ON THE TRUTH CONDITIONAL POTENTIAL OF NEGATIONS[*]

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Abstract

According to Partee (1991) and Hajicova/Partee/Sgall (1998), the meaning of natural language sentences corresponds to the tripartite structure. Scope relations within the sentence meaning may effect different readings of DPs. The essential point is the syntactic position of a DP relative to the position of the (possible) sentence negation. It can be shown that the scope of negation coincides with the domain of prosodic focus. The semantic counterpart of focus is the critical meaning of the sentence or - speaking with Roberts (1996) - its *partial answer*. Scope relations within the sentence yield complex, nested function-argument structures. The resultant operations mapping properties onto individuals mark the structural precondition for DP-readings, e.g. for the specific reading of indefinite DPs. The presentation regards German data as well as data from Czech, which has no overt article system. The movement of DPs out of the prosodically unmarked focus, i.e. the focus of new information, results in the specific DP-reading, at least in the reading of the DP as an individual term: *Petr si auto$_i$ koupil t$_i$* 'Peter car$_i$ bought t$_i$' (= Peter bought the car). The presentation illuminates the semantic composition of sentence meaning with respect to its interaction with the lexical, prosodic, and syntactic level.

1   The problem

The present paper focuses on the interaction of sentence negation and DP-readings. This problem has far-reaching consequences – in particular in Slavic languages which, like Czech, have no overt article system. DPs outside the scope of sentence negation must be interpreted as referential DPs or at least as specific DPs:

(1)   (a)   Petr$_i$ [t$_i$ nekoupil AUto]$_{Focus}$ (Czech)

Peter neg-bought $\varnothing$ car

Peter didn't buy any car.

(b)   Auto$_j$ Petr$_i$ [NEkoupil t$_i$ t$_j$]$_{Focus}$

$\varnothing$ car Peter neg-bought

The car Petr didn't buy.

(c)   Petr$_i$ auto$_j$ [NEkoupil t$_i$ t$_j$]$_{Focus}$

Peter $\varnothing$ car neg-bought

Peter didn't buy the car.

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[*] This paper is a short version of the submitted article Späth (2001): "The Linearization of Argument DPs and Its Semantic Reflection".

A similar effect of sentence negation on DP-readings can also be observed in German. Outside the scope of negation, an indefinite DP is interpreted as a specific one:

(2)   Peter hat einen Wagen [geKAUFT]$_{Focus}$

        Peter BOUGHT a car.

The present paper attempts to identify the structural preconditions for such DP-readings as well as their triggers within the compositional structure of the sentence meaning. It will become clear, that the scope of a (possible) negation function of sentences with unmarked prosodic structure coincides with the focus domain of these sentences.

2   Theoretical and methodical preliminaries

The analysis is based on the concept of Two-Level Semantics. Semantic representations results from the mapping of the syntactic structure onto the Semantic Form (Bierwisch 1987, 1988, Wunderlich 1991). The Semantic Form (SF) is generated by the compositional rules of combination. The assignment of extensional and truth-functional values takes place after the mapping of the SF onto the context of utterance. This process is based on inferential operations.

The analysis of DPs proposed here treats DPs uniformly as quantifiers of the type $<<e, t>, t>>$. The analysis of DPs as terms of type $<e>$ contrastingly does not yield those truth conditions and context conditions which the information structure, i.e. the topic-focus articulation, contributes to the meaning of a sentence and to the conditions for a possible use of this sentence in a context of utterance. The most important argument for the treatment of DPs as quantifiers are the scope relations within a sentence. Individual terms serve only to saturate the argument places of functions. Quantifiers contrastingly create scope relations, leading to nested and coordinated predications. Such structures correspond to the nature of natural-language sentences (cf. Löbner 1990) and constitute structured propositions. Thus with respect to DPs, the topic of a sentence can be either the external argument or one of the internal arguments.

Speaking with Büring (1998), the topic-focus structure of a sentence has effect on the appropriateness conditions. This is not a pragmatic effect. The question-answer sequence (3) shows that both answers have the identical propositional content, but only one sentence is congruent with the context established by the question:

(3)   (a)   Was hat Peter gekauft?

                What did Peter buy?

        (b)   Peter$_{Topic}$ hat ein AUTO$_{Focus}$ gekauft.

                Peter bought a car

        (c)   *Ein Auto$_{Topic}$ hat PETER$_{Focus}$ gekauft.

a car did Peter buy

The present paper argues, that information structure effects the conditions for the identification of situations. In (b), the referent of the external argument is presupposed at the time of utterance. In (c), the referent of the internal argument is asserted as presupposed. The question presupposes only the existence of an event, stating that the referent of the external argument bought something, i.e. the question asks for the referential value of the internal argument.

