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A Unified Analysis of Binominal *each*- Constructions in English, Dutch, and German

1. Introduction

Binominal *each* constructions are found in sentences like English (1a), which is truth-conditionally equivalent to (1b):

(1) a. The boys bought two books *each*.   (binominal *each*)
     b. Each boy bought two books.   (adnominal *each*)

In (1a), binominal *each* in establishes a distributive relation. The group of boys must be construed distributively, yielding the same reading as for (1b) with an adnominal distributive quantifier. This way, the number of books bought altogether depends on how many boys there were. Binominal *each* therefore can be said to link two NPs in a distributive manner (hence its name).

The syntactic and semantic analysis of binominal *each* constructions (henceforth, BECs) is not a trivial matter. Safir & Stowell (1988) is the first detailed structural account of BECs (albeit without an accompanying semantic analysis). As their analysis is devised for English BECs exclusively, it does not carry over in all details to BECs in other languages.

In this article we present a wider cross-linguistic perspective on BECs by drawing other languages (like German, Dutch, French and Irish) into the discussion. We point out that Safir & Stowell (1988) makes wrong predictions as it stands when it comes to word order variation cross-linguistically. Therefore, we suggest a modified account that provides room for word-order differences and makes the function of the binominal element more precise. Besides, we argue that a great deal of the observable behaviour of BECs follows from semantic properties of the binominal element. Our structural analysis of sentences with BECs makes it possible to compute the meaning of sentences with BECs off their surface structure in a strictly compositional fashion, a nice result.

The article is structured as follows. In section 2, we characterize BECs and summarize the syntactic account of Safir and Stowell (1988). In section

3, we present our new syntactic analysis of BECs pointing out why it is superiour to Safir and Stowell (1988). Section 4 contains the type-driven compositional analysis of BECs. The semantics of BECs will be shown to be responsible for some restrictions on the distribution of BECs which were previously thought to be syntactic in nature. In section 5, we show that general structural differences between English/Dutch and German nevertheless play a role in the distribution of binominal elements in these languages.

2.   Binominal *each* constructions in the analysis of Safir & Stowell (1988)

2.1. Terminology

The distributive construal that we referred to in the introduction is a defining characteristic of binominal *each* constructions. For ease of exposition, we refer to the NP that is construed distributively as the *R(ange)-NP* and the NP that combines with binominal *each* as the *Sh(are)-NP* (glossing over the NP/DP status of these constituents)[1]:

(1)   [$_{R-NP}$The boys] bought [$_{Sh-NP}$two books] each.

Binominal *each* is always found adjacent to the Sh-NP, and forms a constituent with it, as also pointed out by Safir and Stowell (1988):

(2)   a. How many books each did the boys buy?
        b. *How many books did the boys buy each?

Those instances of English *each* which do not form a constituent with a Sh-NP, as in *The men each decided to leave*, are instances of floated or 'adverbial' *each* (Sportiche 1988), which falls outside the scope of our discussion altogether.

German poses an additional problem in that it seems to distinguish between a binominal and an 'eventive' use of *jeweils*. In the latter case, it does not establish a distributive relationship between two nominal denotations, but it distributes propositions over a set of (contextually given)
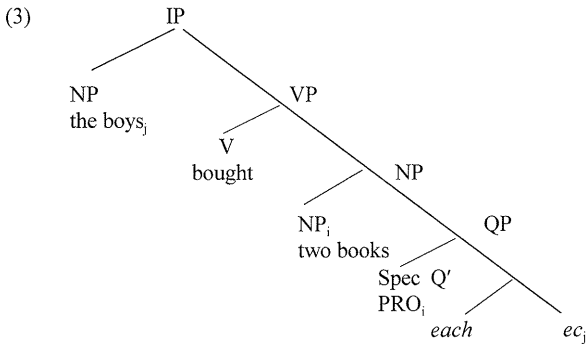
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[1] In Safir & Stowell (1988), Sh(are)-NPs are called D(istributive)-NPs. We opt for Sh-NPs to keep the discussion more transparent in the light of recent developments in the literature on distributivity (cf. e.g. Beghelli & Stowell 1997).

events. On this use, *jeweils* is translated as *each time*, *at a time*, as in *Jeweils zwei Männer kamen herein* 'Two men entered each time'(cf. Link 1998, Moltmann 1991, 1997).[2]

2.2. Safir & Stowell (1988)

Safir & Stowell (1988) propose an analysis of BECs as in (3), in which *each*, a diadic quantifier, heads a projection QP with a PRO specifier and a null object as its complement. They take PRO to be coindexed with the Sh-NP (*two books*); the null object of *each* is assumed to be 'anaphorically related to the R-NP in some way' (ibid.: 435).

(1) The boys$_j$ bought two books$_i$ each.

(3)

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                    IP
              /          \
        NP               VP
     the boys_j        /    \
                     V        \
                  bought       \
                          /       \
                       NP_i        NP
                   two books      /   \
                              Spec Q'  QP
                              PRO_i   /  \
                                  each    ec_j
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    QP is taken to be a complex modifier of the Sh-NP, which explains why, in English, it necessarily follows the NP it modifies. As is well known, other complex modifiers are also banned from prenominal position in English:

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[2] This ambiguity of *jeweils* creates a methodological problem. Unlike their English counterparts with *each*, German sentences containing *jeweils* are always grammatical (on the eventive reading), even if the requirements for a binominal reading are not met. Cf. (i.) with a singular subject DP, which cannot serve as Range-DP in a BEC:
(i.) Peter hat jeweils   zwei Bücher   gelesen.
     P.   has each-time two books   read
     'Peter has read two books each time.'

(4)   *the [$_{AP}$ proud of his children] father

QP in (3) is assumed to undergo LF movement out of the Sh-NP, adjoining to IP[3]. In order for the R-NP to be able to locally A'-bind the null object of *each* (which S&S assume is a requirement imposed by this null object), the R-NP must also undergo A'-movement, into a position higher than the landing-site of the QP. If the R-NP appears *in situ* at S-structure (as in 1), it will have to undergo QR at LF, into an IP-adjoined position above the QP's landing-site.

The movement of QP at LF is assumed to be an obligatory ingredient of the analysis of BECs. According to Safir & Stowell, this accounts for the fact that the Sh-NP of BECs is generally barred from subject positions, as subjects disallow extraction from within:

(5)   *One girl each saw the boys.

2.3. Problems with Safir & Stowell (1988)

Some important claims of the Safir & Stowell (1988) analysis do not hold water upon closer examination of BECs in other Germanic languages. We are going to challenge their proposal mainly on the following two points. The reasons are given here in short and spelled out in more detail in the next section.

First, the claim that the QP is a complex modifier of Sh-NP, and as such expected to pattern together with other complex modifiers of NPs is falsified by data from languages like Dutch, where binominal element and complex modifiers differ in syntactic position. In Dutch, we find binominal *elk* 'each' prenominally in a position in which head-inital complex modifiers are forbidden (*een trots op z'n kinderen vader*, 'a proud of his children father'). We return to this in section 3.2.1.

Second, one can account for the syntax of BECs without making reference to LF-extraction of the QP and subsequent QR of the R-NP. LF-movement need not be called upon, since – as we will show presently – binominal *each* can be found in positions from which extraction is banned otherwise. Most notably, and contrary to Safir & Stowell, there is no syntactic subject restriction on its distribution. This will be shown in section

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[3] See May (1985) on the syntactic level of 'Logical Form (LF)'.

3.2.2. Given that LF-movement of the QP need not be posited, the application of QR to R-NP need not be called upon either.

## 3. The syntactic structure of binominal *each* constructions: a new proposal

3.1. The proposal

To account for the problems listed in section 2.3. above, we propose the modified structure for BECs in (6ab) below:

(1)   The boys bought two books each.

