

# Syntactic force of consistency conditions for German matrix predicates

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## Abstract

The paper discusses particular logical consistency conditions satisfied by German proposition-embedding predicates which determine the question type (external and internal *whether*-form as well as exhaustive and non-exhaustive *wh*-form), the correlate type (*es*- or *da*-correlate) as well as the impact of the correlate on the respective consistency condition. It will turn out that some consistency conditions also determine the embedding of verb second and subject-control.

## 1 Introduction

The paper presents a summary of particular semantic properties of German proposition embedding verbs — the so-called consistency conditions. They determine:

- (i) the clause type of the embedded clause: declarative, *whether*- or *wh*-interrogative — cf. *wissen* ‘know’, *sagen* ‘tell’ and *bedenken* ‘consider’ with *that-whether-wh*, *fragen* ‘ask’ with *whether-wh*, *zweifeln* ‘doubt’ with *that-whether*, and *bedauern* ‘regret’ with *that-wh* in (1) to (3);
- (ii) the possible correlate type — cf. *F denkt darüber nach, dass ...* ‘*F* thinks about that ...’ and *F glaubt es/daran, dass ...* ‘*F* believes it that/in ...’;
- (iii) the possible embedding of verb second — cf. *glauben* ‘believe’ licensing verb second (see (4a)), and *bedenken* ‘consider’, which does not (see (4b));
- (iv) subject-control with respect to ditransitive predicates — cf. *versprechen* ‘promise’ with subject control (see (5a)), and *überzeugen* ‘convince’ with object control (see (5b)).

- (1) a. *F weiß/sagt/bedauert, dass M kommt.*  
*F* knows/tells/regrets that *M* is coming  
b. *F denkt darüber nach dass  $\sigma$ .*  
*F* is thinking about that  $\sigma$   
b'. *F bedenkt [es] dass  $\sigma$ .*  
*F* considers [it] that  $\sigma$
- (2) a. *F weiß/sagt, ob M kommt.*  
*F* knows/tells whether *M* is coming  
b. *F denkt darüber nach ob  $\sigma$ .*  
*F* thinks about whether  $\sigma$   
b'. *F bedenkt [es] ob  $\sigma$ .*  
*F* considers [it] whether  $\sigma$
- (3) a. *F weiß/sagt, wer kommt.*  
*F* knows/tells who is coming

- b. *F denkt darüber nach, wer kommt.*  
*F* thinks about                    who is coming
- b'. *F bedenkt es, wer kommt.*  
*F* considers [it] who is coming
- c. *F bedauert es, wer kommt.*  
*F* regrets [it] who is coming
- (4) a. *F glaubt, M kommt.*  
*F* believes *M* is coming
- b. *\*F bedenkt, M kommt.*  
*F* considers *M* is coming
- (5) a. *F verspricht M zu x<sub>i</sub> kommen.*  
*F* promises *M* to     come
- b. *F überzeugt M zu x<sub>i</sub> kommen.*  
*F* convinces *M* to     come

The consistency conditions also determine how predicates like *wissen dass* ‘know that’ and *darüber nachdenken dass* ‘think about’ differ with respect to the logical forms of their *whether*-forms as well as of their *wh*-forms. *Wissen*, like *sagen*, exhibits what we call the **external *ob*-form** and the **exhaustive *wh*-form**. *Darüber nachdenken, dass* ‘think about’ like *bedenken dass* ‘consider that’, on the other hand, shows the **internal *ob*-form** and the **non-exhaustive *wh*-form**.