3   Blocked external negation

The definition of the notion of topic is based on the aboutness criterion. Every sentence has only one topic, i.e. every sentence has only one main function. In accordance with Jäger (2001), the Discourse Linking Principle holds: "Every atomic clause has a topic" (ebd.). If none of the structural arguments is a topic, "this part has to be taken by the event argument" (ebd.). Thus the existential assertion of an event can be the main function of a sentence as well. This concerns sentences which typically are used as categorical sentences:

(4)   (a)   Es regnet nicht. *Das* freut Marie.

                     It is not raining. Mary is pleased about *that*.

          (b) $\exists e \ [\neg[[rain] \ (e)]]$

The sentence scheme (b) makes clear, why external negation $[\neg\exists e \ [\ ... \ e \ ... \ ]]$ must be blocked for natural language sentences. External negations effects an empty set of discourse referents. Thus, it would be unclear what the referent of the anaphoric pronoun *das* 'that' is. On the contrary, the sentence (4) states: it is the case that it is not raining and Mary is pleased that it is the case that it is not raining. Sentence negation does therefore not concern the existential assertion of the event but the instantiation function of the proposition:

(5) $\exists e \ [\neg[[p] \ (e)]]$[1]

A sentence negation expresses that there exists an event and that this event however is not an instance of the proposition. The existential assertion of the event corresponds to the

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[1] In accordance with Jung/Küstner (1990) it can be assumed that negation of the instantiation function is logically equivalent to negation of the proposition. In natural language, a negated proposition nevertheless cannot be expressed. The application of the negative function to the proposition requires the negation of a predicate $\lambda y \ \lambda x \ [P \ (x, \ y)]$ to take place in the lexicon, before the predicate combines with the instantiation function, which transform the basic lexical entry into an expression with the grammatical category [+V, -N] (i.e. a verb: $\lambda y \ \lambda x \ \lambda e \ [[P \ (x, \ y)] \ (e)])$. This procedure is not in accordance with the principle of compositionality and with the syntactic structure as a basis of the mapping onto a semantic representation.

descriptive content of the declarative sentence-mood operator, which is hosted in the head of the functional projection CP:

(6)

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                          CP
              ┌────────────┴────────────┐
              ∅                    C'   ∃e [(¬)[[p] (e)]]
                              ┌──────────┴──────────┐
                       λP [∃e [P (e)]]              VP
                       ∈ <<e, t>, t>          ┌──────────┘
                                              λe [(¬)[[p] (e)]]
                                              ∈ <e, t>
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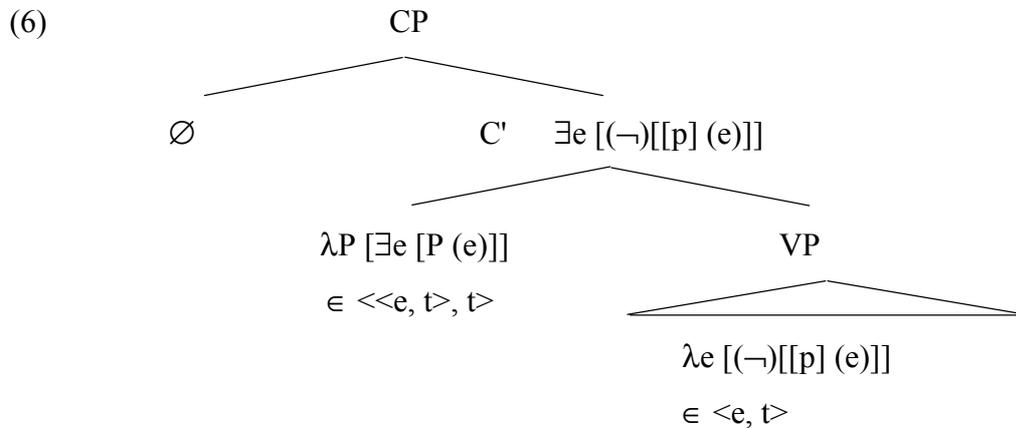
If a structural argument, for instance a DP, is topicalized, the DP has to move beyond the sentence-mood operator. In this way, the topic takes scope over the existential assertion of the event. In this syntactic constellation, the topic is above the position of sentence negation, such that the presupposition of the topic is constant under negation. On negating the event quantification, however, the presupposition triggered by the topic would be the only valid presupposition of the sentence at all. Only the information about the existence of the topicalized individual would therefore ensue from a negative sentence:

(7)   (a)   Utterance: The child does not sleep.