The modification relation between the phrase projected by binominal *each* and the Sh-NP is one of 'predication'. The QP (the precise semantic nature of which will be discussed in section 4) functions as the syntactic predicate over the Sh-NP. The relation between the subject *the book* and its predicate *each-ec* is mediated via a functional projection, P in (6).

(6) a. $[_{IP} [_{R-NP}$ The boys$_j$ $[_{VP}$ bought $[_{DP}$ D0 $[_{SC} [_{Sh-NP}$ two books] P0 [each-ec$_j$]]]]].

b.
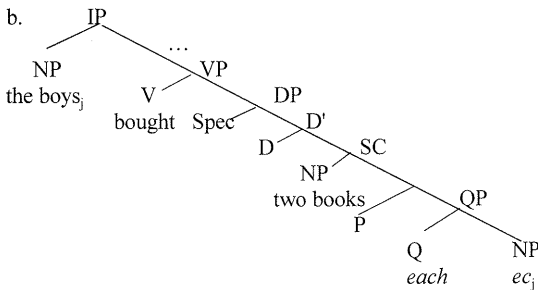
Small clauses (SCs), as structures instantiating predication relations, have been around since Stowell (1981). Stowell introduces small clauses in order to account for secondary predication without having to abandon the requirements of X-bar-syntax (cf. Chomsky?, Jackendoff 1977). Standard examples of small clauses are the following:

(7)   a. Peter painted [$_{SC}$ the house [$_{AP}$ red]]
       b. Peter considered [$_{SC}$ Bill [$_{NP}$ a fool]]

(7a) expresses two predications: that Peter painted the house, and that the house is red. The same holds for (7b). Stowell (1981) points out that SCs occur across lexical categories. Depending on the nature of the predicate, they can be adjectival (7a), or nominal (7b). Similarly, there are also prepositional SCs:

(8)   Peter drove [$_{SC}$ the car [$_{PP}$ into the shed]]

Small clauses have been shown to contain the projection of a functional head (Bowers 1993, Cardinaletti and Guasti 1995, Moro 1997). The reason why we consider the functional head present in BECs to be a preposition has to do with the fact that we find PPs in the postnominal position of QP in many languages. In this position, overt PPs can give rise to the same distributive meaning as BECs:

(9)   De jongens hebben [$_{NP}$twee boeken [$_{PP}$ per persoon]] gekocht. [Dutch]
       the boys   have   two books   per person   bought
       'The boys have bought two books per person.'

The PP in (9) cannot be a complex postnominal argument for *book* is an intransitive noun and does not subcategorize for complements (as opposed to, say, *teacher* in *teacher of French*). It also cannot be a complex postnominal modifier like the PP *from France* in *teacher from France*. Semantically, modifying elements add a property to the property denoted by the head element, independent of syntactic context. Hence, *teacher of France* denotes all those individuals x such that x is a teacher and x is from France. Contrary to this, *twee boeken per persoon* in (9) does not denote all sets X such that X contains two books and X is per persoon. This expression does not make sence. Rather, what (9) expresses are two predications: that the boys bought two books and that there are two books for every boy such that he bought them. We conclude, then, that (9) features a prepositional small clause that induces the same distributive reading as the BEC in (1) above. We propose that the same small clause can be found in (1) as well, with QP as its predicate.

        The DP-layer dominating the small clause in (6) is motivated by the fact that the small clause can be passivized as one constituent (10a), which is not possible for resultative small clauses (10b), which lack the DP-layer.

(10) a. $[_{DP} [_{SC}$ Two books each$]_i$ were bought t_i (by the boys).
     b.   *$[_{SC}$ Two houses red$]_i$ were painted t_i (by the boys).

Therefore, it is reasonable to think of *two books each* as a nominal constituent that is recognized as a DP category externally. DP-contained small clauses are widely discussed in the syntactic literature. The following three examples show constructions which are analyzed in terms of small clauses embedded under a DP-layer: (i.) nominal predication (*N of a N* constructions for short); (ii.) possessive DPs; (iii.) pseudopartitives. Representative examples and their structural analyses are given below:

(11)   a. idiot of a doctor
        b. $[_{DP} \ldots [_{XP=SC}$ doctor $[_{X'}$ idiot $]]]]$ (Den Dikken 1997)
(12)   a. John's car
        b. $[_{DP} \ldots [_{XP=SC}$ car $[_{X'}$ John $]]]]$ (Den Dikken 1997)
(13)   a. a glass of water
        b. $[_{DP} \ldots [_{XP=SC}$ water $[_{X'}$ glass $]]]]$ (Corver 1997)

The (b)-examples show the base structure of each construction. In all cases, the relation between the nominal constituents is conceived of as a primary predication relation. In the syntactic component, further movements (partly through some functional structure that we omitted from the representations for reasons of simplicity) take place to yield the surface word order of the (a)-examples. For a detailed discussion of these derivations, see the references given. In a similar vain, we are proposing a small clause analysis for BECs. The base structure of each BEC has the same schematic representation as the constructions in (11-13):

(14) $[_{DP} \ldots [_{XP=SC} [_{R-NP}$ two books$] [_{X'} [_{QP}$ each$]]]]]$

In our analysis, the internal structure of QP is simpler than that of the QP in the Safir and Stowell analysis. For us, it only contains the complement of Q, which is related to the R-NP. This complement is empty in English, but can have lexical content in many languages. In French, for example, it is spelled out as a nominal corresponding to *one*, which forms part of the lexical reprentation of *chacun(e)*, the French equivalent of binominal *each*:

(15) Les hommes ont   lu   chac-un   deux livres.   [French]
     the men   have read each-one two books
     'The men read two books each.'

The relation of the complement *ec/one* to the R-NP falls out from the semantic characterization of *ec/one*, as we will show in section 4. If there is no element that could serve as a R-NP, *ec/one* will make the derivation crash due to the fact that it cannot be interpreted. The relation between *ec/one* and R-NP, however, is also reflected in the syntax. We think of this relation as that of AGREE in the sense of Chomsky (1998). In many languages this is exhibited by agreement in features: *ec/one* agrees with the R-NP in gender and person in French and in animacy in Irish[4]:

(16) Les hommes   ont   achetés trois livres chac-**un-(*e)**.   [French]
      the men-MASC   have bought   three books each-one-(*FEM)
      'The men bought three books each.'

(17) a. Cheannaigh siad teach   an   **duine**.   [Irish]
        bought   three house the   person
        'They bought three houses per person.'

    b. Chosuuigh na   tilhe   dh'e ch'eod mile   puut   an   **ceann**.
       cost   the   houses two   hundred thousand pounds the   one
       'The houses cost two hundred thousand pounds á piece.'

In section 4, we will return to the structure proposed in (6) and show that it provides the input for a compositional semantic interpretation. In the next subsection we return to showing why our analysis is superiour when it comes to the points raised in 2.3. above.

3.2. The gains of our proposal

3.2.1. Word-oder variation

As far as positioning of binominal *each* is concerned, our analysis does not predict a parallel behaviour with complex modifiers. The fact that in English both binominal *each* and complex modifiers are postnominal seems to be a mere coincidence in the light of facts like the following Dutch paradigm:

(18) a. de   jongens hebben elk   twee boeken   [Dutch]
        the   boys   have   each two   books
    b. % de   jongens hebben twee boeken elk
         the   boys   have   two   books each
(19) a. een trotse   vader
        a   proud   father

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[4] We thank Jim McCloskey (p.c.) for the Irish examples.

b. *een [$_{AP}$trots op z'nkinderen] vader
   a   proud of hischildren   father
c. een vader [$_{AP}$trots op z'n kinderen]
   a   father proud   of his children

The important observation in (18) is that in Dutch, binominal *each*, *elk* 'each' is fine in prenominal position for all speakers. For a subset of speakers, it is also fine in postnominal position. Head-initial complex modifiers, however, like those in (19), behave just like their English counterparts. They can never be prenominal. This clearly shows that binominals do not show the word-order characteristics of complex modifiers.