- (6) a. External *ob*-form (see (2a))  
 $A \text{ verb } ob \sigma \leftrightarrow (A \text{ verb } dass \sigma \vee A \text{ verb } dass \neg\sigma)$  (cf. §4)
- b. Exhaustive *wh*-form (see (3a))  
 $wh(A, \text{verb}, x) \leftrightarrow \forall x[A \text{ verb } ob \sigma(x)]$  (cf. §4)
- c. Internal *ob*-form (see (2b))  
 $A \text{ verb } ob \sigma \leftrightarrow A \text{ verb } dass (\sigma \vee \neg\sigma)$ ,  
 where  $\sigma$  is subject to particular restrictions (cf. §6)
- d. Non-exhaustive *wh*-form (see (3b,c))  
 $wh(A, [\text{cor}], \text{verb}, x) \leftrightarrow A \text{ verb } dass/ob \mu$ ,  
 with  $\mu$  being a contextually given proposition. For example, *Frank denkt darüber nach, dass/ob nur Kinder kommen* ‘Frank thinks about that/whether only children are coming’ (cf. §6)

Our approach towards verbs licensing *dass*- and *ob*-complements (cf. partially Groenendijk and Stokhof’s 1982 extensional verbs) differs from current ones (cf. Hintikka 1976; Ginzburg & Sag 2000; Lahiri 2002; Égré & Spector 2007; Égré 2008) in managing to explain, without recurring to functional notions like “responsive” or “rogative”, why *believe* and *regret* do not license any *whether*-form, how the *whether*-form of *know* differs from the *whether*-form of *think about*, and why *regret*, which is not semi-implicative (see Schwabe & Fittler 2009) or non-veridical (cf. Égré 2008), respectively, becomes semi-implicative or veridical, respectively, and even factive if it embeds a *wh*-clause. The notion of **semi-implicative** is given below in (9a). Égré (2008) defines veridicality in the same way.

## 2 Basics

The underlying semantic models — called **constellations** — consist each of a first order structure modelling the embedded propositions (e.g., *x kommt* ‘*x* comes’ or  $\neg\exists x[x \text{ kommt}]$

‘nobody comes’) upgraded by the embedding verbs with their appropriate clause- and correlate-types (e.g., *F glaubt daran, dass M kommt* ‘*F* believes in that *M* is coming’). The embedded propositions constitute a first-order language based on a given vocabulary  $V$  of individual constants for names of subjects (e.g., *F* or *Frank*, *M* or *Maria* etc.), and unary predicate constants expressing possible properties of subjects (e.g., *kommt* ‘comes’ admitting variables like  $x$  in  $x$  kommt or individual constants like *F* in *F* kommt). The **embedded** formulas of the mentioned first-order language are paired with **embedding** predicates like *F glaubt (daran) dass* ‘*F* believes (in) that’ or *F fragt ob* ‘*F* inquires whether’ in order to generate statements like *F glaubt (daran), dass M kommt* ‘*F* believes (in) that *M* is coming’ or *F fragt, ob  $\exists x[x$  kommt]* ‘*F* inquires whether somebody is coming’. The resulting formal language, the **matrix language**, is not a first-order one anymore. For the present purpose, we need not iterate the pairing process any further. Thus we avoid statements like *F glaubt, dass M weiß, ob jemand kommt* ‘*F* believes that *M* knows whether somebody is coming’.

The possible distribution of truth values of the various matrix statements “ $x$  verb *dass/ob*  $\sigma$ ” depends on  $x$  and  $\sigma$  in a constellation  $\aleph$  with fixed truth values for the embedded statements  $\sigma$  and on the intended meaning of the respective matrix verb. For instance, if  $\sigma$  is invalid, then  $x$  *weiß, dass*  $\sigma$  ‘ $x$  knows that  $\sigma$ ’ has to be invalid, while in case  $\sigma$  is valid, then  $x$  *weiß, dass*  $\sigma$  can have either truth value. Such restrictions will be called **consistency conditions**.

In the following, we need the set of embedded statements the subject  $x$  in  $\aleph$  knows:

$$\text{KN}(x) := \{\sigma \in \Phi[\aleph] \mid \aleph \models x \text{ weiß dass } \sigma\},$$

where  $\Phi[\aleph]$  denotes the set of all statements where parameters from  $\aleph$  are substituted for the free variables of  $\sigma$ . The set of all individual constants, predicate constants and parameters appearing in  $\text{KN}(x)$  will be denoted by  $V(x)$ , the **vocabulary** of the subject  $x$  in the constellation  $\aleph$ .

