Edinburgh Research Explorer

Two question-embedding strategies and answer-orientedness

OPEN ACCESS

Two question-embedding strategies and answer-orientedness*

Deniz Özyıldız　　　　　　　　Wataru Uegaki
Universität Konstanz　　　　　*University of Edinburgh*

Abstract Japanese and Turkish attitude predicates combine with two main kinds of embedded clauses: Nominalizations, and clauses introduced by the morphemes *to* and *diye*. We describe their interrogative variants, showing that nominalizations give rise to answer-oriented inferences with responsive predicates (e.g., factivity, belief), but that *diye/to* interrogatives are question-oriented and entail that the attitude holder linguistically produces the interrogative. We propose a compositional fragment where attitude predicates take nominalizations as arguments, which they may impose semantic restrictions on, and where *diye/to*-clauses modify and enrich attitude meanings with a linguistic production inference.

Keywords: attitude verbs, clause embedding, questions, quotation

1 Introduction

Languages have different ways of combining clausal constituents with attitude predicates. In this paper, we focus on combining attitude predicates with nominalized clauses, in (1), and clauses introduced by the morphemes *diye* and *to*, in (2), in Turkish and in Japanese (respectively in a. and b.).

(1)　a. Ai [kar　yağ-**dığ**-ın-a　　　] şaşırdı.
　　　　Ai　snow fall-NMZ-3S.POSS-DAT　was.surprised

　　b. Ai-wa　[yuki-ga　　hutta-**no**-ni　] odoroita
　　　　Ai-TOP　snow-NOM fall-NMZ-DAT　was.surprised

　　　Ai was surprised that it was snowing.　　　　　　　$\Rightarrow p \wedge B_a p$

(2)　a. Ai [kar　yağ-ıyor　　**diye**] şaşırdı.
　　　　Ai　snow fall-PRES.3S DIYE　was.surprised

　　b. Ai-wa　[yuki-ga　　hutta-**to**] odoroita
　　　　Ai-TOP　snow-NOM fell-TO　was.surprised

　　　Ai was surprised, thinking "it's snowing."　　　　　　$\not\Rightarrow p$

As is the case here, the same predicate may often combine with either type of clause, with the choice giving rise to interpretive differences. One difference visible here is that the sentences in (1) are factive, where "be surprised" combines with nominalized declaratives, while the ones in (2) are non-veridical, with D/T-declaratives. This phenomenon, known as a factivity alternation, has been studied in a variety of languages for declarative complements.[1] A second difference, which has received less attention in the literature and will play a central role here, is that *diye* and *to* give rise to a *linguistic production inference*. This inference, rendered into English with the adjunct clause *thinking "S"*, requires that the attitude holder say, mentally entertain, or otherwise produce the clause that *diye* and *to* introduce.[2]

Many predicates that combine with nominalized and D/T-declaratives also combine with nominalized and D/T-interrogatives, in (3) and (4). (For the nominal status of Japanese embedded questions like in (3b), which don't feature an overt nominalizer, see Tomioka 2020.) These two interrogative embedding strategies form the novel empirical landscape we explore in this paper.

(3) a. Ai [kar-ın   ne zaman yağ-dığ-ın-a   ] şaşır-dı.
        Ai   snow-GEN when   fall-NMZ-3S.POSS-DAT was.surprised

     b. Ai-wa [yuki-ga   itsu   hutta-ka-ni] odoroita.
        Ai-TOP   snow-NOM when fell-Q-DAT   was.surprised

        Ai was surprised by when it had snowed.

(4) a. Ai [kar   ne zaman yağ-dı   diye] şaşır-dı.
        Ai   snow when   fall-PST.3S DIYE was.surprised

     b. Ai-wa [yuki-ga   itsu   huttano-ka-to] odoroita.
        Ai-TOP   snow-NOM when fell-Q-TO   was.surprised

        Ai was surprised, thinking "when did it snow?"

Here too, the choice of a nominalization vs. a D/T-clause makes an interpretive difference. The examples in (3) imply that Ai believes and was surprised by the true answer to the question of when it snowed (e.g., in the morning). In contrast, the examples in (4) require that Ai be surprised by something, and that she linguistically

---

1 The question of whether emotive factives presuppose that their complement is true or that their subject believes that their complement is true does not affect our main point (Klein 1975). The body of work on factivity alternations includes at least Bondarenko 2023 for Azeri, Bondarenko 2020 for Buryat, Djärv 2019 for Greek, Lee 2018 and Jeong 2020 for Korean, Kusumoto 2017 for Japanese, Özyıldız 2017 for Turkish, and Hanink & Bochnak 2017 for Washo.

2 The morpheme *diye* derives from the root *de-*, for the verb "say." *Diye* clauses may independently be read as reason or purpose clauses, neither of which is intended anywhere in this paper. The morpheme *to* does not derive from any speech predicate. See Major 2021 for recent cross-linguistic work on "say" complementation.

produce the interrogatives introduced by *diye* and *to*. In this sense, the former attitude reports are answer-oriented, whereas the latter, question-oriented.

These data raise the broad questions of what the syntactic properties are of these different clause embedding strategies, what semantic effects they have on the overall truth conditions of attitude reports, and if these effects can be analyzed uniformly across declarative and interrogative embedding.

In a nutshell, we propose that attitude predicates stand in a function-argument relation to nominalized clauses, and that they may thus impose on them semantic restrictions like answer-orientedness, factivity, and the like. (This part should not come as a surprise, but is worth spelling out.) *Diye* and *to* clauses, on the other hand, are modifiers and supplement attitude predicates with the inference that the attitude holder linguistically produces the clause that *diye* and *to* introduce. These clauses not feeding into the attitude predicate directly, and producing an interrogative being different from producing a declarative, we capture the contrast between question vs. answer-orientedness and expect that D/T-clauses should escape certain semantic restrictions that attitude predicates may otherwise impose on their arguments.

In **Section 2**, we diagnose the different inferences that nominalized and D/T-clauses give rise to, and suggest that the difference is surprising if certain aspects of meaning are preserved across declarative and interrogative embedding. **Section 3** presents syntactic tests revealing that nominalized clauses pattern like arguments of attitude predicates, and D/T-clauses, like verb phrase modifiers. This difference is used in **Section 4** to propose a compositional semantics for the structures at hand. **Section 5** explores the predictions of our proposal, and **Section 6** concludes.