These examples from Dutch incapacitate the Safir & Stowell analysis of BECs. Our analysis, however, opens up an interesting perspective on word-order variation cross-linguistically. We take it that the structure in (6) is the basic representation of BECs in languages. For a subset of Dutch speakers, who accept (18b), (6) is also the structure in overt syntax. Overt movement, however, can alter the position of terminal elements in (6). This is the case in (18a), where the predicate *each*-phrase (QP) undergoes A'-predicate-fronting into SpecDP:

(20) [$_{DP}$ [$_{QP}$ each (one)]$_i$ D0 [$_{SC}$ Sh-NP P0 [t$_i$]]]

The availability of predicate fronting gives us a window on the word-order facts. It allows us to derive the prenominal structure from an underlying postnominal one, which makes the account maximally constrained. The A-bar nature of the predicate fronting process is not difficult to establish. First of all, the moving consituent is quantificational element. This fact determines its syntactic fate: It moves to an A-bar position (on the A-bar nature of SpecDP, see Kayne 1994 and references cited there.) An immediate prediction of the derivation in (20) is that whenever SpecDP is independently occupied by some other element, the reversed word order should not be available. In Dutch, this prediction is born out. The operator position SpecDP can host wh-operators for example. Interestingly, whenever we find a wh-operator in SpecDP, the prenominal placement of binominal *elk* 'each' is excluded:

(21) *Elk hoeveel   boeken hebben de   jongens gelezen?
      each how-many books   have   the boys   read
      'How many books did the boys read each?'

The ungrammaticality of (21) is a robust fact. It storngly supports the derivation of the prenominal *each* order depicted in (20), which involves movement of the *each*-phrase to SpecDP.

3.2.2. Lack of QP-movement at LF

As we will show in section 4, the *ec/one* category posited as the complement of Q is necessarily linked to the R-NP as a result of its semantics.

This is equivalent to saying that the QP need not undergo LF movement out of the Sh-NP, for the empty complement to become locally A′-bound by the R-NP, which must also undergo A′-movement at LF (QR). Our semantics can do without these otherwise unmotivated LF-movement operations. A very strong argument against LF-movement of the QP phrase comes from the fact that binominal *each* can be found in subject position in languages like German (22a). Overt extraction is impossible from the position which the subject occupies. This is shown in (22b).

(22) a. ...,weil   jeweils ein   Verkäufer den   Kunden   entgegenstürzt.
          Because each   one   salesclerk the   customers rushes-towards
          '...because each of the customers was quickly apporached by one salesclerk.
      b. *[Von welchen Produkten]₁ stürzt [ein   Verkäufer t₁] den   Kunden
            of   which   products   rushes   one   salesclerk   the   customers
            entgegen?
            towards
          '*Of which products did one salesclerk approach the customers quickly?'

The unavailability of extraction from a position where binominal *each* occurs, argues against an LF-movement account of binominal *each*. Instead, it makes an approach without LF-movement, like our analysis, preferable.

4.   The semantics of binominal *each* constructions

In this section we show that the binominal element in BECs can be interpreted *in situ*, at the same time obeying strict surface compositionality. Semantic representation and syntactic surface structure are isomorphic. The binominal element does not have to move at LF for interpretive reasons. The interpretability of *each / elk/ jeweils* in situ supports our non-LF-movement analysis of BECs. It follows that the abstract syntactic level of LF is not necessary for a proper account of BECs.

We present our semantic analysis of BECs in 4.1. In 4.2, we discuss some predictions that our analysis makes. In particular, we show that a number of properties of BECs, including a locality requirement between the binominal element and the R-NP follow from the lexical meaning of the binominal element, and are not due to syntactic restrictions on LF-movement. In section 5, we will turn back to the question why German licenses a binominal element in subject position, whereas English does not. Since we assume no difference in meaning between binominal *jeweils* and *each*, we argue that the difference in syntactic distribution is due to general structural differences between the two languages. These differences concern the underlying position of the verb as well as the (non-) configurationality of theVP in both languages.

4.1   A type-driven compositional semantics for BECs

Let us look at the syntactic structure of BECs in English and German/Dutch again.

(23)   a. The boys$_i$ [$_{VP}$ read [$_{DP}$ D0 [$_{SC=PP}$ two books P0 [each – ec$_i$]]]].
       b. Die   Jungen$_i$ haben [$_{VP}$[$_{DP}$ jeweils$_{i,l}$ D0 [$_{SC}$ zwei   Buecher P0 t$_l$]] gekauft].
          the   boys   have   each   two   books   bought

These structures are peculiar insofar as the distributive (i.e. the binominal) element – unlike the homophonic adnominal distributive quantifier - does not stand in a sister relationship to the NP it distributes over. Instead, the binominal element is the syntactic predicate of the Sh-NP, the denotation of which gets distributed over atomic members of the R-NP denotation. This is witnessed by the constituenthood of Sh-NP and binominal element (cf. 2a). Note that English and Dutch are peculiar in that they do not reflect the difference between adnominal quantifier and binominal element in morphological shape. Other languages do, however. Examples are given in table 1:

Table1:

	adnominal	binominal
French	*chaque*	*chacun(e)*
German	*jede(r/s)*	*jeweils*
Italian	*ogni*	*cessuno*

We take the morphological differences in table 1 as evidence for the claim that adnominal distributive quantifiers and binominal elements differ semantically, even though they undeniably share the meaning component of distributivity.

Can we make sense of the syntactic position of binominal elements semantically? It turns out that we can if we employ a type-driven compositional semantics as in Heim & Kratzer (1998). For type-driven semantics, the syntactic status of an element as head, modifier or complement does not matter to the interpretative component. Also, the interpretative rules are blind to syntactic category-labels. The requirements for a succesful interpretation are twofold: first, that two elements be syntactic sisters in order to be interpreted together. This requirement ensures strict compositionality. Second, the two elements have to be of appropriate semantic types. The normal case is that one of the elements is of a semantic type such that it can serve as the semantic argument of the other.[5]

4.1.1. Interpreting the postnominal order: English

Using type-driven semantics, we can interpret the English BEC in (23a) as follows. Semantically, the SC-predicate *each-ec$_i$* functions as the main functor of the sentence. It takes all other material in the clause as its semantic arguments. To be more concrete, *each-ec$_i$* takes the denotations of two nominal expressions (Sh-NP and R-NP) as arguments and establishes between them a distributive relation of the kind denoted by the verb. This means that the verb denotation is also a semantic argument of binominal 'each'. Formally, *each-ec$_i$* translates as (24), with x* being a variable over plural individuals or groups:

(24) $[[\text{each-ec}_i]] = \lambda Q \lambda R \lambda x^*. \forall x [\text{atom}_i(x,x^*) \rightarrow Q(R)(x)]$

The expression in (24) stands for a function that maps the three arguments expressed by the variables Q, R, and x* onto the truth-value 1 iff for each atomic member x of the denotation of x*, there is a set Y of the kind expressed by Q, such that x stands in R-relation to Y (i.e. 'x Rs Y'). We

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[5] Another possibility is that the two sisters are of the same semantic type and are interpreted by an interpretation procedure that applies equally to both of them. An example is predicate modification between adjectives and nouns, head nouns and restrictive relative clauses, or between adverbs and VPs.