### 3 Consistency conditions

To explain the embedding behaviour of matrix verbs, we first introduce two general consistency conditions: the **Witness Existence Condition (WEC)** and the **Tautology Condition**:

- (7) **Witness Existence Condition (WEC)**  
 $\exists x[x \text{ verb } \textit{dass/ob } \sigma] \vee \exists x[\text{ verb } \textit{dass/ob } \neg\sigma]$
- (8) **Tautology Condition**  
 $x \text{ verb } \textit{dass } \sigma \rightarrow \sigma$  is a tautology

Verbs consistent with WEC are *wissen dass/ob* ‘know that/whether’, *fragen ob* ‘inquire whether’, *glauben dass* ‘believe’, *hoffen dass* ‘hope’, but not *bedauern dass* ‘regret that’, *beweisen dass* ‘prove’ or *kontrollieren ob* ‘check whether’. Verbs that are tautological are, for instance, *bedenken ob* and *diskutieren ob* — see (9g). Both license the internal *ob*-form (6c). All other consistency conditions split up into **absolute**, **relative** and **combined** consistency conditions. Absolute ones correlate the possible truth values of the matrix verb and the possible truth values or consistency properties of the embedded proposition  $\sigma$ . Relative ones, on the other hand, correlate the possible truth values of the matrix verb with the consistency properties of the embedded  $\sigma$  as well as with the set  $\text{KN}(x)$  of statements the matrix-subject  $x$  knows.

(9) **Absolute consistency conditions**

a. **Semi-implicative**

$x$  verb *dass*  $\sigma \rightarrow \sigma$

Examples: *wissen dass* ‘know that’, *erreichen dass* ‘manage’, *beweisen dass* ‘prove’ etc.

b. **Negation-invariant**

$x$  verb *dass/ob*  $\sigma \leftrightarrow x$  verb *dass/ob*  $\neg\sigma$

Examples: *wissen ob* ‘know whether’, *fragen ob* ‘inquire whether’, *zweifeln ob* ‘doubt whether’, *kontrollieren ob* ‘check whether’, *bedenken ob* ‘consider whether’, *darüber nachdenken ob* ‘think about whether’ etc.

c. **Anti-semi-implicative**

$x$  verb *dass*  $\sigma \rightarrow \neg\sigma$

Examples: (*sich*) *irren dass* ‘be wrong’, *verhindern dass* ‘prevent’ etc.

d. **Absolutely intautological**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  is not tautological

Examples: *anbieten dass* ‘offer’, *vermuten dass* ‘imagine’ etc.

e. **Absolutely consistent**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  is consistent

Examples: *bedenken dass* ‘consider’, *bestreiten dass* ‘dispute’ etc.

f. **Absolutely contingent**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  is contingent

Examples: *bedauern dass* ‘regret’, *schätzen dass* ‘appreciate’ etc.

g. **Absolutely tautological**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  is a tautological formula propositionally built upon contingent constituents  $\tau, \eta, \dots$

Examples: *bedenken ob* ‘consider whether’, which is the restriction of *bedenken dass* ‘consider’ to the tautologies of the form  $\tau \vee \neg\tau$ , where  $\tau$  is absolutely contingent

h. **Improperly semi-implicative**

$\leftrightarrow$  semi-implicative, and  $\forall\sigma\forall x[x$  verb *dass*  $\sigma \rightarrow \sigma$  is not tautological]

Examples: *es bedauern dass* ‘regret it that’, *es abstreiten dass* ‘deny it that’

i. **(Improperly) factive**

$x$  verb *dass*  $\sigma \rightarrow (\sigma \wedge \forall\sigma\forall x[x$  verb *dass*  $\sigma \rightarrow \sigma$  is not tautological]), and  $\neg(x$  verb *dass*  $\sigma) \rightarrow (\sigma \wedge \forall\sigma\forall x[x$  verb *dass*  $\sigma \rightarrow \sigma$  is not tautological])

Examples: *es bedauern* ‘regret it’, but not *es beweisen* ‘prove it’ or *es erreichen* ‘manage it’

To formulate the relative consistency conditions properly, we have to refer to the vocabulary  $V(x)$  of the subject  $x$  — see **section 2**. This means that verbs fulfilling a relative consistency condition hold true only for embedded statements  $\sigma$  based on  $V(x)$ , i.e.,  $\sigma$  is formulated by means of individual constants, predicate constants and parameters contained in the vocabulary  $V(x)$  of the subject  $x$ .

