

An Empirical Study of Quantifier Scope in German

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1. Introduction

This paper is aimed at shedding more light on the difficult field of quantifier scope in German. The central question to be investigated in this paper is: Under what conditions are doubly quantified sentences in German (i.e. sentences with two quantified expressions) ambiguous with respect to scope?

In section 2, I will briefly present two approaches towards a syntactic analysis of quantifier scope that can be found in the recent literature. In particular, I will discuss their predictions concerning the (non-)existence of scope ambiguities. In section 3, I will sketch out an empirical test method to find out which of the predictions are borne out. After a brief description of the test set-up, I will in some length discuss the test sentences that were to be judged by (non-linguist) native speakers of German concerning their scope ambiguity or non-ambiguity. This will be followed by the presentation and (cautious) interpretation of the results obtained in section 4. Finally, there will be a short conclusion as well as an outlook concerning the question on which data a further investigation of quantifier scope in German should focus in section 5.

2.1 Scope ambiguity

The central question of this paper is the following: Under what circumstances does a German sentence show scope ambiguities? The phenomenon of scope ambiguity is illustrated by (1):

- (1) Ein Mann liebt jede Frau.
a man loves every woman

Sentences like (1) are generally considered to be ambiguous between a surface scope reading and an inverted scope reading.¹ Under its surface scope reading (1) means that there is one man *x*, such that this man *x* loves every single woman in a given discourse domain. Thus, under this reading the interpretation of the quantified expressions (or 'Quantifier Phrases (QPs)') corresponds to their s-structural relation, and the subject 'ein Mann/some man' has scope over the object 'jede Frau/every woman'. Under its inverted scope reading, however, (1) means that for every woman *y* (in a given discourse domain) there is a (possibly different) man *x*, such that *x* loves *y*. In this case the interpretation of the quantified expressions does not correspond to their s-structural relation. Instead, the object QP takes

¹ The ambiguity comes out more clearly, if the sentence has a 'rise-fall'-intonational pattern, with the rising tone on the first quantifier 'Ein/a' and the falling tone on the second quantifier 'jede/every' (cf. Pafel 1991). The indefinite article 'ein/a' is considered to be a genuine quantifying expression (possibly an abbreviation of 'irgendein/some') contrary to Heim (1982), who argues that indefinites have no quantifying force of themselves.

scope over the subject QP.

It would be a desirable outcome of any study of quantifier scope, if it could be shown that the scopal behaviour of quantified expressions (QPs) was essentially determined and governed by structural, i.e. syntactic (or semantic) properties, more than by pragmatic or other discursive factors. Now, the simplest possible hypothesis about the determination of quantifier scope by syntactic structure² would be something like (2):

(2) **Hypothesis I:**

Scope is syntactically determined: A quantified expression (QP), which c-commands another, takes scope over it.³

However, in view of the ambiguity of sentences like (1) it becomes immediately clear that, if (2) holds true, the relevant syntactic level of representation for the determination of quantifier scope in German cannot be the level of surface structure. If scope was determined at s-structure in German, the existence of the inverted scope reading of (1) could not be accounted for, since the Object-QP does not c-command the subject-QP at this syntactic level.

2.2 The Unrestricted Ambiguity Approach

A possible answer to the difficulties posed to (2) by the existence of an inverted scope reading for (1) is to have the scope of a QP be determined at the syntactic level 'Logical Form (LF)'. This line of argument is taken e.g. by May (1977,1985), Aoun/Li (1993) and Hornstein (1995), who all suggest LF-analyses for quantifier scope. The main underlying assumption of all these analyses can be (somewhat simplified) summarized as follows:

(3) **Hypothesis II:**

Any quantified expression (QP) can be raised at LF by means of a covert syntactic operation 'Quantifier Raising (QR)'. Consequently, inverted scope readings are freely available for sentences with two (or more) QPs (if no other restrictions on syntactic movement are violated).

I shall call this position on quantifier scope the Unrestricted Ambiguity Approach. Its main prediction is, once again, that a sentence with a QP in subject and a QP in object position should have two readings: one surface scope reading with wide scope for the subject, and one inverted scope reading with wide scope for the object.

There is independent evidence for the assumption of a covert movement operation QR at LF: Quantifier scope appears to be subject to the same restrictions on movement that hold

² I shall not be concerned with semantic approaches to quantifier scope in this paper (cf. e.g. Kempson/Cormack 1981).

³ A link between c-command and scope can already be found in Reinhart (1976). It is basic to all syntactic approaches to quantifier scope that are discussed in this paper.

for overt *wh*-movement, e.g. the CNPC and the CSC by Ross (1967). This means that QPs cannot take scope out of syntactic islands. To illustrate this analogous behaviour of quantifier scope and overt *wh*-extraction let us look at (4a) and (4b) (cf. Ruys 1993 for a minute discussion and overview):

- (4a) *Wen_i hat ein Professor [VP[VP t_i bewundert] und [VP den Dekan verachtet]]?
 whom has some professor admired and the dean despised
- (4b) ..., weil ein Professor [VP[VP jeden Studenten bewundert] und [VP den
 , since some professor every student admires and the
 Dekan verachtet].
 dean despises
 '..., since some professor admires every student and despises the dean.'
 ≠'for every student there is one (possibly different) professor who admires him and
 despises the dean.'

In (4a) we see a typical example of a CSC-violation. The interrogative pronoun 'wen/whom' cannot be moved out of the lower VP, since this VP is part of a coordinated structure (the higher VP), and extraction out of parts of coordinated structures is ruled out by the CSC. Similarly, (4b) cannot have the reading under which the universal QP 'jeden Studenten/ every student' takes wide scope over the whole sentence. To get wide scope the universal QP would have to be moved covertly out of the embedded VP to a higher position in the sentence. This movement is - as shown - ruled out by the CSC. Thus, the absence of the wide scope reading for the universal QP in (4b) can be taken as independent evidence for a covert operation 'QR'.