can further reduce (24) in order to get to the meaning of *each* in isolation. The covert element *ec* in (24) (expressed as *un(e)* and *-weils* in French and German respectively) denotes the relation '$\lambda x \lambda y.\text{atom}_i(x,y)$'. This can be paraphrased as 'x is an atomic member of y'. The lexical entry for binominal *each* will then be as in (18):

(25)   [[each]] = $\lambda F \lambda Q \lambda R \lambda x^*. \forall x [F(x)(x^*) \rightarrow Q(R)(x)]$

Lambda-conversion with the lexical meaning of *ec*, yields (24) again[6]. The lexical entry in (24) reflects our intuitive understanding of the semantic contribution of binominal *each-ec*: It splits up a plural individual (the R-NP denotation) into its atomic parts, and then establishes a relation R between these parts and sets Y that are members of the Sh-NP denotation.
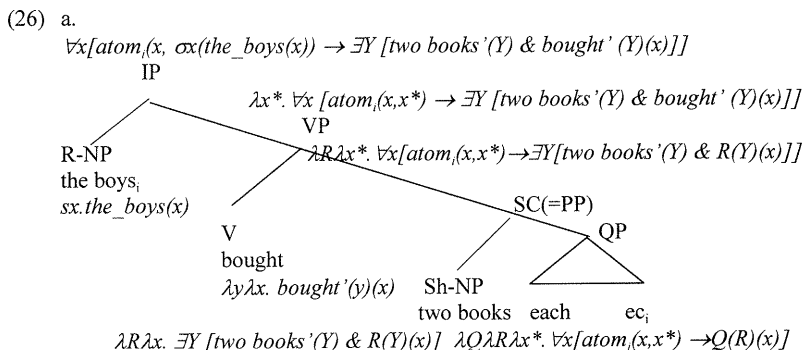
　　In 3.1, we pointed out that coindexation on the covert element *ec*, which denotes the atom-relation in (24), and of the Range-NP is crucial for a proper interpretation. It determines which DP will serve as the Range-NP. As we showed in 3.1, this semantically motivated coindexation is often reflected in the syntactic component by agreement for gender or number. If two DPs are potential candidates for the Range-NP (e.g. a plural subject and a plural indirect object in ditransitive sentences), coindexation is determined by the context of the utterance, i.e. by pragmatics. On this view, the atom-relation *atom$_i$(x,y)* looks like the inverse counterpart to Schwarzschild's (1992) cover function *COV$_i$*, which splits up pluralic groups into exhaustive subgroups. Cover functions always operate on the same domain, but a (pragmatically determined) index on the function itself determines which value (i.e. which set of subgroups) they will yield. As opposed to this, the atom-relation always gives the same value (the set of atomic parts of the pluralic group) while its domain is fixed by the index. If the atom-relation cannot find an appropriate plural denotation which it could split up into its atomic parts, the semantic computation of the meaning cannot proceed.

　　Now that we have established the lexical entry for binominal *each*, the further computation of the meaning of (23a) is straightforward. The only semantic process required is Functional Application (FA). FA of (24) to the Sh-NP denotation, the verb denotation, and the R-NP denotation in this

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[6] Obviously, a selectional restriction holds between *each* and the relation expresses by F. Otherwise, we would expect *each* to combine with any relation-denoting expression, e.g. simple transitive verbs. This is not the case, as illustrated in (i.):

(i.)   *The boys read two books each vote for.

order gives the desired truth-conditions. Note that we treat the Sh-NP as denoting a high-typed Generalized Quantifier of type <eet, et>. The interpretation is illustrated in (26ab), with a paraphrase of the truth-conditions in (26c):

(26)   a.

$\forall x[atom_i(x, \sigma x(the\_boys(x)) \rightarrow \exists Y [two\ books'(Y)\ \&\ bought'\ (Y)(x)]]$

     IP

                $\lambda x^*.\ \forall x\ [atom_i(x,x^*) \rightarrow \exists Y [two\ books'(Y)\ \&\ bought'\ (Y)(x)]]$

                 VP

R-NP $\lambda R \lambda x^*.\ \forall x[atom_i(x,x^*) \rightarrow \exists Y[two\ books'(Y)\ \&\ R(Y)(x)]]$

the boys$_i$

$sx.the\_boys(x)$ SC(=PP)

             V   QP

            bought

           $\lambda y \lambda x.\ bought'(y)(x)$ Sh-NP

                          two books   each   ec$_i$

    $\lambda R \lambda x.\ \exists Y [two\ books'(Y)\ \&\ R(Y)(x)]$ $\lambda Q \lambda R \lambda x^*.\ \forall x[atom_i(x,x^*) \rightarrow Q(R)(x)]$

β   b. $[[IP]] = \forall x\ [atom_i(x, \sigma x.the\_boys(x)) \rightarrow \exists Y[two\ books'(Y)\ \&$ bought'$(Y)(x)]]$

        c. For each atomic member x of the group denoted by *the boys*, there is a set Y such that Y consists of two books and x bought Y.

(26c) seems to be an adequate paraphrase of the meaning of (23a). We conclude that an *in situ* interpretation of binominal *each* is possible.

4.1.2. Interpreting the prenominal order: German and Dutch

Let us now turn to the German sentence (23b) (repeated here), in which the SC-predicate *jeweils* has moved to the specifier position of DP, preceding the Sh-NP.

(23)   b.   Die Jungen$_i$ haben [$_{VP}$ [$_{DP}$ jeweils$_{i,1}$ D0 [$_{SC}$ zwei Buecher P0 t$_1$]]
            the boys   have   each   two books
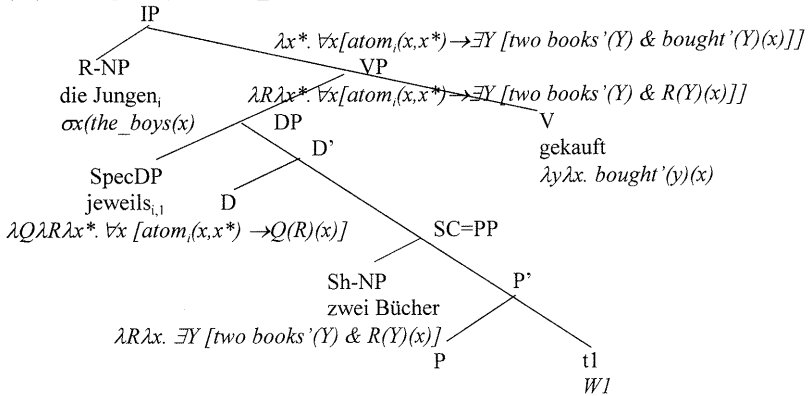   gekauft].
            bought

As will be shown shortly, we can interpret (23b) by assigning to *jeweils* the same meaning as to *each-ec$_i$* (cf.24). The same holds for the Dutch counterpart of (23b). From a cross-linguistic perspective, this is desirable, since this way we minimize the difference between English and German

BECs to a mere difference in word order. The only extra assumption needed is that the trace left behind by *jeweils* is of type <eet> (a relation) rather than of type e (an individual). Since *jeweils* establishes a distributive relation between two nominal expressions semantically, this should not be too surprising.

The interpretation proceeds as illustrated in (27). (27c) is a correct paraphrase of the meaning of (23b). Since the interpretive procedure is rather complex, a step-by-step-account is given in (28). Note that the different word order OV vs. VO is of no relevance to the outcome of the interpretation.

(27) and (28) show that interpreting *jeweils* in prenominal position (before the Sh-NP) is unproblematic given that moved elements may leave behind traces of types other than <e>. Note that in German (and in English) we find other instances of moved elements leaving behind a trace of type <eet>, e.g. with contrastive verb fronting as in (29) [7]. Hence, we consider the <eet>-type of the *jeweils*-trace unproblematic.