(10) **Relative consistency conditions**

a. **Relatively cognitent**

$x$  verb *dass*  $\sigma \rightarrow (\sigma$  follows from  $\text{KN}(x)) \wedge (\sigma$  is based on  $V(x))$

Examples: *sich darauf konzentrieren dass* ‘concentrate upon’, *darüber nachdenken dass* ‘think about’ etc.

b. **Relatively consistent**

$x$  verb *dass*  $\sigma \rightarrow (\sigma$  is consistent with  $\text{KN}(x)) \wedge (\sigma$  is based on  $V(x))$

Examples: *sich freuen dass* ‘be glad’, *darüber diskutieren dass* ‘discuss’, *sich bemühen dass* ‘make an effort’ etc.

c. **Relatively contingent**

$x$  verb *dass*  $\sigma \rightarrow (\sigma$  is contingent with  $\text{KN}(x)) \wedge (\sigma$  is based on  $V(x))$

Examples: *sich darauf freuen dass* ‘look forward’ etc.

d. **Relatively incognitent**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  does not follow from  $\text{KN}(x)$

Examples: *darauf hoffen dass* ‘hope for’

e. **Relatively tautological**

$x$  verb *dass*  $\sigma \rightarrow \sigma$  is a propositional tautology built upon constituents  $\tau, \eta, \dots$ , contingent with  $\text{KN}(x)$ , and  $\sigma$  is based on  $V(x)$

Examples: *darüber nachdenken ob* ‘think about whether’, which is the restriction of *nachdenken darüber dass* ‘think about that’ to the tautologies of the form “ $\tau \vee \neg\tau$ ”, where  $\tau$  is contingent with the subject’s knowledge (cf. (6c)).

f. **Improperly relatively cognitent/consistent**

verb is relatively cognitent/consistent, and for all  $\sigma, x$ :  $x$  verb *dass*  $\sigma$  does not hold true for any propositional tautology  $\varphi$  built upon constituents  $\tau, \eta, \dots$  contingent with  $\text{KN}(x)$ , and  $\sigma$  is based on  $V(x)$

Examples: *sich darüber freuen dass* ‘be glad about’, *daran denken dass* ‘think of’, *sich darüber freuen dass* ‘be glad’, *darüber klagen dass* ‘complain’ etc.

Combined consistency conditions have the form  $\alpha \# \beta$ , where  $\alpha$  is an absolute consistency condition, and  $\beta$  is a relative one. Saying that a verb fulfils  $\alpha \# \beta$  with respect to the absolute consistency condition  $\alpha(\sigma)$  and the relative consistency condition  $\beta(x, \sigma)$  means  $x$  verb *dass*  $\sigma \rightarrow (\alpha(\sigma) \vee \beta(x, \sigma))$ . To avoid ambiguities, one has to assume that neither  $\alpha$  nor  $\beta$  implies the other.

(11) **Combined consistency conditions**

a. absolutely contingent  $\#$  relatively incognitent

$x$  verb *dass*  $\sigma \rightarrow$   
 $(\sigma$  is contingent  $\vee$   
 $(\sigma$  does not follow from  $\text{KN}(x) \wedge (\sigma$  is based on  $V(x)))$ )

Examples: *hoffen dass* ‘hope’ etc.

b. factive  $\#$  relatively consistent

$x$  verb *dass*  $\sigma \rightarrow$   
 $(\sigma$  is valid  $\vee ((\sigma$  is consistent with  $\text{KN}(x)) \wedge (\sigma$  is based on  $V(x)))$ )

Examples: *diskutieren dass* ‘discuss’ etc.

c. absolutely intautological  $\#$  relatively consistent

$x$  verb *dass*  $\sigma \rightarrow$

( $\sigma$  is not tautological  $\vee$

(( $\sigma$  is consistent with  $\text{KN}(x)$ )  $\wedge$  ( $\sigma$  is based on  $V(x)$ )))

Examples: *glauben dass* ‘believe’ etc.