2 Inferences associated with nominalized and D/T-interrogatives

2.1 Answer-oriented and question-oriented attitudes

Attitude reports that minimally differ in whether they feature a nominalized or a D/T-interrogative give rise to different inferences about the (relationship that the attitude holder bears to the) denotation of the interrogative.

To illustrate this difference, we begin with emotive factives.[3] Attitude reports where emotive factives combine with nominalized interrogatives typically give rise to the inference that the attitude holder is related to an answer to the interrogative, which is true and which they believe to be true. (We set aside issues related to exhaustivity.) In the case of "be surprised," in (5), the sentence asserts that the

---

3 Emotive factive reports are convenient because the answer-oriented report in (5) and the question-oriented one in (6) can be true in similar situations: Being surprised by which singer came to the party may elicit the production of the interrogative "Which singer came to the party?" and, conversely, being surprised and producing that question may indicate which singer came is what is surprising.

attitude holder is surprised by that answer.

(5)   Ai [parti-ye   hangi şarkıcının geldiğine   ] şaşırdı.
      Ai   party-DAT which singer   come.NMZ   was.surprised
      Ai was surprised by which singer came to the party.

In contrast, when the same predicate combines with a D/T-interrogative, in (6), the sentence no longer implies that the attitude holder is related to any answer to the interrogative. Rather, the inference is that they linguistically produce the interrogative itself, in addition to being surprised by something.

(6)   Ai [parti-ye   hangi şarkıcı geldi diye] şaşırdı.
      Ai   party-DAT which singer came DIYE   was.surprised
      Ai was surprised, thinking "Which singer came to the party?"

To substantiate the difference in answer-orientedness just described, observe that the continuations in (7) sound contradictory after (5) but acceptable (in the appropriate contexts) after (6). The first two contrasts substantiate the difference in whether the attitude holder believes an answer to the interrogative (7b) that is true (7a). The third illustrates that "be surprised" + a D/T-interrogative can be conjoined with a question-oriented attitude of wondering about the content of that interrogative.

(7)   a. . . . ama partide şarkıcı yoktu.
         . . . but there were no singers at the party.   # after (5); ✓after (6)

      b. . . . ama hangisinin geldiğine dair bir düşüncesi yoktu.
         . . . but she had no thoughts as to which had come.   # after (5); ✓after (6)

      c. . . . ve hangisinin geldiğini merak etti.
         . . . and wondered which had come.   # after (5); ✓after (6)

Note that not knowing and wondering about the answer are not obligatory inferences with D/T-interrogatives, and that example (6) may perfectly describe Ai's surprise at hearing the (true) piece of information that Carly Rae Jepsen has arrived at the party.

Nominalized and D/T-interrogatives give rise to interpretive differences with predicates other than emotive factives as well. The examples in (8a) and (8b) illustrate with Turkish "guess" and "answer." Sentence (8a) entails that Ai produced the answer to the embedded interrogative, saying, for example, that Lovelace was a mathematician. In contrast, (8b) entails that Ai produced the interrogative itself, saying "Who is Ada Lovelace?" (in a game of Jeapordy! for example).

(8)   a. Ai [Ada Lovelace'in   kim olduğunu] {tahmin etti, cevapladı}.
         Ai   Ada Lovelace.GEN who be.NMZ   guessed   answered
         Ai {guessed, answered} who Ada Lovelace was.

b. Ai [Ada Lovelace kim diye   ] {tahmin etti, cevapladı}.
Ai   Ada Lovelace who DIYE   guessed   answered

Ai {made a guess, answered a question}, saying "Who is Ada Lovelace?"

Similar patterns can be observed with Japanese "guess" and "write" as well:

(9)   a. Ai-wa [Ada Lovelace-wa dare-ka   ]-o   {iiateta, kaita}.
Ai-TOP   Ada Lovelace-TOP who-Q-TO -ACC   guessed wrote

Ai {guessed, wrote down} who Ada Lovelace is.

b. Ai-wa [Ada Lovelace-wa dare-ka-to] {iiateta,   kaita}.
Ai-TOP   Ada Lovelace-TOP who-Q-TO   guessed wrote

Ai {made a guess, saying / wrote } "Who is Ada Lovelace?"

The interpretive contrast that nominalized and D/T-interrogatives give rise to generally affects the Japanese and Turkish equivalents of those responsive predicates that are characterized as answer-oriented, e.g., "agree," "deny," other response-stance, manner of speech, and certain preferential predicates.[4] But, there is a class of responsive predicates that combine naturally with nominalized interrogatives, but that give rise to unexpected results with D/T-clauses. For Japanese, the predicate *sitteiru*, "know," is reported to be degraded with *to*-declaratives in the positive polarity by Kuno (1973), while Kusumoto (2017) reports it to be acceptable but factive across nominalized vs. *to*-clauses. With *to*-interrogatives, *sitteiru* is unacceptable. In Turkish, the predicate *bil-*, "believe" or "know," is perfectly acceptable and non-veridical with *diye* declaratives, but it is unacceptable with *diye* interrogatives unless the predicate is further embedded, e.g., under "want" (Özyıldız 2017, 2019; Rabinovitch 2022).

(10)   Ai [yağmur yağıyor mu   diye] {*biliyor, bilmek   istiyor}.
Ai   rain   is.falling POLQ DIYE   knows know.INF wants

a. Unavailable: Ai {knows, believes an answer to} whether it's raining.

b. Ai wants to know whether it's raining.

Additional restrictions seem to bear on the distribution of D/T-clauses, which we leave for further research. Our investigation rests for now on the existence and behavior of the class of predicates that includes "be surprised," "guess," and "answer," which give rise to the answer- vs. question-oriented attitude contrast described above.

---

4 Rogative predicates like the equivalents of "wonder" and "ask" are also compatible with both nominalized and D/T-interrogatives. With these, nominalized interrogatives are question-oriented.

2.2 Probing for the linguistic production inference

The intuition that the pairs of sentences discussed differ in whether or not they may give rise to a linguistic production inference is evidenced by the contrast in the felicity of the continuation in (11c) uttered after (11a) and (11b). The continuation triggers the additive presupposition that somebody else *said* the question corresponding to a nominalized vs. a D/T-interrogative, which is satisfied in the latter case, but not in the former.[5]

(11)   a. Ai [partiye hangi şarkıcının]$_{NMZ}$ geldiğine şaşırdı.
       Ai was surprised by which singer came to the party.

       b. Ai [partiye hangi şarkıcı geldi diye]$_{DT}$ şaşırdı.
       Ai was surprised, saying "Which singer came to the party?"

       c. Ben$_F$ de   [hangi şarkıcı geldi] dedim.
          I   ADD   which singer came   I said

          I too said "Which singer came?"   # after (11a); ✓ after (11b)

In the context of the continuation, (11b) can be interpreted as involving a saying, as opposed to, e.g., a thinking. Consistent with the data, we take events of linguistic production to be underspecified. They may involve physical utterances, in different modalities, or thoughts, and possibly other acts of communication so long as these events have a linguistic form (Maier 2017; Major 2021). While the surprise eventuality in (11a) is not conceptually incompatible with the accommodation of the saying event described by (11c), the infelicity of the continuation suggests that this might be difficult to do.