      (b)   Semantic Form: $∃!x$ [[*child* (x)]∧[¬∃e [[*sleep* (x)](e)]]][2]

      (c)   Presupposition: $∃!x$ [*child* (x)]

Since unique existence is asserted for a child, independently of any event or state of affairs, the presupposition (7c) would yield an invalid assumption about the world of discourse. With respect to the referent of the topic, nothing would be the case in this world. The referent of the topic DP could be neither anchored in a potential event described by the proposition, nor evaluated within a time-world index. Thus the function of negation may not rise to C^0, since otherwise no event would be introduced. A negation of the event quantification for this reason is blocked in natural-language sentences. Sentence (7a) rather asserts that, with respect to the topic *child*, it is the case that it does not sleep:

(8) $∃!x$ [[*child* (x)]∧[∃e [¬[... e ... x...]]]]

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2   The semantic representation λQ [$∃!x$ [[P (x)] ∧ [Q (x)]]] is a notational abbreviation for the truth condition of λQ [∃x [∀y [*boy* (y) ↔ x = y] ∧ [Q (x)]]].

The structure tree (9) shows the syntactic constellation, wherein the external argument is the topic of the sentence:[3]

(9)

$$\text{CP}$$

DP   C'

the child

$\lambda P\,[\exists e\,[P\,(e)]]$

(10)   topic   comment

$\exists!x\,[[child\,(x)]\wedge[\exists e\,[[sleep\,(x)]\,(e)]]]$
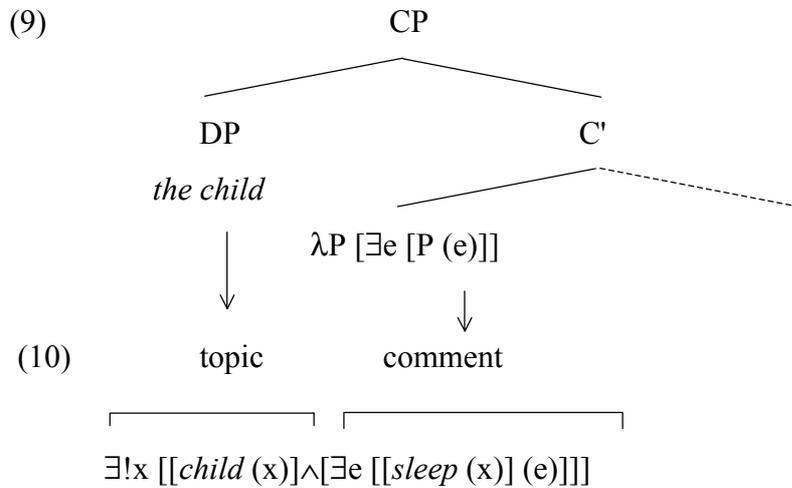
The topic DP moves beyond the sentence-mood operator in C^0 and takes scope over the event quantification. Placed in this syntactic position, the topic is always located outside the scope of negation. This syntactic configuration satisfies the structural preconditions for individual terms in argument position, which too cannot be negated. Within the conceptual system, topicalized DPs can be interpreted as individual terms, using an equivalence:

(11) $\underline{\exists x\,[[P\,(x)]\wedge[Q\,(x)]]}$ ≡ $\underline{Q\,(\iota x\,[P\,(x)])}$

       Semantic Form   Conceptual interpretation

4   Semantic Effects of DP Movement

The movement of an argument DP into the topic position depends on its status in the given discourse. The DP has to represent that individual which the sentence is about.

(12)   (a)   Peter hat ein AUTO gekauft.

         (b)   Ein Auto hat PETER gekauft.

Sentence (12a) enables us to refer to a discourse model, wherein the referent of the external argument, but not of the internal argument, is presupposed. The opposite is the case in (12b). Languages vary in how far the grammatical system is able to express context conditions

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[3]   It is not clear whether the topic moves to SpecCP, especially with respect to embedded sentences. In any case, the topic must be syntactically hosted on top of C^0.

explicitly. For instance, the same syntactic and prosodic structure of (12), translated to Czech, carries different presuppositions by the determinerless internal argument DP:

(13) (a) Petr koupil AUTO.

(b) Auto koupil PETR.

Under unmarked prosodic conditions, the inversion of topic and focus or the subject-object inversion yields the specific and referential reading for the topicalized internal argument (13b). In German, the DP interpretation results from the interaction of the syntactic and prosodic information with the specific lexical meaning of the determiner of the noun. In Czech, which systematically lacks articles, the specific meaning introduced by the indefinite determiner is not realized. It is rather the case that all DPs moved outside the focus domain have to be interpreted referentially, like in (c):

(c) Petr si auto$_i$ [KOUPIL t$_i$]$_{Focus}$

Including sentence negation, is can be assumed, that the negation operator has a fixed position in the syntactic structure of the sentence. Speaking with Dölling (1988), the scope of negation coincides with the focus domain of the sentence. In accordance with Haftka (1995), the negation operator is hosted in the head of the positional phrase PosP, which dominates the VP:

(14) [$_{CP}$ [$_{C'}$ [$_C$]] ... [$_{PosP}$ [$_{VP}$]]]

Those constituents which are part of the new information and part of the focus domain bear the feature [+F] and remain within the VP. These constituents are not anaphoric entities. The feature [-F] in turn is assigned to anaphoric constituents. Anaphoric constituents move outside the VP and beyond the PosP. Thus the target of syntactic movement of non-focused constituents is a position outside the PosP, i.e. outside the scope of (possible) negation. For this reason, the topic-DP moves outside the VP. In (15), the internal argument has moved too:

(15) (a) weil Peter$_i$ ein Auto$_j$ [(nicht) t$_i$ t$_j$ geKAUFT hat]$_{Focus}$

(b) Petr$_i$ auto$_j$ [(NE-)koupil t$_i$ t$_j$]$_{Focus}$ (=1c)

Peter ∅ car (neg-)bought

Peter bought/didn't buy the car.

5 Semantic mechanism of mapping

The function of negation precedes the focus domain, which marks the part of new information of the sentence. This becomes more clear, when we set a sentence and its topic-focus inversion into the context of appropriate questions:

(16) (a) Q: Was hat sich Peter gekauft?

A: Peter hat sich ein AUTO gekauft.

(b) Q: Wer hat sich ein Auto gekauft?

A: Ein Auto hat sich PETER gekauft.

The semantic structure of the questions provides that part of the proposition to which, in the given context, the referential value is not yet assigned. The focus-semantic structure of the answers yields the referential value which accordingly is assigned to the non-bound argument place in the open proposition of the question. Starting out from this, the focus-semantic value of the answers can be realized elliptically:

(16') (a') Q: Was hat sich Peter gekauft?

A: Ein AUTO (hat sich Peter gekauft).

(b') Q: Wer hat sich das Auto gekauft?

A: PETER (hat sich ein Auto gekauft).

The elided parts of the answers are existentially asserted and considered to be presupposed. They therefore have not to be evaluated existentially in the given discourse model. According to Roberts (1996), the new information of the sentence corresponds to its *partial answer* relative to a possible question.[4] In terms of a formal-semantic representation, the partial answer can be identified with the critical property of the sentence. The property *sleep* (x) holds undividedly with respect to the individual *child* (see Löbner 1990):

(17) (a) The child sleeps.

$sleep$ (ιx [$child$ (x)])

(b) The child don't sleep.

$\neg sleep$ (ιx [$child$ (x)])

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4 "A *partial answer* to a question q is a proposition which contextually entails the evaluation – either true or false – of at least on element of Q-alt(q). A *complete answer* is a proposition which contextually entails an evaluation for each element of Q-alt(q)" (Roberts 1996).

The argument DP meets the criterion of *Consistency*: "If the predicate P is true for the NP, then its negation not-P is false for the NP" (Löbner 1987). This means for the sentences (17), that sentence (a) is only true, if the predicate *sleep* holds and the predicate not-*sleep* does not hold for the argument, while it is vice versa for (b). The presupposition of the argument DP is constant under negation.[5] In the case of two-place predicates, e.g. *buy* (x, y), the critical property may be more complex than in the case of the one-place predicate in (17):

(18)   (a)   Der Mann hat sich (k-)ein AUTO gekauft.

       (b) $\lambda x\ [(\neg)bought\ (x,\ \varepsilon y\ [car\ (y)])]\ (\iota x\ [man\ (x)])$[6]

With respect to the individual *man*, sentence (18) is only true or false, if an event, described by the complex predicate *buy* (x, y) and involving an object described by the patient DP *a car*, has taken place. In case that the internal argument is topicalized, the sentence (19) is only true or false with respect to the individual *car*, if an event, described by the complex predicate *buy* (x, y) and involving an object described by the agent DP *a man*, has taken place:

(19)   (a)   (a)   Das Auto hat sich (k-)ein MANN gekauft.

               (b) $\lambda y\ [(\neg)bought\ (\varepsilon x\ [man\ (x)],\ y)]\ (\iota y\ [car\ (y)])$

As implied by the discussion of the last two examples, the comment is a complex function which is mapped onto the topic. The degree of complexity depends on the scope of (possible) negation. In examples (18) and (19), the scope of (possible) negation coincides with the entire comment. Thus, the comment represents the critical property of the sentence. This is contrastingly not the case in (20):

(20)   (a)   Der Mann hat sich das Auto (nicht) GEKAUFT.

       (b) $\lambda P\ [(\neg)\ P\ (\iota x\ [man\ (x)],\ \iota y\ [car\ (y)])]\ (\lambda y\ \lambda x\ [bought\ (x,\ y)])$

In (20), both DPs are existentially asserted and are considered as presupposed. Since the topic moved outside the VP into the sentence-initial position, and since the non topical DP moved outside the scope of negation, the critical property is only the descriptive content of the underlying state of affairs. Within the comment, the critical property is mapped onto the non–

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5   The undivided reading of the DP does not hold for weakly quantified DPs:

    (i)   Einige Kinder SCHLAFEN (nicht). 'Some children are not sleeping.'