The union of the three classes of absolute, relative and combined consistency conditions are partially ordered by logical implication, e.g., relatively contingent implies absolutely consistent. So each matrix predicate satisfying a particular consistency condition  $\alpha$ ,  $\beta$  or  $\alpha \# \beta$ , respectively, fulfils also all weaker consistency conditions  $\varphi$  implied by  $\alpha$ ,  $\beta$  or  $\alpha \# \beta$ , respectively. The strongest consistency condition satisfied by a matrix predicate we call its **(consistency) degree**. Notice that the consistency conditions mentioned in connection with the examples in (9), (10) and (11) are their consistency degrees in most cases.

#### 4 Objective predicates, the external *ob*-form and the exhaustive *wh*-form

Verbs which are simultaneously consistent with the Witness Existence Condition WEC in (7) and either semi-implicative or negation-invariant or anti-semi-implicative are called **objective predicates** (provided they do not display their possible correlates). Objective predicates are, for example, *wissen dass* ‘know’, *hören dass* ‘hear’, *sagen dass* ‘tell’ (consistent with WEC and semi-implicative), *wissen ob* ‘know whether’, *hören ob* ‘hear whether’, *zweifeln dass/ob* ‘doubt that/whether’ (consistent with WEC and negation-invariant), and (*sich*) *irren dass* ‘be wrong’ (consistent with WEC and anti-semi-implicative). In contrast to *hören dass* ‘hear’ and *sagen dass* ‘tell’, *wissen dass* ‘know’ is inherently semi-implicative. Hence, there are constellations where *hören* and *sagen* are not semi-implicative. But in the external *whether*-form, they are semi-implicative — cf. Égré & Spector (2007) for a similar opinion. All *ob*-forms are inherently negation-invariant, regardless whether the verb is objective or not. *Es beklagen dass* ‘complain’ and *beweisen dass* ‘prove’ are semi-implicative, but they are not consistent with WEC. *Glauben dass* ‘believe’ is consistent with semi-implicative as well as with WEC, but never with both together.

In contrast to all non-objective predicates, all objective predicates, except the anti-semi-implicative ones, license the external *ob*-form — cf. (6a). And they do not allow the internal *ob*-form (cf. 6c)) without exhibiting a legitimate correlate.

Another characteristic feature is that, again in contrast to all non-objective predicates, they license the exhaustive *wh*-form, provided that they do not contradict *wissen dass* ‘know’.

As we will show below, objective verbs also license correlates. If they exhibit their legitimate correlate, they are, by definition, not considered objective.

#### 5 *Es*- and *da*-correlates

(i) ***Es*-correlates** in connection with non-objective verbs are licensed by those having an absolute or combined consistency degree (cf. *es bedauern dass* ‘regret it that’, *es diskutieren dass/ob* ‘discuss it that/whether’, *es glauben dass* ‘believe it that’) and by those without any degree (cf. *es flüstern dass* ‘whisper it that’, *es schreien dass* ‘shout it that’ and *es zischen dass* ‘hiss it that’). And they are licensed by objective verbs which are (non-)inherently semi-implicative (*es wissen dass/ob* ‘know it that/whether’, *es sagen dass/ob* ‘tell it that/whether’). Non-objective verbs like *sich freuen dass* ‘be

glad that’ and *darüber nachdenken dass/ob* ‘think about that/whether’, which have a relative consistency degree, as well as the objective *fragen ob* ‘inquire whether’, (*sich*) *irren dass/ob* ‘be wrong that/whether’ and *zweifeln dass/ob* ‘doubt that whether’, which are not (non-)inherently semi-implicative, do not license an *es*-correlate.