(27) a. $\forall x[atom_i(x, \sigma x(the\_boys(x)) \rightarrow \exists Y$ [two books'(Y) & bought'(Y)(x)]]

IP

$\lambda x^*. \forall x[atom_i(x,x^*) \rightarrow \exists Y$ [two books'(Y) & bought'(Y)(x)]]

R-NP

VP

die Jungen_i $\lambda R\lambda x^*. \forall x[atom_i(x,x^*) \rightarrow \exists Y$ [two books'(Y) & R(Y)(x)]]

$\sigma x(the\_boys(x)$ DP   V

D'   gekauft
$\lambda y\lambda x.$ bought'(y)(x)

SpecDP
jeweils_{i,1}   D
$\lambda Q\lambda R\lambda x^*. \forall x [atom_i(x,x^*) \rightarrow Q(R)(x)]$ SC=PP

Sh-NP   P'
zwei Bücher
$\lambda R\lambda x. \exists Y$ [two books'(Y) & R(Y)(x)]
P   t1
W1

b. [[IP]] $\Rightarrow \lambda x^*. \forall x[atom_i(x, \sigma x(the\_boys(x)) \rightarrow \exists Y$ [two books'(Y) & bought'(Y)(x)]]

c. For each atomic member x of the group denoted by *the boys*, there is a set Y such that Y consists of two   books and x bought Y.

---

[7] Cf. Heim & Kratzer (1998:212f.) and references cited there.

(28)   a.   [zwei Buecher t_1]^g
            $\Rightarrow (\lambda R\lambda x. \exists Y$ [two_books'(Y) & R(Y)(x)])(W)
            $\Leftrightarrow \lambda x. \exists Y$ [books'(Y) &| Y| = 2 & W1(Y)(x)]
            λ-abstraction over trace index 1:
       b.   [1 zwei Buecher t1]$^{g,R\rightarrow 1}$
            $\Rightarrow \lambda R\lambda x. \exists Y$ [two_books'(Y) & R(Y)(x)])
            FA of [jeweils$_i$] to (b):
       c.   [jeweils$_{i,1}$ zwei Buecher t_1]
            $\Rightarrow \lambda R\lambda x^*.\forall x[atom_i(x,x^*)\rightarrow\exists Y$ [two_books'(Y) & R(Y)(x)]]
            FA of (21c) to [gekauft]:
       d.   [jeweils$_{i,1}$ zwei Buecher t_1 gekauft]
            $\Rightarrow \lambda R\lambda x^*.\forall x[atom_i(x,x^*)\rightarrow\exists Y$ [two_books'(Y) & R(Y)(x)]]
            $(\lambda y\lambda x.$bought'(y)(x))
            $\Leftrightarrow \lambda x^*.\forall x[atom_i(x,x^*)\rightarrow\exists Y$ [two_books'(Y) & bought' (Y)(x)]]
            FA of (21d) to [die Jungen]:
       e.   [die Jungen jeweils zwei Buecher t1 gekauft]
            $\Rightarrow \lambda x^*.\forall x[atom_i(x,x^*)\rightarrow\exists Y$ [two_books'(Y) & bought' (Y)(x)]]
            $(\sigma x.$the_boys'(x))
            $\Leftrightarrow \forall x[atom_i(x, \sigma x.$the_boys(x))$\rightarrow\exists Y$ [two books'(Y) & bought' (Y)(x)]]

(29)   Anrufen$_1$ werde   ich   Peter morgen t_1. (Heute emaile ich ihm nur.)
       call   will   I   Peter tomorrow. (Today I only email him.)

Summing up, in this section we have shown that BECs in English and German/Dutch can be interpreted directly off the surface structure. Furthermore, it has been shown that only one lexical entry is needed for binominal elements occurring in pre-Sh-NP position (German *jeweils*), and for those in post-Sh-NP position (English *each*). This welcome result follows from our unified analysis of BECs, which assumes that the German/Dutch word order is derived from the underlying English word order. In the next section, we turn to some further predictions of this semantic analysis.

4.2. Some predictions of the *in situ* analysis

The in-situ analysis of BECs in 4.1 makes a number of predictions, which we discuss in turn.

The Two-Argument-Requirement (TAR)

First, since binominal elements always establish a distributive relation between two such nominal expressions, they always need two NP/DP-denotations as semantic arguments. Therefore TAR bans *each/jeweils* from occurring in intransitive sentences, which provide it with only one nominal argument:

(30) *The boys decided to leave each.

The Group-Requirement on R-NP(GR)

Second, due to the atom-relation in the lexical entry of *jeweils/each* in (24), the R-NP must denote a (plural) group consisting of atomic members. This explains why (31) is ungrammatical, as opposed to the grammatical (32ab) with group-denoting R-NPs (cf. also Heim/Lasnik/May 1991 on reciprocals):

(31)   *The boy / *Bill bought two books each
(32)   a. The boys / Bill and Mary / Five boys / Some boys / All boys bought two books each.
       b. ?More than five boys / ??Less than five boys bought two books each.

The atom-relation in the lexical entry of *jeweils/each*, also effects that BECs are impossible (or very degraded) with proper quantificational R-NPs, which are already distributive by themselves.

(33)   a. *No boy bought two books each.
       b. *Each boy / *Every boy bought two books each.

The sentences in (33ab) would receive the semantic representations in (34):

(34)   a. $\neg\exists z$ [boy'(z) & $\forall x$[atom(x,z)$\rightarrow\exists Y$ [two books'(Y) & bought' (Y)(x)]]
       b. $\forall z$ [boy'(z) & $\forall x$[atom(x,z)$\rightarrow\exists Y$ [two books'(Y) & bought' (Y)(x)]]

Since the variable *z* ranges over atomic individuals, and since the relation *atom(x)(y)* cannot apply to atomic individuals (it is not defined for these), the expressions in (33) receive no well-formed interpretation.

The Clausemate Constraint (CC)

Finally, TAR and the GR conspire to yield the so-called 'Clausemate Constraint (CC)'. It is well-known (cf. Choe 1987, S&S 1988, Sakaguchi

1998) that binominal *each* and *jeweils* cannot distribute over a R-NP in a higher finite clause, but that the R-NP has to be a clausemate of the binominal. This is illustrated for English in (35):

(35) *The boys believe that Sue saw one film each.

(35) does not mean that for each of the boys there is a different film such that Sue watched it. In fact, (35) is ungrammatical. Similarly, (36) is unambigouous. It only has the reading where *each* distributes over the girls.

(36)   The boys believe that the girls saw one film each.
       OK: The boys (all of them) believe that each of the girls saw one (different) film.
       NOT: Each of the boys believes that the girls (as a group) saw one (different) film.

Safir & Stowell (1988) give a syntactic explanation for the ungrammaticality of (35) and the non-ambiguity of (36). They simply stipulate that LF-movement of the *eachQP* is restricted to the immediate clausal domain. As opposed to their account, we would like to suggest that the CC derives from the semantic properties of the binominal element. Recall that the binominal element requires two nominal arguments in its sentential domain to yield a well-formed, interpretable expression. Therefore, in (36) it <u>has</u> to choose the embedded subject *the girls* as its R-NP. There simply is no option of skipping *the girls* for the sake of the matrix subject *the boys*, for then the embedded sentence would receive no interpretation. In (35), the embedded subject *Sue*, which could potentially serve as a R-NP, does not denote a plural individual or group. Hence, the atom-relation cannot apply to its denotation, and the entire structure will receive no proper interpretation.