Here, we shall not be concerned with the exact status of 'QR' as A- or A-bar-movement, the possible landing sites for QPs at LF, nor with other differences between the various LF-analyses, which have been mentioned⁴. For our purposes it is enough to note that all these analyses assume that, if a sentence is to have an inverted scope reading, the s-structurally lower QP has to be covertly moved across the higher QP into a position from where it can c-command the latter.

However, in recent years there has been an increasing number of authors who argue that Hypothesis II in (3) might be too strong in the sense that it predicts scope ambiguities where there are none.

2.3 The Restricted Ambiguity Approach

Among those authors who argue that hypothesis II is too strong and needs to be more restricted are e.g. Frey (1993), Beghelli (1993), Ruys (1993), and Liu (1997). The central

⁴ For technical details see the references cited. For a summarizing overview of the analyses of May (1985), Aoun/Li (1993) and Hornstein (1995) and their applicability to German see also Zimmermann (1997).

claim of their approach to quantifier scope is the following: Not all doubly quantified sentences are ambiguous with respect to scope. I shall call this position on quantifier scope the Restricted Ambiguity Approach. Let us look at sentences (5) (from Beghelli 1993) and (6) (from Frey 1993):

- (5) Two students passed fewer than six classes.
 ≠‘There is a class of fewer than six seminars so that each of these seminars was passed by two students.’
- (6) Viele Männer haben mindestens eine Frau hofiert.
 many men have at least one woman courted.
 ‘Many men have courted at least one woman.’
 ≠‘There is at least one woman *x* so that *x* was courted by many men.’

Now, what makes (5) and (6) interesting is that these sentences show no scope ambiguities according to Beghelli and Frey. They hold that the sole reading of (5) and (6) is the surface scope reading, with the subject taking scope over the object. The inverted scope readings given in paraphrases are judged to be impossible. Moreover, it appears to be the case that modified cardinal QPs such as ‘mindestens eine/ at least one’, ‘weniger als sechs/ fewer than six’, ‘höchstens drei/ at most three’ generally take scope *in situ* (i.e. in their s-structural position) (cf. Beghelli 1993:68). Consequently, modified cardinal QPs can never take scope over an s-structurally higher QP, and inverted scope readings with this kind of QP are predicted to be impossible. If this observation can be confirmed empirically, it will contradict the predictions made by hypothesis II in (3).

Given that Beghelli’s and Frey’s judgments of (5) and (6) respectively are correct, it is obvious that hypothesis II in its present form could not account for (5) and (6). It would be too strong and predict inverted scope readings that do not exist. What is needed, then, is a more restricted hypothesis, which can account for (5) and (6). A possible solution to the puzzle would be that only some QPs can be raised at LF, but others cannot. This different syntactic behaviour would best be anchored to some inherent semantic properties of the quantifiers involved. What properties could this be?

2.3.1 Strong vs. Weak Quantifiers

Ruys (1993) takes the properties of ‘strength’ and ‘weakness’ for the relevant semantic properties of quantifiers that are responsible for their different scopal behaviour. Restriction and nuclear scope of a ‘weak’ quantifier can be exchanged without a change in truth conditions. Relevant for the truth is only the cardinality of the intersection between the classes denoted by both. ‘Weak’ quantifiers (such as ‘zwei/two’, ‘höchstens drei/at most three’, and ‘viele/many’) are therefore also called ‘intersective’ or ‘symmetric’ quantifiers. On the other hand, the exchange of restriction and nuclear scope of a ‘strong’ quantifier is not possible without a change in truth conditions. Strong quantifiers (such as ‘jede(r)/every’,

‘die meisten/most’ and ‘alle/all’) are therefore also called ‘asymmetric’ quantifiers. Ruys’ observation can now be stated as in (7):

(7) **Hypothesis III:**

Only strong QPs can be raised by QR at LF and thus take inverse scope. Weak QPs cannot raise at LF and therefore *have* to take scope *in situ* (cf. Ruys 1993:130).

Hypothesis III in (7) covers the ambiguity of (1) as well as the claimed non-ambiguity of (5) and (6). The QP ‘jede Frau/every woman’ in (1) is a strong QP, since ‘jeder/every’ is a strong quantifier. Being strong, the QP can be raised at LF and thus take scope over the subject QP. The ambiguity of (1) is therefore covered by hypothesis III. Modified cardinal QPs, on the other hand, are weak QPs, since modified cardinals such as ‘mindestens eine/at least one’ are weak quantifiers. Being weak, the object QP ‘mindestens eine Frau/ at least one woman’ in (6) cannot raise at LF but must be interpreted *in situ*. Consequently, (6) has only the surface scope reading with the subject taking scope over the object. Given that, the claimed non-ambiguity of (5) and (6) is correctly covered by hypothesis III.⁵

The adequacy of hypothesis III in (7) hinges on the non-ambiguity of sentences such as (5) and (6) as opposed to the ambiguous sentence (1). In order to confirm or deny hypothesis III, it is therefore essential first to confirm the judgments of (5) and (6) as (non-) ambiguous. Due to the insecurity and instability of these judgments this confirmation cannot be reached by mere introspection alone, but has to be based on a broader empirical footing.

However, there are some data that seem to suggest that hypothesis III is on the right track, and that weak and strong quantifiers behave differently with respect to scope in identical syntactic environments. Compare sentences (8) and (9):

- (8) Irgendjemand hat viele Politiker fotografiert
 someone has many politicians taken a picture of
 ‘Someone has taken a picture of many politicians.’
 ≠ ‘There is a large group of politicians, and each politician of this group had their picture taken by somebody different.’
- (9) Irgendjemand hat die meisten Verdächtigen gewarnt.
 someone has the most suspects warned
 ‘Someone has warned most suspects.’
 ‘There is a large group of suspects, and each of these suspects has been warned by somebody different.’