The continuation test in (11) shows that D/T-interrogatives *may* give rise to a linguistic production inference. Can we further test whether this inference is obligatory? Because many kinds of events count as linguistic productions, it is difficult to probe for the obligatoriness of the inference by means of a direct cancellation test. Indeed, uttering "...but she didn't say or think such a thing" sounds unnatural after (11a) or (11b), in addition to not exhausting the ways in which one can linguistically produce an interrogative. Instead of cancellation, we use of the pair in (12), which ascribes surprise to a cat: Example (12a) is unmarked, while (12b) sounds odder—to the extent that it is acceptable, it involves anthropomorphizing the cat.

(12)   a. Kedi [ev-e   kim-in   geldiğine] şaşırdı.
          cat   home-DAT who-GEN came.NMZ   was.surprised

          The cat was surprised by who came home.

---

b.?Kedi [ev-e   kim geldi diye] şaşırdı.
    cat   home-DAT who came DIYE   was.surprised

?The cat was surprised, saying/thinking "Who came home?"

These tests suggest that the inference is obligatory with D/T-clauses and unavailable with nominalizations, at least for predicates like "be surprised."

Because of the linguistic production inference, attitude reports with D/T-interrogatives appear to describe two events: The matrix event, and a linguistic production event. These events must occur at the same time, but they are not independent from each other. For the attitude reports at hand introduced by "be surprised," for example, the linguistic production event *indicates* surprise. (We will be more specific about this in Section 4 and say that the linguistic production event contextually entails the eventuality described by the matrix attitude predicate.)

2.3   Two embedding strategies and clausal distributivity

Certain inferences that an attitude predicate gives rise to when it composes with a declarative are expected to carry over to the inferences that it gives rise to when it composes with a corresponding interrogative, and vice versa. Here, we present one formal implementation of this expectation, and show that nominalized clauses give rise to attitude reports that satisfy it, but that D/T-clauses do not because of the linguistic production inference.

The expectation comes from Spector & Egré's (2015) meaning postulate relating responsive predicates' meanings across declarative and interrogative embedding, dubbed c(lausal)-distributivity in Theiler, Roelofsen & Aloni 2018. The statement in (13) captures the relationship in simplified form: For any individual x, predicate V and interrogative denotation Q, x stands in the V relation to Q iff a sentence $\ulcorner x\ V\ Q \urcorner$ is true iff there is a propositional answer p to Q s.t. the sentence $\ulcorner x\ V\ p \urcorner$ is true. "Know" and "agree," for example, satisfy the equivalence.[6]

(13) $\ulcorner x\ V\ Q \urcorner \Leftrightarrow$ there is a $p \in Q$ s.t. $\ulcorner x\ V\ p \urcorner$

(14)   a. Al and Bo {know, agree on} which singer was at the party.

       b. There is an x s.t. Al and Bo {know, agree on} that x was the unique singer at the party.

The equivalence in (13) does not specify which types of clauses contribute Q and p. For Turkish and Japanese, it can be broken down into (15a) and (15b) for

---

6 (Potential) counter-examples to the equivalence exist in both directions (Elliott, Klinedinst, Sudo & Uegaki 2017; Roelofsen & Uegaki 2020). These are due to the semantics of particular predicates, and not conditioned by the choice of clause type.

nominalized and D/T-clauses respectively. Note that these statements assume that a nominalizer NMZ's complements denote the same kinds of objects as *diye* and *to*'s complements, but that they don't prejudge how these constituents compose with V.

(15)   a. $\ulcorner x\ Q\text{-NMZ}\ V \urcorner \Leftrightarrow$ there is a $p \in Q$ s.t. $\ulcorner x\ p\text{-NMZ}\ V \urcorner$

   b. $\ulcorner x\ Q\ diye/to\ V \urcorner \Leftrightarrow$ there is a $p \in Q$ s.t. $\ulcorner x\ p\ diye/to\ V \urcorner$

The equivalence is satisfied with nominalized clauses. To illustrate, the sentences in (16) are judged to be equivalent.

(16)   a. Ai [partiye hangi şarkıcının geldiğine]$_{\text{NMZ}}$ şaşırdı.
       Ai was surprised by which singer came to the party.

   b. Ai [partiye Carly Rae'in geldiğine]$_{\text{NMZ}}$ şaşırdı.
       Ai was surprised that Carly Rae came to the party.

However, with D/T-clauses, the equivalence fails in both directions. Example (17a) does not entail that Ai uttered an answer to the question which singer came, e.g., (17b). And example (17b) does not entail that Ai uttered any question that "Carly Rae came" is an answer to, e.g., (17a). As both of the sentences entail that the attitude holder is surprised by something, this component of meaning does not make a difference here. But, intuitively, because linguistically producing an interrogative is independent of linguistically producing an answer to that interrogative, the equivalence fails.

(17)   a. Ai [partiye hangi şarkıcı geldi diye]$_{\text{DT}}$ şaşırdı.
       Ai was surprised, thinking "Which singer came to the party?"

   b. Ai [partiye Carly Rae geldi diye]$_{\text{DT}}$ şaşırdı.
       Ai was surprised, thinking "Carly Rae came to the party."

To account for the truth conditions of attitude reports with nominalized vs. D/T-clauses, we will make use of a syntactic difference between the two kinds of clauses, namely that the former are complements of attitude predicates, and that the latter are verb phrase modifiers. The assumption that predicates may only impose semantic restrictions (like answer-orientedness or factivity) on their complements will account for the truth conditions associated with nominalized clauses. The assumption that *diye* and *to* are semantically contentful and that they encode the linguistic production inference will account for those associated with these clauses.