To conclude this section, we have shown that a number of properties of BECs, namely its absence from intransitive sentences, its need for a group-denoting antecedent, and a locality restriction between the binominal and its antecedent follow from the semantic properties of the binominal element. Crucially, we do not account for the locality effects in syntactic terms. We do not postulate constraints on covert movement of the binominal element because on our account the binominal does not move at LF.

5.   Distributional differences between German *jeweils* and English *each*

So far, we have shown that an in situ interpretation of binominal elements is possible and that all the relevant properties of BECs follow from the semantic properties of the binominal element. In this section, we will tie up a loose end, namely the open question why German – as opposed to English – licenses the binominal element in subject position of small clauses and of finite transitive sentences. The reader may recall that the impossibility of binominal *each* in subject position was the major motivation behind Safir and Stowell's (1988) analysis of BECs in terms of LF-movement. The question arises, then, why German does allow for binominal elements in subject position. The relevant contrast is illustrated again in (37) and (38):

(37) a. *The boys considered [$_{SC}$ two girls each pretty].
      b. Die   Jungen haben   [$_{SC}$jeweils zwei Mädchen   schön]   gefunden.
          the   boys   have   each   two   girls   pretty   considered
          'Each of the boys considered two girls pretty.'
(38) a. *because one salesclerk each is approaching the customers.
      b. …,weil   jeweils   ein   Verkäufer den   Kunden   entgegenstürzt.
             because each   one   salesclerk the   customers rushes-towards
          '…for each of the customers, there is one salesclerk running towards him.'

In (37b), the binominal element distributes the denotation of the subject 'backwards' over the denotation of the object. This reading is even more salient when the object *den Kunden* 'the customers' scrambles overtly across the subject, as in (39):

(39) …,   weil   den   Kunden   jeweils ein Verkäufer entgegenstürzt.
            because the   customers.DAT each   a   salesclerks rushes-towards

Note that we cannot derive these distributional differences from the semantics of the construction, which we take to be the same for both languages. Instead, we would like to suggest that the different syntactic behaviour of German BECs follows from the underlying V-finiteness of German, and from the non-configurationality of VPs in German. We will look at *each/jeweils* in small clauses first, and then turn to *each/jeweils* in subject position of transitive sentences.

5.1. *Each/jeweils* in small clauses

The ban on binominal *each* from subject position of small clauses follows directly from the semantics in (24), repeated as (40):

(40) $[[\text{each-ec}_i]] = \lambda Q \lambda R \lambda x^*. \ \forall x[\text{atom}_i(x,x^*) \rightarrow Q(R)(x)]$

According to (40), *each* requires its second argument to denote a binary relation, e.g. a transitive verb. Now, as shown in (41), the sister of *two girls each* does not denote a relation. Instead, the small-clause predicate *pretty* denotes a property, and cannot semantically combine with *each* due to type-mismatch.

(41) a. [$_{VP}$ consider [$_{SC}$ [two girls] pretty]
      b.   <eet,et>   <et>

As a consequence of this type-mismatch, the meaning computation cannot proceed, and the entire small clause will receive no proper interpretation. Hence, binominal *each* is banned from subject position of small clauses for reasons of interpretation.

The situation in German is different from English in so far as the small clause –predicate *schön* 'pretty' in (37b) stands adjacent to the sentence-final matrix (transitive) verb. Let us assume that reanalysis of small clause-predicate and matrix verb into a modified transitive verb is possible under adjacency. After reanalysis, the underlying small clause in (37b) has the surface structure in (42a)[8]:

(42) a. [$_{VP}$ [$_{DP}$ jeweils$_1$ [zwei Mädchen t$_1$]] [$_V$ schön + gefunden]]
            each   two girls   pretty   considered
      b. [<eet,et>   ] [<eet>   ]

After reanalysis, the sister of the *jeweils*-DP, the complex verb *schön gefunden* 'considered pretty', denotes a relation and meets the semantic requirements of the former. There is no type-mismatch, and the interpretation can proceed. This accounts for the occurrence of *jeweils* in – what looks like – small clause constructions in German.

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[8] Alternatively, it is possible to conceive of reanalysis as a semantic process. Such a move would require a slight weakening of the homomorphism requirement on the syntax-semantic interface.

This line of thinking gets support from the fact that binominal *each* gets substantially better in English small clauses, too, if the constituent Sh-NP+*each* does not intervene between matrix verb and small-clause predicate. This is the case in Heavy-NP-shift constructions like (43):

(43)   ?The boys considered pretty two girls from the same neighbourhood each.

On the assumption that English also allows for reanalysis under adjacency, the improved status of (43) is accounted for. This observation reduces the differences in syntactic distribution between *each* and *jeweils* in small clauses to the different order of verb and complement in the two languages, namely VO (English) vs. OV (German)[9].

Finally, sentences like (44) seem be problematic for the analysis presented here.

(44)   Die   Jungen   finden$_1$ [$_{SC}$ jeweils   zwei   Mädchen   schön] t$_1$.
         the   boys   consider   each   two   girls   pretty
         'Each of the boys consideres two girls pretty.'

In (44) the finite verb has moved to C, as is normal in German main clauses (German being a V2-language). This makes reanalysis at surface structure impossible. However, it is possible that the verb reconstructs at LF to its base position. Given that movement to C is not motivated by the need to license arguments, Haider (1997) analyzes this kind of head-movement as A-bar-movement. Since A-bar-moved elements are generally free to reconstruct at LF, the same should – by analogy – be possible for A-bar-moved verbs. Since the reconstructed verb is adjacent to the small clause predicate at LF, reanalysis can proceed. Perhaps data like (44) suggest, then, that reanalysis is best thought of as a semantic operation applying at the level of semantic representation (see fn.8). If these consideration are on the right track, data like (44) are no longer problematic for our analysis.

5.2. *Each/jeweils* in subject position of transitive clauses

Let us turn to *each/jeweils* in subject position of transitive sentences now. We will first show that the ungrammaticality of binominal *each* in English subject position follows from the semantics of *each* plus the configurational nature of English. After that, we show that subject-*jeweils*
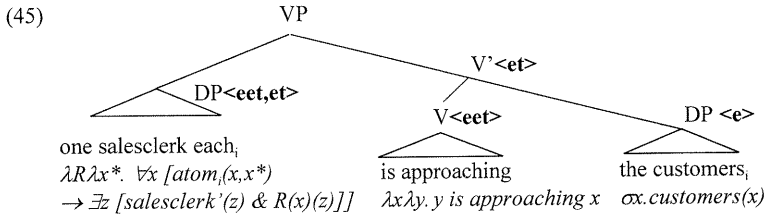
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[9] For a recent discussion of the OV-nature of German and Dutch, see e.g. Haider (1997).

is possible in German because German is non-configurational in that sense that it has a flat VP-structure.

As discussed in the previous section, the semantics of *each/jeweils* in (40) require the sister of the constituent [Sh-NP+*each*] to denote a relation of type <eet>. This relation serves as the second semantic argument of *each*.

(40) $[[\text{each-ec}_i]] = \lambda Q \lambda R \lambda x^*. \ \forall x \ [\text{atom}_i(x,x^*) \rightarrow Q(R)(x)]$

If we look at the VP-structure of (38a) however, we see that the sister of *one salesclerk each* denotes a function of type <et>[10]. This is illustrated in (45) below. Obviously, the righthand sister of type <et> cannot be argument to the lefthand sister of type <eet<et>>. (31a) cannot receive a proper interpretation, and binominal *each* is banned from subject position of transitive sentences for the same reason that keeps it from occurring in small clauses: type-mismatch.

(45)

one salesclerk each$_i$
$\lambda R \lambda x^*. \ \forall x \ [atom_i(x,x^*)$
$\rightarrow \exists z \ [salesclerk'(z) \ \& \ R(x)(z)]]$ is approaching   the customers$_i$
$\lambda x \lambda y. y$ is approaching x $\sigma x.customers(x)$

Why, then, is subject-*jeweils* possible in (38b) and (39) (repeated as 46ab)?