⁵ Beghelli (1993:70) suggests an even more restrictive (minimalist) analysis of quantifier scope: For him, only ‘distributive’ QPs like ‘jeder/every’ can be raised covertly at LF, since they have to move to SpecDistP at LF. Therefore only distributive QPs can take inverse scope over other (s-structurally higher) QPs. Beghelli thus predicts scope ambiguities only for sentences with distributive QPs in a lower s-structural position. That the property of ‘distributivity’ is of some importance for the phenomenon of quantifier scope was already observed by Ioup (1975). For the interaction of quantifier scope and distributivity in German cf. also Pafel (1991).

(8) seems to be unambiguous. It has only the surface scope reading, under which there is only one person x that has warned many politicians. The inverted scope reading (given in paraphrase) seems impossible for (8). Contrary to that, sentence (9) appears to be ambiguous between the surface scope reading and the inverted scope reading (given in paraphrase).

Hypothesis III predicts this difference between (8) and (9): The non-ambiguity of (8) can be covered, since the object ‘viele Politiker/many politicians’ is a weak QP, ‘viele/many’ being a weak quantifier. As such the QP cannot be raised at LF. It can thus take no scope over the subject QP, which it does not c-command at LF. Hence, the inverted scope reading is out. In (9), on the other hand, the object QP ‘die meisten Verdächtigen/ most suspects’ is a strong QP. As such it can be raised across the s-structural subject at LF according to hypothesis III. Hence, it can take scope over the latter. Consequently, both scope readings are possible for (9).

Now let us look at the ‘Inverse linking-constructions’ in (10) to (12):

- (10) Drei Politiker *aus jedem Land* stimmten für den Entschluß.
 three politicians from every country voted for the resolution
- (11) Drei Politiker *aus mindestens zwei Ländern* stimmten für den Entschluß.
 three politicians from at least two countries voted for the resolution
 ≠‘There are at least two countries from which three politicians each voted for the resolution.’
- (12) Drei Politiker *aus zwei Ländern* stimmten für den Antrag
 three politicians from two countries voted for the resolution
 ≠‘There are two countries from which three politicians voted for the resolution.’

Inverse linking-constructions are known for the fact that they allow relatively easily for the inverted scope reading, under which the embedded quantified PP (in italics) takes scope over a higher QP. If we look at the data in (10) to (12), we see that the inverted scope reading is possible for (10), where the embedded PP is quantified by a strong quantifier. The same seems impossible for (11) and (12). Apparently, these sentences do not allow for the inverted scope readings given in paraphrases.⁶ The difference in the scopal behaviour of the quantified PPs in (10) on the one hand and (11) and (12) on the other can again be accounted for by hypothesis III in (7): The quantified PPs in (11) and (12) contain a weak quantifier. They can therefore not be raised by QR at LF, and the inverted scope reading is out.

⁶ If correct, this observation is the more remarkable, since the surface scope reading, under which three politicians from two countries *each* voted for the resolution, is likely to be ruled out by our knowledge of the world. In fact, the most likely reading for (12) would be something like ‘There are exactly three politicians from exactly two countries (i.e. two politicians from the first country and one politician from the second country, or vice versa), who voted for the resolution’. Cf. section 3.1 for a further discussion of this additional reading.

3.2.2 Topicalization

Besides the presence of a strong quantifier there seems to be one other condition under which a German sentence can be ambiguous. This observation can be found in Frey (1993). Compare sentences (13a) and (13b) as well as (14a) and (14b) respectively (all examples are from Frey 1993):

- (13a) Viele Männer haben mindestens eine Frau hofiert.
 many men have at least one woman courted
 'Many men have courted at least one woman.'
- (13b) Mindestens eine Frau l haben viele Männer t1 hofiert.
 at least one woman have many men courted
 'At least one woman, many men have courted.'
- (14a) ..., daß viele Männer mindestens eine Frau hofierten.
 that many men at least one woman courted
- (14b) ..., daß mindestens eine Frau l viele Männer t1 hofierten.
 that at least one woman many men courted
 '...that many men courted AT LEAST ONE WOMAN.'

Frey (1993) judges (13a) and (14a) to be unambiguous. According to him they have only the surface scope reading with 'viele Männer/ many men' taking scope over the object. Contrary to that, (13b) and (14b) are ambiguous between the surface and the inverted scope reading according to Frey. Now, the relevant factor for the ambiguity of (13b) and (14b) seems to be that in those sentences the 'normal word order' (i.e. subject before object) has been changed by an overt syntactic operation, i.e. topicalization of the object and object scrambling respectively. The object QP has been raised overtly across the subject QP and can, unsurprisingly, take scope over the latter. In addition to that, however, the subject QP can still take scope over the object QP. Frey accounts for this observation by postulating the relevance of traces of QPs for the determination of scope:

- (15) Frey's Scope Principle (1993:185)
 A quantified phrase α can take scope over a quantified phrase β , if the head of the chain of α [here the subject QP in its s-structural position] c-commands the base of the chain of β [here the trace left behind by the object QP].

Frey's Scope Principle is to hold at s-structure.⁷ To maintain the assumption that scope is

⁷ This is not in contradiction to what has been said so far. Frey (1993) can maintain that scope is determined at s-structure in German because he does not consider expressions with 'jeder/every' to be genuine quantifying expressions, but possible referring expressions. Thus, sentences like (1) do not pose a problem for Frey's account, since - according to him - they do not illustrate the fact that QPs can take inverted scope, but the different fact that referring expressions (e.g. proper names) can always take widest scope in a sentence.

determined at LF, it is necessary to slightly modify Frey's account: Instead of considering QP-traces at s-structure to be relevant for the determination of scope one could also say that there is optional reconstruction of the overtly moved QP into its base position at LF. If optional reconstruction takes place, the subject QP will take scope over the object QP in (13b) and (14b). If optional reconstruction does not take place, we will get the surface scope reading with the object QP taking wide scope. If one holds up the additional assumption that only A-bar-movement can be reconstructed at LF, we get the following picture:

- (16) Hypothesis IV:
Overt A-bar-movement causes scope ambiguities.