3   Argumenthood and adjuncthood

In this section, we turn to syntactic differences between nominalized clauses and D/T-clauses. Specifically, we will present evidence suggesting that nominal clauses

pattern like other *arguments* in the language whereas D/T-clauses pattern like *adjuncts* (Saito 2012, 2015; Goodhue & Shimoyama 2022). This syntactic difference will turn out to be crucial as we attempt to capture the semantic behaviors of nominalized clauses and D/T-clauses as outlined in the previous section.

Below, we will present three empirical arguments for the syntactic distinction between nominalized and D/T-clauses: (i) one based on the clauses' (in)ability to compose with (derived) intransitive predicates, (ii) one based on the choice of the pro-form to refer back to the clauses, and (iii) one based on their (in)ability to occur in a subject position of adjectival predicates. Note that we will make these arguments using examples involving embedded interrogatives, but this is only due to space limitations, and the arguments/examples can be replicated with embedded declaratives as well.

3.1 Composition with (derived) intransitive predicates

One property that generally distinguishes arguments from adjuncts is that predicates impose restrictions on the number of arguments that they can (or must) have, whereas adjuncts are generally free to compose with predicates regardless of these restrictions. We observe, for example, that a sentence like (18a) is ungrammatical when we try to combine the predicate *eat* with two object NPs, but that a sentence like (18b) is acceptable, regardless of whether we choose to express the modifier *quickly* or not.

(18) a. Alex ate a taco (*a burrito).

   b. Alex ate a taco (quickly).

Applying this test to nominalized vs. D/T-clauses composed with "be surprised," we observe a similar pattern:

(19) a.*Ai kar-a   [ne zaman yağ-dığ-ın-a   ] şaşırdı.
      Ai snow-DAT   when   fall-NMZ-3S.POSS-DAT   was.surprised

   b. Ai kar-a   [ne zaman yağdı diye] şaşırdı.
      Ai snow-DAT   when   fell   DIYE was.surprised

   Ai was surprised by the snow, thinking "When did it fall?"

(20) a.*Taro-wa yuki-ni   [itsu   hutta-ka(-ni)] odoroita.
      Taro-TOP snow-DAT   when fell-Q-DAT   was.surprised

   b. Taro-wa yuki-ni   [itsu   huttano-ka-to] odoroita.
      Taro-TOP snow-DAT   when fell-Q-TO   was.surprised

   Taro was surprised by the snow, saying/thinking "When did it snow?"

The a-examples in (19–20) show that nominalized clauses cannot be combined with "be surprised" if its internal argument slot is already saturated by a DP "(the) snow."

On the other hand, the b-examples show that D/T-clauses are free to co-occur with an internal argument of "be surprised." The same points can be made with intransitive verbs, such as "look around" or "stand up":

(21) a.*Taro [ses-in   ne   ol-abil-eceğ-in-e   ] arandı.
         Taro   sound-GEN what be-MODAL-NMZ-3S.POSS-DAT   looked around

      b. Taro [ses   ne   ol-abil-ir   diye] arandı
         Taro   sound what be-MODAL-AOR.3S DIYE   looked around

      Taro looked around, saying/thinking "What sound could it be?"

(22) a.*Taro-wa [nan-no   oto   daroo-ka] tachiagatta.
         Taro-TOP   what-GEN sound MODAL-Q   stood.up

      b. Taro-wa [nan-no   oto   daroo-ka-to] tachiagatta.
         Taro-TOP   what-GEN sound MODAL-Q-TO   stood.up

      Taro stood up, saying/thinking "What sound could it be?"

3.2   Nominal vs. adverbial pro-forms

In Japanese, distinct pro-forms are used to refer to nominal and adverbial antecedents (Tanaka 2014; Shimamura 2018). As exemplified below, nominal antecedents are referred to by *sore* "it" while adverbial antecedents are referred to by *soo* "so."[7]

(23) a. Ken-ga   C-no   koodo-o   hiita-node, Ai-mo {??**soo/sore**-o} hiita.
         Ken-NOM C-GEN chord-ACC played-so Ai-too so/it-ACC   played
         The teacher played the C chord, so Ai played it too.

      b. Ken-ga   gitaa-o   karuku hiita-node, Ai-mo {**soo**/??**sore**-o} hiita.
         Ken-NOM guitar-ACC softly   played-so Ai-too so/it-ACC   played
         'Ken played the guitar softly, so Ai played the same way.

The examples below show that nominal clauses are referred to by *sore* while a *to*-clause is referred to by *soo*, suggesting that the former is a nominal argument while the latter is an adverbial form:

(24) a. Ai-wa   [dare-ga   kuru-ka-ni   ] odoroita.
         Ai-TOP   who-NOM come-Q-DAT   was.surprised.

      Ken-mo {??**soo/sore**-ni} odoroita.
      Ken-too so/it-DAT   was.surprised

      Ai was surprised by who will come. Ken was surprised by it too.

7 Some speakers prefer an alternative adverbial pro-form *sonoyooni* in (23b). For such speakers, the argument based on (24) below can be reformulated with *sonoyooni* instead of *soo*.

b. Ai-wa [dare-ga   kuru-ka-to] odoroita.
Ai-TOP   who-NOM come-Q-TO   was.surprised

Ken-mo {**soo**/??**sore**-ni} odoroita.
Ken-too so/it-DAT   was.surprised

Ai was surprised, thinking "Who will come?" Ken was surprised in that way too.

Turkish exhibits a parallel pattern:

(25)   a. Taro [kim-in   gel-diğ-in-e   ] şaşırdı.
Taro   who-GEN come-NMZ-3S-DAT   was.surprised

Jiro da   {??**öyle/on-a**} şaşırdı.
Jiro too {so/that-DAT} was.surprised

Taro was surprised who came. Jiro was surprised by that too.

b. Taro [kim gel-ecek   diye] şaşırdı.
Taro   who come-FUT DIYE   was.surprised

Jiro da   {**öyle**/??**on-a**} şaşırdı.
Jiro too {so/that-DAT} was.surprised

Taro was surprised, thinking "Who will come?" Jiro was surprised in that way too.

3.3   Subjecthood

Nominalized clauses can appear as subjects as shown in (26):

(26)   [Kim-in   gel-diğ-i   ] belli.
who-GEN come-NMZ-3S   obvious

(27)   [Dare-ga   kita-ka-ga   ] akirakada.
who-NOM came-Q-NOM   obvious

It is obvious who came.