    The quantifier *einige* 'some' presupposes the existence of both sleeping and not sleeping children within the same discourse model.

6   In order to simplify the semantic representations and for the sake of clarity, DPs are represented as individual terms and the event role is neglected in (34)–(37).

topical DP. From this operation results the complex function of the comment, which in turn is mapped onto the topic.

Distinct scope hierarchies of predication are triggers of varying presuppositions of DPs relative to a possible situation. Referring to the topic-focus inversion (cf. example (3)), let us return to this point, concentrating on the reference to situations triggered by information structure:

(21) Q: Was hat sich Peter gekauft?

      A: Peter$_{Topic}$ hat sich ein AUTO$_{Focus}$ gekauft.

      A': *Ein Auto$_{Topic}$ hat sich PETER$_{Focus}$ gekauft.

Although both answers are subject to the same propositional content, answer A' is not valid in the restricted context of question Q. This conflict is due to the topicalization of the internal argument DP *ein Auto* 'a car' and the assignment of focus to the external argument DP *Peter*. In this way, the existence of the referent of the DP *ein Auto* is considered as presupposed. On the other hand, the focused DP *Peter* is part of the critical meaning of the sentence, such that the existence of the referent is not regarded as presupposed. The restricted context of Q, however, asserts the contrary. Thus both answers describes dissimilar situations.

The nested mapping onto an individual in (18–20) shows that the Mapping Hypothesis (in the sense of Diesing 1992) can be specified. Anaphoric constituents move outside the VP, because the VP is the domain of the new-information focus, which is marked by phonological means. Constituents moved outside the VP are existentially asserted with respect to the context of utterance. Constituents within the VP can be expressions, but they are neither anaphoric nor existentially asserted. These constituents are crucial for the truth-conditional evaluation of the sentence.

6   Compositionality of context conditions

6.1   Semantic composition of the comment

Following Wunderlich (1991), the sentence meaning consists of truth conditions and context conditions, as far as both conditions are compositional parts of the linguistic structure of the sentence. Scope relations within the sentence reflect context conditions. The topic-DP takes absolute scope and dominates the existential assertion of an event under C^0. DPs in a position below C^0 are part of the sentence's comment. If such a DP additionally is part of the focus domain, then the DP is in the scope of the (possible) negative function and part of the critical meaning of the sentence. If so, the DP may be semantically integrated below PosP, such that the internal argument is the complement of V^0 (a) and the external argument is hosted in SpecVP (b):

(22)   (a)   [... [$_{PosP}$ ($\neg$) [$_{VP}$ t$_i$ [$_{V'}$ [$_V$ *koupil*] [$_{DP}$ *auto*]]]] ...]

       (b)   [... [$_{PosP}$ ($\neg$) [$_{VP}$ *petr* [$_{V'}$ [$_V$ *koupil*] [$_{DP}$ t$_i$]]]] ...]

With respect to compositionality, there is the problem that the DP is a second-order one-place predicate, while the verb is a first-order n-place predicate:

(23) $\lambda Q\ [\exists y\ [[P\ (y)] \wedge [Q\ (y)]]]$ $(\lambda y\ \lambda x\ \lambda e\ [[R\ (x, y)]\ (e)])$

$\in\ <e, t>, t>>$ $\in\ <e, <e, <e, t>>>$

The semantic type conflict is a rather natural one, since DPs are no individual terms but quantifiers which take scope and which create structured propositions. In accordance with Zimmermann (1998) and Steedman (1998), DPs can enter into the semantic representation by means of semantic type shift. This operation of semantic type coercion (Partee 1987, 1992) operates upon the argument structure of the verb (von Stechow 2000). In addition, it is necessary to define a rule which is flexible for the topicalization of either the external or the internal argument. The higher-order predicate variable $\Re$ in (24) has to be saturated by that DP which is not topicalized:

(24) $\lambda P\ \lambda \Re\ \lambda x_i\ ...\ \lambda x_1\ [\Re\ (\lambda x_{j \geq 1}\ [P\ (x_n\ ...\ x_1)])]^7$

         [+T]

The feature [+T] identifies that argument to which the topic feature is assigned within the argument structure of the verb. The respective argument place can be identified using an alpha numeric rule:

(25)   (a)   alpha-numeric identification:

         $\lambda P\ \lambda \Re\ \lambda x_i\ ...\ \lambda x_1\ [\Re\ (\lambda x_{j \geq 1}\ [P\ (x_n\ ...\ x_1)])]\ (\lambda y\ \lambda x\ \lambda e\ [[R\ (x, y)]\ (e)])$

         [+T]   [+T]

         $\equiv \lambda P\ \lambda \Re\ \lambda x\ \lambda e\ [\Re\ (\lambda y\ [P\ (e, x, y)])]\ (\lambda y\ \lambda x\ \lambda e\ [[R\ (x, y)]\ (e)])$

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[7]   The rule (30) holds only for structually two-place verbal predicates. For n-place predicates, the specification of the features of the argument places has to consider that the discourse embedding features are subject to the assignment of the features [±T(opic)] and [±F(ocus)]:

(i)   ... λx_i ...   [... x_1 ...]