Note that hypothesis IV in (16) predicts a difference between topicalized and passive sentences as ambiguous and unambiguous respectively. Frey (1993) does not comment on passive constructions, but his scope principle does not generally exclude the possibility that doubly quantified passive constructions, too, are ambiguous between a surface reading and an inverted scope reading. Hypothesis IV, however, clearly predicts the non-ambiguity of passive constructions such as (17), the latter being derived by A-movement (from VP to SpecIP), which is assumed to be unreconstructable at LF:

- (17) [Mindestens eine Frau]₁ wurde t₁' von vielen Männern t₁ hofiert.
at least one woman was by many men courted
'At least one woman was courted by many men.'

The adequacy of hypothesis IV can therefore be checked by confirming or disconfirming the predicted contrast between topicalized and passivized structures in the empirical study.⁸

Summing up, we have seen the following picture emerge: Whereas from the perspective of the Unrestricted Ambiguity Approach all sentences with two QPs should in principle be ambiguous (cf. hypothesis II), the Restricted Ambiguity Approach predicts scope ambiguities in two cases only: a. if the lower embedded QP is a strong QP (cf. hypothesis III), and b. if a QP has been overtly A-bar-moved across another QP (cf. hypothesis IV). The empirical test was designed to check the differing predictions made by the four hypotheses I to IV.

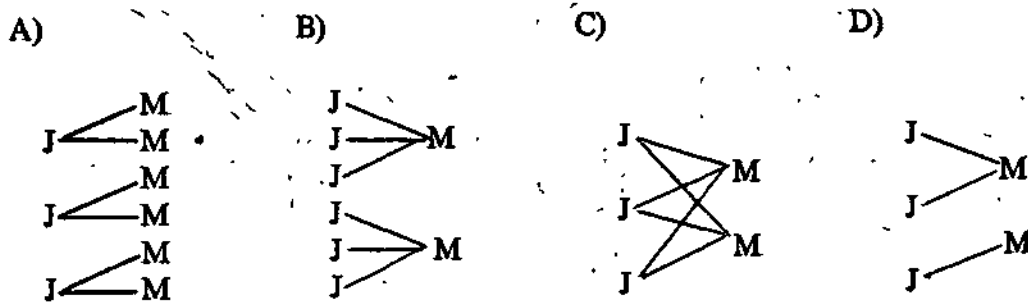
3. The Test

3.1 The Set-Up

The set-up for the test is taken from Gil (1982). The informants were presented with 11 test sentences. For each of these sentences they were presented with four different diagrams as demonstrated in (18):

⁸ Since the status of scrambling as A-movement or A-bar-movement is not clear (cf. Grewendorf/Sternefeld 1990), we will restrict ourselves to the investigation of topicalized and passive sentences in the empirical study.

- (18) Drei Jungen küßten zwei Mädchen.
Three boys kissed two girls



Each of these diagrams represents a situation that could - according to some author or other - be described by sentence (18), *J* standing for 'Junge/boy', *M* for 'Mädchen/girl', and the connecting lined for the relation that is expressed by the predicate 'küssen/kiss'. Underneath each diagram the informants were given an additional verbal paraphrase (of the form 'Boy 1 kissed two girls, and boy 2 kissed two girls, and boy 3 kissed two girls') that also describes the situation depicted by the diagramm. Presented with this information, the informants had the following task: For every test sentence they had to state for each of the four situations, a. if the sentence in question was 'true' if uttered in that situation, or b. iff the sentence in question was 'false' if uttered in that situation, or c. if they were not sure.

Now, what are the possible situations that (18) could in principle be used to describe? They are paraphrased in (19):

- (19) A: Three boys kissed two girls each.
B: Two girls were each kissed by three boys.
C: Three boys all kissed the same two girls.
D: Three boys kissed two girls between them.

We see that the use of sentences with two cardinal QPs brings along one additional difficulty. Not only are we confronted with the two 'dependent' readings, which have been discussed so far. These are the surface scope reading (A) and the inverted scope reading (B). In addition to that, there are also two so-called 'independent' readings, the 'complete group reading' C and the 'incomplete group reading' D.⁹ Under these latter readings the two quantified expressions are calculated independently of each other. So under both readings

⁹ Among the first to discuss that sentences like (15) have at least these four readings were - to the best of my knowledge - Lakoff (1972) and Jackendoff (1972). For a more detailed discussion of these readings cf. Kempson/Cormack (1981). For a semantic treatment of complete group readings cf. *ibid.* or Hintikka (1974). For incomplete group readings cf. Scha (1981).

the sentence describes a situation with exactly three boys and two girls.¹⁰ Nevertheless, although the independent readings were included in the test, we shall largely concentrate on the two dependent readings in this paper. Therefore we will keep on talking of ambiguity, if both dependent readings are available. If only one of the dependent readings is available, we will keep on talking of non-ambiguity irrespective of what other (independent) readings might be available.

3.2 The Test Sentences

The 11 test sentences were designed to check the predictions made by hypotheses I to IV. For each of the sentences there will be a short discussion why it was chosen. All sentences have in common that they are simple transitive sentences with two QPs. All sentences contain predicates that do not allow for a collective reading (e.g. predicates such as 'heben/ to lift), since this would lead to yet another increase in the number of possible readings.