As for non-objective predicates, the legitimate use of the *es*-correlate strengthens their consistency degree as a rule by restricting their range of validity. Predicates with an absolutely consistent consistency degree become either absolutely contingent (*es ausschliessen dass* ‘exclude’) or factive (*es bedenken dass* ‘consider’). Verbs like *bedauern dass* ‘regret’ with an absolutely contingent degree are rendered improperly factive. Absolutely intautological predicates become absolutely contingent (*es sich vorstellen dass* ‘imagine it that’ and *es annehmen dass* ‘assume it that’). However, the semi-implicative and improperly semi-implicative non-objective predicates like *beweisen dass* ‘prove’ or *erreichen dass* ‘manage’ do not change their consistency degree.

Any objective, absolutely consistent (non-)inherently semi-implicative verb like *wissen dass* ‘know’ and *hören dass* ‘hear’ becomes factive if it exhibits an *es*-correlate. *Es sagen dass* ‘tell it that’ is not factive, not even semi-implicative since *sagen dass* ‘tell’ is not absolutely consistent.

(ii) **Da-correlates** are allowed for all non-objective *dass*-verbs having a relative or a combined consistency degree — cf. *sich darauf/darüber freuen dass* ‘be glad/look forward’ and *darauf hoffen dass* ‘hope for’. And they can occur with absolutely consistent objective *dass/ob*-verbs the range of validity of which is not **deductively closed**. “Deductively closed” means that the verb’s range of validity  $\varrho(x) = \{\tau | \aleph \models x \text{ verb } \textit{dass} \tau\}$  contains at least all its own logical consequences which are not tautologies. Examples of not deductively closed, i.e., “deductively open” ranges of validity arise with the verbs *wissen dass/ob* ‘know that/whether’, *erfahren dass/ob* ‘learn that/whether’ and *hören dass/ob* ‘hear that/whether’, *fragen ob* ‘inquire whether’ and *zweifeln dass/ob* ‘doubt that/whether’. They license a *da*-correlate in contrast to the deductively closed *merken dass/ob* ‘notice that/whether’ and the deductively open but not absolutely consistent *sagen dass/ob* ‘tell that/whether’.

The intended meaning of “*x* verb *da*-cor *dass*  $\sigma$ ” for a (non-)inherently (anti-)semi-implicative verb is paraphrased as: ‘either  $\varrho(x) = \{\tau | \aleph \models x \text{ pred } \textit{dass} \tau\}$  entails  $\sigma$  provided  $\sigma$  is not tautological, or else  $\sigma$  belongs to  $\varrho$ . For instance, *F hört davon, dass M kommt* means ‘*M* is coming is entailed by what *F* hears’. Thus the range of validity of the (non-)inherently semi-implicative verb “*x* verb *da*-cor *dass*  $\sigma$ ” is the deductive closure of the range of validity of the original verb, i.e., the smallest deductively closed set containing  $\varrho(x)$  as a subset. The use of the *da*-correlate does not imply the semi-implicative use of a non-inherently semi-implicative *dass*-verb.

As to an anti-semi-implicative objective *dass*-verb like *irren, F irrt sich darin, dass M kommt* ‘*F* is wrong about that *M* is coming’, it can be paraphrased by ‘*M* is not coming follows from the negations of the embedded statements  $\tau$  that *F* is wrong about’.

As to non-objective verbs, the use of an optional *da*-correlate strengthens their relative consistency degree in that it restricts the range of validity of the verb. For instance, *sich freuen dass* ‘be glad that’, which is improperly relatively consistent, becomes relatively contingent by the correlate *darauf* — cf. *sich darauf freuen dass* ‘look forward’. And it becomes improperly relatively cognitive, even improperly **relatively cognitive**, by the correlate *darüber*. “Relatively cognitive” means that the validity of the negated matrix-predicate with the *da*-correlate implies that the embedded *dass*-clause follows from the subject’s knowledge  $\text{KN}(x)$  — cf. *x freut sich (nicht) darüber, dass  $\sigma$*  ‘*x* is (not) glad that

$\sigma$  entails that  $\sigma$  follows from what  $x$  knows. Non-objective relatively cognitent predicates are always relatively cognitive, and exhibit a *da*-correlate.