On the other hand, D/T-clauses cannot be subjects:

(28)   *[Kim geldi diye   ] belli.
who came DIYE   obvious

(29)   *[Dare-ga   kita-ka-to   ] akirakada.
who-NOM came-Q-TO   obvious

This contrast in the ability to occur as subjects is explained if nominalized clauses serve as arguments to the adjectival predicate while D/T-clauses cannot.[8]

---

8 Although adjunction is in principle possible with adjectival predicates, D/T-clauses are ruled out as adjuncts for adjectival predicates. We speculate that this is for semantic reasons. One possibility is that

4 Proposal

In this section, we propose our semantic analysis of the nominalized complements and D/T-clauses with "be surprised," based on the argument/adjunct distinction we argued for in the previous section. Our analysis aims to capture the following three observations:

i. the factivity alternation with the two types of declarative clauses;

ii. the answer-oriented inference that the relevant attitudinal relation holds between the attitude-holder and an answer in the case of nominalized interrogative clauses, as well as the lack of such an inference in the case of D/T-clauses;

iii. the linguistic production inference with D/T-clauses.

To account for these observations, we will make two crucial assumptions about the semantic ingredients. One is a relatively uncontroversial one: Emotive factives like "be surprised," when they take a question as their internal argument, relate the attitude holder to a true answer of the question. The other assumption concerns the semantics of *diye*/*to*. Building on insights from the existing literature on D/T and similar complementizers cross-linguistically (Saito 2012, 2015; Özyıldız 2017; Özyıldız, Major & Maier 2019; Major 2021; Goodhue & Shimoyama 2022), we argue that D/T-clauses adjoin to a VP and introduce an additional linguistic-production event which is related to the main event (e.g., the surprisal event) in systematic ways.

As we will see below, the observations in i–iii above fall out straightforwardly once we combine these assumptions with the syntactic distinction between nominalized and D/T-clauses. Given the syntactic distinction, semantic restrictions that a predicate imposes on the internal argument (such as factivity and the answer-orientedness) are only operative with nominalized complements, but not with D/T-clauses. This leads to factivity alternations and to the presence/absence of the answer-oriented inference (Observations i and ii).[9] Furthermore, the semantics of *diye*/*to* encodes the linguistic production inference characteristic of D/T-clauses, capturing Observation iii.

---

adjectival predicates do not provide eventuality arguments that are of the right kind for D/T-clauses to relate a linguistic production inference to (along the lines of what we will propose in §4.2) as adjectives characterize states rather than events. Another possibility is that the eventualities characterized by these adjectives are incompatible/cannot be supplemented with a linguistic production event. We leave open the precise analysis of this issue for future research.

9 See Bondarenko 2020 for a similar analysis of factivity alternation.

4.1 The semantics of predicates and nominalized complements

Concretely, the semantics of predicates like "surprise" is defined as in (30):

(30) $[\![odoroku / \text{şaşır- 'be surprised'}]\!]^w$
$= \lambda Q_{\langle st,t \rangle} \lambda e_v \colon \underline{\exists p \in Q[p(w)]}. \exists p \in Q[p(w) \wedge \textbf{surprise}(e) \wedge \textbf{Theme}(e,p)]$

Assuming a uniform semantics for clausal complementation (Theiler et al. 2018; Uegaki 2019, 2022), we take both declarative and interrogative nominalized complements to saturate the internal argument slot Q in (30). When (30) takes a declarative complement, Q is the singleton set consisting of the proposition (classically) expressed by the complement. This ensures that the predicate imposes factivity on nominalized declarative complements. This is illustrated below:

(31) $[\![[p]_{nmz} \ odoroku/\text{şaşır-}]\!]^w$
$= \lambda e_v \colon \underline{\exists p' \in \{p\}[p'(w)]}. \exists p'' \in \{p\}[p''(w) \wedge \textbf{surprise}(e) \wedge \textbf{Theme}(e,p'')]$
$= \lambda e_v \colon \underline{p(w)}. \ p(w) \wedge \textbf{surprise}(e) \wedge \textbf{Theme}(e,p)$

The account furthermore ensures that "surprise" with a nominalized interrogative yields an answer-oriented inference, as can be seen in the the denotation of "surprise" + a nominalized interrogative below:

(32) $[\![[Q]_{nmz} \ odoroku/\text{şaşır-}]\!]^w$
$= \lambda e_v \colon \underline{\exists p \in Q[p(w)]}. \exists p \in Q[p(w) \wedge \textbf{surprise}(e) \wedge \textbf{Theme}(e,p)]$

More formally, (31) and (32) show that c-distributivity is satisfied with nominalized complements. The event predicate in (32) and the event predicate in (31) are true of the same set of events if p is an answer to Q (assuming exhaustivity neutrality).

4.2 The semantics of D/T-clauses

D/T-clauses adjoin to a VP and introduce an additional eventuality of linguistic production associated with the main attitudinal event. In our analysis, *diye/to* has two semantic contributions: (a) it specifies the linguistic form of events that satisfy a contextually supplied description P (Maier 2017, see also Shan 2010; Potts 2007); and (b) it relates P to a matrix event description. Concretely, we have the following LF and the denotation for a D/T-clause, which we label as diyeP for convenience:

(33)

```
                diyeP
              /       \
          UttP        diye/to
         /    \        /    \
   "Who came?"     P    diye/to
```

(34) $[\![(33)]\!]^{w,g} = \lambda R_{vt}\lambda e_v:$ $\dfrac{g(P)(e) \models_C \exists e^+[\tau(e) \sqsubseteq \tau(e^+) \wedge R(e^+)].}{g(P)(e) \wedge \mathbf{form}(e) = \text{"Who came?"}}$ (*presupposition*)

(*assertion*)

($\models_C$: contextual entailment)

Here, P is a pronoun for a contextually supplied event description true of a linguistic production event. The assertive part of (34) states that the linguistic form of this event is specified as "who came?" The presuppositional part of (34) establishes the relationship between the linguistic production event e and the 'main' event e^+ described by R. Specifically, it requires that (a) the runtime of e is included in the runtime of e^+ and (b) the fact that P is true of e contextually entails that R is true of e^+.[10]

Let us illustrate this with a concrete Japanese example in (35):

(35) Ai-wa [dare-ga kitano-ka-to] odoroita.
      Ai-TOP who-NOM came-Q-TO was.surprised
      Ai was surprised, saying "Who came?"   (Jp)

The LF of (35) is represented as in (36), where P is a contextually supplied event description (for the linguistic production event) and Q is a null pronoun for the internal argument of "surprise."[11] The denotation of (36) comes out as in (37):

(36)

---
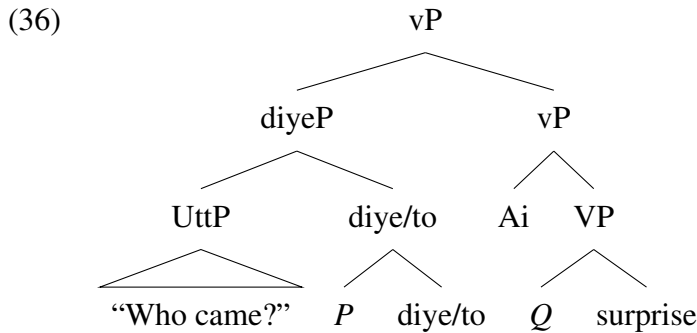
10 The analysis is inspired by Alxatib's (2019) and Homer's (2021) analysis of actuality entailments.