For reasons of exposition, the order of presentation does not correspond to the order used in the test. The sentence numbers refer to the test order:

Sentence 1: Drei Jungen bespuckten zwei Plakate.
three boys spat at two posters.

This sentence is the basic case to be tested: A transitive sentence with two cardinal (i.e. weak) QPs in normal word order. No overt movement has taken place. According to the Unrestricted Ambiguity Approach (hypotheses I + II), this sentence should be ambiguous. According to the Restricted Ambiguity Approach (hypotheses I + III + IV), this sentence should only have the surface scope reading, since none of the two conditions for scope ambiguity in German is met.

Sentence 7: Drei Jecken küßten zwei Närrinnen.
three fools kissed two (female)jesters

This sentence has the same formal properties as sentence 1. The sentence has normal word order and both QPs are weak. Again, hypotheses I and II predict the sentence to be ambiguous. Hypotheses I and III and IV together predict the sentence to be unambiguous.

¹⁰ In preliminary tests it showed that the independent readings are very much in the foreground of the informants' attention. Thus they had to be included in the study to avoid confusion. The use of test sentences with two cardinal QPs has one theoretical and one practical motivation. The theoretical motivation is that these sentences allow for a clearcut distinction of the truth-conditions of the inverted reading from the reading, under which the object is used referentially and gets widest scope (cf. Fn.7 and Beghelli 1993). The practical motivation is that cardinal QPs lend themselves most easily for a representation through diagrams.

The function of this sentence is mainly that of a control sentence. It is used to control, if the informants judged the test sentences in a consistent or in a random way: Since the syntactic structure of 7 and the type of quantifiers involved are identical to those of 1, the judgments concerning both sentences should also be identical.

Sentence 11: Zwei Autonome bespuckten drei Schaufenster.
two radicals spat at three shop-windows

This sentence is again identical to 1 and 7 with respect to syntactic structure and quantifier type. Hence it serves as yet another control sentence. In addition, the cardinalities of the sets denoted by subject and object respectively have been interchanged. Therefore, 11 can also serve to illustrate, if the variation of the cardinalities involved affects the existence of possible readings of a doubly quantified sentence, or if the judgments remain stable despite the change.

Sentence 5: Zwei Plakate wurden von drei Jungen bespuckt.
two posters were by three boys spat at.
'Two posters were spat at by three boys.'

Sentence 5 is the passivized counterpart of sentence 1. It serves to check the influence of passivization on the meaning of doubly quantified sentences in contrast to sentences with normal word order. The existence of the surface reading with the logical object taking scope over the logical subject is predicted, since the former c-commands the latter. The central question to be answered is, if the inverted scope reading also exists. According to hypothesis IV, it should not exist, since A-movement (i.e. raising of the logical object from within VP to SpecIP) cannot be reconstructed at LF. Consequently, the logical object 'Zwei Plakate/two posters' can never be in the c-command-domain of the logical subject inside the PP (which is here considered to be adjoined to VP). If 5 was in fact ambiguous, hypothesis IV could not be adequate in its present form.

Sentence 9: Zwei Plakate bespuckten drei Jungen.
two posters(Acc.), spat at three boys
'Two posters, three boys spat at.'

Sentence 9 is the counterpart of sentence 1 after topicalization of the object. It serves to check the claim that doubly quantified sentences are ambiguous after overt A-bar-movement has taken place (cf. hypothesis IV). It now becomes clear that it was necessary to choose an inanimate object in 1. Plural cardinal QPs are not marked overtly for case in German, if they are in the nominative or in the accusative case. Consequently, subject and object in

1 and in 9 are identical in form. If we change the word order from subject>object to object>subject, e.g. by topicalization, the emerging sentence will inevitably be taken for a sentence in normal word order, the object will be (mis)interpreted as the subject of the sentence. By using an inanimate object, we try to avoid this possible misinterpretation, since only the intended interpretation with ‘Jungen/ poster’ as subject agrees with our knowledge of the world. As opposed to that, the other reading, under which ‘Plakate/ posters’ can spit, should be excluded by our knowledge of the world.

Sentence 2: 25 Spieler schossen zwei Tore.
25 players scored two goals.

The predicate in 2 is a so-called ‘asymmetric’ predicate. Asymmetric predicates express ‘one-to-many’- and ‘many-to-one’-relations between the members of the sets denoted by subject and object respectively. In the case of 2, the predicate ‘Tore schießen/ to score goals’ expresses a one-to-many-relation between the players and the scored goals, for a single goal can impossibly be scored by more than one player. Hypotheses III and IV predict sentence 2 to be unambiguous. The surface scope reading, under which 25 players scored two goals each (i.e. 50 goals all together), should be the sole dependent reading according to these hypotheses. This is because 2 contains only weak QPs, and no overt movement has taken place. However, the defendants of hypothesis II, which predicts scope ambiguities across-the-board, could also account for the non-existence of the inverted scope reading by simply assuming that the latter is ruled out due to our knowledge of the world. After all, the inverted scope reading, under which two goals are scored by 25 players each, is rendered implausible by the special semantics of the predicate. Thus, the lack of this latter reading would not necessarily speak against hypothesis II. The next sentence is more interesting in this respect.

Sentence 3: Fünf Gewehrkegeln trafen elf Zielscheiben.
five rifle bullets hit eleven targets.