        [+T]   [-T]   [-T]

        [+F]   [-F]   [+F]

(b)   lambda-application:

$\lambda P \, \lambda \mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [P \, (e, x, y)])] \, (\lambda y \, \lambda x \, \lambda e \, [[R \, (x, y)] \, (e)])$

$\equiv \lambda \mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [[R \, (x, y)] \, (e)])]$

The result of (b) contains the argument place $\lambda \mathfrak{R}$, which needs a second-order one-place predicate. DPs fulfill the required semantic type:

(c)   concatenation of a DP and the type shifted verb:

$\lambda \mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [[R \, (x, y)] \, (e)])] \, (\lambda Q \, [\exists y \, [[P \, (y)] \wedge [Q \, (y)]]])$

$\equiv \lambda x \, \lambda e \, [\exists y \, [[P \, (y)] \wedge [[R \, (x, y)] \, (e)]]]$

The result of (c) represents the Semantic Form of the VP. If there are no modifiers of VP, the negative function in PosP can be applied to expression (c). The rule of combination is functional composition:

(26) $\lambda p \, [(\neg)[p]] \, \lambda x \, \lambda e \, [\exists y \, [[P \, (y)] \wedge [[R \, (x, y)] \, (e)]]]$ f. c.

$\equiv \lambda x \, \lambda e \, [\lambda p \, [(\neg)[p]] \, (\lambda x \, \lambda e \, [\exists y \, [[P \, (y)] \wedge [[R \, (x, y)] \, (e)](e) \, (x))]$

$\equiv \lambda x \, \lambda e \, [(\neg)[\exists y \, [[P \, (y)] \wedge [[R \, (x, y)] \, (e)]]]]$

If the DP moved outside the focus domain by adjunction, the SF of the verb first combines with the (possible) negative function, then the (possibly) negated expression combines with the DP. The consequence of this steps of semantic amalgamation is that the position of the DP lies outside the scope of (possible) negation and outside the critical meaning of the sentence, as well:

(27)   (a) $[\ldots [_{XP} \, auto_j \, [_{PosP} \, (\neg)[_{VP} \, t_i \, koupil \, t_j]]] \ldots]$

(b)   combination of the negation function and the SF of the verb:

$\lambda p \, [(\neg)[p]] \, (\lambda y \, \lambda x \, \lambda e \, [[R \, (x, y)] \, (e)])$ f. c.

$\equiv \lambda y \, \lambda x \, \lambda e \, [\lambda p \, [(\neg)[p]] \, (\lambda y \, \lambda x \, \lambda e \, [[R \, (x, y)] \, (e)])(e) \, (x) \, (y))]$

$\equiv \lambda y \, \lambda x \, \lambda e \, [(\neg)[[R \, (x, y)] \, (e)]]$

The semantic composition of the (possibly) negated VP with the moved DP requires again the semantic combination rule of type shift:

(c) $\lambda P \, \lambda \mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [P \, (e, x, y)])] \, (\lambda y \, \lambda x \, \lambda e \, [(\neg)[[R \, (x, y)] \, (e)]])$

$$\equiv \lambda\mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [(\neg)[[R \, (x, \, y)] \, (e)]])]$$

The result of (c) is an expression, which may combine with the adjunct-DP, which is part of the comment of the sentence:

(d) $\lambda\mathfrak{R} \, \lambda x \, \lambda e \, [\mathfrak{R} \, (\lambda y \, [(\neg)[[R \, (x, \, y)] \, (e)]])] \, (\lambda Q \, [\exists y \, [[P \, (y)] \wedge [Q \, (y)]]])$

        $\equiv \lambda x \, \lambda e \, [\exists y \, [[P \, (y)] \wedge [(\neg)[[R \, (x, \, y)] \, (e)]]]]$

The result of (d) is the mapping of the verbal predicate as critical meaning onto the internal argument.

6.2   Semantic integration of the topic-DP

There is further problematic consequence for the syntax-semantic interface: As shown in (6), the lexical entry (28) holds only for thetic sentences, wherein the existential assertion of an event represents the main function of the sentence.