11 We assume that the event description P is always silent but that the internal argument of the predicate Q can be pronounced along with a D/T-clause. Evidence for this comes from examples such as the following, where a nominalized interrogative and a D/T-interrogative co-occur:

(i)   Ai [kimin geldiğine] [Carly mi geldi diye] şaşırdı.
      Ai who came.NMZ Carly POLQ came DIYE was.surprised
      Ai was surprised by who came, thinking "Is it Carly who came?"

(ii) Ai-wa [*pro* Carly datta-noka to] [dare-ga kita-ka-ni] odoroita.
      Ai-TOP   Carly COP.PST-Q TO who-NOM came-Q-DAT was.surprised
      Ai was surprised by who came, thinking "It was Carly!?"

$$(37) \quad \lambda e_v: \frac{g(P)(e) \models_C \exists e^+ \left[\begin{array}{c} \tau(e) \sqsubseteq \tau(e^+) \wedge \\ \exists p \in g(Q)[p(w) \wedge \textbf{surp}(e^+) \wedge \textbf{hldr}(\textbf{a}, e^+) \wedge \textbf{Th}(e^+, p) \end{array} \right].}{g(P)(e) \wedge \textbf{form}(e) = \text{``Who came?''}}$$

The event predicate in (37) is (a) defined of e only if being a P-event contextually entails there to be a longer event e^+ which is Ai's surprise about the true answer of Q; and, (b) if defined, (37) is true of e iff e is a P event and has the linguistic form "Who came?". What kind of event description P satisfies this presupposition? In other words, what is P such that knowing that e is a P-event allows us to infer that Ai was surprised in a larger event e^+? For example, if Ai utters "Who came?" with their eyes wide open and jaw dropped, we can infer that they are surprised. In this case, we accommodate P to be something like $\lambda e.\textbf{utterance}(e) \wedge \textbf{jawdrop}(e)$. This is our way of capturing the systematic relationship between the surprial event and the linguistic production event in a sentence like (35). Roughly, the linguistic production event is something whose existence contextually entails the surprial event. The sentence is underspecified regarding what exactly the linguistic production looks like, but it is constrained to be one that licenses this contextual entailment.

Finally, in addition to capturing the linguistic production inference, the analysis correctly captures the fact that interrogative D/T-clauses do not license the answer-oriented inference. According to our analysis, an interrogative D/T-clause gives rise to the interpretation that there is a linguistic production event whose form is the relevant interrogative clause. Such an interpretation is not answer-oriented, as it is compatible with the attitude holder not producing (or believing) any of its answers. For example, (37) does not yield the inference that Ai linguistically produced an answer to "who came?"

4.3 Interim summary

In this section, building on the argument/adjunct distinction of nominalized and D/T-clauses discussed in §3, we have proposed a semantic analysis of nominalized and D/T clauses that accounts for the different inferences associated with each clause type, as outlined in §2. Since a nominalized clause serves as an internal argument of the clause-embedding predicate, various semantic restrictions imposed by the embedding predicate manifest themselves with nominalized complements. These include the factive inference and the answer-oriented inference. On the other hand, the adjunct status of D/T-clauses derives the lack of both factive and answer-oriented inferences. In addition, we outlined how the linguistic production inference comes about as a result of the semantics of the *diye/to* head, as well as how the relation between the main attitudinal event and the linguistic production event can be constrained.

It is worth noting that a number of authors have proposed an adjunction strategy for clausal composition in general (Kratzer 2006; Moulton 2009; Bogal-Allbritten 2016; Elliott 2017; Bassi & Bondarenko 2020; Moltmann 2020; Stephen 2022). Furthermore, it has been claimed that both a complementation and an adjunction strategy are available for some languages (Özyıldız 2020 for Turkish, Bochnak & Hanink 2022 for Washo). Although the adjunction strategy for D/T-clauses we have proposed here has conceptual similarities to what has been proposed in the literature, it is crucial for us that D/T-adjunction give rise to truth conditions that differ from (adaptations of) the traditional complementation strategy so that we may derive the interpretive contrasts between D/T and nominalized clauses. We leave a proper comparison of our proposal with the existing adjunction analyses of clausal composition for a future study.

5 Predictions

Our analysis of nominalized and D/T-clauses makes further predictions about their interpretive contrasts. In this section, we discuss two such predictions, both of which are borne out, as far as we can see.

5.1 Semantic restriction on internal arguments other than factivity

Our analysis predicts that there may be semantic restrictions other than factivity that are imposed by predicates and apply uniformly to nominal declaratives and interrogatives, but not to D/T-declarative/interrogatives. This prediction is borne out with predicates like Japanese *hantai-suru* "to oppose" and Turkish *sorgula* "to question." These predicates belong to the class of RESPONSE-STANCE VERBS (Cattell 1978), which presuppose that the content of their internal argument has been introduced in the reported discourse. Relevant Japanese examples are given below.

(38)   Ai-wa [Ken-o   yobu koto/ka-ni   ] hantai-shita.
       Ai-TOP   Ken-ACC invite NMZ/Q-DAT   opposed
       Ai opposed inviting Ken/the decision on whether to invite Ken
       ⤳ {the proposition that Ken will be invited/the question of whether Ken will be invited} had been introduced in the reported discourse

(39)   Ai-wa [{ Ken-ga   kuru / dare-ga   kuru-ka } to] hantai-shita.
       Ai-TOP   Ken-NOM come / who-NOM come-Q   TO   opposed
       Ai opposed something, saying "Ken will come" / "who will come?"
       ⤳̸ {the proposition that Ken will come/the question of who will come} had been introduced in the reported discourse

The examples with a nominalized complement, (38), yield the inference that the content of the complement has been introduced in the reported discourse. On the other hand, the examples with a D/T-clause, (39), do not yield a parallel inference. Rather, the sentences give rise to the interpretation that the subject, Ai, produced the linguistic form corresponding to the clauses in response to something else. This is expected if the semantic restriction the predicate imposes manifests itself with nominalized complements but not with D/T-clauses, as predicted by our analysis.