Again we have to do with an asymmetric predicate: ‘Zielscheiben treffen/ to hit targets’ expresses a many-to-one-relation between the bullets that are fired and the targets that are hit. To put it another way: Under ordinary circumstances we do not expect one bullet to hit more than one target. On the other hand, one and the same target can be hit by many bullets. Thus, the inverted scope reading, under which eleven targets are hit by five bullets each, is the only plausible reading for 3. The sentence is therefore the ideal test case in order to make a decision between the Unrestricted (cf. hypothesis II) and the Restricted Ambiguity Approach (cf. hypotheses III and IV): The Unrestricted Ambiguity Approach predicts the existence of inverted scope readings for all doubly quantified sentences, hence

also for sentence 3. Contrary to that, the Restricted Ambiguity Approach predicts the absence of an inverted scope reading for 3, since the object QP is weak and hence cannot be raised at LF, and no overt movement has taken place. If it turns out that the inverted scope reading for 3 is missing, even though it is the only plausible interpretation, we will have a strong case against hypothesis II: The defenders of hypothesis II could not claim any longer that the missing inverted scope reading is impossible on the grounds of our world knowledge. On the contrary, since the inverted scope reading is the only plausible reading it should be present if not prevented by other (i.e. structural) properties of the sentence.

Thus, the lack of an inverted scope reading for 3 would also be further evidence for a structural determination of scope against pragmatic scope theories, since the only relevant factors for the nonavailability of this reading would be the syntactic structure and the weakness of the object QP.

Sentence 10: Zwei Tore schossen 25 Spieler.
 two goals (acc.) scored 25 players.
 ‘Two goals, 25 players scored.’

10 is the counterpart of sentence 2 after topicalization of the object. Hypothesis IV predicts the sentence to have only one plausible reading, under which 25 players scored two goals each. This reading is the inverted scope reading with the subject taking scope over the overtly raised object. Its existence would be explained by reconstruction of the raised object QP into its base position (cf. hypothesis IV). In its base position the object is c-commanded by the subject QP, and the latter can take scope over the former.

In sentence 10, same as in sentence 3, we have to do with the fact that the only plausible reading (due to our knowledge of the world) is the inverted scope reading. If pragmatic accounts of quantifier scope are correct, we would expect the existence of the inverted scope reading in both cases. If only sentence 10 has an inverted scope reading, we have evidence both for a syntactic determination of quantifier scope and for the correctness of hypothesis IV: The only relevant difference between sentence 3 and 10 is that in 10 the object has been overtly A-bar-moved across the subject. This structural difference would therefore be the most plausible explanation for differences in the informants’ judgments of these two sentences.

Sentence 6: Elf Zielscheiben trafen fünf Gewehr­kugeln.
 eleven targets (acc.) hit five bullets
 ‘Eleven targets, five bullets hit.’

Sentence 6 is the counterpart of 3 after topicalization of the object QP. The surface scope

reading, under which eleven targets are hit by five bullets each, is the sole plausible reading. The inverted scope reading, under which five bullets hit eleven targets each, is expected to be absent due to our knowledge of the world. If it turns out that 6 has a reading with the object taking scope over the subject (here the surface reading), but that for 3 that reading (in that case the inverted scope reading) is missing, we have further evidence that the syntactic configuration plays an important role in the determination of scope.

Satz 4: Zwei Tierquäler schlugen jeden Hund.
 two animal tormentors beat every dog.

This sentence was selected in order to test the adequacy of hypothesis III: If strong QPs can be raised at LF as stated by that hypothesis, sentence 4 is predicted to be ambiguous between surface scope and inverted scope reading.

Satz 8: Jeden Hund schlugen zwei Tierquäler.
 every dog (acc.) beat two animal tormentors
 ‘Every dog, two animal tormentors beat.’

This sentence was included in the test to show that the reading under which every dog is beaten by two (possibly different) animal tormentors (the inverted scope reading of sentence 4), does in principle exist. Unfortunately, sentence 8 cannot give evidence concerning the adequacy of hypothesis IV, although the object is topicalized. The reason is that due to the particular semantics of ‘jeder/ every’ the inverted scope reading, under which the same two animal tormentors beat every dog is logically included by the surface scope reading. 4 is therefore vague with respect to the two dependent readings and the inverse reading could be inferred pragmatically from the surface scope reading. Even if both readings exist, it is thus impossible to tell if we have to do with optional reconstruction of the object (according to hypothesis IV), or if we have to do with a case of vagueness.

4. Results and Interpretation

4.1 The Results

Below, we see the judgments for all eleven test sentences. It is important to note that the label ‘Reading A’ does not automatically correspond to the surface scope reading, but to that reading under which the logical subject takes scope over the logical object: Correspondingly, ‘Reading B’ refers to that reading under which the logical object takes scope over the logical subject. Thus, ‘Reading B’ will correspond to the surface scope reading in those cases, in which the object has overtly raised across the subject. In all other cases, it corresponds to the inverted scope reading. I will come to the significance of the two

kinds of shading below.

Table1 Sentence 1: Drei Jungen bespuckten zwei Plakate. / Three boys spat at two posters.

	READING A	READING B	READING C	READING D
true	12	6	22	16
not sure	-	-	-	1
false	11	17	1	6

Sentence 7: Drei Jecken küßten zwei Närrinnen. /
Three fools kissed two (female) jesters.

	READING A	READING B	READING C	READING D
true	13	7	21	19
not sure	1	-	-	-
false	9	16	2	4

Sentence 11: Zwei Autonome bespuckten drei Schaufenster. /
Three radicals spat at two shopwindows

	READING A	READING B	READING C	READING D
true	12	5	21	21
not sure	1	-	-	-
false	10	18	2	2

Table2 Sentence 5: Zwei Plakate wurden von drei Jungen bespuckt. /
Two posters were spat at by three boys.

	READING A	READING B	READING C	READING D
true	6	11	21	18
not sure	-	-	-	-
false	17	12	2	5

Sentence 9: Zwei Plakate bespuckten drei Jungen. / Two posters, three boys spat
at.

	READING A	READING B	READING C	READING D
true	6	7	16	15
not sure	-	-	-	-
false	17	16	7	8

Table3 Sentence 2: 25 Spieler schossen zwei Tore. / 25 players scored two goals.