Predicates with a combined consistency degree  $\alpha \# \beta$  get the consistency degree  $\alpha$  in the presence of the *es*-correlate, and the consistency degree  $\beta$  in the presence of the *da*-correlate.

## 6 Internal *ob*-form and non-exhaustive *wh*-form

The internal *ob*-form (see (6c)) applies to particular non-objective as well as to certain originally objective predicates.

(i) **Objective *dass*-verbs** license the internal *ob*-form in the presence of a legitimate *da*-correlate if they are not inherently semi-implicative — cf. *davon hören ob* ‘hear about whether’, *daran zweifeln ob* ‘doubt about whether’, *danach fragen ob* ‘inquire about whether’ and *darin irren ob* ‘be wrong about whether’, but not *\*davon wissen ob* ‘know *da*-cor about whether’.

As to the meaning of the internal *ob*-form in the non-inherently semi-implicative case — cf. *F hört davon ob M kommt* ‘*F* hears *da*-cor whether *M* comes’, it is determined by: If  $\sigma$  in “*x* verb *da*-cor *ob*  $\sigma$ ” is a formula in the recursive build-up of a formula  $\varphi$  belonging to the range of validity of “*x* verb *da*-cor  $\varphi$ ”, then “*x* verb *da*-cor *ob*  $\sigma$ ” can be paraphrased by “*x* pred *da*-cor *dass* ( $\sigma \vee \neg\sigma$ )”. Take our example above, and imagine  $\varphi$  as ‘*F* hears about that *P* comes if *M* comes’. Then *F* hears about whether *M* comes’ and also ‘*F* hears about whether *P* comes’.

(ii) **Non-objective verbs** license the internal *ob*-form if they have the absolutely or relatively tautological consistency degree — cf. *kontrollieren ob* ‘check whether’, *bedenken ob* ‘consider whether’ and *überlegen ob* ‘think about whether’, but not *\*bedauern ob* ‘regret whether’, *\*bestreiten ob* ‘dispute whether’, *\*sich darüber/darauf freuen ob* ‘be glad about/look forward to’. Provided the verb also has the *dass*-form, it has to be factive or relatively consistent/cognitent in the presence of the legitimate correlate in order to allow a non-empty restriction of its range of validity to tautologies of the form ( $\sigma \vee \neg\sigma$ ) — cf. *es bedenken dass* ‘consider’ (factive), *es überlegen dass* ‘think about that’ (factive), *darüber nachdenken dass* ‘think about that’ (relatively cognitent), but not *es bedauern dass* ‘regret it’ (improperly factive), *es bestreiten dass* ‘dispute it that’ (absolutely contingent) and not *sich darüber/darauf freuen dass* ‘be glad about/look forward to’ (improperly relatively cognitent/relatively contingent).

As to non-objective verbs with a combined consistency degree  $\alpha \# \beta$ , the internal *ob*-form is licensed iff both “*x* pred *es*-cor *dass*  $\sigma$ ” and “*x* pred *da*-cor *dass*  $\sigma$ ” allow the internal *ob*-form, i.e.,  $\alpha$  and  $\beta$  both do not exclude tautologies. Thus *diskutieren dass* (factive  $\#$  relatively cognitent) licences the internal *ob*-form, whereas *glauben dass* (absolutely intautological  $\#$  relatively consistent) excludes it. The reason for this is that *es glauben dass* is absolutely intautological.

The non-exhaustive *wh*-form (cf. (6d)) is licensed by a non-objective verb if (i) the verb allows an internal *ob*-form — cf. *es bedenken wh* ‘consider’, *es/darüber diskutieren wh* ‘discuss’, or if (ii) the verb is improperly factive or improperly relatively cognitent, respectively, together with the legitimate *es*- or *da*-correlate — cf. *es bedauern wh* ‘regret’ and *sich darüber freuen wh* ‘be glad about’. It is not licensed by *es beweisen* ‘prove’, which is not factive, or *es/darauf hoffen* ‘hope’, which is absolutely contingent/relatively incognitent.