(46)   a.   …,weil   jeweils$_i$ ein   Verkäufer   den   Kunden$_i$ entgegenstürzt.
          because each   one   salesclerks   the   customers   rushes-towards
          '…for each of the customers is approached quickly by one salesclerk.'
   b.   …,weil   den   Kunden$_{1,i}$ jeweils$_i$ ein   Verkäufer t$_1$ entegenstürzt.
          because the   customers   each   a   salesclerk   rushes-towards

In (46b), the object has scrambled overtly across the subject. It is tempting

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[10] We assume with Koopman & Sportiche (1991) that all arguments of the verb are base-generated VP-internally (the so-called VP-internal hypothesis). For the argument to be made, it does not matter if the subject moves to SpecIP at surface structure or not. Inportant is the hierarchical layering inside VP.

to assume that the same process applies in (46a), albeit covertly at the syntactic level of LF. If so, (46ab) will be structurally identical at the level of LF, and they should receive the same interpretation. This expectation is borne out. Now, on this analysis (46ab) look like typical Weak Crossover-Configurations[11]: The coindexed (but not c-commanding) element *jeweils*$_i$ intervenes between the trace of the scrambled object and its antecedent. The moved element has 'crossed over' the coindexed element:

(47) Weak Crossover (WCO):
      ...DP$_i$...[DP NP$_i$]...t$_i$...

As is well known, WCO-configurations are ungrammatical in English, but grammatical in German. Examples are given in (48ab):

(48) a. *Who$_i$ does [$_{DP}$ his$_i$ mother] love t$_i$?   English: WCO → *
      b. Wen$_i$ liebt seine$_i$ Mutter t$_i$?   German: WCO → OK
          who   loves his   mother

One might want to attribute the ungrammaticality of binominal *each* in subject position to the ungrammaticality of WCO in English. Likewise, one might want to attribute the grammaticality of binominal *jeweils* in subject position to the insensitivity of German to WCO-effects. A welcome result, or so it seems. However, it turns out that the structure of (46b), the alleged input to interpretation is not interpretable at all, at least not with the desired reading. To see this more clearly, let us look at (49)

(49) a. ... den Kunden$_{1,i}$ jeweils$_i$ ein Verkäufer t$_1$ entgenstürzt.
          the   customers each   one   salesclerk   rushes-towards

b.
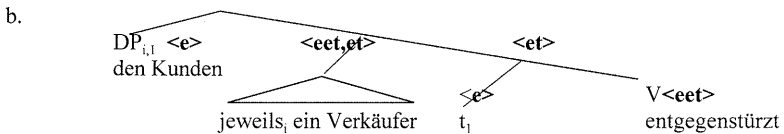
Regardless of the syntactic labels assigned to the nodes, the semantic value of the object trace will serve as an argument to the value of the verb,

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[11] See Postal (1971) for a first discussion of these data.

yielding an expression of type <et>. This expression cannot be an argument to its sister-node (being of type <eet,et>), nor vice versa. The type-mismatch would lead to ungrammaticality. A modification of the lexical semantics of *jeweils* by changing it into an expression that takes a predicate of type <et> as its second argument, also will not do. A semantic entry like in (50a) would assign (46b) the truth-conditions in (50b), as the gentle reader may verify for herself:

(50) a. $[[jeweils_i]] = \lambda Q \lambda P \lambda x^*. \forall x [atom_i(x,x^*) \rightarrow Q(P)]$
b. For every x, with x an atomic member of the group of boys, there is a set Y such that Y contains one salesclerk, and the salesclerk flings himself.

The crucial fact about (50ab) is that x is not present in the afterclause of the conditional. (50b) expresses no logical connection between single boys and the action of the salesclerks at all. (50b) is not what sentence (46b) means. This result receives support from similar data in Dutch. Like German, Dutch, is insensitive to WCO-effects. WCO-configurations like (51a) are grammatical. Nevertheless, binominal *elk* is impossible in subject position of transitive sentences, as shown in (51b):

(51) a. Van wie$_i$ houdt zijn$_i$ moeder t$_i$?
of who loves his mother
'Who does hi mother love?'
b. *..., omdat elk$_i$ een verkoper op de diva's$_i$ wacht.
because each one salesclerk on the divas waits
'... because each of the divas is being awaited by one salesclerk.'

We conclude, then, that a WCO-solution for the (un)availability of binominal elements in subject position is on the wrong track.

We would like to suggest instead that the difference between German and English/ Dutch follows from another syntactic difference. In particular, we would like to suggest that German (46ab) contain a 'flat' VP-structure, like in (52):

(52)


```
                        V
              ┌─────────┼─────────┐
           SUBJ       OBJ        V
  jeweils  ein Verkäufer den Kunden  entgegenstürzt
```

In other words, following Haider (1986) we suggest that parts of the syntactic structure of German are organized non-configurationally[12]. In our view, German allows for flat VPs because it licenses external arguments ('designated arguments' in Haider's terms) morphologically through case-marking, whereas in English (and Dutch) external arguments are licensed qua structural position in the absence of morphological case. It follows that German underlying subjects can be identified and licensed as subjects by NOM case. Accordingly, they are interpreted as external arguments. They do not need to be singled out in the syntactic (VP)-structure.

The flat strucure in (52) can get the correct interpretation with one minimal change in the lexical entry for *jeweils*. This change concerns the order in which the arguments in the afterclause of the material implication are processed. The atomic members x of x* serve now as the first argument for the relation R (as expected, since x* is denoted by the object NP). The resulting value R(x) serves as the argument for the denotation of the Sh-NP in subject position. The entry for subject-*jeweils* is given in (53a). (53b) shows the lexical entry for object-*jeweils* for comparison.

(53) a. $[[\text{jeweils}_{\text{subject}}]] = \lambda Q \lambda R \lambda x^*. \forall x [\text{atom}_i(x,x^*) \rightarrow Q(R(x))]$
      b. $[[\text{jeweils}_{\text{object}}]] = \lambda Q \lambda R \lambda x^*. \forall x [\text{atom}_i(x,x^*) \rightarrow Q(R)(x)]$

With (53a) we can interpret (46a) as follows. Note that the type of Sh-NP is now <et,t>, as is generally the case for quantified expressions in subject position:

(54)
$\forall x [\text{atom}_i(x,\text{the\_customers'}) \rightarrow \exists z [\text{salesclerk'}(z) \& \text{rush\_towards'}(z)(x)]]$

$\lambda R \lambda x^*. \forall x [\text{atom}(x,x^*) \rightarrow \exists z [\text{salesclerk'}(z) \& (R(x))(z)]]$

SUBJ   OBJ   V
den Kunden   entgegenstuerzt
Sh-NP $\sigma x.\text{the\_customers'}(x)$ $\lambda y \lambda x.\text{rush\_towards}(x)(y)$
jeweils ein Verkaeufer
$\lambda P. \exists z [\text{salesclerk'}(z) \& P(z)]$
$\lambda Q \lambda R \lambda x^*. \forall x [\text{atom}_i(x,x^*) \rightarrow Q(R(x))]$

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[12] Haider (1993) does not assume a flat VP-structure for German. Instead, he assumes strict binarity to hold for German syntactic structures as well.

The denotation of *jeweils* applies first to the Sh-NP-denotation. In a second step, the resulting function applies to the relation denoted by the verb *entgegenstürzen* and then to the object denotation. This is possible under the plausible assumption that a part of a ternary branching structure can semantically combine with its two sister nodes in any order (type permitting!). Ultimately, then, it is the flat VP-structure of (52) which licenses *jeweils* in subject position in German. Note that this analysis also accounts for the ungrammaticality of Dutch binominal *elk* in subject position, if Dutch is non-configurational as argued in Haider (1986).

