focus
 - at LF, DP must move to position outside of DP with clausal scope

At this point, (41) is a descriptive generalization. I hope future work in syntax can derive (41) from more general principles, but at this point have no contentful suggestions regarding this endeavour.

Now consider the semantic interpretation of structure (40b). The central intuition is that (39) involves association with focus, as Herburger already proposes for her focus-affected readings. Rooth (1985, 1992) has proposed different semantic mechanisms for association with focus: direct association in Rooth (1985) and indirect association in (Rooth 1992). While Herburger adopts direct association, I assume indirect association in the following. Already Krasikova (2011) presents a version of Herburger's proposal using indirect association, so my proposal essentially extends this analysis to reversed quantification. In the indirect analysis, the silent operator \sim associates directly with focus and a contextual variable links \sim with the focus-sensitive quantifier. A structure for focus-sensitive quantification is shown in (42).

- (42) $\text{many}_C \sim_C \lambda_x [\text{cooks}_F(x) \wedge \text{applied}(x)]$

Rooth's operator \sim introduces the presupposition that $C \subset \lambda x \text{ applied}(x)$. This presupposition is derived from the set of focus alternatives of $\lambda_x [\text{cooks}_F(x) \wedge \text{applied}(x)]$. Since *C* restricts *many*, the predicted interpretation of (42) is the one paraphrasable as a large part of the people who applied were cooks.

For the syntactic derivation of (42), the determiner *many* moves from the DP internal position to a position with clausal scope. This movement furthermore introduces the abstractor λ_x in (42), while \sim_C must be inserted countercyclically (Nissenbaum 2000). Finally, the variable

²⁰In LF representation in (40b), the semantic heads establishing association with focus are omitted for simplicity. See the further discussion below.

x must inserted by the movement twice; in the argument position of the noun phrase and also the verb.

For reversed quantification exactly the same structure predicts the observed interpretations. Consider again (31), repeated in (43).

- (43) Zwanzig Prozent [DEUTsche]_F Studenten sind angenommen worden.
 twenty percent German_F students be accepted become
 ‘Twenty percent of the accepted students were German.’

The logical form representation of (43) is shown in (44).

- (44) $20\%_C \sim_C \lambda_x [[\text{German}_F \text{ students}](x) \wedge \text{was-accepted}(x)]$

Since in (44), the focus is only on the adjective, the value of C is presupposed to be a subset of $\lambda_x [\text{students}(x) \wedge \text{was-accepted}(x)]$; that is, the set of accepted students. The interpretation is therefore predicted to only range over accepted students, not all people accepted.

4 Conclusion

In this paper, I discussed contrasts like (45) (repeated from (4)) in German. Specifically noteworthy is that (45b) violates the conservativity universal.

- (45) a. 60% der Frauen haben gewählt.
 60% the.GEN women have voted
 ‘60% of the women voted.’ (conservative)
 b. 60% Frauen haben gewählt.
 60% women have voted
 ‘60% of the voters were women.’ (reverse)

I argued that proportional quantifiers with heads like *Prozent* ‘percent’ and the fractions such as *Drittel* ‘third’, and pseudo-partitives in German can occur in the two kinds of structures shown below (repeated from (10)); one leading to conservative quantification, the other leading to focus-affected quantification.

- (46) a. conservative
-
- ```

graph TD
 DP_X_CASE[DP_{X-CASE}] --- 20[20]
 DP_X_CASE --- D_prime[D']
 D_prime --- D[D]
 D --- Prozent[Prozent]
 D_prime --- DP_GEN[DP_{GEN}]
 DP_GEN --- der[der]
 DP_GEN --- Studenten[Studenten]

```
- b. reverse
- 
- ```

graph TD
  DP_X_CASE[DP_{X-CASE}] --- DP_X_CASE_20[DP_{X-CASE}]
  DP_X_CASE --- NP_X_CASE[NP_{X-CASE}]
  DP_X_CASE_20 --- 20[20]
  DP_X_CASE_20 --- D[D]
  D --- Prozent[Prozent]
  NP_X_CASE --- Studenten[Studenten]
  
```

In both cases, I assumed that the quantifiers project a DP headed by *Prozent* ‘percent’ or another uninflected measure noun. In the conservative structure, this determiner takes a DP complement which receives genitive case. In the structure leading to the reversed interpretation, however, the associated NP is merged to the DP projected from *Prozent* (‘percent’) and the numeral

preceding the measure noun. I claim that this structure explains certain morphosyntactic behaviors of the reversed quantifiers: they agree with respect to case, but at the same time behave like to independent nominal phrases with respect to strong/weak adjective marking.

For the interpretation, I argue that the mechanisms of focus-associated readings that Herburger (2000) developed must be applied. Specifically, this involves LF-movement of the determiner to a position with clausal scope. Conservativity is violated by the reversed structure at the overt structure, but at LF conservativity holds.

Further support for the LF-movement analysis comes from the observation that some adverbials (though not all, as example (18) showed) can occur in the same position as the reversed quantifiers.

- (47) a. Größtenteils / Überwiegend [KINd-er]_F hab-en das Konzert besucht.
biggest.part / over.weighing child-PL have-PL the concert visited
'Most of people who attended the concert were children.'
- b. Ausschließlich / Nur [HOLLändische]_F Frau-en sind Fahrrad gefahren.
exclusively / only [Dutch]_F woman-PL be.PL bicycle driven
'All the women who rode a bicycle were Dutch.'

These examples share the constituency of reversed quantification. Also, the NP associated with the quantificational adverbial must contain a focus that associates with the fronted constituent. However, there is one selectional difference: adverbials allow the associated phrase to also be a full DP rather than just an bare NP, as the contrast in (48) illustrates.

- (48) a. Größtenteils / Ausschließlich die Kinder_F hat sie versorgt.
biggest.part / exclusively die child-PL has she for.cared
'She mostly / only took care of the children.'
- b. *Zwei Drittel / 99% die Kinder hat sie versorgt.
two third / 99% the child-PL has she for-cared

Finally, there is also evidence from islands to LF-movement (see Bayer 1996) that corroborates the analysis. (49) is one relevant example: if the reversed quantifier is embedded within a complex DP, the reversed quantifier interpretation is difficult.

- (49) *?Die Bilder von (nur) 20% Frauen hängen im Louvre.
the pictures of (only) 20% women hang in the Louvre

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