As to objective predicates, the non-exhaustive *wh*-form applies at most in the presence of a legitimate correlate, for instance, *x weiß/sagt es, wer kommt* and *x weiß/hört davon, wer kommt*.

As shown in (6d), the meaning of the non-exhaustive *wh*-form relates to a contextually given specification  $\mu$ . The non-exhaustive *wh*-form of non-objective verbs allowing the internal *ob*-form translates into “*x* verb *ob*  $\mu$ ” or “*x* verb *dass*  $\mu$ ”. The exhaustive *wh*-form of all other non-objective verbs as well as the non-exhaustive *wh*-form of objective verbs can only be paraphrased by “*x* verb *dass*  $\mu$ ”.

## 7 Verb second and subject control

We have seen how the consistency conditions determine the different types of question embedding as well the choice and impact of a correlate. They also turn out to be a useful means to explain the behaviour of matrix predicates towards the embedding of verb second clauses (see (4a)) and subject control with respect to ditransitive verbs (see (5a)).

(i) **Verb second** is licensed by the matrix verb iff the latter is either objective and (non-)inherently semi-implicative, or it is non-objective and does not exclude contradictions — cf., for example, *wissen dass* ‘know’, *erfahren dass* ‘learn’ and *sagen dass* ‘tell’, which are objective and (non-)inherently semi-implicative; the absolutely intautological *versprechen dass* ‘promise’, the relatively incognitent *drohen dass* ‘threaten’, *hoffen dass* ‘hope’, the degree of which is (absolutely contingent  $\neq$  relatively incognitent), and *flüstern dass* ‘whisper’, which does not have any consistency degree. Counterexamples are the objective *zweifeln dass* ‘doubt’ (consistent with negation-invariant and WEC) and the non-objective and semi-implicative *beweisen dass* ‘prove’, the non-objective and absolutely consistent *verbieten dass* ‘forbid’ and the non-objective and improperly relatively consistent *bitten dass* ‘ask’.

(ii) **Subject control** of a ditransitive matrix verb is given just in case the verb does not exclude contradictions, i.e., it licenses verb second — cf. *versprechen dass* ‘promise’, which is absolutely intautological, i.e., *x verspricht y dass  $\sigma$*  ‘*x* promises *y* that  $\sigma$ ’ can be valid for some contradiction  $\sigma$ , and *drohen dass* ‘threaten’, which is relatively incognitent, i.e., *x droht y dass  $\sigma$*  ‘*x* threatens *y* that  $\sigma$ ’ can also be valid for some contradiction.

Counterexamples are *bitten dass* ‘ask’, which is of degree improperly relatively consistent, i.e., *x bittet y dass  $\sigma$*  implies that  $\sigma$  is consistent with  $\text{KN}(x)$ , hence absolutely consistent, *verbieten dass* ‘forbid’, the degree of which is absolutely consistent, *x verbietet y dass  $\sigma$*  implies that  $\sigma$  is consistent.

## REFERENCES

- Égré, P. 2008. Question-embedding and factivity. *Grazer Philosophische Studien* 77: 85–125.
- Égré, P. and B. Spector. 2007. Embedded questions revisited: An answer, not necessarily the answer. Ms., Harvard and IJN.
- Ginzburg, J. and I. A. Sag. 2000. *Interrogative Investigations. The form, meaning, and use of English interrogatives*. Stanford CA: CSLI Publications.
- Groenendijk, J. and M. Stokhof. 1982. Semantic analysis of *wh*-complements. *Linguistics and Philosophy* 5: 117–233.
- Hintikka, J. 1976. The semantics of questions and the questions of semantics. *Acta Philosophica Fennica* 28.
- Lahiri, U. 2002. *Questions and answers in embedded contexts*. Oxford: Oxford Studies in Theoretical Linguistics.

Schwabe, K. and R. Fittler. 2009. Semantic characterizations of German question-embedding predicates. In: P. Bosch, D. Gabelaia and J. Lang (eds.). TbiLLC 2007. Number 5422 in LNAI. Berlin and Heidelberg: Springer-Verlag. 229–241.