     Of course, for the sake of consistency we must also assume ternary branching VPs for *jeweils* in object position (22a), and subject-*jeweils* with scrambled objects (46b). The relevant structures with flat VPs are given in (55ab):

(55)   a.   ..., weil die Jungen$_{1,i}$ [$_{VP}$ t$_1$ jeweils$_i$ zwei Bücher kauften].
      b.   ..., weil den Kunden$_{1,i}$ [$_{VP}$ jeweils$_i$ ein Verkäufer t$_1$ entgegenstürzte].

The assumption of a flat VP for German makes an interesting prediction for sentences like (56) and (57), in which subject and object are formally identical and both animated. This is because German does not formally distinguish between NOMpl and ACCpl. If German has a flat VP-structure, we are led to expect (56) and (57) to be ambiguous between a subject-distributive and an object-distributive reading. The relevant structures are given in (56ab) and (57ab).

(56)   ...,weil   die Jungen jeweils zwei Mädchen   erwarten.
      ... because the boys   each   two girls   wait-for
     a.   ..., weil die Jungen$_{NOM,1,i}$ [$_{VP}$ t$_1$ jeweils$_i$ zwei Mädchen$_{ACC}$ erwarten]. (SU>>OBJ)
       '...because the boys are waiting for two girls each.'
     b.   ..., weildie Jungen$_{ACC,1,i}$ [$_{VP}$ jeweils$_i$ zwei Mädchen$_{NOM}$ t$_1$ erwarten]. (OBJ>>SU)
       '... because the boys are being awaited by two girls each.'

(57)   ...,weil   jeweils zwei Mädchen   die Jungen erwarten.
      ... because each   two girls   the boys   wait-for
     a.   ..., weil jeweils$_i$ zwei Mädchen$_{NOM,1}$ [$_{VP}$ t$_1$ die Jungen$_{ACC,i}$ erwarten].
      (SU>>OBJ)
       '...because the boys are being awaited by two girls each.'
     b.   *...,weil jeweils$_i$ zwei Mädchen$_{ACC,1,i}$ [$_{VP}$ die Jungen$_{NOM,i}$ t$_1$ erwarten].
      (OBJ>>SU)
       '...because the boys are waiting for two girls each.'

The two readings are indeed attested for (56), in which the *jeweils*-DP comes second. Unexpectedly, however, the subject-distributive reading is absent if the *jeweils*-DP comes first as in (57). In this case, the *jeweils*-DP must be interpreted as subject, contrary to our prediction. A solution to this – at first glance - unexpected puzzle can be found if we look at the informational status of the nominal arguments in (57). Lenerz (1977) has shown that German indefinite objects can precede their subject in the midfield if and only if they receive a topic-like, often specific, interpretation. I.e., an indefinite can precede its subject iff the set denoted by it has already been established in previous discourse. Now, since the denotation of *jeweils*-DPs must be determined wrt to the denotation of the nominal argument they distribute over, *jeweils*-DPs can never act as topics. Consequently, they cannot scramble across their subject, and structure (57b) is excluded by a general constraint on word order in German. The non-ambiguity of (57) thus follows from independent reasons, whereas the ambiguity of (56) is in line with our flat-VP analysis[13].

Before we conclude, let us add a few remarks on non-configurational VPs in German. The status of German as a (non)-configurational language was much discussed in the '80s. While Haider (1986) assumes the existence of flat syntactic structures for German, Fanselow (1987) and Grewendorf (1988) treat it as configurational even though German satisfies most characteristic properties of non-configurational languages (cf. Fanselow 1987). However, most generative work done on German in the last 10 years or so seems to implicitly or explicitly assume strict binary branching (i.e. non-configurationality) for German (e.g. Haider 1993, 1997). Empirical motivation for this claim comes from sentences like (58ab) and (59):

(58) a. ..., weil   jede Mutter$_i$ ihren$_i$ Sohn verehrt.
         ... because each mother   her   son admires
         '...because every mother$_i$ admires her$_i$ son.'

      b. *..., weil   ihr$_i$ Sohn jede Mutter$_i$ verehrt.
             because her   son every mother admires
         '...because her$_i$ son admires every mother$_i$.'

---

[13] Of course, the ambiguity of (56) would also follow non a configurational (steep VP-) analysis of German. Such an anlysis would simply assume reconstruction of the scrambled object over its subject at LF. The non-ambiguity of (57) would also follow from the restriction on overt scrambling in the main text.

(59)   [Einen Hund   gebissen]₁ hat der   Mann t₁.
         a   dog   bitten   has the   man
         'It was a dog that the man has bitten.'

In (58a), the universally quantified subject can semantically bind the pronominal object, whereas a pronominal subject cannot be bound by a universally quantified object. This is shown in (58b). This asymmetry is unexpected if subject and object are mutual sisters. However, it is only unexpected as long as linear precedence is denied any part in licensing semantic binding (cf. Barss & Lasnik 1986, Jackendoff 1990 for accounts that assign grammatical relevance to linear precedence). An alternative possibility to account for the asymmetry in (58ab) is to assume that the subject leaves the flat VP at surface structure and moves to SpecIP to ensure agreement with the verb. If so, the quantified subject in SpecIP c-commands (and binds) the object pronoun in (58a), but the quantified object inside VP cannot c-command (and bind) the subject pronoun in SpecIP in (58b).

(59) poses a challenge for a non-configurational analysis because a non-constituent (consisting of two daughters of a ternary branching constituent) is moved. The VP-internal subject hypothesis solves this potential problem, too: In (59), the subject *der Mann* raises to SpecIP before the remnant VP, which contains subject trace, object and verb, topicalizes. Hence, (59) has the surface structure in (60), in which a proper constituent has been moved.

(60) [t₁ Einen Hund gebissen]₂ hat der Mann₁ t₂.

We conclude that the data in (58ab) and (59) do not necessarily argue against an analysis of German as non-configurational. We are aware, though, that this position is not in line with current minimalist (cf. Chomsky 1995) or antisymmetric (cf. Kayne 1994) ideas that seem to exclude the possibility of ternary branching structures altogether. Those who would like to keep the assumption of strict binary branching for German, could choose one of the following three options: (i.) to abandon a unified analysis of BECs in English, Dutch, and German, possibly by treating German *jeweils* as quantifying over events (cf. Moltmann 1997). In Zimmermann (2000) it is shown that such a move is not unproblematic; (ii.) to abandon strict (surface) compositionality in the analysis of BECs; or

(iii.) to maintain a unified analysis and compositionality and develop a new semantics which is more in line with the requirements of strict binarity.

Summing up this section, we take German to possess a non-configurational, flat VP. On this assumption, the contrast between English/Dutch and German regarding the grammaticality of binominal elements in subject position follows from the (non-)configurationality of VP in these languages.

5. Conclusion

We have shown that S&S's syntactically based account of binominal *each* constructions faces both conceptual and empirical problems. In particular, the prediction that binominal *each* can never occur in subject position has been shown to be inadequate. Our semantically oriented account does not rule out binominal *each* in subject position. All typical properties of BECs follow from the lexical meaning of the binominal element. Word-order variation of binominals among languages and within one language is reduced to A-bar predicate fronting. Differences in syntactic distribution of binominals between English and German are derived from general syntactic differences between these two languages. Finally, our analysis enables us to compute the meaning of BECs from surface structure in a strictly compositional fashion. Therefore, LF-movement is not required for interpretative reasons. This makes our analysis more economical, and it lessens the importance of a syntactic level LF in interpreting natural language expressions.

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