5.2 S-selection

Our analysis furthermore predicts that S-selection—which can be thought of lexical semantic restrictions on internal arguments—is observed for nominal clauses but not for D/T-clauses. This prediction is borne out. For example, the Turkish predicate *um-* "hope" is incompatible with nominal interrogatives but compatible with D/T-interrogatives:

(40) a.*Ai [kızı-nın   kazan-ıp   kazan-ma-yacağ-ın-ı   ] umdu.
       Ai   her daughter-GEN win-CONJ win-NEG-FUT-3S.POSS-ACC   hoped

      b. Ai [kızı   kazan-acak mı diye] umdu.
       Ai   her daughter win-FUT   Q   DIYE hoped

      Ai hoped and wondered whether her daughter would win.

The Japanese predicate *tazuneru* 'ask' is incompatible with nominalized declaratives but compatible with D/T-declaratives.

(41) a.*Ai-wa [musume-ga   katta hazu-na-no-o   ] shimpan-ni
       Ai   her daughter-GEN won should-COP-NMZ-ACC   judge-DAT
       (shoosai-o) tazuneta.
       details-ACC asked

      b. Ai-wa [musume-ga   katta hazu-da-to   ] shimpan-ni shoosai-o
       Ai-TOP   daughter-NOM won should-COP-TO   judge-DAT details-ACC
       tazuneta.
       asked

      'Ai asked the judge about details, saying her daughter should have won.'

At first sight, these D/T-clause examples may appear to involve violations of the predicates' selectional properties revealed by nominalized complements. However, this behavior is expected, since s-selectional properties, qua semantic restrictions on predicates' internal arguments, apply to nominalized complements but not to D/T-clauses.

6   Conclusions and open issues

This paper has dealt with two types of embedded interrogative clauses in Turkish and Japanese: one involving nominalized interrogative complements and the other involving clauses headed by specialized heads, *diye* in Turkish and *to* in Japanese (D/T-clauses). Declarative clauses involving these two embedding strategies have been investigated in the literature, especially in the context of factivity alternations (Özyıldız 2017; Kusumoto 2017). However, less attention has been given to their interrogative counterparts (Özyıldız 2019 being an exception). By providing a detailed analysis of the two types of interrogative clauses, we have shed a new light on the semantics of the two types of embedding strategies. More specifically, we have identified two interpretive contrasts between nominalized and D/T interrogatives. First, while nominalized interrogatives give rise to answer-oriented inferences, D/T-interrogatives don't. Second, D/T-interrogatives are characterized by a linguistic production inference. Our analysis accounts for the first contrast (i.e., the presence/absence of the answer-oriented inference) and the factivity alternation with declarative clauses in a unified matter. Both of them are accounted for by the idea that the relevant inferences (i.e., factivity and answer-orientedness) arise from the embedding predicates' semantic restrictions on their internal argument, given that nominalized complements are arguments while D/T-clauses are adjuncts. The linguistic production inference with D/T-clauses is accounted for by our analysis of the D/T head, which introduces an additional linguistic production event systematically related to the main attitudinal event.

   We have to leave open many issues concerning the precise analysis of D/T-clauses. Here we mention two of them. First, it is not completely clear whether all instances of D/T-clauses are adjuncts. There are reasons to suspect that at least some D/T-clauses are true complements. Certain speech act predicates, such as *iu* 'say' in Japanese, seem to obligatorily take D/T-clauses. Also, as mentioned in §2, Kusumoto (2017) observes that the Japanese 'know' *sitteiru* + *to*-clause licenses a factive inference. These data raise empirical questions regarding the precise distributions of the adjunctive use and the non-adjunctive use of D/T-clauses, as well as theoretical questions regarding what might explain such distributions, including further semantic constraints on the relation between the main event and the linguistic production event in the adjunctive use (see also fn. 8).

   Another issue concerns the relation between the adjoined D/T-clauses discussed here and other adjunctive uses of interrogatives from the literature. In particular, Kim & Tomioka (2014) discuss Korean and Japanese constructions where interrogative clauses (without a D/T-particle) adjoin to the main clause and conventionally implicate an agent- or speaker-oriented self-addressed question. We leave for another occasion a comparison of such constructions and adjoined D/T-interrogatives.

References

Alxatib, Sam. 2019. Actuality entailments and free choice. *Journal of Semantics* 36(4). 701–720. doi:https://doi.org/10.1093/jos/ffz011.

Bassi, Itai & Tatiana Bondarenko. 2020. Composing CPs: Evidence from disjunction and conjunction. In *Semantics and Linguistic Theory 30*, 583–602. doi:https://doi.org/10.3765/salt.v30i0.4837.

Bochnak, M. Ryan & Emily Hanink. 2022. Clausal embedding in Washo: Complementation vs. modification. *Natural Language & Linguistic Theory* 40(4). 979–1022. doi:https://doi.org/10.1007/s11049-021-09532-z.

Bogal-Allbritten, Elizabeth. 2016. *Building Meaning in Navajo*: University of Massachusetts, Amherst PhD dissertation.

Bondarenko, Tatiana. 2020. Factivity from pre-existence: Evidence from Barguzin Buryat. *Glossa: a journal of general linguistics* 5. 1–35. doi:https://doi.org/10.5334/gjgl.1196.

Bondarenko, Tatiana. 2023. Factivity-alternating attitude verbs in Azeri. *Languages* 8(3). doi:https://doi.org/10.3390/languages8030184.

Cattell, Ray. 1978. On the source of interrogative adverbs. *Language* 54(1). 61–77. doi:https://doi.org/10.2307/412999.

Djärv, Kajsa. 2019. *Factive and Assertive Attitude Reports*: University of Pennsylvania PhD dissertation.

Elliott, Patrick. 2017. *Elements of clausal embedding*: UCL PhD dissertation.

Elliott, Patrick, Nathan Klinedinst, Yasutada Sudo & Wataru Uegaki. 2017. Predicates of relevance and theories of question embedding. *Journal of Semantics* 34(3). 547–554. doi:https://doi.org/10.1093/jos/ffx008.

Goodhue, Daniel & Junko Shimoyama. 2022. Clausal embedding under TO in Japanese as speech acts. In *Amsterdam Colloquium 2022*, 98–105.