	READING A	READING B	READING C	READING E ¹¹
true	10	0	12	16
not sure	-	-	-	-
false	13	23	11	7

Sentence 3: Fünf Gewehrkegeln trafen elf Zielscheiben. /
Five rifle bullets hit eleven targets.

	READING A	READING B	READING C	READING E
true	7	6	12	6
not sure	1	1	2	1
false	15	16	9	16

Table4 Sentence 10: Zwei Tore schossen 25 Spieler. / Two goals, 25 players scored.

	READING A	READING B	READING C	READING E
true	11	2	10	9
not sure	-	-	0	-
false	12	21	13	14

Sentence 6: Elf Zielscheiben trafen fünf Gewehrkegeln.
Eleven targets, five bullets hit. (n=20)

	READING A	READING B	READING C	READING E
true	4	10	7	4
not sure	1	-	2	-
false	15	10	11	16

Table5 Sentence 4: Zwei Tierquäler schlugen jeden Hund. /
Two animal tormentors beat every dog.

	READING A ¹² = READING C	READING B	READING D (n=22)
true	23	11	8
not sure	-	-	-
false	-	12	14

¹¹ The incomplete group reading D does not exist in this case: Since one goal can only be scored by one player it is impossible that 25 players score 2 goals between themselves. An even weaker reading is possible, though: Reading E stands for this reading, under which one or two players score the two goals, and the rest of the 25 players does not score at all (but is possibly involved in the process of scoring in one way or another). The same holds for the other sentences with asymmetric predicates 3, 10 and 6.

¹² Reading A is an existent surface scope reading and should as such be marked by a lighter shading. Unfortunately, my word processor proved unable to use two different degrees of shading in one and the same table. Therefore the lighter shading had to be omitted here.

Sentence 8: Jeden Hund schlugen zwei Tierquäler. /
Every dog, two animal tormentors beat. (n=22)

	READING A = READING C	READING B	READING D
true	19	16	3
not sure	-	-	-
false	3	6	19

4.2 Interpreting the Results

All in all, the judgments of 23 informants were taken into account. It is obvious that this number is far too small for a scientific statistical evaluation. All that this test can do is therefore show some trends and tendencies, and point in the direction that is to be taken in the further course of the investigation of quantifier scope.

First, we see that the independent readings C and D (and E respectively) are preferred as the meaning of doubly quantified sentences. Of these the complete group reading C is the one that is most preferred. Where C is plausible (with sentences 1, 7, 11, 5, 9, 4, 8), it is chosen by almost all informants. I do not want to speculate on possible explanations for this result, which was already observed by Gil (1982). Let it be enough that, even in the best case, the dependent surface reading, which is predicted to exist by all syntactic theories, is chosen by only 13 of the 23 informants as a possible meaning for the sentence. Therefore the interpretation of the results is based on the following stipulation: A reading is considered to be existent, if and only if roughly half of the informants (i.e. at least ten) consider it to be a possible meaning. Based on this stipulation we can cautiously come up with the following conclusions:

a.) All sentences have the surface scope reading (where the surface scope reading exists it is marked by lighter shading) with the exception of sentences 3 and 10 (cf. tables 3 and 4), and of sentence 9. In the case of sentences 3 and 10 the surface scope reading is the one that does not agree with our knowledge of the world. In one case two goals would have to be scored by 25 players each, in the other five bullets would have to meet eleven targets each. In both cases we have a pragmatic explanation for the lack of the surface scope reading.¹³

¹³ It is interesting to note that, although the independent reading C in its strict sense is implausible for sentences 2, 3 and 10, about half of the informants (i.e. 12, 12, and 10) nevertheless judged this reading to be possible for these sentences. This highlights once more the informants' general preference for the independent reading C. That the choice of reading C is not arbitrary, we can see by comments added on the test sheet by some of the informants: In the case of 2 and 10, reading C was reinterpreted as a 'team'- or 'collective effort'-reading, meaning: 'Obviously, only (one or) two players scored the two goals in question, but the efforts of the rest of the *team* were essential for the scoring of these two goals'. In the case of 3, some informants chose reading C because they made the additional (and in the 'real' world not very likely) assumption that the eleven targets were positioned behind one another. On this assumption, reading C, under which five bullets hit all the same eleven targets, makes sense. It is remarkable

In the case of sentence 9 (cf. table 2), however, we are confronted with a problem: 9 is the sentence with two weak quantifiers and a topicalized object. Hypothesis IV predicts it to be ambiguous between surface scope and inverted scope reading, but at the very least it should have the surface scope reading. Instead of these predictions, none of these readings is accepted for the sentence by the informants as a whole. The only explanation for the lack of both dependent readings that I can offer at this point is that the sentence as a whole was not accepted as a well-formed sentence of German. Apparently, quite a number of the informants did not recognize the topicalization - despite the selection of an inanimate object - and misinterpreted the sentence with the object 'Zwei Plakate/ two posters' as the subject. This misinterpretation, however, is nonsensical and was thus rejected. Possible evidence for a misinterpretation can be seen in the fact that the number of informants that chose the complete group reading C as a possible meaning is down to 16 from 22, 21, 21, and 21 for the other sentences in table 1 and 2. We must therefore suspect that those informants who did not choose reading C as a possible reading for 9 did misinterpret the sentence as a whole. Unfortunately, sentence 9 could not serve to check the adequacy of hypothesis IV.

As opposed to the surface scope reading, only *two* sentences can have the inverted scope reading (these two cases are marked by darker shading): The inverted scope reading is present in the case of sentences 10 and 4, to which I will return below.