(28) $\lambda P \, [\exists e \, [P \, (e)]] \in \,<<e, \, t>, \, t>$

In categorical sentences, the topic-DP has to move beyond the sentence mood. Since the event argument is bound in C^0 by the sentence mood, and since the topic argument [+T] is bound beyond C^0, the semantic input for C^0 is a two-place predicate:

(29) $\lambda x_i \, \lambda e \, [\, ... \, e \, ... \, x_i \, ... \,] \in \,<<e, \, <e, \, t>$

     [+T]

The type-semantic conflict can be resolved by differentiating basic and actual lexical entries (cf. Bierwisch/Schreuder 1992). The transformation of the basic lexical entry into an actual lexical entry is achieved by the implementation of functional lexical entries. The message structure provides discourse-embedding indices (Levelt 1989), affecting the actualization of lexical entries. For our purposes, the semantic template (30) transforms the basic lexical entry (28) into an actual entry:

(30) $\lambda\mathfrak{R} \, \lambda Q \, \lambda x_i \, [\mathfrak{R} \, (\lambda e \, [Q \, (e, \, x_i)])] \, \mathfrak{R} \in \,<<e, \, t>, \, t>, \, Q \in \,<e, \, <e, \, t>>, \, x_i \in \, e$

        [+T]

The result of this lexical operation is an expression which enables us to bind the event argument in C^0 and to map the comment onto the nuclear scope of the topic DP. The argument place λx_i is addressed to that argument which represents the topic of the sentence.

The discourse-embedding feature [+T] can be identified with the respective argument place of the verb by using an alpha numeric rule. The application of rule (30) to the basic lexical entry (28) within the lexicon yields the actual lexical entry of the declarative sentence-mood operator for topic-comment structures. The expression corresponds to the descriptive content of the head of CP:[8]

(31) $\lambda\mathfrak{R} \, \lambda Q \, \lambda x_i \, [\mathfrak{R} \, (\lambda e \, [Q \, (e, x_i)])] \, (\lambda P \, [\exists e \, [P \, (e)]])$

$\equiv \lambda Q \, \lambda x_i \, [\lambda P \, [\exists e \, [P \, (e)]] \, (\lambda e \, [Q \, (e, x_i)])]$

$\equiv \lambda Q \, \lambda x_i \, [\exists e \, [Q \, (e, x_i)]]]$ with $Q \in \ <e, <e, t>>, x_i \in e$

The result of (31) can be applied to the comment, depending on the topicalization of the external (a) and internal (b) argument, respectively:

(32) (a)

$$CP \quad \exists x \, [[P \, (x)] \land [\exists e \, [(\neg)[\, ... \, e \, ... \, x \, ... \, y \, ... \,]]]]$$

$\lambda Q \, [\exists x \, [[P \, (x)] \land [Q \, (x)]]]$ $C' \quad \lambda x \, [\exists e \, [(\neg)[\, ... \, e \, ... \, x \, ... \, y \, ...]]]$

$\lambda Q \, \lambda x_i \, [\exists e \, [Q \, (e, x_i)]]]$ PosP
$[+T]$

$\lambda x \, \lambda e \, [(\neg)[\, ... \, e \, ... \, x \, ... \, y \, ...]]$
$[+T]$

(b)

$$CP \quad \exists y \, [[P \, (y)] \land [\exists e \, [(\neg)[\, ... \, e \, ... \, x \, ... \, y \, ... \,]]]]$$

$\lambda Q \, [\exists y \, [[P \, (y)] \land [Q \, (y)]]]$ $C' \quad \lambda y \, [\exists e \, [(\neg)[\, ... \, e \, ... \, x \, ... \, y \, ...]]]$

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[8] The transformation into an actual lexical entry and the re-evaluation of the argument structure is no exceptional lexical operation. E.g. in the case of passivation, the external argument place of the verb is already blocked in the lexicon by means of the semantic templet and functional composition, which absorbs the external agrument:

(ii) $\lambda P \, [P \, (z)] \, (\lambda y \, \lambda x \, \lambda e \, [[P \, (x, y)](e)]) \equiv \lambda y \, \lambda e \, [[P \, (z, y)](e)]$

At the same time, the blocking of the external argument changes the preconditions for case assigment. Following the order of argument places, nominative is assigned to the second argument place. In this way, the internal argument becomes the subject of the sentence (cf. also Bierwisch 1996). This syntactic operation is up to the communicative requirements on the utterance, namely the suppression of the agent. In the Semantic Form of the sentence, the external argument is a semantic parameter which can be interpreted only relatively to the context.

$$\lambda Q \ \lambda x_i \ [\exists e \ [Q \ (e, \ x_i)]]]] \qquad\qquad PosP$$

$$\lambda y \ \lambda e \ [(\neg)[\ ... \ e \ ... \ x \ ... \ y \ ...]]$$

[+T]   [+T]

The structures (32) show the semantic composition of the topic-comment structure by mapping the syntactic structure onto a compositional semantic representation.