Hanink, Emily & Ryan Bochnak. 2017. Factivity and two types of embedded clauses in Washo. In *North East Linguistic Society 47*, 65–78.

Homer, Vincent. 2021. Actualistic interpretations in French. *Semantics and Pragmatics* 14. 1–56.

Jeong, Sunwoo. 2020. Prosodically-conditioned factive inferences in Korean: An experimental study. In *Semantics and Linguistic Theory 30*, 1–21. doi:https://doi.org/10.3765/salt.v30i0.4798.

Kim, Jooyoung & Satoshi Tomioka. 2014. Two types of unselected embedded questions. In *West Coast Conference on Formal Linguistics 31*, 276–284.

Klein, E. H. 1975. Two sorts of factive predicate. *Pragmatics Microfiche* 1.1. B5–C14.

Kratzer, Angelika. 2006. Decomposing attitude verbs. Handout from a talk honoring Anita Mittwoch on her 80th birthday at the Hebrew University of Jerusalem,

July 4 2006.

Kuno, Susumu. 1973. *The Structure of the Japanese Language*. Cambridge, MA.: The MIT Press.

Kusumoto, Kiyomi. 2017. Clause-embedding in Japanese: *to* vs. *koto* alternation. *Jinbun Ronkyu* 67(3). 49–77.

Lee, Chungmin. 2018. Non-factive alternants of the attitude verb 'know' in Korean, Turkish, and Hungarian. *Journal of The National Academy of Sciences. Republic of Korea* 58(1). 37–85.

Maier, Emar. 2017. The pragmatics of attraction: Explaining unquotation in direct and free indirect discourse. In Paul Saka & Michael Johnson (eds.), *The Semantics and Pragmatics of Quotation*, Berlin: Springer. doi:https://doi.org/10.1007/978-3-319-68747-6_9.

Major, Travis. 2021. *On the nature of "say" complementation*: University of California, Los Angeles PhD dissertation.

Moltmann, Friederike. 2020. Truthmaker semantics for natural language: Attitude verbs, modals, and intensional transitive verbs. *Theoretical Linguistics* 46. 159–200. doi:https://doi.org/10.1515/tl-2020-0010.

Moulton, Keir. 2009. *Natural Selection and the Syntax of Clausal Complementation*: University of Massachusetts, Amherst PhD dissertation.

Özyıldız, Deniz. 2017. Attitude reports with and without true belief. In *Semantics and Linguistic Theory 27*, 397–417. doi:https://doi.org/10.3765/salt.v27i0.4189.

Özyıldız, Deniz. 2019. Potential answer readings expected, missing. In *Workshop on Turkic and Languages in Contact with Turkic 4*, 74–88. doi:https://doi.org/10.3765/ptu.v4i1.4620.

Özyıldız, Deniz. 2020. Embedded clauses in Turkish: Both argumenthood and modification are paths to composition. Handout from an LSA 94 presentation.

Özyıldız, Deniz, Travis Major & Emar Maier. 2019. Communicative reception reports as hear-say: Evidence from indexical shift in Turkish. In *West Coast Conference on Formal Linguistics 36*, 296–305.

Potts, Christopher. 2007. The dimensions of quotation. *Direct compositionality* 405–431. doi:https://doi.org/10.1093/oso/9780199204373.003.0012.

Rabinovitch, Jack. 2022. Intensional Predicates as Complex Predicates: a Perspective from Restrictions on Intensional Interrogative Complements in Uyghur. In *North East Linguistic Society 52*, 35–46.

Roelofsen, Floris & Wataru Uegaki. 2020. Searching for a universal constraint on the denotations of clause-embedding predicates. In *Semantics and Linguistic Theory 30*, 542–561. doi:https://doi.org/10.3765/salt.v30i0.4834.

Saito, Mamoru. 2012. Sentence types and the Japanese right periphery. In Günther Grewendorf & Thomas Ede Zimmermann (eds.), *Discourse and Grammar: From Sentence Types to Lexical Categories*, 147–175. Berlin: Walter De Gruyter.

Saito, Mamoru. 2015. Cartography and selection: Case studies in Japanese. In Ur Shlonsky (ed.), *Beyond Functional Sequence*, 255–274. Oxford: Oxford University Press. doi:https://doi.org/10.1093/acprof:oso/9780190210588.003.0014.

Shan, Chung-chieh. 2010. The character of quotation. *Linguistics and Philosophy* 33. 417–443. doi:https://doi.org/10.1007/s10988-011-9085-6.

Shimamura, Koji. 2018. *The Theory of Quotative Complementation in Japanese Semanticosyntax*: University of Connecticut PhD dissertation.

Spector, Benjamin & Paul Egré. 2015. A uniform semantics for embedded interrogatives: an answer, not necessarily the answer. *Synthèse* 192(6). 1729–1784. doi:https://doi.org/10.1007/s11229-015-0722-4.

Stephen, Thomas. 2022. *The Semantics of Nominal and Clausal Embedding*: University of Edinburgh PhD dissertation.

Tanaka, Hideharu. 2014. The derivation of *soo-su*: Some implications for the architecture of Japanese VP. In Michael Kenstowicz, Ted Levin & Ryo Masuda (eds.), *Japanese/Korean Linguistics 23*, 265–279. CSLI Publications.

Theiler, Nadine, Floris Roelofsen & Maria Aloni. 2018. A uniform semantics for declarative and interrogative complements. *Journal of Semantics* 35(3). 409–466. doi:https://doi.org/10.1093/jos/ffy003.

Tomioka, Satoshi. 2020. Japanese embedded questions are nominal: Evidence from Quantificational Variability Effect. *Journal of Japanese Linguistics* 36(1). 121–156. doi:https://doi.org/10.1515/jjl-2019-2020.

Uegaki, Wataru. 2019. The semantics of question-embedding predicates. *Language and Linguistics Compass* 13(1). doi:https://doi.org/10.1111/lnc3.12308.

Uegaki, Wataru. 2022. *Question-orientedness and the Semantics of Clausal Complementation*. Springer. doi:https://doi.org/10.1007/978-3-031-15940-4.

Deniz Özyıldız
Universität Konstanz
Universitätsstraße 10
78464 Konstanz
Germany
deniz.ozyildiz@uni-konstanz.de

Wataru Uegaki
University of Edinburgh
3 Charles Street
EH8 9AD Edinburgh
United Kingdom
w.uegaki@ed.ac.uk