These findings are compatible with hypothesis I: the syntactic structure seems to play a role in the determination of quantifier scope in the form of c-command. Thus, if not ruled out by our knowledge of the world, a syntactically higher QP (at s-structure) will normally take scope over a lower QP. The rather limited acceptance of inverted scope readings, on the other hand, can be taken as evidence against hypothesis II, which predicts a free availability of inverted scope readings for quantified sentences.

b.) The second finding is that weak QPs cannot take inverse scope in sentences with normal word order (cf. table 1). The non-existence of inverted scope readings for the sentences in table 1 is predicted by hypothesis III, which states that only strong QPs can be raised at LF, thereby inducing an inverted scope reading. Again, hypothesis II appears to be not adequate because it predicts the existence of inverted scope readings for the sentences in 1.

c.) Thirdly, the passivized sentence 5 (cf. table 2) has only the surface scope reading. This finding is compatible with hypotheses (I and) III and IV. Since the (s-structurally) lower QP is weak it can under no circumstances be raised at LF. Since A-movement is not reconstructable, the logical object cannot be reconstructed into its base position. Thus, the logical subject cannot c-command the logical object and the inverted scope reading is out.

d.) In the case of sentence 4 (cf. table 5) the strong object QP can take inverse scope. The

that in certain cases the informants went through some pains in constructing contexts in order to let particular readings become plausible. As noted above, this was done frequently in the case of the independent reading C.

sentence is ambiguous between a surface scope and an inverted scope reading. This was correctly predicted by hypotheses I and III.

e.) Finally, let us look at the four sentences with asymmetric predicates (cf. tables 3 and 4). Let us first look at sentences 10 and 6 in table 4: 10 has only the inverted scope reading, 6 has only the surface reading B. Both readings are the only plausible readings given our knowledge of the world as it is. One could take this observation and argue that the relevant factors for the determination of scope are pragmatic factors, such as our knowledge of the world, and not the syntactic structure of the sentence. That this cannot be the correct analysis, however, is shown by sentence 3 (cf. table 3). The only plausible reading for 3 is the inverted scope reading B. However, contrary to sentence 10, which - according to the informants' intuitions - can have the inverted scope reading, sentence 3 cannot have this reading. The only difference between 3 and 10 is a difference in syntactic structure: In 3 the object was not raised across the subject overtly, in 10 it was. This structural difference can now help to explain the differences in judgments between the two sentences. Hypothesis IV predicts that overtly A-bar-moved QPs can be reconstructed to their base position at LF. This seems to be what happens in the case of sentence 10, and the existence of the inverted scope reading for 10 therefore confirms the adequacy of hypothesis IV. Similarly, hypothesis III predicts that weak QPs can never be raised at LF. This prediction is borne out by the non-availability of the inverted scope reading for 3, although this reading would be the only plausible reading. The judgments for sentence 3 thus present us with the strongest argument against the validity of hypothesis II, which predicts the existence of inverted scope readings for all doubly quantified sentences. The fact that 3 does not have the (plausible) inverted scope reading, even though the surface scope reading is implausible, casts doubt on the assumption that other sentences with a plausible surface scope reading should have an additional inverted scope reading. The non-existence of an inverse scope-reading for 3 is thus the strongest argument for the validity of hypothesis III and the invalidity of hypothesis II. At the same time, the existence of an inverted scope reading for 10 is a strong argument for the validity of hypothesis IV.

5. Conclusion and Outlook

The empirical study documented in this paper was meant to help decide between two syntactic positions on quantifier scope in German. Both positions share the assumption that the scope of a QP is determined by its c-command domain at LF. However, whereas the Unrestricted Ambiguity Approach predicts the existence of scope ambiguities for all doubly quantified sentences, the Restricted Ambiguity Approach predicts scope ambiguities in German under two conditions: The s-structurally lower QP must be a strong QP (and can then consequently be raised at LF), or the 'normal word order' must have been changed by overt A-bar-movement of one QP across another.

It cannot be stressed enough that the present empirical study is far too limited with respect to the number of informants as well as the number of sentences tested (or the possible combinations of possibly scope-determining factors), in order to lay any claim to generality.

Nevertheless, the judgments of the test sentences show a clear tendency: There has been no evidence for the assumption that inverted scope readings are possible across-the-board, and that doubly quantified sentences are generally ambiguous in German. On the contrary, the judgments for sentence 3, which show the inverted scope reading to be absent despite its being the only plausible reading, strongly argue that the Unrestricted Ambiguity Approach (cf. hypothesis II) is too strong and needs to be further restricted.

As for the two restrictions on quantifier scope that have been suggested in the form of hypotheses III and IV, the picture that has emerged is not so clear. Although, the judgments of the test sentences appear to be compatible with hypothesis III (in particular the existence of an inverted scope reading for sentence 4), they are far from being conclusive. More work needs to be done in this area. In order to get a clear picture on whether hypothesis III is correct or not, the study would have to be extended to a large variety of QPs modified by different strong and weak QPs. In particular, we need to get more evidence about the scopal behaviour of other strong but non-distributive QPs (e.g. QPs modified by 'die meisten/most') in order to decide, whether the relevant property for the determination of scope is in fact the strength or weakness of a quantifier, or its distributivity (as has been suggested by Beghelli 1993).

Concerning hypothesis IV, we have seen that only indirect evidence for its adequacy is available (through the existence of an inverted scope reading for sentence 10). We have discussed the problems involving sentence 9, which was primarily meant to check whether overt A-bar-movement makes doubly quantified sentences in German ambiguous or not. To test the influence of overt A-bar-movement on quantifier scope in future empirical studies, one should therefore focus on sentence pairs with verbs that assign oblique case (e.g. dative) to their direct object. A possible candidate for such a pair would be: 'Drei Schüler glaubten zwei Lehrern (Three students believed two teachers)' and 'Zwei Lehrern glaubten drei Schüler (Two teachers, three students believed). Here, the object QP is clearly distinguishable from the subject QP. A misinterpretation as with sentence 9 should therefore not occur.

It is hoped that an extension of the empirical study along the lines suggested will shed more light on the exact conditions for scope ambiguity in German.

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