7   Focus domain and positional operator

The presented analysis of topic-comment structure, focus-background structure, and their interaction with the sentence negation imply that positive sentences need a positional operator just as negative sentences need a negation operator. The problem will become clearer when we delete the sign of the negative functions in (33).

(33)   (a)   Petr si nekoupil AUTO.

$\exists x \ [[peter \ (x)] \wedge [\exists e \ [\neg[\exists y \ [[car \ (y)] \wedge [[bought \ (x, \ y)] \ (e)]]]]]]]$

(b)   Petr si auto NEKOUPIL.

$\exists x \ [[peter \ (x)] \wedge [\exists e \ [\exists y \ [[car \ (y)] \wedge [\neg[[bought \ (x, \ y)] \ (e)]]]]]]]$

In this way, we get equal truth condition for both sentences, although the prosodic structure establishes reference to different situations. A negated sentence has to be true with respect to the operans of the negative function and a positive sentence has to be true with respect to the operans of the positive function. Otherwise the sentence is false. The positive function [pos (p)] and its negative complement [neg (p)] mark the critical meaning of the sentence, which is marked by the prosodic focus.

8   Summary

The order of argument places meets the syntactic constraints on the lexical insertion into the basic positions and on the assignment of morphosyntactic features into functional projections. The semantic composition of lexical entities in their basic positions, however, supplies some simple propositional content of a sentence, which does not adequately represent the truth and context conditions of the sentence. Natural-language sentence are embedded into a given context. Thus the referents of syntactic constituents appear in positions within the sentence structure dependently on their status in information structure. From these positions, DPs take scope, which in turn is the trigger of several presupposition of DPs. For the semantic interpretation of DPs, the position of a DP relative to the scope of the (possible) negative function is significant. This position is prosodically marked by the focus both in positive and in negative sentences. The descriptive content of the focus domain corresponds to the critical meaning of the sentence. This means that the critical meaning of the sentence is a function

which is mapped onto referential constituents, e.g. onto DPs outside of scope of (possible) negation. In the sentence scheme of (34), the VP focus, corresponding to the critical meaning, is a complex function concatenating the internal argument DP and the verb. The focus domain in the given example coincides with the comment of the sentence, which itself is a valid predication on the topicalized individual:

(34)　(a)　Petr$_{\text{Topic}}$ [si (ne-)koupil AUTO]$_{\text{Focus}}$

　　　(b)　　Background　　　　　Focus

$$\exists x \, [[P \, (x)] \wedge [\exists e \, \{_{\alpha}(\neg)[\exists y \, [[C \, (y)] \wedge [[B \, (x, y)] \, (e)]]]\}]]$$

　　　　　　　Topic　　　　　Comment

In contrast to (34), the focus domain in (35) represents a function which, as a function of the critical meaning, is mapped onto the moved internal argument DP.

(35)　(a)　Petr$_{\text{Topic}}$ si auto [(NE-)KOUPIL]$_{\text{Focus}}$

　　　(b)　　Background　　　　　　　Focus

$$\exists x \, [[P \, (x)] \wedge [\exists e \, [\exists y \, [[C \, (y)] \wedge \{_{\alpha}(\neg)[[B \, (x, y)] \, (e)]\}]]]]$$

　　　　　　　Topic　　　　　Comment

Because of the Presupposition of Indivisibility, which results from function-argument structures, the critical meaning marked by the focus has to be true or false, as soon as it is applied to the internal argument *auto*. Following this structural precondition, the DP is read as an individual term. In turn, this reading is the type-semantic precondition for a referential reading. Since Czech lacks the definite and indefinite article, (48) is semantically underspecified regarding a specific sortal predication in the sense of a particular car. German and English, among other languages, are additionally able to express a specific reading by making use of the indefinite article for a DP outside the scope of (possible) negation. The referential reading of a topicalized DP results from the analogous mapping of the comment onto the topic. In comparison, a specific and holistic reading of indefinite and of all weakly quantified DPs in the topic position (cf. Diesing 1992, Jäger 1995) is motivated by the function-argument character of the topic-comment structure. These conclusions finally explain why the undivided reading of (36b) does not make sense.

(36)　(a)　Whales$_{\text{Topic}}$ [are MAMMALS]$_{\text{Focus}}$

(b)   Mammals$_{Topic}$ [are WHALES]$_{Focus}$

Presuming that natural-languages sentences are structured propositions, the argumentation supports the conception that the sentence meaning is a complex expression, which consists of hierarchically nested predications. The hierarchy motivates various scope relations which, relative to a given discourse model, trigger different presuppositions of argument DPs.

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